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ANDERSON ECONOMIC GROUP

# *Empowering Michigan*

## Fourth 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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# *Summary of Findings*

The University Research Corridor (URC) is an alliance of Michigan's three largest academic institutions: Michigan State University, the University of Michigan, and Wayne State University. In 2007 the URC universities asked Anderson Economic Group to undertake the first comprehensive study that benchmarks the economic impact of the URC's activities on Michigan's economy. This 2010 report is the fourth in a series of annual reports. While many benchmarks will likely not show large changes from year to year, over time these reports will reveal trends. We present the key findings of our analysis in this section.

## KEY BENCHMARKS

This report presents benchmarks using the most recent data available. We used fiscal year 2009 (July 1, 2008 to June 30, 2009) financial data to estimate the economic impact of the URC's operations on Michigan's economy in 2009. The rankings of technology transfer activities are based on the average of the annual data for the previous five years from the date of the report. For example, the ranking for start-up companies is based on the average number of companies the URC helped start each year between 2005-2009. A ranking of "1" indicates the university cluster with the highest tech transfer activity for that indicator.

The URC's economic impact in Michigan was $14.8 billion in 2009. In four years, the URC's economic impact has grown by $1.9 billion.The URC's highest ranking tech transfer activity is the number of patent grants awarded, ranking third in this year's report. See Table 1 below.

**TABLE 1. Key Benchmarks of the URC**

| | Benchmark: 2007 Report (2006 data) | 2009 Report (2008 data) | 2010 Report (2009 data) | Change Since Benchmark Year of 2007 |
|---|---|---|---|---|
| Operational Expenditures | $6.5 billion | $7.3 billion | $7.5 billion | + $1 billion |
| Fall Enrollment (Degree-Seeking Only) | 131,635 | 132,008 | 137,152 | + 5,517 students |
| Net Economic Impact[a] | $12.9 billion | $14.5 billion | $14.8 billion | + $1.9 billion |
| Tax Revenue Impact on State of Michigan | $351 million | $414 million | $401 million | + $50 million |
| Total R&D Expenditures[b] | $1.369 billion | $1.405 billion | $1.482 billion | + $113 million |
| Rank of Technology Transfer Activities[c] | | | | |
| No. of Start-up Companies Cultivated[d] | 5 | 5 | 5 | +0 Improvement |
| Patent Grants Awarded[e] | 4 | 3 | 3 | +1 Improvement |
| Technology Licenses Issued | 5 | 5 | 5 | +0 Improvement |

*Analysis: Anderson Economic Group, LLC; See remainder of report body for detailed sources and calculations.*

a. American Recovery and Reinvestment Act (ARRA) funds awarded to URC universities accounted for $57.4 million or 0.8% of operational expenditures.

b. Total R&D expenditures lag one year behind the rest of the data. This year's report includes FY 2008 R&D.

c. Rankings are based on five year averages of annual activity and are out of seven clusters. The 2007 report uses 2002-2006 data, the 2009 report uses 2004-2008 data, and the 2010 report uses 2005-2009 data.

d. The 2009 report ranking reflects revised start-up data. We removed the number of start-ups that did not involve a licensed technology, lowering the number of URC cultivated start-ups from 28 to 17.

e. The benchmark year (2007 report) ranking reflects revised patent grant data.

## SCALE OF THE URC

The URC had 137,152 students enrolled in the fall of 2009. The students at the URC universities are drawn from throughout Michigan and around the world. Students from the state of Michigan accounted for 77% of total enrollment in the fall of 2009, while 14% came from elsewhere in the U.S. and the remaining 9% came from other countries. The URC has students from every county in Michigan, every state, and more than 100 countries. See "URC Students and Alumni" on page 3 for our complete analysis.

The URC universities collectively spent almost $7.5 billion on operations in FY 2009. The $7.5 billion was used to pay the salaries of 50,176 full-time-equivalent staff and faculty, purchase supplies and equipment, and maintain buildings and equipment. This figure—$7.5 billion—is about 2% of all economic activity in the state, as measured by Michigan's gross state product.

In 2009, there were 550,595 known alums of a URC university living in Michigan, making up 7.2% of Michigan's population over the age of 18 years. These alums earned an estimated $26 billion in salary and wages in 2009, or 15.3% of all wage and salary income in Michigan. See Table 2 below for the scale of the URC.

**TABLE 2. Scale of the URC, FY 2009**

| Category | Impact |
|---|---|
| Number of Enrolled Students (degree seeking) | 137,152 |
| Full-Time-Equivalent Employees | 50,176 |
| Operational Expenditures (e.g. supplies, payroll, equipment) | $7.5 billion |
| Known Alumni Living in Michigan | 550,595[a] |
| Wage and Salary Earnings of URC Alumni in Michigan | $26 billion |

*Data Sources: National Center for Education Statistics, IPEDS; URC Universities*
*Analysis: Anderson Economic Group, LLC*

a. The number of alumni living in Michigan is lower than the 572,123 alumni in Michigan reported in the 2009 report. This is due to improvements in the alumni databases of the URC that led to downward revisions. See Methodology in A-1.

## ECONOMIC IMPACT

We define *net economic impact* as the additional earnings to state residents caused by the operations of these institutions. In estimating the net economic impact, we follow a careful methodology that counts expenditures only once, takes into account substitution of one activity within the state by another, and uses very conservative multipliers for indirectly-caused activity. Among other conservative assumptions, we assume that most URC students would attend college even if these research institutions were not located in Michigan, and that many employees of the URC would find other jobs in Michigan even if the URC institutions left Michigan. We detail our methodology for the economic impact of the operational expenditures by URC universities in "Operational Expenditures Methodology" in Appendix A.

In FY 2009, the URC's operations contributed $14.8 billion to the Michigan economy. This was due to expenditures by the URC universities on non-payroll items

(such as supplies and equipment) and by employees, students, and alumni. See Table 3 below.

**TABLE 3. Net Economic Impact of URC, FY 2009 (in billions)**

| Impact Category | Net Economic Impact |
|---|---|
| Non-payroll Operating Expenditures | $3.2 |
| Faculty & Staff Wages and Benefits | $4.7 |
| URC Student Expenditures | $2.1 |
| Incremental Alumni Earnings[a] | $4.8 |
| **TOTAL NET ECONOMIC IMPACT** | **$14.8** |

*Source: Anderson Economic Group, LLC*

a. We estimate that $4.04 billion of earnings by URC alumni living in Michigan in 2009 were additional earnings directly caused by the education they received at a URC university. See "Methodology" on page 26.

In addition to new earnings, 72,042 jobs in Michigan were directly and indirectly supported by the URC's operations in the state in FY 2009. This jobs figure includes 10,912 faculty members and 39,265 staff directly employed by the URC universities, and 21,865 indirectly generated jobs in other industries in the state due to the expenditures by the URC universities and their faculty, staff, and students. Our complete analysis is in "Impact on Jobs and Income" on page 22.

## NEW STATE TAX REVENUE DUE TO URC

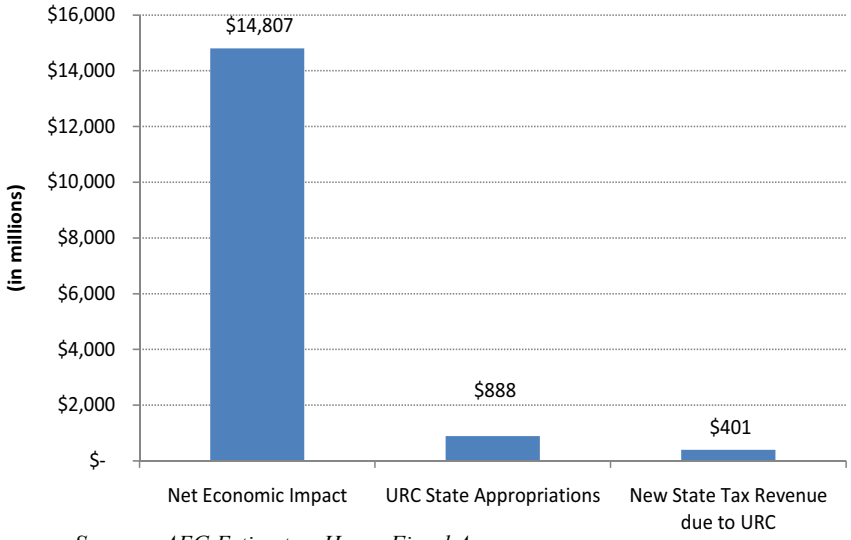
In 2009, we estimate that $2.8 billion in wages of URC employees and over $4 billion of the $26 billion in URC alumni earnings in Michigan were caused by the URC by keeping more college graduates in Michigan's labor force and by helping URC graduates earn more than they would have otherwise. We estimate that the tax revenue the state received because of these earnings, that otherwise would not exist in the state, is $401 million.[1] This includes new tax revenue the state receives from personal income, sales and use, property, and gasoline taxes. Our complete analysis can be found in "Impact on State Revenue" on page 27.

## COMPARISON OF ECONOMIC IMPACT WITH STATE APPROPRIATIONS

Comparing the URC's net economic impact on the state to the State of Michigan's funding of the URC universities illustrates how much greater the benefits of the URC are compared to the State's cost. The $14.8 billion in net economic impact is over 16 times greater than the state's funding for URC universities, as shown in Figure 1, "URC Net Economic Impact and New State Tax Revenue vs. State Appropriations," on page iv. Additionally, the State of Michigan receives $401 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.

1. The number of alumni living in Michigan is lower than in the 2009 report due to improvements in the alumni databases of the URC that led to downward revisions. This has also meant lower tax revenue from alumni in this year's report. See Methodology on page A-1.

**FIGURE 1. URC Net Economic Impact and New State Tax Revenue vs. State Appropriations**




*Sources: AEG Estimates; House Fiscal Agency*
*Analysis: Anderson Economic Group, LLC*

## COMPARISON WITH PEER UNIVERSITY CLUSTERS

To benchmark the URC against other university clusters in the nation, we selected six of the best-known groups of universities in California (North and South), Illinois, Massachusetts, North Carolina, and Pennsylvania. Each cluster includes three well-known universities from the same state.

- Northern California: U of C San Francisco, U of C Berkeley, Stanford
- Southern California: U of C Los Angeles, U of C San Diego, University of Southern California
- Illinois: University of Illinois, University of Chicago, Northwestern
- Massachusetts: Harvard, MIT, Tufts
- North Carolina: Duke, University of North Carolina, North Carolina State
- Pennsylvania: Penn State, University of Pittsburgh, Carnegie Mellon

We benchmark the URC against these peer university clusters on student enrollment and degree completions, research and development expenditures, and technology transfer activities. We use the most recent data available, which in some cases may lag by two years.

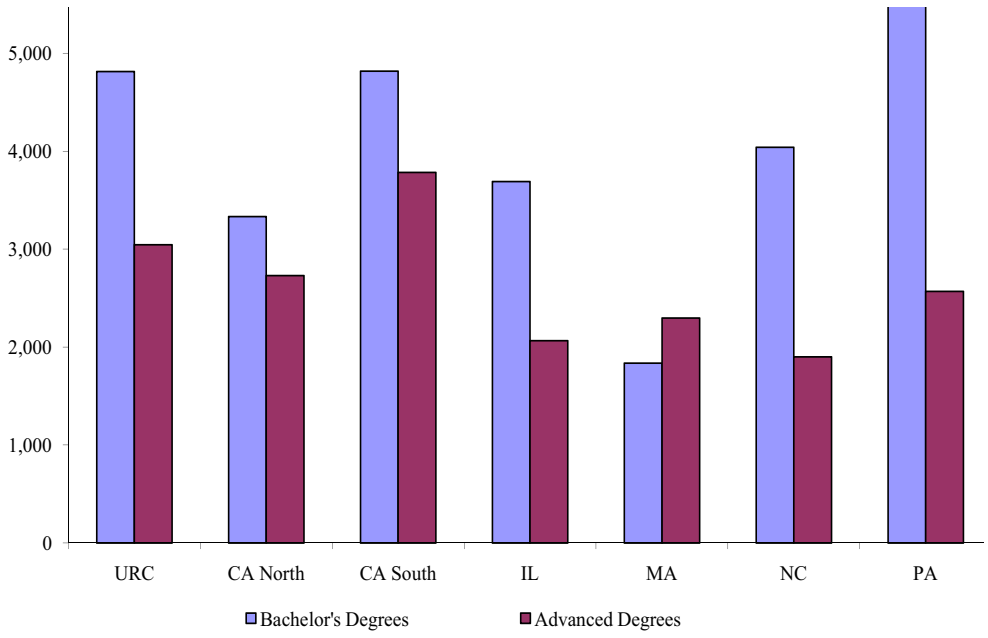
**Student Enrollment and Degrees Granted.** The URC's 132,008 students in the fall of 2008 (the most recent year for which we have data for all university clusters) make it the largest research university cluster, in terms of enrollment, in our analysis. The next largest is the Pennsylvania cluster with just over 120,000 students enrolled in the fall of 2008.

The URC ranks second among the university clusters with 28,095 degrees conferred during the academic year of 2008-09. The Pennsylvania cluster awarded more undergraduate degrees than the URC (28,195). Only the Illinois cluster (11,167) awarded more advanced degrees than the URC (9,949).

The URC ranks particularly well in awarding a high number of degrees in certain subject areas. The URC confers more bachelors, masters, doctoral and professional degrees in *Medicine and Biological Science* than any of the other comparison university clusters. After accounting for total number of undergraduate degrees conferred, the URC ranks second in *Business Management and Law* and *Medicine and Biological Science* As a share of total graduate degrees conferred, the URC ranks first in *Medicine and Biological Science* and second in *Physical Science, Agriculture, and Natural Resources*.

Michigan has a vibrant high-tech industry, and the URC universities graduate a large number of students with degrees that prepare them for jobs in these industries. We define "high tech" as degrees in biological and biomedical sciences, physical sciences, computer sciences, architecture, engineering, mathematics and statistics, and some agricultural sciences. As shown in Figure 2 below, the URC awarded the third largest number of high tech degrees (7,857). Only the Southern California (8,599) and Pennsylvania (8,093) university clusters awarded more high-tech degrees than the URC.

**FIGURE 2. Completion of High Tech Degrees, 2008-2009**




*Base Data Source: National Center for Education Statistics, IPEDS*
*High-Tech Definition: Anderson Economic Group, LLC*
*See "Academic Program Definitions" on page 9 for a definition of "high tech" degrees.*

**R&D Expenditures.** R&D expenditures by the seven university clusters in FY 2008 totalled over $11.6 billion, which accounts for over 22% of R&D expenditures by all U.S. universities. The URC universities spent nearly $1.5 billion on R&D in FY 2008. Approximately 58% of R&D funding came from federal sources, bringing almost $862 million in federal dollars into the state of Michigan for research. See Table 4 below.

**TABLE 4. Total Research and Development Expenditures, 2008**

| | Total Expenditures (in millions) | Federally Funded Expenditures | Federal Share of Total Expenditures | Institutional Share of Total Expenditures[a] |
|---|---|---|---|---|
| **Michigan's URC** | **$1,482** | **$862** | **58%** | **27%** |
| Northern California | $2,165 | $1,231 | 57% | 18% |
| Southern California | $2,233 | $1,312 | 59% | 19% |
| Illinois | $1,342 | $817 | 61% | 26% |
| Massachusetts | $1,252 | $974 | 78% | 2% |
| North Carolina | $1,659 | $956 | 58% | 17% |
| Pennsylvania | $1,507 | $1,034 | 69% | 15% |
| *All U.S. Universities* | *$51,909* | *$31,231* | *60%* | *20%* |

*Source: National Science Foundation, Integrated Science and Engineering Resources Data System*
*Analysis: Anderson Economic Group, LLC*

a. Institutional funding includes research funding from non-profit organizations, corporate foundations, endowments, and fellowships to students.

**Tech Transfers.** An important function of successful university R&D is its effectiveness at transferring technology to the private sector. The URC ranks third in average annual number of patents awarded and fifth in number of licenses granted. The URC ranks fifth in licensing revenue per dollar of expenditure. This indicates a higher percentage of URC expenditures resulted in a product that is licensed and sold than two of the other comparison clusters. In addition, over the past five years, the URC has helped cultivate on average 14 start-up companies annually. See Table 5 on page vii.

**TABLE 5. Average Annual Patent and Licensing Activity, 2005-2009**

| | Start-up Companies Cultivated | *Rank* | Patent Grants | *Rank* | Licensing Revenue (in millions) | *Rank* | Revenues per Expenditures | *Rank* |
|---|---|---|---|---|---|---|---|---|
| **Michigan's URC** | **14** | **5** | **136** | ***3*** | **$31.8** | ***5*** | **2.1%** | ***5*** |
| Northern California | 21 | 3 | 198 | *1* | $187.9 | *2* | 8.7% | *2* |
| Southern California | 29 | 2 | 126 | *4* | $53.1 | *4* | 2.4% | *4* |
| Illinois | 13 | 6 | 101 | *5* | $225.8 | *1* | 16.9% | *1* |
| Massachusetts | 31 | 1 | 192 | *2* | $80.0 | *3* | 6.4% | *3* |
| North Carolina | 11 | 7 | 85 | *7* | $14.1 | *7* | 0.9% | *7* |
| Pennsylvania | 18 | 5 | 88 | *6* | $16.2 | *6* | 1.1% | *6* |

*Data Source: Universities' websites, technology transfer offices, Association of Technology Managers (AUTM) Surveys*
*Analysis: Anderson Economic Group, LLC*
*Note: See "Average Annual Patent and Licensing Activity, 2005-2009" on page 17 for complete source notes and methodology.*

## COMPARISON WITH INTERNATIONAL UNIVERSITIES

In addition to benchmarking the URC to other top universities in the U.S., the URC has started comparing itself to top universities worldwide. While a more comprehensive comparison may be possible in the future if data is available, our initial research in this report compares total R&D expenditures of three clusters of universities in other countries.

To select these universities we started with the countries that spend the most on R&D as a percentage of GDP. Next we looked at university rankings selected schools that were in the top 150 worldwide. Finally, we selected countries with good available data that allowed for an apples-to-apples comparison, and had three top universities in close proximity to each other. We selected universities in three countries: Israel, Japan, and the United Kingdom. Israel and Japan are in the top five countries with highest R&D expenditures as a share of gross domestic product (GDP), and the United Kingdom has three universities ranked in the top 25 worldwide.[2] We show the universities below.

- Israel: Technion University, Hebrew University, Tel Aviv University
- Japan: University of Tokyo, Kyoto University, Tokyo Institute of Technology
- United Kingdom: University of Oxford, University of Cambridge, University College of London

We compared R&D expenditures by these international universities to the URC. While these universities differ in size, total R&D expenditures is a good indicator of the sheer amount of research activity clustered at these insitutions.The United King-

2. R&D expenditures as a percentage of GDP is from the *OECD Science, Technology and Industry Outlook 2008*. University rankings are from the Academic Ranking of World Universities by the Center for World-Class Universities.

dom cluster outpaced the URC and the other two international clusters in total R&D expenditures with $2.1 billion in 2008. The URC, with R&D expenditures of $1.5 billion, performed better than both the Japanese and Israeli clusters in overall R&D spending. Japan's cluster spent a total of $859 million on R&D, while Israel's cluster spent the least, with a total of $330 million. As a country, Israel spends the most on R&D as a percentage of GDP. While Israel's population is three-fourths that of Michigan's, and enrollment is half that of the URC's, the URC spent over four times more than the Israeli cluster on R&D in 2008. See Table 6 below.

**TABLE 6. FY 2008 R&D Expenditures for International Clusters and URC**

| | R&D Expenditures (in millions) |
|---|---|
| **Michigan's URC** | **$1,482** |
| Israel | $330 |
| Japan | $859 |
| United Kingdom | $2,144 |

*Source: See Methodology on page A-1.*
*Analysis: Anderson Economic Group*

## 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. Anderson Economic Group has completed economic and fiscal impact studies for a variety of public and private sector clients. See "Appendix B: About the Authors" for more information.

# *I. Introduction*

## WHAT IS MICHIGAN'S UNIVERSITY RESEARCH CORRIDOR?

The University Research Corridor (URC) is an alliance of Michigan's three largest academic institutions: Michigan State University, the University of Michigan, and Wayne State University. The purpose of this alliance is to accelerate economic development in Michigan 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, but the URC's 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 page 2.

## REPORT PURPOSE & METHODOLOGY

Michigan's University Research Corridor universities asked Anderson Economic Group 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 fourth in a series of annual reports intended to measure and benchmark the contributions of the URC universities to Michigan. The information in this report allows 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 question: What would the loss be to the state if the URC universities left Michigan? We then studied the loss in terms of jobs, earnings, tax revenue, and research. The following four chapters of this report provide quantitative measures of how the URC is performing in those areas.

## PEER UNIVERSITY CLUSTERS

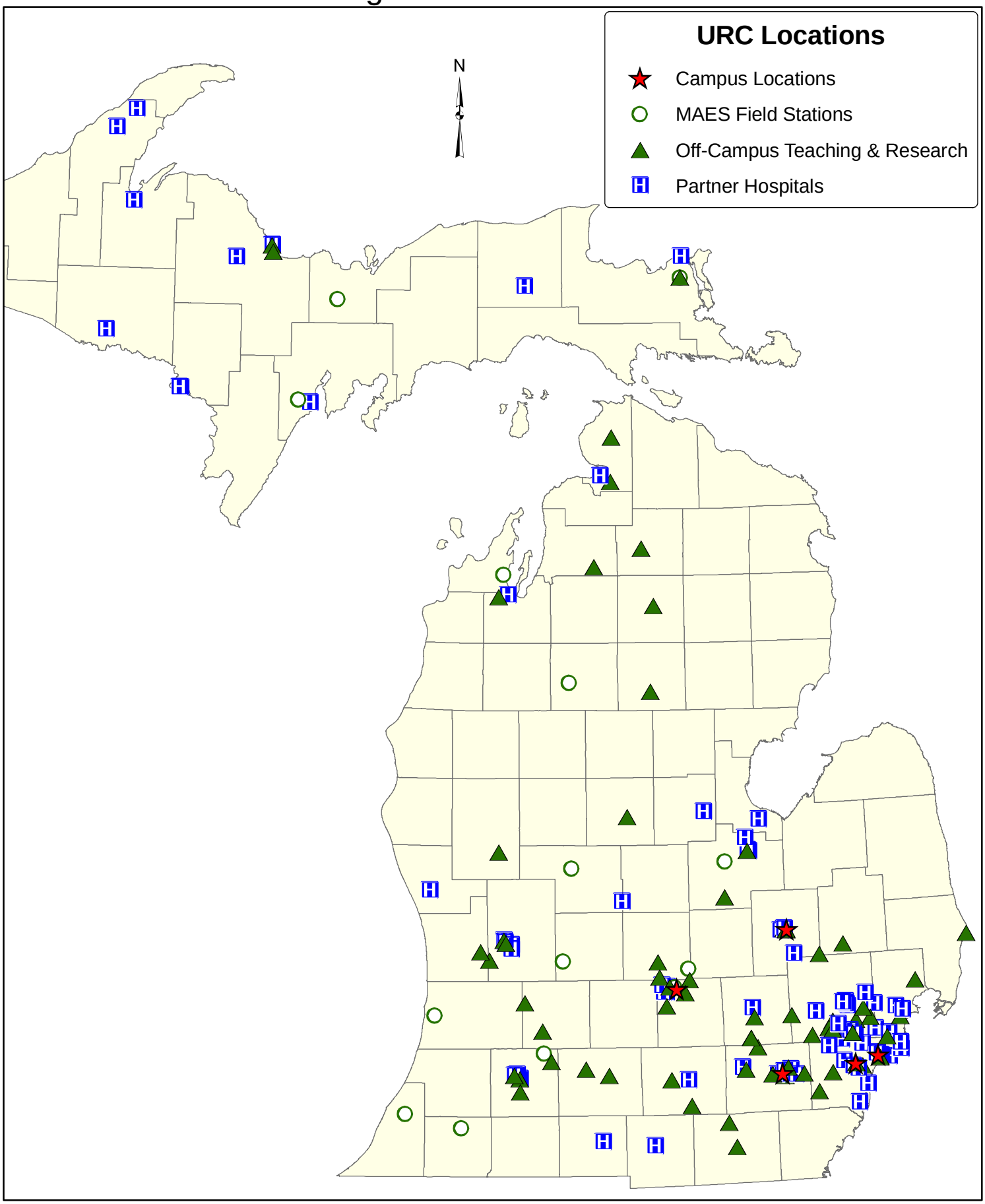
In addition to tracking the URC's performance year-to-year, we compare the URC to six peer university clusters in five states. We compare Michigan's URC with some of the best universities (public and private) in each of these states, as shown in Table 7 below, on a number of research and technology transfer measures.

**TABLE 7. Comparison Peer University Clusters**

| **Michigan's URC** | Michigan State University | University of Michigan | 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) | Tufts University |
| **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 |

*Source: Anderson Economic Group, LLC*

# URC's Presence in Michigan




Created By: Anderson Economic Group, LLC
Data Source: ESRI; Michigan Sate University, University of Michigan, Wayne State University
September 2007

# II. URC Students and Alumni

## URC STUDENT ENROLLMENT

The University Research Corridor had 137,152 students enrolled in the fall of 2009. This represents a 2.3% increase in enrollment from the fall of 2008 when total URC enrollment was just over 132,000. The number of undergraduate students increased, although graduate student enrollment at URC universities declined 11%. See Table 8 below.

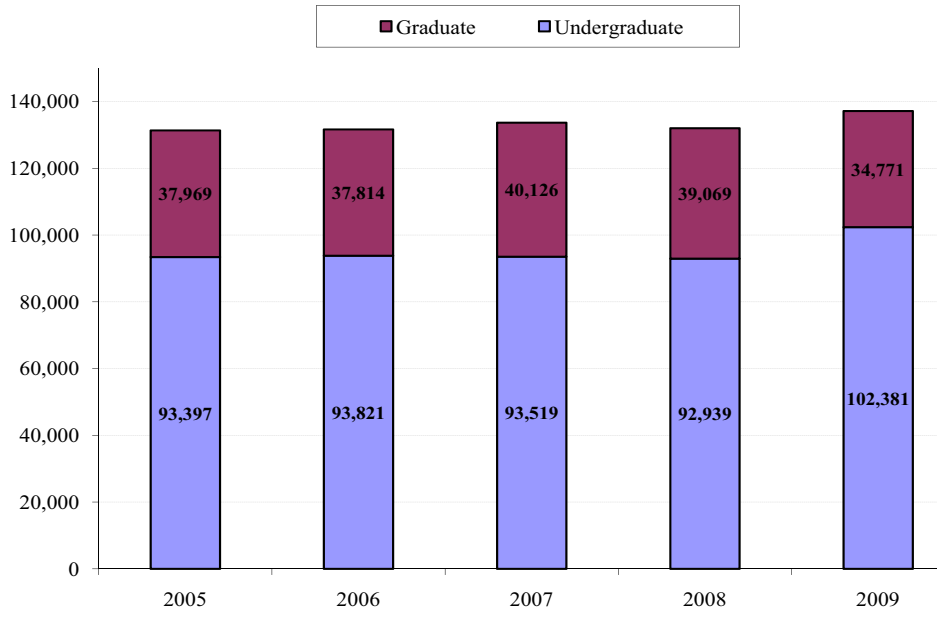
**TABLE 8. URC Enrollment, Fall 2005-2009**

| | 2005 | 2006 | 2007 | 2008 | 2009 | Change 2008-09 |
|---|---|---|---|---|---|---|
| Undergraduate | 93,397 | 93,821 | 93,519 | 92,939 | 102,381 | 10.2% |
| Graduate | 37,969 | 37,814 | 40,126 | 39,069 | 34,771 | -11.0% |
| TOTAL | 131,366 | 131,635 | 133,645 | 132,008 | 137,152 | 2.3% |

*Note: Previous reports had an "other" category that included non-degree students.*
*Data Source: IPEDS fall enrollment numbers for 2005-2008, URC Registrar for 2009.*
*Analysis: Anderson Economic Group, LLC*

As shown in Figure 3, the ratio of undergraduate to graduate students increased from 2005 to 2009, with graduate enrollment decreasing and undergraduate enrollment increasing. In 2009, approximately 75% of total enrollment was comprised of undergraduate students and 25% graduate students (including doctoral and professional).

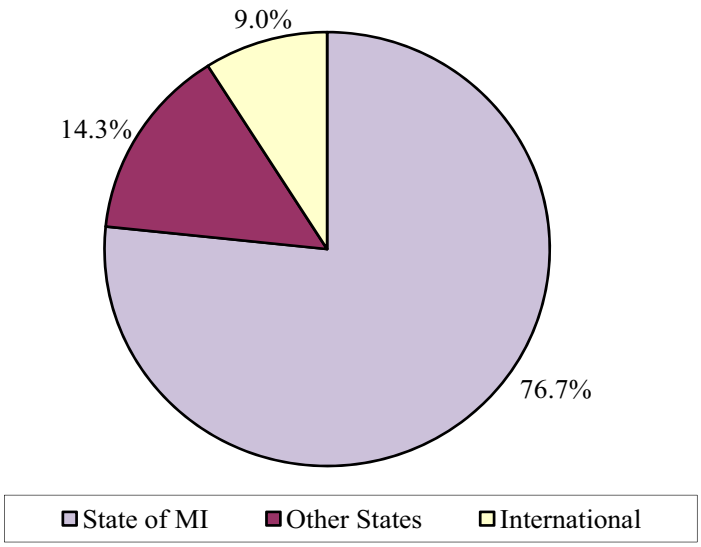
**FIGURE 3. URC Enrollment, Fall 2005-2009**




*Data Source: Offices of the Registrar at the URC Universities*
*Analysis: Anderson Economic Group, LLC*

The URC helps draw talented students to Michigan, many of whom spend their working careers in the state. Students who attend URC universities are drawn from throughout the state, across the United States, and around the world. In fall of 2009, students from the state of Michigan accounted for the majority (77%) of total enrollment in URC universities. About 14% came from elsewhere in the United States and 9% came from other countries, as shown below in Figure 4.

**FIGURE 4. Origin of URC Students, Fall 2009**




*Data Source: Offices of the Registrar at the URC Universities*
*Analysis: Anderson Economic Group, LLC*

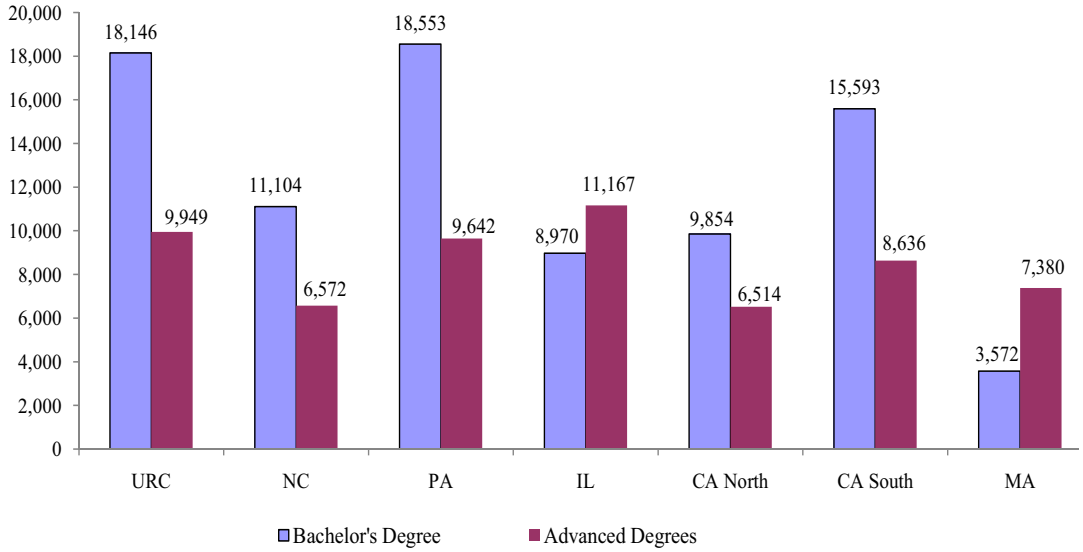
## TOTAL DEGREES GRANTED

We compare the URC's enrollment and degrees granted with other peer university clusters in five states: California, Illinois, Massachusetts, North Carolina, and Pennsylvania. We present the list of peer university clusters in Table 7 on page 1.

The URC's fall 2008 enrollment of 132,008 students make it the largest research university cluster, in terms of enrollment, of those in our analysis. The next largest is the Pennsylvania cluster, with just over 120,000 students enrolled in fall 2008. Total enrollment (undergraduate and graduate) at these university clusters has grown slightly from 2005 to 2008. The average annual growth rate for the URC was approximately 0.2% during this time period, or about 200 students annually, and most of the comparison university clusters experienced annual growth of about 0.4%.

During the 2008-2009 academic year, the URC ranked second in total number of degrees (undergraduate and graduate) conferred overall. The Pennsylvania cluster (28,195) conferred 100 more degrees than the URC (28,095). As shown in Figure 5, the URC issued 18,146 undergraduate degrees and Pennsylvania granted 18,553. Only the Illinois cluster (11,167) awarded more advanced degrees than the URC (9,949).

**FIGURE 5. Completions by Type of Degree, 2008-09 academic year**




*Data Source: National Center for Education Statistics, IPEDS Enrollment*
*Analysis: Anderson Economic Group, LLC*

## DEGREES BY PROGRAM AREA

We analyzed the number of degrees granted by the URC and the peer university clusters by subject area. First, we discuss the academic programs and then the number of undergraduate and graduate degrees conferred in each area.

### *Academic Program Definitions*

The academic program areas used in this section are based on the National Center for Education Statistics (NCES) Classification of Instructional Programs (CIP) codes for 2000. The composition of each program area 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 con-

sumer 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 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; and physical sciences.

### *Undergraduate Degrees Conferred*

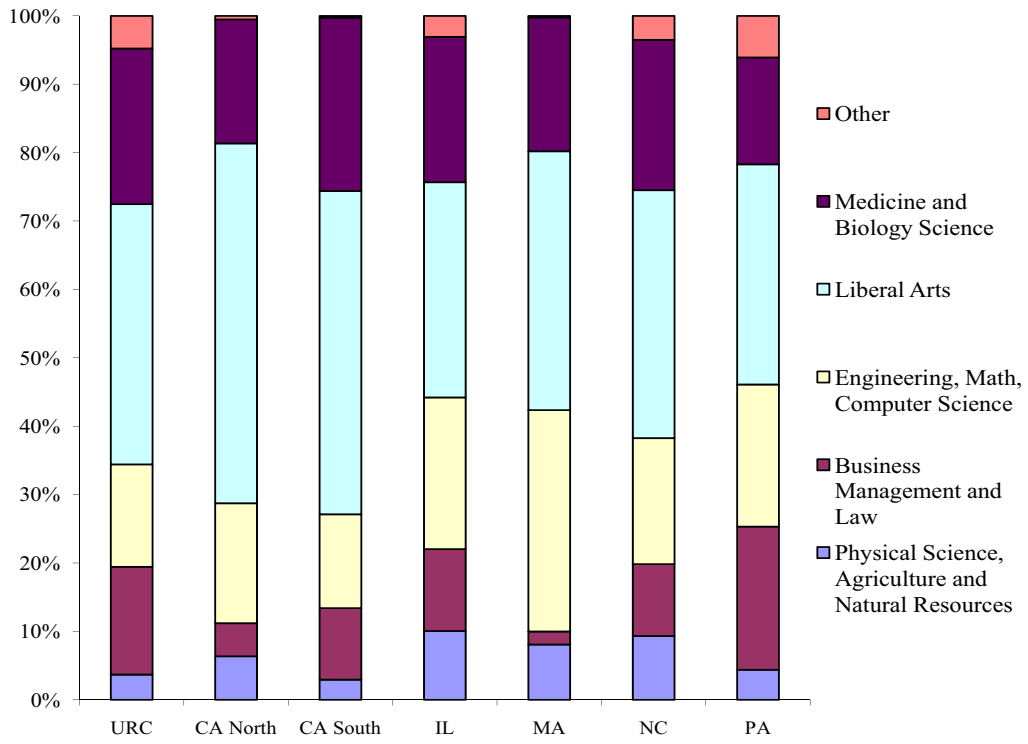
The URC confers more bachelor's, masters, doctoral and professional degrees in *Medicine and Biological Science* than any of the other comparison university clusters. The URC was in the top three for number of bachelor's degrees awarded in *Physical Science, Agriculture, and Natural Resources*; *Engineering, Math and Computer Science*; *Liberal Arts*; and *Business Management and Law*.[3] Looking at advanced degrees awarded, the URC was first in *Physical Science, Agriculture and Natural Resources*, fourth in *liberal arts,* and top three in the other four academic programs.

While the URC confers more degrees in medicine, the physical sciences, and business than most of our comparison university clusters, this is partially a result of the URC teaching thousands more students each year overall than these comparison schools. To put the number of degrees awarded into context, Figure 6, "Undergraduate Degrees Conferred by Area, 2008-2009," and Figure 7, "Graduate Degrees Conferred by Area, 2008-2009," illustrate the concentration of type of degree conferred, as measured by total degrees awarded for that academic year.

3. See the academic program definitions at the end of this section for information on the composition of each academic program area.

After accounting for total number of undergraduate degrees conferred, the URC ranks second in *Business Management and Law* and *Medicine and Biological Science*. The URC ranks third in *Liberal Arts,* and sixth in *Physical Science, Agriculture, and Natural Resources* and *Engineering, Math, Computer Science.* The Massachusetts cluster issues a high concentration of undergraduate degrees in engineering, math, computer science (32% of undergraduate degrees conferred), while the Northern California cluster primarily grants bachelor's degrees in liberal arts (52%).

**FIGURE 6. Undergraduate Degrees Conferred by Area, 2008-2009**

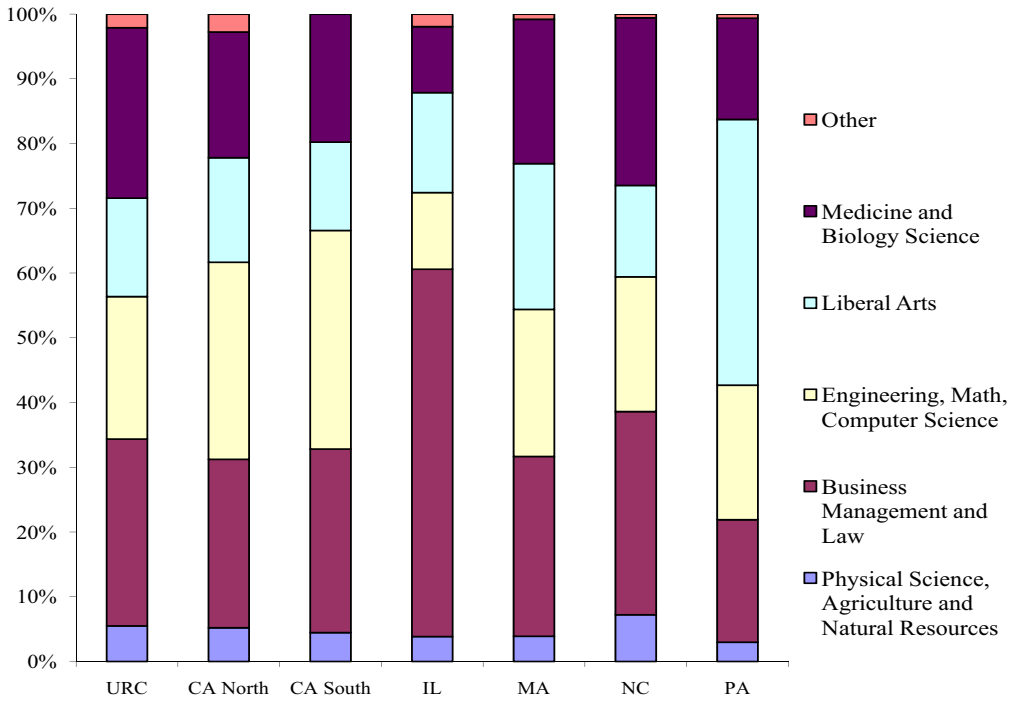



*Data Source: National Center for Education Statistics, IPEDS*
*Analysis: Anderson Economic Group, LLC*

### *Graduate Degrees Conferred*

As a share of total graduate degrees conferred, the URC ranks first in *Medicine and Biological Science,* second in *Physical Science, Agriculture, and Natural Resources*, third in *Business Management and Law*, fourth in *Engineering, Math, Computer Science*, and fifth in *liberal arts.* The Pennsylvania cluster awards over a third of their advanced degrees in liberal arts (41%). The Illinois cluster confers the majority of its advanced degrees in business management and law (56%)—this is the most concentrated share of any other cluster.

**FIGURE 7. Graduate Degrees Conferred by Area, 2008-2009**



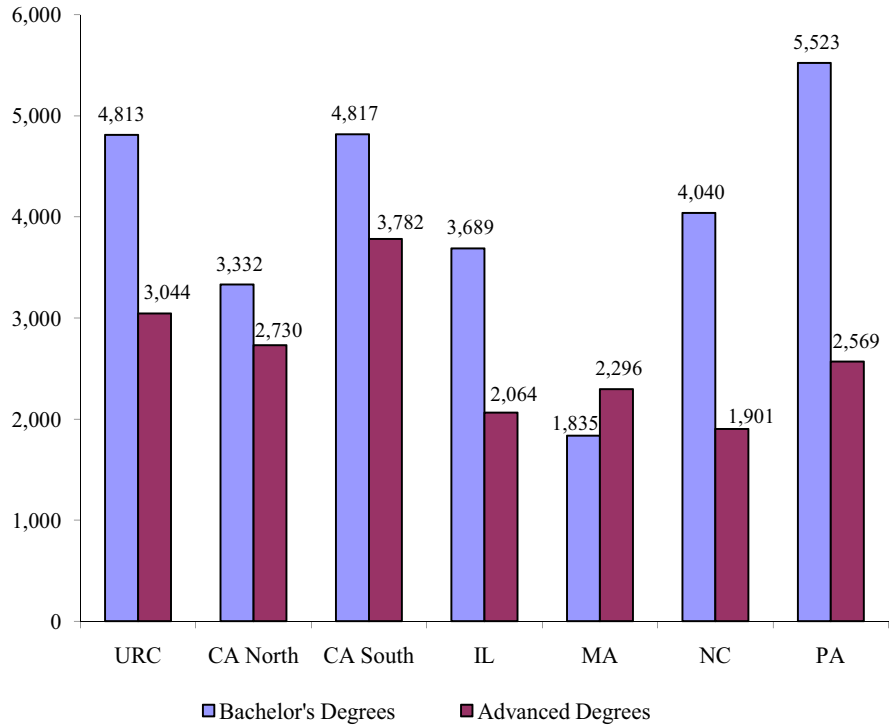

*Data Source: National Center for Education Statistics, IPEDS*
*Analysis: Anderson Economic Group, LLC*

Michigan has a vibrant high-tech industry, and the URC universities graduate a large number of students with degrees that prepare them for jobs in this industry. AEG's definition of high-tech jobs (one that we use regularly to assess Michigan's high-tech industry in Southeast Michigan) includes many life sciences jobs.[4] The number of life sciences jobs in Michigan has grown since 2000 while other industries have shed a significant numbers of jobs.[5] The URC grants the most degrees of any university cluster in medicine and biological sciences. These degrees prepare students for high tech life sciences jobs in medical laboratories, research laboratories, and pharmaceutical manufacturing.

As shown in Figure 8, the URC awarded the third largest number of high-tech degrees (7,857). Only the Southern California (8,599) and Pennsylvania (8,093) university clusters awarded more high-tech degrees than the URC.

4. See Scott D. Watkins, Cameron Van Wyngarden, and Lauren Hathaway, *Driving Southeast Michigan Forward*, prepared for Automation Alley (November 2008).
5. See Caroline M. Sallee, Hilary A. Doe, and Patrick L. Anderson, *Life Sciences Industry in Michigan the University Research Corridor* (May 2009).

**FIGURE 8. Completion of High Tech Degrees, 2008-2009**




*Data Source: National Center for Education Statistics, IPEDS*
*Analysis: Anderson Economic Group, LLC*

## MEDICAL EDUCATION IN THE URC

**Medical Schools.** The URC sponsors the only medical schools in the state of Michigan that provide Doctor of Medicine (M.D.) and Doctor of Osteopathic Medicine (D.O.) degrees. Michigan's URC has four medical schools. All three URC universities have allopathic (M.D.) medical schools and Michigan State also has an osteopathic (D.O.) medical school.

These medical schools train students through a combination of classes taught on campus and in clinical settings. Students typically spend the first two years of their medical education in a classroom on campus and the next two years in clerkships at hospitals located throughout Michigan. For example, Michigan State's College of Human Medicine has students at six community campuses, five of which are located outside East Lansing. MSU's College of Osteopathic Medicine has 21 affiliated hospital training sites in which they place third- and fourth-year medical students. University of Michigan trains students primarily in its own hospital and health centers and in other locations in Southeast Michigan. Wayne State University trains many students in hospitals close to its medical school in Detroit.

In 2008-2009, the most recent year data was available, Michigan's URC graduated 691 students from its medical schools, almost a 10% increase from the 2007-2008

academic year. URC institutions graduate the most students in medicine and biological science compared to the other university clusters in this report.[6]

**TABLE 9. URC Medical School Graduates, 2000-2009**

| University | Degree Granted | 2000 | 2008 | 2009 | % Change 2007-2008 |
|---|---|---|---|---|---|
| Michigan State University | M.D. | 102 | 82 | 107 | *30.5%* |
| Michigan State University | D.O. | 107 | 135 | 173 | *28.1%* |
| University of Michigan | M.D. | 160 | 169 | 161 | *-4.7%* |
| Wayne State University | M.D. | 243 | 243 | 250 | *2.9%* |
| TOTAL | | 612 | 629 | 691 | *9.9%* |

*Source: National Center for Education Statistics, IPEDS*
*Analysis: Anderson Economic Group, LLC*

**Dentistry Program.** The University of Michigan School of Dentistry offers students a Doctor of Dental Surgery (DDS) program and a dental hygiene program.[7] In addition, the school teaches specialty programs (endodontics, oral and maxillofacial surgery, orthodontics, oral diagnosis, oral pathology, pediatric dentistry, and periodontics) and continuing education programs for practicing dentists.

In 2008 and 2009, the University of Michigan School of Dentistry program graduated a total of 222 students with a DDS degree. During the same two year time period, 56 students graduated with a dental hygienist degree. See Table 10 below.

**TABLE 10. Graduates from the University of Michigan School of Dentistry**

| Program | 2000 | 2008 | 2009 | Total 2008 & 2009 | Change 2000-2009 |
|---|---|---|---|---|---|
| Dentistry (DDS) | 95 | 111 | 111 | 222 | *16.8%* |
| Dental Hygiene (Bachelor's and Master's Degree) | 28 | 28 | 28 | 56 | *0.0%* |
| TOTAL | 123 | 139 | 139 | 278 | *13.0%* |

*Source: National Center for Education Statistics, IPEDS*
*Analysis: Anderson Economic Group, LLC*

**Veterinary Medicine.** Michigan State University has the only school of veterinary medicine in the state and one of only 28 veterinary schools in the country. Its Col-

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

7. The DDS (Doctor of Dental Surgery) and DMD (Doctor of Dental Medicine) are the same degree. The majority of dental schools award the DDS degree; however, some award a DMD degree. The amount of education required for the degrees and the essence of the degrees are the same.

lege of Veterinary Medicine offers a four-year Doctor of Veterinary Medicine (DVM) degree requiring five semesters of classroom training and four semesters of clinical work. Third- and fourth-year veterinary students spend three weeks in equine and food-animal practices throughout Michigan to experience the daily routine of large-animal practice.[8]

As seen in Table 11 below, the college issued a total of 214 students a Doctorate in Veterinary Medicine in 2008 and 2009. The college also operates the Veterinary Teaching Hospital (VTH), the only tertiary referral center for veterinary medicine in the state of Michigan. The VTH has one of the largest case loads in the nation, seeing more than 136,000 animals (23,000 annually and an additional 113,000 in the field).

**TABLE 11. Graduates from Michigan State's College of Veterinary Medicine**

| Program | 2000 | 2008 | 2009 | Total 2008 & 2009 | Change 2000-2009 |
|---|---|---|---|---|---|
| Veterinary Medicine (DVM) | 106 | 107 | 107 | 214 | 0.9% |
| Veterinary Biomedical and Clinical Sciences (Cert, MS, PhD) | 0 | 7 | 5 | 12 | na |
| Total Degrees Granted | 106 | 114 | 112 | 226 | 5.7% |

*Source: National Center for Education Statistics, IPEDS*
*Analysis: Anderson Economic Group, LLC*

The college houses over 15 research centers and facilities, through which it provides research and service programs. In particular, the college's Diagnostic Center for Population and Animal Health runs over 1.5 million tests a year to provide an early warning system for impending epidemics; to identify infectious animal disease, contaminants, and regulatory diseases; and to diagnose nutritional diseases. The Veterinary Extension within the college focuses on solving and preventing animal health management problems to ensure its safety for human consumption. The program is currently researching Johnes Disease, Avian Influenza, and Mad Cow Disease.[9]

## NUMBER OF URC ALUMNI

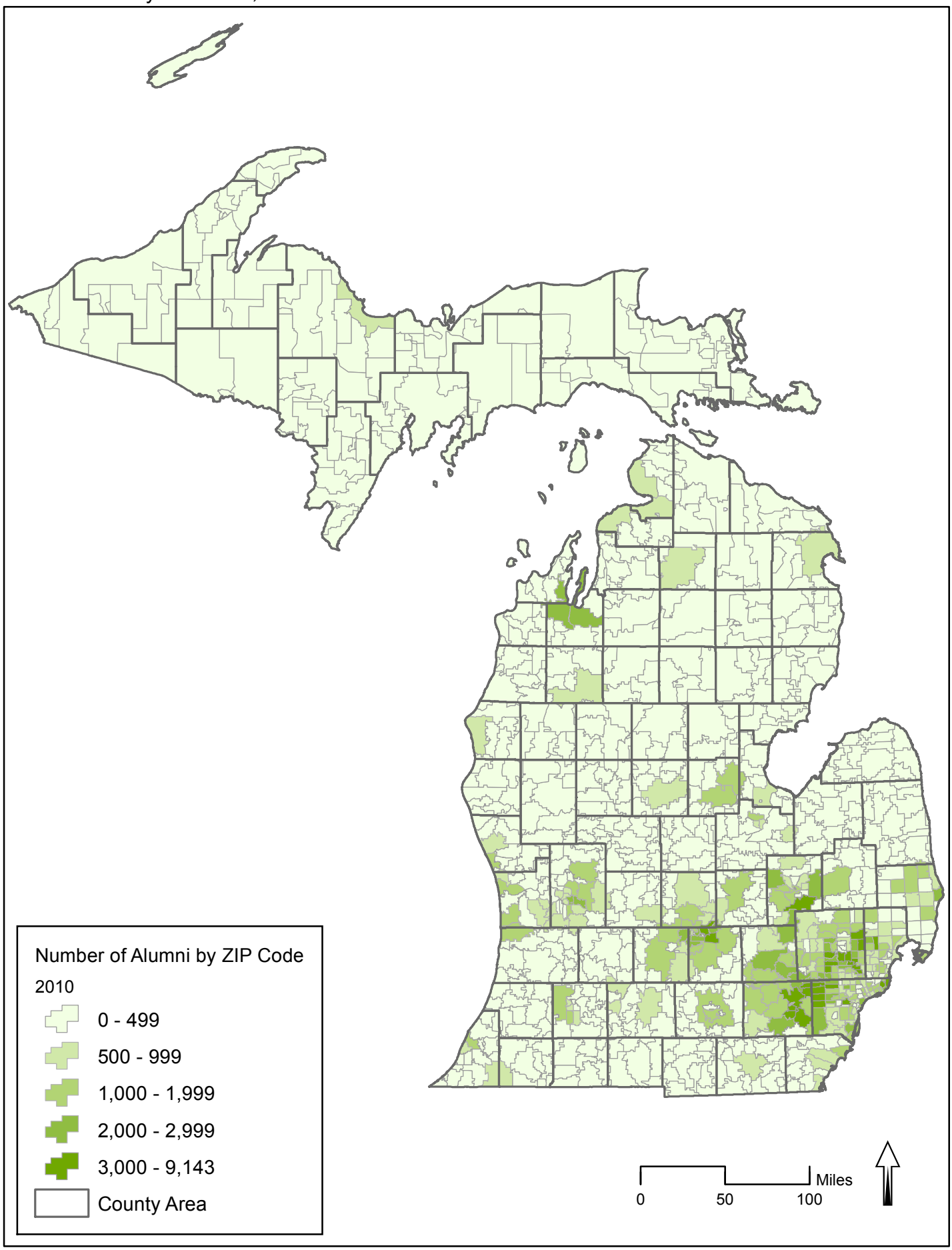
As of summer 2010, there were 550,595 URC alumni living in Michigan, making up 7.2% of Michigan's population over the age of 18 years.[10] URC universities currently have alumni in every state in the U.S. (see "URC Alumni by State, 2010" on page 12), and in every county in Michigan (see "URC Alumni in Michigan by Zipcode, 2010" on page 13.) URC alumni also live in more than a 170 countries.

8. Information provided by MSU's College of Veterinary Medicine.
9. Ibid.
10. According to the U.S. Census Bureau, Michigan had 7,619,835 residents over the age of 18 years on July 1, 2009.

URC Alumni by State, 2010


*Data: ESRI, Inc.; University Alumni Associations.*
*Source: Anderson Economic Group, LLC, 2010.*

URC Alumni by ZIP Code, 2010




*Data: ESRI, Inc.; University Alumni Associations.*
*Source: Anderson Economic Group, LLC 2010.*
*Note: Data include alumni with known ZIP codes.*

# *III. Comparison with Peer University Clusters*

## COMPARISON PEER UNIVERSITY CLUSTERS

To gauge how the URC compares with other university clusters in the nation, we selected six of the best-known groups of universities in California (North and South), Illinois, Massachusetts, North Carolina, and Pennsylvania. Each of these clusters has three universities from the same state that are well known for their research and development activities. We present the list of peer university clusters in Table 12 below.

**TABLE 12. Comparison Research 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)[a] | Tufts University |
| **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 |

*Source: Anderson Economic Group, LLC*

a. Note: Lincoln Lab is not included in spending reported by MIT, because it is not classified as academic R&D. Lincoln Lab includes communications, space surveillance, missile defense, tactical surveillance systems, and air traffic control.

## ACADEMIC R&D EXPENDITURES

Using the most recent data available from the National Science Foundation, we compare the research and development (R&D) expenditures for each university cluster. In 2008, the URC had the fifth highest R&D expenditures of the seven university clusters at nearly $1.5 billion. Total R&D expenditures by the seven university clusters totaled approximately $11.6 billion in 2008, making up over 22% of R&D expenditures by all U.S. universities.

For almost every cluster, 2008 brought an increase in funding from every source, especially industry and institutional funding, compared to the previous year. The URC relies on institution funds for a higher share of its research and development spending than the average university and more than every other cluster shown in Table 13 on page 15.

**TABLE 13. Source of Funding for R&D Expenditures (in millions), 2008**

| | Total R&D Expenditures | Federal Government | State and Local Government | Industry[a] | Institution[b] | Other |
|---|---|---|---|---|---|---|
| **Michigan's URC** | **1,482** | **58%** | **4%** | **4%** | **27%** | **7%** |
| Northern California | 2,165 | 57% | 4% | 7% | 18% | 15% |
| Southern California | 2,233 | 59% | 3% | 7% | 19% | 12% |
| Illinois | 1,342 | 61% | 4% | 3% | 26% | 7% |
| Massachusetts | 1,252 | 78% | 0% | 9% | 2% | 11% |
| North Carolina | 1,659 | 58% | 9% | 12% | 17% | 3% |
| Pennsylvania | 1,507 | 69% | 6% | 8% | 15% | 2% |
| *All U.S. Universities* | *51,909* | *60%* | *7%* | *6%* | *20%* | *8%* |

*Source: NSF, Integrated Science and Engineering Resources Data System*

*Note: 2008 data is the most recent available from this source. Our 2009 annual report contained 2007 R&D data.*
*Analysis: Anderson Economic Group, LLC*

a. Industry funding are grants and contracts for R&D activities from non-profit organizations.

b. Institutional funding includes research funded from non-profit organizations, corporate foundations, endowments, and fellowships to students.

Between 2007 and 2008, the URC increased expenditures on R&D by 5.5%, which is the third highest percentage increase of the university clusters, as shown in Table 14 below. This growth rate was higher than the average increase by all U.S. universities, and significantly higher than the increase the year before when expenditures grew only 1.9%. Only the Illinois universities and Pennsylvania universities had a bigger increase. While the California schools had a lower annual increase in R&D expenditures than the URC, they still spend over $500 million more annually than the URC. The California clusters were alone in experiencing a decline in federal government funding between 2007 and 2008.

**TABLE 14. Growth in Total Academic R&D Expenditures**

| | Annual Growth 2000 - 2008 (CAGR) | Annual Growth 2007- 2008 | *Rank Growth 2007-08* |
|---|---|---|---|
| **Michigan's URC** | **5.8%** | **5.5%** | ***3*** |
| Northern California | 5.4% | 4.0% | *7* |
| Southern California | 6.5% | 4.8% | *4* |
| Illinois | 6.9% | 8.3% | *1* |
| Massachusetts | 4.6% | 4.7% | *5* |
| North Carolina | 7.9% | 4.3% | *6* |
| Pennsylvania | 7.3% | 7.1% | *2* |
| *All U.S. Universities* | *7.1%* | *5.0%* | |

*Source: NSF, Integrated Science and Engineering Resources Data System*
*Analysis: Anderson Economic Group, LLC*

Michigan's eight year average annual growth rate in R&D expenditures is slower than most of the other clusters. Michigan is fifth (out of seven) in average annual increase in R&D expenditures between 2000 and 2008.

Table 15 below shows each cluster's R&D expenditures in science and engineering fields as a percentage of total spending. Research priorities vary across the university clusters. The North Carolina and California clusters spent a larger share of research dollars on life sciences, while the Massachusetts and Pennsylvania clusters spent significantly less than the U.S average. Furthermore, the Pennsylvania cluster spent significantly more on math and computer sciences than any other cluster and the U.S university averages, as did the URC on social sciences. The URC is consistent in the other fields with U.S. university averages, although with slightly lower than average spending for environmental sciences and math and computer sciences.

**TABLE 15. Share of Total R&D Expenditures by Science and Engineering Fields, 2008**

| | Environmental Sciences[a] | Life Sciences[b] | Math & Computer Sciences | Physical Sciences[c] | Psychology | Social Sciences[d] | Sciences, Other | Engineering[e] |
|---|---|---|---|---|---|---|---|---|
| **Michigan's URC** | **1%** | **62%** | **2%** | **8%** | **1%** | **10%** | **1%** | **15%** |
| Northern California | 1% | 67% | 2% | 8% | 1% | 3% | 3% | 14% |
| Southern California | 8% | 65% | 7% | 6% | 1% | 3% | 1% | 9% |
| Illinois | 4% | 57% | 8% | 10% | 2% | 3% | 1% | 16% |
| Massachusetts | 4% | 51% | 5% | 13% | 1% | 3% | 2% | 20% |
| North Carolina | 3% | 75% | 3% | 4% | 1% | 5% | 0% | 9% |
| Pennsylvania | 4% | 50% | 11% | 6% | 3% | 3% | 1% | 23% |
| *All U.S. Universities* | *5%* | *60%* | *4%* | *8%* | *2%* | *4%* | *2%* | *15%* |

*Source: National Science Foundation, Survey of Research and Development Expenditures at Universities and Colleges*
*Analysis: Anderson Economic Group, LLC*

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

## TECHNOLOGY TRANSFERS

University research and development expenditures often lead to the production and sale of new products and services in the private sector. The success of academic research and development activities is often measured in terms of technology transfer to the private sector. The pharmaceutical, medical, computer technology, consumer electronic, telecommunication, agricultural, and manufacturing industries are among the many industries benefiting from research and development conducted at universities. Common indicators of tech transfer achievement include the number of patent applications and the number of inventions disclosed in a given year.

While these statistics show activity, they do not necessarily indicate the effectiveness of the activity. Other statistics, such as the number of patents granted, the number of licenses or options entered into, royalty revenue, and the number of new start-ups are more informative indicators of technology transfer. We examine these indicators and compare the URC's performance to that of the other clusters.

The URC ranks near the bottom when comparing its 2005-2009 average annual technology transfer activities to the peer university clusters. The URC ranks third in average annual number of patent grants, and fifth in invention disclosures, licenses and options issued, and licensing revenue. See Table 16 below.

**TABLE 16. Average Annual Patent and Licensing Activity,[a] 2005-2009**

| | Invention Disclosures | *Rank* | Patent Grants | *Rank* | Licenses/ Options | *Rank* | Licensing Revenue (in millions) | *Rank* |
|---|---|---|---|---|---|---|---|---|
| **Michigan's URC[b]** | **486** | ***5*** | **136** | ***3*** | **131** | ***5*** | **$31.8** | ***5*** |
| Northern California[c] | 731 | *3* | 198 | *1* | 172 | *3* | $187.9 | *2* |
| Southern California[d] | 749 | *2* | 126 | *4* | 118 | *6* | $53.1 | *4* |
| Illinois[e] | 510 | *4* | 101 | *5* | 99 | *7* | $225.8 | *1* |
| Massachusetts[f] | 784 | *1* | 192 | *2* | 186 | *1* | $80.0 | *3* |
| North Carolina[g] | 446 | *7* | 85 | *7* | 178 | *2* | $14.1 | *7* |
| Pennsylvania[h] | 466 | *6* | 88 | *6* | 145 | *4* | $16.2 | *6* |

*Source: Universities' websites and technology transfer offices, Association of Technology Managers (AUTM) Surveys*

a. Average includes 2005-2009 data where available.

b. Michigan State University, the University of Michigan, and Wayne State University information was obtained from the URC.

c. The University of California provided statistics for all their campuses through their Office of Technology and its Annual Reports for 2005-2009. Stanford University provided all statistics for 2005-2009 through their website except the number of patents issued, which was provided by their Office of Technology Licensing.

d. The University of California provided statistics for all their campuses through their Office of Technology and the office's Annual Reports for 2004-2009. USC data for 2004-2006 were collected from the AUTM surveys and through USC's Stevens institute for 2007-2009.

e. Northwestern University provided all statistics for 2004-2009 through their website. University of Chicago provided all statistics through their Office of Technology & Intellectual Property. University of Illinois, Urbana-Champaign provided all statistics through their Office of Technology Management website.

f. MIT, and Tufts reported 2004-2009 data on their websites. Harvard data were collected from the 2004-2006 AUTM surveys and through Harvard's Office of Technology Development for 2007-2009.

g. Data for UNC Chapel Hill and NC State University were collected from their Offices of Technology Development. Data for Duke University was provided from the 2004-2006 AUTM surveys and through their Office of Licensing & Ventures for 2007-2009.

h. Data collected for the Pennsylvania cluster was from the University of Pittsburgh's Office of Technology Management, Penn State's Intellectual Property office, Center for Technology Transfer, and the 2004-2006 AUTM surveys.

The URC's rankings in recent years follow a longer-run trend of technology transfer activities from 2002 to 2009. Looking at the average annual activity for a longer period, the URC ranks fifth in average number of invention disclosures, third in pat-

ent grants awarded, sixth in licenses and options, and fifth in licensing revenue. See Table 17 below.

**TABLE 17. Average Annual Patent and Licensing Activity, 2002-2009**

| | Invention Disclosures | *Rank* | Patent Grants | *Rank* | Licenses/ Options | *Rank* | Licensing Revenue (in millions) | *Rank* |
|---|---|---|---|---|---|---|---|---|
| **Michigan's URC** | **457** | ***5*** | **132** | ***3*** | **119** | ***6*** | **$36.9** | ***5*** |
| Northern California | 680 | *3* | 201 | *1* | 177 | *2* | $148.9 | *1* |
| Southern California | 683 | *2* | 124 | *4* | 122 | *5* | $42.4 | *4* |
| Illinois | 458 | *4* | 119 | *5* | 100 | *7* | $145.6 | *2* |
| Massachusetts | 749 | *1* | 201 | *1* | 197 | *1* | $69.8 | *3* |
| North Carolina | 426 | *7* | 81 | *7* | 150 | *3* | $11.5 | *7* |
| Pennsylvania | 428 | *6* | 107 | *6* | 134 | *4* | $14.2 | *6* |

*Source: See footnotes in Table 16*
*Analysis: Anderson Economic Group, LLC*

From 2008 to 2009, nearly every cluster's number of start-ups declined, as shown in Table 18 below. The number of URC cultivated start-ups fell from 17 in 2008 to 8 in 2009. On average, 14 new companies are started each year with licenses technology from a URC university. The URC ranks fifth in number of start-ups in our university clusters.

**TABLE 18. Annual Number of Start-ups Cultivated at University Clusters, 2005-2009**

| | 2005 | 2006 | 2007 | 2008 | 2009 | Average, 2005-09 |
|---|---|---|---|---|---|---|
| **Michigan's URC[a]** | **14** | **18** | **14** | **17** | **8** | **14** |
| Northern California | 14 | 18 | 27 | 27 | 18 | 21 |
| Southern California | 24 | 36 | 25 | 31 | 29 | 29 |
| Illinois | 13 | 13 | 16 | 12 | 13 | 13 |
| Massachusetts | 28 | 29 | 35 | 34 | 30 | 31 |
| North Carolina | 8 | 14 | 9 | 16 | 9 | 11 |
| Pennsylvania | 18 | 21 | 21 | 16 | 16 | 18 |

*Data Source: Universities' websites and technology transfer offices (See footnotes in Table 16 on page 17)*

a. We revised the 2008 data to exclude the number of start-ups assisted by the URC that did not involve a licensed technology. The number for 2008 dropped from 28 to 17.

The URC has improved its performance on one technology transfer indicator. Table 19 on page 19 shows the rankings on average number of start-ups, patent grants, and licenses and options awarded over three 5-year time periods. The URC's most recent ranking on average number of patent grants improved from fourth in

2003-2007 to third in 2005-2009. The URC's ranking in the number of start-ups and licenses has remained the same.

**TABLE 19. Average Annual Patent and Licensing Activity Rankings**

| | 2003-2007 | | | 2004-2008 | | | 2005-2009 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Start-ups | Patent Grants | Licenses /Options | Start-ups[a] | Patent Grants | Licenses /Options | Start-ups | Patent Grants | Licenses /Options |
| **Michigan's URC** | 5 | 4 | 5 | 5 | 3 | 5 | **5** | **3** | **5** |
| Northern California | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 3 |
| Southern California | 2 | 5 | 4 | 2 | 4 | 5 | 2 | 4 | 6 |
| Illinois | 6 | 3 | 7 | 6 | 5 | 7 | 6 | 5 | 7 |
| Massachusetts | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| North Carolina | 7 | 7 | 6 | 7 | 7 | 4 | 7 | 7 | 2 |
| Pennsylvania | 4 | 6 | 3 | 5 | 6 | 3 | 5 | 6 | 4 |

*Source: Universities' websites and technology transfer offices, Association of Technology Managers (AUTM) Surveys*[b]
*Analysis: Anderson Economic Group, LLC*

a. Ranking for average number of start-ups between 2004-2008 includes revised data for 2008. This lowered the ranking from 4 to 5.

b. See footnotes in Table 16 on page 17.

To measure the success of each university's R&D expenditures, we examined the amount of licensing revenue generated by each dollar of expenditure. Since licensing revenue can have large year-to-year variations caused by the sale of a large license, we compared the average revenue over a five-year period (2005-2009) to the total R&D expenditures in 2008 (the most recent year for which data is available). Table 20 shows that the URC has performed better than the North Carolina, and Pennsylvania clusters in terms of revenues earned per R&D dollar spent.

**TABLE 20. 2005-2009 Average Annual Licensing Revenue as a Percent of 2008 Expenditures**

| | Licensing Revenue (in millions) | Total R&D Expenditures[a] (in millions) | Revenues per Expenditures | *Licensing Revenue per Expenditure Ranking* |
|---|---|---|---|---|
| **Michigan's URC** | **$31.8** | **$1,482** | **2.1%** | ***5*** |
| Northern California | $187.9 | $2,165 | 8.7% | *2* |
| Southern California | $53.1 | $2,233 | 2.4% | *4* |
| Illinois | $225.8 | $1,342 | 16.9% | *1* |
| Massachusetts | $80.0 | $1,252 | 6.4% | *3* |
| North Carolina | $14.1 | $1,658 | 0.9% | *7* |
| Pennsylvania | $16.2 | $1,507 | 1.1% | *6* |

*Data Sources: See footnotes in Table 15 on page 18*
*Analysis: Anderson Economic Group, LLC*

a. Total R&D expenditures are for FY 2008 and from the National Science Foundation.

## INTERNATIONAL COMPARISON

In addition to benchmarking the URC to other to universities in the U.S., the URC has started comparing itself to top universities worldwide. While a more comprehensive comparison may be possible in the future if data are available, our initial research in this report compares total R&D expenditures of three clusters of universities in other countries.

To select these universities we began with the countries that spend the most on R&D as a percentage of GDP. Next we looked at university rankings and selected schools that were in the top 150 worldwide. Finally, we selected countries with good available data that allowed for an apples-to-apples comparison, and had three top universities in close proximity to each other. We selected universities in three countries: Israel, Japan, and the United Kingdom.

### *Israel*

Israel has become a leader in R&D in the last few decades. Israel leads the world in research and development expenditures as a percent of GDP with almost 5% of GDP going towards R&D. For comparison, the United States spends 2.68% of GDP on research and development and is ranked eighth. Hebrew University, Tel Aviv University, and Technion are all ranked in the top 150 universities in the world and are the leading research universities in Israel.[11]

### *Japan*

Japan has long been a technology leader in the world. Japan has consistently ranked near the top worldwide in R&D expenditures as a percentage of GDP. Japan spends 3.8% of its GDP on R&D. The University of Tokyo and Kyoto University are two of the top 25 universities worldwide. The Tokyo Institute of Technology is also a top-150 university and is dedicated to engineering and technology research.

### *United Kingdom*

Two of the top ten universities in the world, University of Cambridge and University of Oxford, are located in the United Kingdom. The University College of London is ranked in the top 25 universities in the world and has a strong reputation in the UK and Europe for research and development. These three universities account for over 20% of all R&D expenditures by higher education in the UK and provide a strong basis for comparison with the URC.

11. University rankings are from the Academic Ranking of World Universities by the Center for World-Class Universities.

The university clusters we have chosen for comparison are presented below in Table 21.

**TABLE 21. International Comparison Research University Clusters**

| | | | |
|---|---|---|---|
| **Israel** | Technion University | Hebrew University | Tel Aviv University |
| **Japan** | University of Tokyo | Kyoto University | Tokyo Institute of Technology |
| **United Kingdom** | University of Oxford | University of Cambridge | University College of London |

*Source: Anderson Economic Group, LLC*

In deciding which clusters were most appropriate and useful for comparison to the URC, we considered many countries. We did not select universities in China because data availability and reliability were big problems for creating useful comparisons. We also did preliminary research on Indian universities; however, India has a very low level of R&D funding for a country its size, and Indian universities suffer from uneven funding, poor documentation, and research faculty shortages. We also reviewed data for universities in several European countries, but did not find three universities in a single country that fit our criteria except for the United Kingdom.

## R&D EXPENDITURES BY INTERNATIONAL CLUSTERS

We compared R&D expenditures by these international universities to the URC. While these universities differ in size, total R&D expenditures is a good indicator of the sheer amount of research activity clustered at these institutions. The United Kingdom cluster outpaced the URC and the other two international clusters with total R&D expenditures of $2.1 billion in 2008. The URC, with R&D expenditures of almost $1.5 billion, performed better than both the Japanese and Israeli clusters in overall R&D spending. Japan's cluster spent a total of $859 million on R&D, while Israel's cluster spent the least, with a total of $330 million.[12]

**TABLE 22. FY 2008 R&D Expenditures for International Cluster**

| | R&D Expenditures (in millions) |
|---|---|
| **Michigan's URC** | **$1,482** |
| Israel | $330 |
| Japan | $859 |
| United Kingdom | $2,144 |

*Source: See "Appendix A. Methodology" on page A-1*
*Analysis: Anderson Economic Group*

12. See "Appendix A. Methodology" on page A-1 for data sources.

# *IV. Impact on Jobs and Income*

## SCALE OF OPERATIONS & EXPENDITURES

The University Research Corridor makes significant contributions to the state's economy. URC institutions spent over $7.4 billion on operations in FY 2009 (July 1, 2008 to June 30, 2009) and employed 50,176 full-time-equivalent faculty and staff throughout Michigan.[13] About a quarter (23%) of expenditures paid for instruction of students, while 14% of expenditures went towards university research, as shown in Table 23. About a third (30%) of all expenditures went towards equipment, supplies, salaries, and maintaining facilities at U-M Hospital.

**TABLE 23. Operational Expenditures by the URC, FY 2009**

| | Expenditures ($ in millions) | % of Total |
|---|---|---|
| Instruction | $1,709 | 23% |
| Research[a] | $1,094 | 14% |
| Public Services, Academic Support, Student Services, and Institutional Support | $1,324 | 18% |
| Operation and Maintenance of Plants, Auxiliary Enterprises, and Other Expenses | $1,125 | 15% |
| University of Michigan Hospital | $2,217 | 30% |
| **Total Operational Expenditures[b]** | **$7,469** | **100%** |

*Data Source: IPEDS Finance FY 2009*
*Analysis: Anderson Economic Group, LLC*

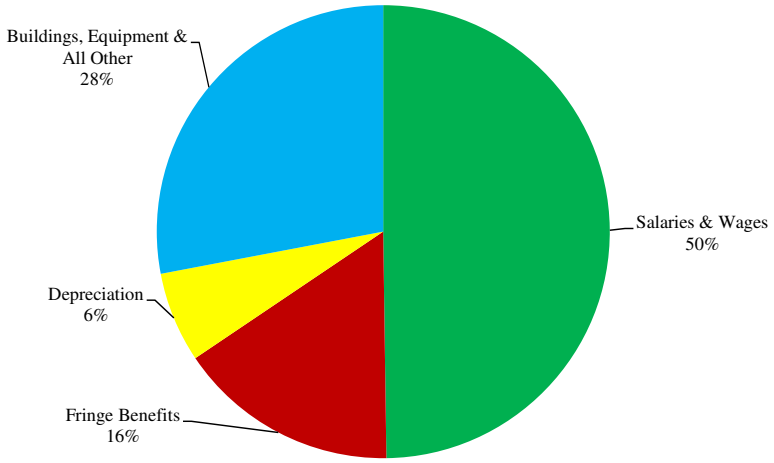
a. The data reported to IPEDS for research expenditures are lower than the research expenditures reported to the National Science Foundation. Research expenditures reported to IPEDS only include direct research costs. Indirect costs, while included in NSF reporting, are counted in other spending categories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

b. American Recovery and Reinvestment Act (ARRA) funds awarded to URC universities accounted for $57.4 million or 0.8% of operational expenditures.

We also examined URC expenditures by function, as shown in Figure 11 on page 23. Half of all operational expenditures paid for the salaries and wages for university faculty and staff. Fringe benefits made up 16% of expenditures, while depreciation accounted for 6%. The remaining 28% paid for supplies, equipment, maintenance of plant, and any other expenditure not included in the previous categories.

13. Faculty and staff counts reflect full-time-equivalent positions in fall 2009. Figure includes the University of Michigan Hospital doctors and staff.

**FIGURE 11. URC Operational Expenditures by Function, FY 2009**




*Data Source: National Center for Education Statistics, IPEDS Finance*
*Analysis: Anderson Economic Group, LLC*

## DEFINITION OF ECONOMIC IMPACT

URC expenditures encourage even more economic activity throughout the state of Michigan than indicated by the total spending shown in Table 23 on page 22. The money that the URC spends on supplies, equipment, and staff and faculty salaries is then re-spent as businesses and households throughout Michigan purchase other goods and services. 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?"

We define *net economic impact* as the new economic activity directly or indirectly caused by the URC, excluding any economic activity associated with the University Research Corridor universities that merely replaces or displaces other economic activity in the state. For example, we exclude expenditures by students who would have attended another college in Michigan if the URC did not exist. Since these students would have stayed in Michigan and spent money in the state, we do not count these expenditures as new economic activity caused by the URC. We also exclude all expenditures by URC universities that go to firms outside Michigan.

We present two measures of economic impact in this section:

- *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 substitution plus indirectly-generated activity by both firms and households in Michigan.
- *New Jobs*
  The URC directly employs over 50,000 people and indirectly generates more

jobs in Michigan due to the multiplier effect of university and employee spending in the State.

## COMPONENTS OF ECONOMIC IMPACT

The expenditures shown in Table 23 on page 22 pay the salaries of professors, researchers, doctors, and administrative staff, and purchase supplies, equipment, and maintain buildings. As the URC makes purchases, the money is then re-spent throughout the Michigan economy, creating a "multiplier" effect, generating more economic activity in the state. We describe the components of the URC's economic impact below.

### *Nonpayroll Operating Expenditures*

Nonpayroll operating expenditures include payments made for instruction of students, research equipment and supplies, and U-M hospital supply and equipment purchases. In FY 2009, the URC spent $1.4 billion directly on these items in the State of Michigan.

### *Payroll Expenditures for Faculty and Staff*

The URC universities spent $4.9 billion on salary, wages, and fringe benefits for their employees in FY 2009. After taxes and substitution for wages that would have been earned in Michigan in the absence of the URC, we estimate that $2.8 billion of this amount was re-spent by employees in the state, generating additional economic activity.

### *Student Expenditures*

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 the state of Michigan for a college degree if it were not for the URC universities. We count these expenditures as new economic activity. We estimate that new student direct expenditures in Michigan due to the URC was $1.5 billion in FY 2009.

### *Alumni Expenditures*

Alumni of URC universities contribute greatly to the state's economy. We calculated the earnings in 2009 of 550,595 URC alums living in Michigan using a model that accounts for the higher wages of URC alumni over the average college graduate's salary, the university of the graduate, and the alum's year of graduation. We detail our methodology in Appendix B of our first annual benchmarking study, released in 2007.

We estimate that, in 2009, URC alumni earned over $26 billion, or 15.3% of all wage and salary income in Michigan. 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.

**TABLE 24. Michigan Earnings of URC Alumni by Age and Degree, 2009 (in millions)**

| | 21-24 Years | 25-34 Years | 35-44 Years | 45-64 Years | Over 65 Years | Total |
|---|---|---|---|---|---|---|
| Bachelor Degree | $1,038 | $3,757 | $4,374 | $6,338 | $306 | $15,813 |
| Advanced Degree | $0 | $2,355 | $3,145 | $4,306 | $434 | $10,240 |
| Total Earnings | $1,038 | $6,112 | $7,519 | $10,644 | $740 | $26,053 |
| *memo: Earnings as a percentage of wages & salary income in Michigan* | | | | | | *15.3%* |

*Source: 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. Like all educational institutions, URC universities strive to increase the knowledge and skills of the students they teach. An increase in usable knowledge and skills adds to students' *human capital* and often allows them to earn a higher wage—much like adding physical capital (e.g. buildings and equipment) allows a factory to increase production. For some 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 their college degree or pursuing their education outside Michigan. For the remainder of the students, the existence of URC universities simply means finding the right mix of features, location, and price, whatever their specific reason for choosing Michigan State, the University of Michigan, or Wayne State.

The main components considered in estimating the additional earnings of URC graduates are: (1) projections of the earnings of URC graduates, and (2) substitution of earnings that would have occurred even if the individual had not attended a URC university. We detail our methodology in Appendix B of our first annual benchmarking study, released in 2007. Note that 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.

Using this same simulation model and an updated set of alumni data for 2009, we estimate that URC alums living in Michigan in 2009 earned $4.04 billion more due to the URC.

## TOTAL NET ECONOMIC IMPACT

In FY 2009, the total net economic impact of the URC in Michigan was $14.8 billion. In other words, we estimate that the value of the economic activity that the universities generated in the state, benefiting households and businesses, was almost

$15 billion last year. This net economic impact figure does not include the economic activity that would have occurred in Michigan even without the URC.

**TABLE 25. Net Economic Impact of URC in Michigan, FY 2009**

| Impact Category | Net Economic Impact (in billions) |
|---|---|
| Non-payroll Operating Expenditures for Instruction, Research, and U-M Hospital | $3.2 |
| Faculty & Staff Wages and Benefits | $4.7 |
| URC Student Expenditures | $2.1 |
| Incremental Alumni Earnings[a] | $4.8 |
| **TOTAL ECONOMIC IMPACT** | **$14.8** |

*Source: Anderson Economic Group, LLC*

a. We estimate that $4.04 billion of earnings by URC alumni in 2009 were additional earnings directly caused by the education they received at a URC university. See "Methodology" on page 26. With indirectly-generated activity included, incremental alumni earnings result in $4.8 billion of economic output, as shown above.

## JOBS IMPACT OF URC OPERATIONS

We estimate that 72,042 jobs in Michigan in 2009 were directly or indirectly caused by the URC's operations in Michigan.This jobs figure includes 10,912 faculty members and 39,265 staff directly employed by the URC universities, and 21,865 indirectly-generated jobs in other industries in the state due to expenditures by the URC universities and their faculty, staff, and students.

## METHODOLOGY

In calculating the net economic impact, we follow a careful methodology that counts expenditures only once, takes into account substitution of one activity within the state by another, and uses conservative multipliers for indirectly-caused activity. We detail our methodology for the economic impact of the operational expenditures by Research Corridor universities in "Operational Expenditures Methodology" in Appendix A.

# *V. Impact on State 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.[14] Then, we estimate the income, sales, property, and transportation taxes generated as a result of this additional income. This estimate is, by necessity, an approximation, as the actual tax revenue collected by the state government is the result of millions of individual purchasing and tax planning decisions by URC employees and alumni. While we do not estimate *every* tax and fee the state collects because of the URC, we provide an estimate of most *new tax revenue* the state collects from (1) earnings of employees at URC universities and (2) earnings by URC alumni living in Michigan.

## ADDITIONAL INCOME DUE TO THE URC

We estimate that $2.8 billion in wages of URC employees in Michigan was *caused by* the URC in 2009. This figure accounts for substitution of URC employees for other Michigan wages that would have been paid in the absence of the URC. We also estimate that URC alums living in Michigan in 2009 earned $4.04 billion more due to the URC.

## CATEGORIZING INCOME

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 Appendix B of our first annual benchmarking study, released in 2007.

**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. 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 in Table 26 on page 28.

14. As described in the first annual benchmarking study, released in 2007, we use a conservative methodology to estimate the current earnings caused by the URC. Specifically, we assume that most URC graduates would have attended college somewhere else if these institutions were not in Michigan, and would have earned wages near those of the average for college graduates of their age.

**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 taxes depends on whether their additional Michigan 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 they will pay in taxes divided by their income.[15] Table 26 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 26. Percentage of Income Paid to the State of Michigan**

| Tax | On Additional Marginal Income | On Additional Average Income |
|---|---|---|
| Personal Income Tax | 4.35% | 2.36% |
| Sales and Use Tax | 1.70% | 2.62% |
| Property Tax | 0.38% | 0.47% |
| Transportation Tax | 0.13% | 0.30% |

*Source: Analysis by Anderson Economic Group*

**Income Tax.** The tax rate on marginal income in Michigan was 4.35% in 2009. We do not attempt to estimate the proportion of marginal income going toward tax exempt expenditures. To calculate the 2.36% income tax rate on average income, we divided the state's revenue from the income tax in 2007 by the state's personal income, then scaled the result to account for the personal income tax rate's rise from 3.9% to 4.35%.[16]

**Sales Tax.** We calculate the sales and use tax burden using data from the U.S. Bureau of Labor Statistics' 2005 Consumer Expenditure Survey. First, we identified spending categories subject to the sales and use tax.[17] We estimate that consumers in the middle 20% of earners (making between $33,381 and $53,358 in income)

15. 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%.

16. Base data source for the income tax in 2007 was the Michigan Senate Fiscal Agency. Revenue from income tax in 2007 was $7,324,800,000. According to the U.S. Bureau of Economic Analysis, personal income was $345,940,000,000 in 2007.

spent approximately 43.6% of their 2005 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 (making between $53,358 and $85,147 in income). 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. 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%.[18] 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 government, 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. 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 6.3%, the effective rate of the gasoline tax,[19] resulting in an effective rate on income of 0.30%. 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 6.3% effective gas tax rate, we estimate the effective gas tax rate on marginal income to be 0.13%.

## TOTAL ADDITIONAL STATE TAX REVENUES

We find $1.15 billion in income categorized as "marginal," and $5.67 billion in "average" income ($2.89 billion from alumni and $2.79 billion from URC employees). We calculate the additional taxes to the State of Michigan due to the URC universities by multiplying this income by the effective tax rates identified in Table 26 of the preceding section. Table 27 below shows the results of this analysis: $401.3

17. 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.

18. See 2004 U.S. Census of Governments State and Local Finance data.

19. Gasoline is not taxed as a percentage of its price, but rather at a per-unit rate of $0.15 per gallon. The gasoline tax of $0.19 per gallon is divided by $3 per gallon of gasoline to yield a 6.3% effective rate.

million in additional tax revenue to the state of Michigan paid by URC graduates in 2009.

**TABLE 27. Additional Tax Revenue to State of Michigan Caused by URC, 2009**

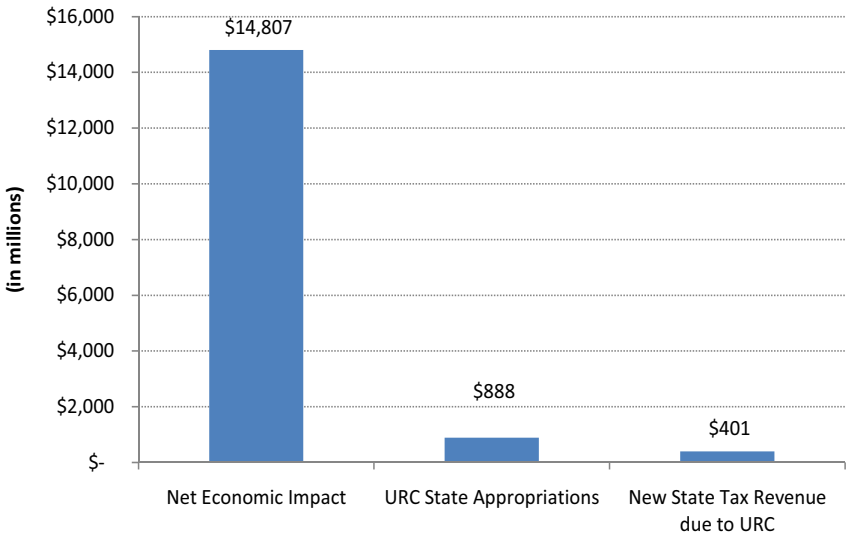
| | Effective Tax Rate on Marginal Income | Marginal Income and Tax Receipts (million) | Effective Tax Rate on Average Income | Average Income and Tax Receipts (million) |
|---|---|---|---|---|
| Total Additional Income | | $1,148 | | $5,674 |
| Personal Income | 4.35% | $49.9 | 2.36% | $134.0 |
| Sales and Use Tax | 1.70% | $19.6 | 2.62% | $148.4 |
| Property Tax | 0.38% | $4.4 | 0.47% | $26.5 |
| Gasoline Tax | 0.13% | $1.5 | 0.30% | $16.9 |
| Subtotal | | $75.4 (A) | | $325.8 (B) |
| | | | Total Tax Receipts (A+B) | $401.3 |

*Base Data Sources: AEG; 2005 Consumer Expenditure Survey by BLS*

## COMPARISON WITH ECONOMIC IMPACT AND URC APPROPRIATIONS

Comparing the URC's net economic impact on the state to the state's appropriations for URC universities illustrates how much greater the benefits of the URC universities are than the costs. As shown in Figure 12 below, the $14.8 billion in net economic impact is over 16 times greater than the state's funding for the URC universities, in FY 2009, of $888 million. In addition, the State of Michigan receives $401 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 12. URC Net Economic Impact and New State Tax Revenue vs. State Appropriations**




*Data Sources: AEG Estimates; House Fiscal Agency*
*Analysis: Anderson Economic Group, LLC*

# *Appendix A. Methodology*

## OPERATIONAL EXPENDITURES METHODOLOGY

In order to quantify the economic impact of the URC's activities, we asked ourselves the following question: What would the loss be to the state if the URC universities left Michigan? We then studied the loss in terms of jobs and economic output.

We quantified the *net economic impact*, which we define as the new economic activity directly or indirectly caused by the University Research Corridor, excluding any economic activity that replaces or displaces other activity in the state. We followed the following steps to calculate the net economic impact of the URC's operational expenditures.

**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 2008 from the National Center for Education Statistics Integrated Postsecondary Education Data System (IPEDS).
2. We relied on information provided by the universities to determine the percentage of expenditures that went to businesses located outside of Michigan.
3. We used data from the universities and the 2007 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.

**Accounted for Likely Substitution.** After calculating the non-payroll and payroll expenditures by the URC and student expenditures, we accounted for spending that would have occurred even if the URC were not part of the state's economy. For instruction of Michigan residents, we used a substitution effect of 10%. One way to think about this is that 10% 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.

We used a zero substitution effect for out-of-state students who come to Michigan. 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.

Most research dollars come from out-of-state sources. URC universities receive 93% of all federal research dollars in Michigan. To account for a small increase in research expenditures by other universities in Michigan in the absence of the URC, we chose a small substitution effect of 2% for research expenditures.

We used a substitution effect of 30% for faculty and staff expenditures. We assumed that almost all tenured faculty would leave the URC, but about half the staff would find jobs in Michigan. We used a substitution effect appropriate to the payroll share of staff and faculty that would leave the state. For hospital faculty and staff, we use a 14% substitution effect, assuming that some staff would go to other hospitals in Michigan if the URC universities did not exist.

Finally, we used a substitution effect of 30% for non-payroll hospital expenditures. Based on the operations of the hospital, we accounted for some of the clinical care currently provided by UMHS being taken up by other hospitals in Michigan. We assumed that speciality clinics and most research would go elsewhere.
See Table A-1 below.

**TABLE A-1. Substitution Effect Parameters for URC Expenditures Analysis**

| Category | Parameter |
|---|---|
| Instruction of Resident MSU Students | 10% |
| Instruction of Non-resident MSU Students | 0% |
| Research Dollars | 2% |
| Student Expenditures | 6% |
| Faculty Expenditures | 30% |
| Hospital Expenditures | 30% |
| Hospital Faculty and Staff | 14% |

*Source: Anderson Economic Group, LLC*

**Direct and Indirect Impacts.** The *direct* economic impact is calculated as the in-state non-payroll operational expenditures by the URC and the in-state expenditures of URC faculty, staff, and students, after accounting for substitution. This is spending that only occurs in the state because of the URC. See Table A-3 on page A-5.

We calculated the *indirect* economic impact of URC's expenditures by multiplying the direct expenditures by U.S. Department of Commerce's Regional Multipliers (RIMS II). We use the multipliers for industry 611A00 Colleges, Universities, and Junior Colleges for the State of Michigan. See Table A-3 on page A-5.

## INTERNATIONAL CLUSTERS DATA SOURCES

We used annual reports, financial documents, and university websites to obtain the information on the R&D by the international universities. When data was not available in annual reports we contacted the university or technology transfer organization affiliated with the university to obtain the data. In order to compare

expenditures we converted currencies to the U.S. dollar using the average exchange rate for fiscal year 2008. See Table A-2 below.

**TABLE A-2. Data Sources for International University Clusters**

| University | 2008 R&D Expenditures Source |
|---|---|
| Hebrew University | 2009-2010 Annual Report |
| Technion University | Technion President's Report 2009 |
| Tel Aviv University | Tel Aviv University presentation |
| Kyoto University | Kyoto University Facts and Figures |
| Tokyo Institute of Technology | Correspondence with Dr. Sekiya at TIT |
| University of Tokyo | FY 2008 financial statements |
| University of Cambridge | 2009 Annual Report |
| University of Oxford | 2009 Research Income data |
| University College of London | 2009 Annual Report |

*Source: Anderson Economic Group, LLC*

## 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.

There is a significant change in the number of alumni from MSU in our dataset for this year's report. Updates in MSU's alumni database have provided more accurate addresses for thousands of alumni with whom they are in contact. In past years we used information on alumni with known addresses to estimate the proportion of MSU alumni with unknown addresses living in Michigan. The more-accurate data available this year reveals that the true number of MSU alumni in Michigan is lower than our estimate. As a result, this year shows a drop on MSU alumni in Michigan that is not indicative of a broader trend in the location of URC alumni, and will not be repeated in future years when we will have continued access to MSU's improved alumni database.

## HUMAN CAPITAL METHODOLOGY

### *Incremental Alumni Earnings in 2009 Caused by URC*

We estimated the additional 2009 earnings using 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.

2. We estimated the proportion of URC alumni in each counterfactual group (as detailed in our 2007 URC economic impact report) by assuming that all past years' graduating classes exhibited the same behavior as our estimates for the current year's graduating class.
3. We used census and workforce participation data to calculate each counterfactual category'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.

## Table A-3. Net Economic Impact of URC's Operations

FY 2009 (July 1, 2008 to June 30, 2009)

| | | | | Economic Impact in Michigan |
|---|---|---|---|---|
| **Direct Expenditures In-State, After Likely Substitution** | | | | |
| A. Instruction of In-State Students (Non-payroll) | | $ | 1,095,227,487 | |
| *less: expenditures out of state* | *40%* | $ | (438,090,995) | |
| *Subtotal: Expenditures in state* | | $ | 657,136,492 | |
| *less: substitution of higher expenditures by other MI colleges & univ.* | *10%* | $ | (65,713,649) | |
| | | | | $ 591,422,843 |
| B. Instruction of Out-of-State Students (Non-payroll) | | $ | 361,192,044 | |
| *less: expenditures out of state* | *40%* | $ | (144,476,817) | |
| *Subtotal: Expenditures in state* | | $ | 216,715,226 | |
| *less: substitution of out-of-state students to other MI colleges & univ.* | *0%* | $ | - | |
| | | | | $ 216,715,226 |
| C. Research Expenditures (Non-payroll) | | $ | 474,068,783 | |
| *less: expenditures out of state* | *50%* | $ | (237,034,391) | |
| *Subtotal: Expenditures in state* | | $ | 237,034,391 | |
| *less: substitution of more research dollars coming into other MI colleges & univ.* | *2%* | $ | (4,740,688) | |
| | | | | $ 232,293,704 |
| D. Student Living Expenses (excludes tuition and fee expenditures) | | $ | 1,721,122,618 | |
| *less: expenditures out of state* | *5%* | $ | (86,056,131) | |
| *Subtotal: Expenditures in state* | | $ | 1,635,066,487 | |
| *less: likely substitution of students to other colleges in MI* | *6%* | $ | (98,103,989) | |
| | | | | $ 1,536,962,498 |
| E. URC Employee Earnings & Fringe Benefits, After Taxes (excluding Hospital) | | $ | 3,259,473,893 | |
| *less: expenditures out of state, savings* | *20%* | $ | (651,894,779) | |
| *Subtotal: Expenditures in state* | | $ | 2,607,579,115 | |
| *less: likely substitution to jobs with other universities in Michigan* | *30%* | $ | (782,273,734) | |
| | | | | $ 1,825,305,380 |
| F. Hospital Expenditures (Non-payroll) | | $ | 707,925,000 | |
| *less: expenditures out of state* | *20%* | $ | (141,585,000) | |
| *Subtotal: Expenditures in state* | | $ | 566,340,000 | |
| *less: likely substitution of higher spending by other MI hospitals* | *30%* | $ | (169,902,000) | |
| | | | | $ 396,438,000 |
| G. Hospital Employee Earnings & Fringe Benefits, After Taxes | | $ | 1,451,856,100 | |
| *less: expenditures out of state, savings* | *20%* | $ | (290,371,220) | |
| *Subtotal: Expenditures in state* | | $ | 1,161,484,880 | |
| *less: likely substitution to jobs with other health care systems in Michigan* | *14%* | $ | (162,607,883) | |
| | | | | $ 998,876,997 |
| **Total Direct Expenditures (in state, after substitution)** | | | | **$ 5,798,014,648** |

*Data Sources: National Center for Education Statistics, IPEDS Finance; URC Universities; 2005 Consumer Expenditure Survey*

| | | | |
|---|---|---|---|
| **Indirect Expenditures In-State, After Likely Substitution** | | | |
| A. Instruction of In-State Students (Non-payroll) | *2.2149* | $ | 718,519,612 |
| B. Instruction of Out-of-State Students (Non-payroll) | *2.2149* | $ | 263,287,328 |
| C. Research Expenditures (Non-payroll) | *2.2149* | $ | 282,213,621 |
| D. Student Living Expenses (excludes tuition and fee expenditures) | *1.369* | $ | 567,139,162 |
| E. URC Employee Earnings & Fringe Benefits, After Taxes (excluding Hospital) | *1.6781* | $ | 1,237,739,578 |
| F. Hospital Expenditures (Non-payroll) | *2.225* | $ | 485,636,550 |
| G. Hospital Employee Earnings & Fringe Benefits, After Taxes | *1.6781* | $ | 677,338,492 |
| **Total Indirect Expenditures (in state, after substitution)** | | **$** | **4,231,874,342** |

## Table A-3. Net Economic Impact of URC's Operations (continued)

| | | | | Economic Impact in Michigan |
|---|---|---|---|---|
| **Total Direct & Indirect Expenditures In-State, After Likely Substitution** | | | | |
| A. | Instruction of In-State Students (Non-payroll) | | | $ 1,309,942,455 |
| B. | Instruction of Out-of-State Students (Non-payroll) | | | $ 480,002,554 |
| C. | Research Expenditures (Non-payroll) | | | $ 514,507,324 |
| D. | Student Living Expenses (excludes tuition and fee expenditures) | | | $ 2,104,101,659 |
| E. | URC Employee Earnings & Fringe Benefits, After Taxes (excluding Hospital) | | | $ 3,063,044,959 |
| F. | Hospital Expenditures (Non-payroll) | | | $ 882,074,550 |
| G. | Hospital Employee Earnings & Fringe Benefits, After Taxes | | | $ 1,676,215,488 |
| | **TOTAL NET ECONOMIC IMPACT OF UNIVERSITY OPERATIONS** | | | **$ 10,029,888,990** |
| **Jobs Impact on the State, After Likely Substitution** | | | | |
| A. | Number of FTE Faculty, Excluding Hospital | | 8,869 | |
| | *less likely substitution to other jobs in Michigan* | *12%* | (1,064) | |
| | *Subtotal: New faculty jobs in Michigan* | | 7,805 | |
| | ** Indirect Employment Multiplier* | *2.20* | 9,366 | |
| | *Total Faculty in Michigan Caused by URC Operations* | | | 17,170 |
| B. | Number of FTE Faculty, Hospital | | 2,043 | |
| | *less likely substitution to other jobs in Michigan* | *8%* | (163) | |
| | *Subtotal: New faculty jobs in Michigan* | | 1,879 | |
| | ** Indirect Employment Multiplier* | *1.93* | 1,756 | |
| | *Total Faculty in Michigan Caused by URC Operations* | | | 3,635 |
| C. | Number of FTE Staff, Excluding Hospital | | 27,410 | |
| | *less likely substitution to other jobs in Michigan* | *40%* | (10,964) | |
| | *Subtotal: New staff jobs in Michigan* | | 16,446 | |
| | ** Indirect Employment Multiplier* | *2.00* | 16,446 | |
| | *Total Staff in Michigan Caused by URC Operations* | | | 32,893 |
| D. | Number of FTE Staff in Hospital | | 11,854 | |
| | *less likely substitution to other jobs in Michigan* | *20%* | (2,371) | |
| | *Subtotal: New staff jobs in Michigan* | | 9,483 | |
| | ** Indirect Employment Multiplier* | *1.93* | 8,860 | |
| | *Total Staff in Michigan Caused by URC Operations* | | | 18,343 |
| | **Total Direct & Indirect Jobs Caused by URC** | | | **72,042** |

# *Appendix B: About the Authors*

## CAROLINE M. SALLEE

Ms. Sallee is Director of the Public Policy, Fiscal, and Economic Analysis practice area at Anderson Economic Group. Ms. Sallee's background is in applied economics and public finance.

Ms. Sallee is the primary author of the first three *Annual Economic Impact Reports* for the University Research Corridor. Her recent work includes fiscal and economic impact studies for Michigan State University and Wayne State University, and the benchmarking of Michigan's business taxes with other states in a project for the Michigan House of Representatives. She has also completed detailed state tax and budget analysis for Business Leaders for Michigan.

Prior to joining Anderson Economic Group, Ms. Sallee worked for the U.S. Government Accountability Office (GAO) as a member of the Education, Workforce and Income Security team. She also has worked as a market analyst for Hábitus, a market research firm in Quito, Ecuador, and as a legislative assistant for two U.S. Representatives.

Ms. Sallee holds a Master of Public Policy degree from the Gerald R. Ford School of Public Policy at the University of Michigan and a Bachelor of Arts degree in economics and history from Augustana College.

## PATRICK L. ANDERSON

Mr. Anderson founded the consulting firm of Anderson Economic Group in 1996, and serves as a Principal and Chief Executive Officer in the company. In this role he has successfully directed projects for state governments, cities, counties, nonprofit organizations, and corporations in over half of the United States.

Mr. Anderson's views are often cited in news reports throughout the United States, and his articles have been published by T*he Wall Street Journal*, *The Detroit News, The Detroit Free Press*, *American Outlook*, *Business Economics*, and other publications. His book *Business Economics and Finance* was published in 2004, and his paper on "Pocketbook Issues and the Presidency" was awarded the Edmund Mennis Award for the best contributed paper in 2004 by the National Association for Business Economics. Mr. Anderson also contributed the chapter on business valuation and commercial damages to the book *Litigation Economics*, published in 2005, and is the executive editor of the *State Economic Handbook* 2008, which was published by Palgrave MacMillan in the fall of 2007.

Prior to founding Anderson Economic Group, Mr. Anderson served as the Chief of Staff of the Michigan Department of State, and as Deputy Budget Director for the State of Michigan under Governor John Engler. Prior to his involvement in State Government, Mr. Anderson served as an officer in Alexander Hamilton Life Insurance, an economist for Manufacturers National Bank of Detroit, and a graduate fellow with the Central Intelligence Agency in Washington DC.

Mr. Anderson is a graduate of the University of Michigan, where he earned a Master's degree in public policy and a Bachelor's degree in political science. He is a member of the National Association for Business Economics and the National Association of Forensic Economists. The Michigan Chamber of Commerce awarded Mr. Anderson its 2006 Leadership Michigan Distinguished Alumni award for his civic and professional accomplishments.

## CONTRIBUTORS

### *Alex L. Rosaen*

Mr. Rosaen is a Consultant at Anderson Economic Group, working in the Public Policy and Economics practice area. Mr. Rosaen's background is in applied economics and public finance.

Prior to joining Anderson Economic Group, Mr. Rosaen worked for the Office of Retirement Services (part of the Michigan Department of Management and Budget) for the Benefit Plan Design group. He also has worked as a mechanical engineer for Williams International in Walled Lake, Michigan.

Mr. Rosaen holds a Master of Public Policy degree from the Gerald R. Ford School of Public Policy at the University of Michigan. He also has a Master of Science degree and a Bachelor of Science degree in mechanical engineering from the University of Michigan.

### *Erin Agemy*

Ms. Agemy is an Analyst at Anderson Economic Group, working in the Public Policy, Business Valuation and Economic Analysis practice areas.

While with AEG, Ms. Agemy has worked on economic impact and fiscal analysis for counties in Michigan and Florida. She is also currently contributing to the book, Economics of Business Valuation, a forthcoming publication of Stanford University Press.

Prior to joining AEG, Ms. Agemy worked as a contract consultant providing research and detailed data analysis to economic and financial consulting firms in Michigan and Ohio. She was also one of four students selected to be graduate fellows at the Mercatus Center in Arlington, Virginia. While there she contributed to their Gulf Coast Recovery Project, which received the Templeton Freedom Award for Special Achievement. Ms. Agemy has also conducted original fieldwork on the political economy of charter schools in New Orleans, which she presented at an international conference for the Association of Private Enterprise Education.

Ms. Agemy holds a masters degree in economics from George Mason University and a Bachelors of Science degree in Political Economy from Hillsdale College.