

Research and Development in the URC

An Update to the 2010 Economic Impact Report

Commissioned by Michigan's University Research Corridor

Michigan State University
University of Michigan
Wayne State University

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Executive Summary

MICHIGAN'S URC

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, supporting innovation, encouraging the transfer of technology to the private sector, and attracting talented workers to the state. See "Appendix" on page 7 for more information about the URC.

R&D UPDATE

Since 2007, Anderson Economic Group has prepared an annual economic impact study to benchmark the URC's activities on the Michigan economy. The URC released the fourth of these reports, entitled *Empowering Michigan*, in October of 2010. The 2010 economic impact study included R&D expenditure data from 2008. Shortly after the publication of this study the National Science Foundation released university R&D data for 2009. This update report uses the recently-released 2009 research and development expenditure data and updates measures found in the 2010 URC annual economic impact study.

COMPARISON CLUSTERS

To gauge how the URC's performance on research and development activities compares with other universities, we created a set of six university clusters across the nation against which we could benchmark the URC. Table 1 shows the three universities in each cluster. These clusters include some of the best universities nationwide. We created clusters with similar size, research focus, diversity, and geographic proximity as the URC universities.

TABLE 1. Comparison Research University Clusters

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

KEY FINDINGS

R&D expenditures by the seven university clusters in our study totaled approximately \$12.4 billion in FY 2009, making up almost 23% of the R&D expenditures by all U.S. universities. Below we provide key findings of our analysis.

- ***In 2009, URC universities spent over \$1.6 billion on R&D, bringing \$917 million in federal dollars to Michigan.***

About 56% of R&D expenditures by the URC were federally funded in 2009. This meant \$917 million federal dollars flowed into the state for URC employee salaries, supplies, and equipment.

- ***Between FY 2008 and 2009, R&D expenditures by the URC increased 10.1% compared to 5.8% for all universities nationwide.***

In FY 2009, the URC universities spent \$150 million more on R&D than they did in the previous fiscal year for a 10.1% increase. As shown in Table 3 on page 4, nationally all U.S. universities increased research expenditures by 5.8%. The URC's increase between fiscal years was the second-highest of the seven university clusters. Only the North Carolina universities experienced a more dramatic increase in R&D expenditures at 10.4%.

- ***In four years, R&D expenditures by the URC has increased by \$253 million.***

In 2006, the first year the URC began tracking its performance relative to other universities, the URC spent just under \$1.4 billion. As of 2009, the URC spent over \$1.6 billion—an increase of over 18%.

- ***The URC universities devote the largest portion of their R&D spending to the life sciences.***

In 2009, the URC spent \$1 billion, or 63% of its R&D expenditures, on the life sciences. The life sciences industry is an important industry in Michigan employing 80,000 people (2% of total employment in Michigan) and providing average wages of over \$83,000.¹ The URC universities have prepared students for careers in this field and created companies and jobs through the commercialization of technologies developed during life sciences research.

- ***URC licensing revenue is low relative to its R&D expenditures.***

In both 2008 and 2009, the URC ranked fifth (out of seven) in licensing revenue generated by each dollar of R&D expenditure. The URC performed better than the North Carolina and Pennsylvania clusters. The URC's recent increase in R&D expenditures may generate greater licensing revenue in the future.

1. See Sallee, Doe, and Anderson, Life Sciences Industry in Michigan and the University Research Corridor, May 2009 available at <http://www.AndersonEconomicGroup.com>.

Research and Development Activities

ACADEMIC R&D EXPENDITURES

From 2008 to 2009, R&D expenditures by universities grew by an average of 5.8% across the U.S. The 2009 R&D expenditures by the seven university clusters totaled over \$12.4 billion, making up approximately 23% of the R&D expenditures by all U.S. universities. The share of funding sources for all universities on average has remained unchanged from 2008 to 2009, as shown in Table 2. Each of the seven clusters shown below experienced an increase in funding amounts from almost every source compared to the previous year.

The URC universities spent \$1.6 billion on R&D in 2009. Over half of these expenditures (56%) were funded by the federal government. In FY 2009, \$917 million in federal dollars flowed into Michigan for R&D. This money was spent on employee salaries and supplies and equipment, in part from Michigan businesses. The California clusters experienced a decline in the amount of federal government funding from 2007 to 2008. While it was brought back to previous levels in 2009, its share of federal funding fell.

As in past years, the URC received a higher share of its R&D funding from institutions (30%) compared to the average university. In 2009, the average amount of institutional funding (which includes money from non-profits, corporate foundations, and endowments) for university R&D was about 20% throughout the U.S. The previous year, only Southern California received more total institutional funding than the URC (although its overall R&D expenditures exceeded the URC's by over \$600 million). In 2009, several other clusters totaled greater overall R&D funding than the URC, but none received more research funding from non-profits, corporations and endowments.

TABLE 2. Source of Funding for R&D Expenditures (in millions), 2009

	Total R&D Expenditures	Federal Government	State and Local Government	Industry^a	Institution^b	Other
Michigan's URC	1,632	56%	3%	4%	30%	7%
Northern California	2,304	53%	4%	8%	18%	17%
Southern California	2,302	59%	3%	8%	18%	13%
Illinois	1,456	61%	3%	3%	25%	8%
Massachusetts	1,346	76%	0%	10%	2%	12%
North Carolina	1,831	55%	11%	13%	18%	3%
Pennsylvania	1,594	67%	5%	8%	16%	3%
<i>All U.S. Universities</i>	<i>54,935</i>	<i>59%</i>	<i>7%</i>	<i>6%</i>	<i>20%</i>	<i>8%</i>

Data Source: National Science Foundation, Division of Science Resources Statistics, Academic Research and Development Expenditures: Fiscal Year FY 2009

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.

GROWTH IN R&D EXPENDITURES

Between 2008 and 2009, the URC increased its R&D expenditures by 10.1%. Only the North Carolina cluster (10.4%) exceeded the URC in R&D expenditure growth, as shown in Table 3. This growth rate was higher than the average increase by all U.S. universities of 5.8%, and significantly higher than the URC's increase the year before when expenditures grew by 5.5%. While Michigan's nine year average annual growth rate is slower than most of the other clusters, the URC has spent recent years closing this gap. Last year the URC was fifth in R&D expenditure growth since 2000. Michigan is now fourth (out of seven) in average annual increase in R&D expenditures between 2000 and 2009.

TABLE 3. Growth in Total Academic R&D Expenditures

	Annual Growth 2000 - 2009 (CAGR)	Annual Growth 2008- 2009	Rank: Growth Rate 2008-09
Michigan's URC	6.2%	10.1%	2
Northern California	5.5%	6.4%	5
Southern California	6.1%	3.1%	7
Illinois	7.0%	8.5%	3
Massachusetts	4.9%	7.5%	4
North Carolina	8.2%	10.4%	1
Pennsylvania	7.1%	5.7%	6
<i>All U.S. Universities</i>	<i>6.9%</i>	<i>5.8%</i>	

Data Source: National Science Foundation, Division of Science Resources Statistics, Academic Research and Development Expenditures: Fiscal Year FY 2009
Analysis: Anderson Economic Group, LLC

RESEARCH PRIORITIES

Research concentrations vary across the university clusters, as shown below in Table 4. However, expenditures in science and engineering fields have remained fairly consistent for each cluster, with only small changes in R&D expenditures as a percentage of total spending between 2008 and 2009.

The URC's primary field of concentration continues to be the life sciences where they devote 63% of their R&D funding. The North Carolina and California clusters spent a larger share of research dollars on life sciences compared to the U.S. average for universities, while the Massachusetts and Pennsylvania clusters spent significantly less. In other fields, the URC is consistent with U.S. university averages, although they spend slightly less than average on environmental sciences, math and computer sciences, but more on social sciences research. The Pennsylvania cluster spent significantly more on math and computer sciences than any other cluster—well above the U.S. university average.

TABLE 4. Share of Total R&D Expenditures by Science and Engineering Fields, 2009

	Environmental Sciences ^a	Life Sciences ^b	Math & Computer Sciences	Physical Sciences ^c	Psychology	Social Sciences ^d	Sciences, Other	Engineering ^e
Michigan's URC	2%	63%	2%	7%	2%	9%	0%	16%
Northern California	2%	68%	1%	7%	1%	3%	4%	14%
Southern California	8%	64%	7%	6%	2%	3%	1%	9%
Illinois	4%	57%	9%	10%	2%	3%	1%	15%
Massachusetts	4%	52%	4%	13%	1%	3%	3%	21%
North Carolina	3%	75%	3%	3%	1%	6%	0%	9%
Pennsylvania	4%	50%	11%	6%	3%	2%	1%	24%
<i>All U.S. Universities</i>	<i>5%</i>	<i>60%</i>	<i>4%</i>	<i>8%</i>	<i>2%</i>	<i>4%</i>	<i>2%</i>	<i>16%</i>

Data Source: National Science Foundation, Division of Science Resources Statistics, Academic Research and Development Expenditures: Fiscal Year FY 2009

Analysis: Anderson Economic Group, LLC

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

**EFFECTIVENESS OF
R&D EXPENDITURES**

To measure the success of each university cluster's R&D expenditures, AEG examined the licensing revenue generated by each dollar of R&D expenditure. Since a single large license can cause a large variation in licensing revenue from one year to the next, we compared the average licensing revenue over a five-year period (2005-2009) to the total R&D expenditures in 2009, as shown in Table 5.

In 2009, for each dollar of expenditure on R&D, the URC universities received 1.9 cents back in licensing revenue. The URC performed better on this measure than the North Carolina and Pennsylvania clusters, but not as well as the California, Illinois, and Massachusetts clusters. The Illinois university cluster had the greatest return on its R&D expenditures.

TABLE 5. Average Annual Licensing Revenue (2005-2009) as a Percent of 2009 Expenditures

	Licensing Revenue (in millions)	Total R&D Expenditures (in millions)	Revenues per Expenditures	Licensing Revenue per Expenditure Ranking
Michigan's URC	\$31.8	1,632	1.9%	5
Northern California	\$187.9	2,304	8.2%	2
Southern California	\$53.1	2,302	2.3%	4
Illinois	\$225.8	1,456	15.5%	1
Massachusetts	\$80.0	1,346	5.9%	3
North Carolina	\$14.1	1,831	0.8%	7
Pennsylvania	\$16.2	1,594	1.0%	6

Data Sources: National Science Foundation, Division of Science Resources Statistics, Academic Research and Development Expenditures: Fiscal Year FY 2009;

See footnotes in Table 16 on page 17 of the 2010 report "Empowering Michigan: Fourth Annual Economic Impact Report of Michigan's University Research Corridor" for licensing revenue sources

Analysis: Anderson Economic Group, LLC

Appendix

DATA SOURCES

Data presented in this report is from the National Science Foundation Division of Science Resource Statistics for FY 2009. We obtained information on individual university research and development expenditures, source of funding, and expenditures by category and summed the data by university cluster. Licensing revenue data presented in Table 5 on page 6 are from university websites, university office of technology annual reports, and Association of Technology Managers (AUTM) surveys. Please see Table 16 on page 17 of the 2010 report, *Empowering Michigan: Fourth Annual Economic Impact Report of Michigan's University Research Corridor*.

ABOUT THE URC

The University Research Corridor (URC) is an alliance between Michigan State University, the University of Michigan, and Wayne State University. The purpose of this alliance is to transform, strengthen, and diversify the Michigan economy. Research Corridor universities spark regional economic development via invention, innovation and technology transfer, by educating a work force prepared for the knowledge economy, and by attracting smart and talented people to Michigan. The URC universities have research facilities, teaching locations, and partner hospitals located throughout the state of Michigan. For more information about the URC visit www.urcmich.org.

ABOUT ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC is a research and consulting firm with expertise in economics, public policy, finance, and market analysis. AEG has offices in East Lansing, Michigan and Chicago, Illinois. AEG has conducted economic and fiscal impact assessments for colleges and universities located throughout the nation. The URC has retained AEG to complete its annual economic impact study and sector studies since 2007. For access to previous reports visit www.AndersonEconomic-Group.com.