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ANDERSON ECONOMIC GROUP

Empowering Michigan

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

Commissioned by Michigan's University Research Corridor

Michigan State University
University of Michigan
Wayne State University

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Executive Summary

INTRODUCTION AND PURPOSE

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 throughout the state, as shown in Map 1, "Michigan's University Research Corridor," on page 2.

Since 2007, the URC has commissioned Anderson Economic Group to provide annual reports that estimate the URC's economic impact on the state and compare its performance to peer universities nationwide. In these reports we present data on the URC's contributions to jobs and income for residents, its impact on state tax revenue, the number of degrees it awards to students, its research and development (R&D) expenditures, and its activities transferring knowledge and technology to the private sector. Over time these measurements will reveal trends in how the URC impacts Michigan, and how this impact compares to peer universities in other states.

This report differs in one respect from previous annual reports. In our four previous reports we compared the URC's performance to a group of peer university clusters in other states. Due to changes in the release dates of data we use for these comparisons, we are not able to provide similar comparisons in this report. We will issue a separate report later this year that contains these peer comparisons.

SCALE OF THE URC

The URC universities are the largest public universities in Michigan. We summarize the size of the URC in 2010, including number of students, employees, alumni, and amount of operational expenditures in Table 1 below.

TABLE 1. Scale of the URC in FY 2010

Category	Impact
Number of Enrolled Students (degree seeking)	137,583
Number of Full-Time-Equivalent Employees	50,531
Operational Expenditures (e.g. supplies, payroll, equipment)	$7.7 billion
Known URC Alumni Living in Michigan	573,621
Wage and Salary Earnings of URC Alumni in Michigan	$28.6 billion

Data Sources: IPEDS Finance FY 2010; URC Universities
Analysis: Anderson Economic Group, LLC

The URC universities had 137,583 students enrolled in the fall of 2010. URC students made up 25% of full-time students attending a higher education institution (including community colleges, for-profit institutions, and traditional 2- and 4-year colleges and universities) last year.[1] These students were drawn to the URC from throughout Michigan and around the world. A quarter of these students came from locations outside Michigan. The URC has students from every county in Michigan, every state, and more than 100 countries. See "URC Students" on page 3.

The URC universities collectively spent $7.7 billion on operations in FY 2010. Expenditures were made for the salaries of 50,531 full-time-equivalent staff and faculty, supplies, equipment, and maintaining buildings. The $7.7 billion in expenditures is about 2% of all economic activity in the state, as measured by Michigan's gross state product. See "URC Expenditures in FY 2010" on page 22.

As of summer 2011, there were 573,621 known URC alums living in Michigan, making up 7.6% of Michigan's population over the age of 18 years. These alums earned an estimated $28.6 billion in salary and wages in 2010, or 16.4% of all wage and salary income in Michigan. See "Alumni Expenditures" on page 27.

SUMMARY OF IMPACT

The URC universities contribute to the state's economy in many ways. For example, the URC universities train the state's future workforce, employ people directly, purchase supplies from businesses in the state, and assist with the development of new start-up companies. We present a summary of the URC's economic contributions to the state in Table 2 below. We describe these impacts in more detail in the remainder of the executive summary.

Economic and Fiscal Impact. The URC's net economic impact in Michigan was $15.2 billion in FY 2010. In four years, the URC's economic impact has grown by $2.3 billion. We estimate that the State of Michigan collected $426 million more in tax revenue in 2010 due to the URC. See "Economic Impact" on page iii.

R&D and Tech Transfer. The URC helped cultivate 14 start-ups in 2010, which is equal to their five year average between 2006 and 2010. The URC received more patent awards and technology licenses on average between 2006-2010 than the initial benchmark period of 2002-2006. See Table 2 below.

TABLE 2. Trends and URC Impact on Michigan, FY 2006-2010

	Benchmark: 2007 Report (2006 data)	2010 Report (2009 data)	2011 Report (2010 data)	Change Since Benchmark Year of 2007
Operational Expenditures	$6.5 billion	$7.5 billion	$7.7 billion[a]	+$1.2 billion
Fall Enrollment (Degree-Seeking Only)	131,635	137,152	137,583	+5,948
Net Economic Impact	$12.9 billion	$14.8 billion	$15.2 billion	+$2.3 billion
Tax Revenue Impact on State of Michigan	$351 million	$401 million	$426 million	+$75 million
Total R&D Expenditures[b]	$1.451 billion	$1.734 billion	$1.878 billion	+$427 million
Start-up Companies Cultivated (Previous 5 Year Avg)	15	14	14	-1
Patent Grants Awarded (Previous 5 Year Avg)	124	136	135	+11
Technology Licenses Issued (Previous 5 Year Avg)	119	131	129	+10

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 $98.1 million or 1.3% of operational expenditures.

b. This includes both science and engineering and non-science and non-engineering research expenditures.

1. According to IPEDS, 434,286 full-time students were enrolled at a public or private higher education institution in Michigan last year. We used full-time enrollment, which is slightly different than head count reported elsewhere for the URC universities, to calculate this share.

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 the state even if the URC institutions left Michigan. We describe our methodology for the total economic impact of the operational expenditures by URC universities in Appendix A.

In FY 2010, the URC's operations contributed $15.2 billion to the Michigan economy. This was due to (1) expenditures by the URC universities on non-payroll items (such as supplies and equipment) for instruction and research, and (2) incremental earnings by employees, students, and alumni. The total impact includes both direct and indirect impacts. See Table 3 below.

TABLE 3. Net Economic Impact of URC, FY 2010 (in billions)

Impact Category	Net Economic Impact
Non-payroll Operating Expenditures	$3.3
Faculty & Staff Wages and Benefits	$4.5
URC Student Expenditures	$2.3
Incremental Alumni Earnings[a]	$5.2
TOTAL NET ECONOMIC IMPACT	**$15.2**

Note: Numbers may not sum to total due to rounding.
Source: Anderson Economic Group, LLC

a. We estimate that URC alumni in Michigan earned $28.6 billion in wage and salary earnings last year. Of this, we only count $4.35 billion as incremental earnings directly caused by the URC. Once we account for taxes, savings, and indirectly-generated activity, we estimate a total economic impact of $5.2 billion, as shown above. See "Alumni Expenditures" on page 27.

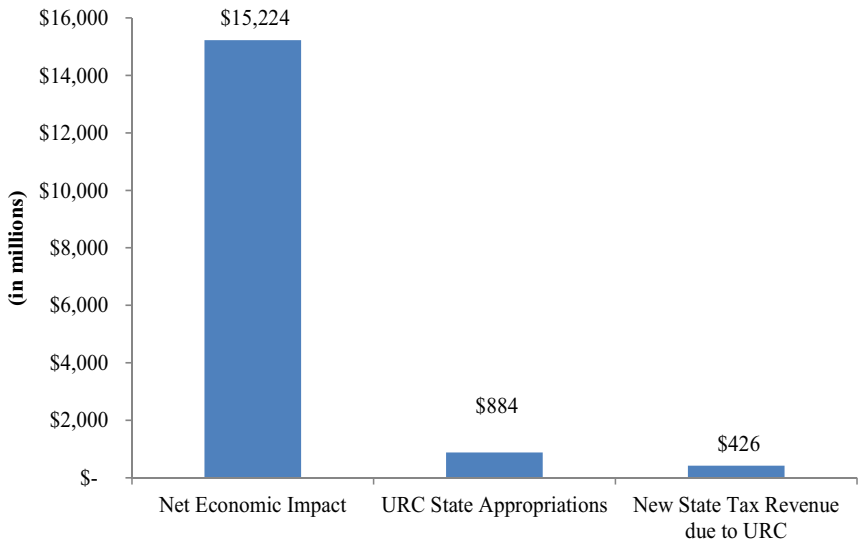
In addition to new earnings, 72,713 jobs in Michigan were directly and indirectly supported by the URC's operations in the state in FY 2010. This jobs figure includes 11,227 faculty members and 39,303 staff directly employed by the URC universities. It also includes 22,183 indirectly-generated jobs in 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 2010, we estimate that $2.9 billion in wages of URC employees and over $4.35 billion of URC alumni earnings in Michigan were caused by the URC. We attribute this share of alumni earnings to the URC since these universities helped graduates earn more than they would have otherwise. We estimate that the tax revenue the state received in 2010 because of these additional earnings was $426 million. This includes tax revenue the state receives from personal income, sales and use, property, and gasoline taxes. Our complete analysis can be found in "Impact on State Revenue" on page 30.

Comparison of Economic Impact with State Appropriations. Of course the main goal of these universities is not generating economic impact and tax revenue for the state. However, since the state government provides funding for these universities, we compare the net economic benefit these universities provide to the "cost" to the state government in Figure 1 below. The $15.2 billion in net economic impact is over 17 times greater than the state's funding for URC universities. Additionally, the State of Michigan receives $426 million in tax revenue from URC employees and alumni that it would otherwise not have received if the URC universities were not located in Michigan.

FIGURE 1. URC Net Economic Impact vs. State Appropriations, FY 2010



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

DEGREES AWARDED

One direct measure of the URC's contributions to the state is the number of degrees granted by its institutions. Last year the URC granted 32,157 degrees, up 7% from 2006. The 2010 figure includes 20,200 undergraduate degrees, the largest amount to date and a 10% increase from 2006. The number of graduate degrees rose by roughly 1.6% between 2006 and 2010, although the total fell slightly from 2009 to 2010. See "Total Degrees Granted" on page 4.

High-Tech Degrees. 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 those in biological and biomedical sciences, physical sciences, computer sciences, architecture, engineering, mathematics and statistics, and some agricultural sciences. We acknowledge that many people with degrees in other fields work in high-tech industries.

The URC has annually increased the number of high-tech degrees it awards, going from 6,993 degrees awarded in 2006 to almost 8,000 total degrees in high-tech fields in 2010. The number of undergraduate degrees in these fields has risen more

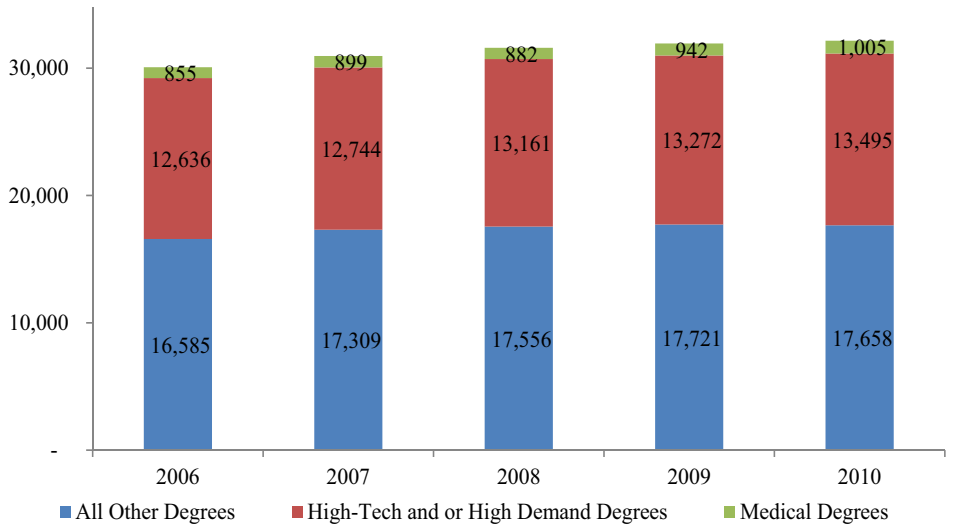
steadily than graduate degrees. Between 2006 and 2010 the number of high-tech undergraduate degrees awarded increased by 20.7% from 4,118 graduates to nearly 5,000.

Degrees in High-Demand Fields. The three fields of study with the highest demand among employers are Business, Computer Science, and Engineering, according to a survey done by the National Association of Colleges and Employers.[2] In 2010, the URC awarded 8,800 degrees in these "high demand" fields or 28% of all degrees awarded.

Degrees in Medical Fields. Michigan's URC is home to four medical schools, a school of dentistry, and a college of veterinary medicine. In 2010, the URC granted 750 degrees from its medical schools, 149 degrees from U-M's School of Dentistry, and 106 degrees by MSU's College of College of Veterinary Medicine.

We show the number of students earning a high-tech, high demand or medical degree in Figure 2 below. The reader should note there is some overlap in fields that count as high demand and high-tech. Since 2006, the number of URC degrees awarded has increased across the board, including degrees awarded in these areas. However, the share of degrees in these fields has remained roughly constant at approximately 43% of all URC degrees.

FIGURE 2. High-tech, High Demand and Medical Degrees Awarded by URC



Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

2. The National Association of Colleges and Employers' *Job Outlook 2011 Report* surveyed approximately 200 employers from a variety of sectors. We describe the degree categories in "Degree Completions" on page A-1.

R&D EXPENDITURES

In 2010, the URC spent almost $1.9 billion on research and development. This is an 8% increase from the previous year, when the universities spent over $1.7 billion.[3] In the last five years (2006 to 2010), the URC increased their R&D spending by 29%. Over half (58%) of this research was funded by the federal government. The URC institutions themselves funded 31% of R&D with state and local governments, nonprofits, and business partners funding the remainder.

The increase in funding occurred in almost all subject areas (or fields) from 2009 to 2010. The largest increase occurred in life sciences, which continues to account for the majority of R&D funding at URC universities. Life sciences R&D increased by $88 million from 2009 to a total of $1.1 billion in 2010. The field with the largest percentage increase was the physical sciences, with an increase in R&D funds of 26%, to a total of $148 million in 2010. R&D spending in non-science and non-engineering fields was substantial, as well, at $94 million in 2010. See "Research and Technology Transfer" on page 17.

TECH TRANSFERS

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

We report the following measures of technology transfer in this report:

- **Patent and Licensing Activity** includes invention disclosure, patents issued and agreements of licensing and options entered into. The URC has issued more patents and entered into more licensing/options in 2010 than their five-year average, although there were slightly less invention disclosures in 2010 than the past five year average.
- **The Number of Cultivated Start-Ups** is one indicator of the research and development process. Although it is impossible to accurately measure the number of new companies assisted in some way by the URC, we have some data on the number we can directly attribute to the URC. In 2010, the URC produced 14 start-ups, which is the same as their longer-run trend of 14 start-ups annually. Since 2002, the URC has cultivated 131 start-up companies, 71 of which have formed within the past five years.

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

ABOUT ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC is a consulting firm that specializes in economics, public policy, financial valuation, and market and industry analysis. AEG 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.

3. URC expenditures using ARRA awards totaled $98.1 million in FY 2010, or roughly two-thirds of the increase in federal support for science and engineering R&D from 2009 to 2010.

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 in Map 1 on page 2. This maps shows the URC campuses, main research locations, and hospitals that all four URC medical schools partner with to train students throughout the state.

REPORT PURPOSE & METHODOLOGY

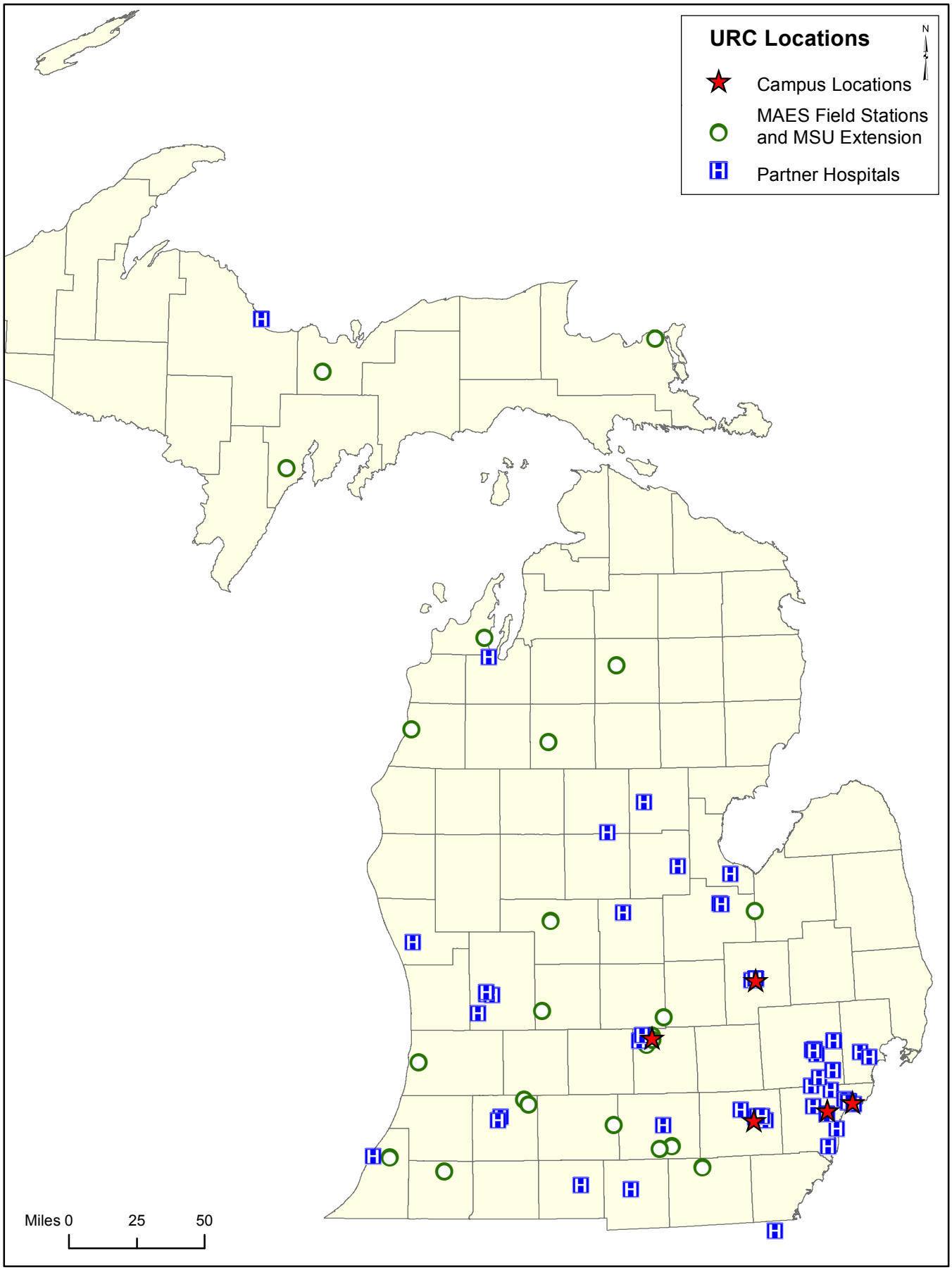
Michigan's University Research Corridor universities commissioned Anderson Economic Group to undertake a comprehensive study that quantifies the economic impact of the URC's activities on Michigan's economy. This report is the fifth in a series of annual reports intended to measure and benchmark the 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.

BENCHMARKING TO PEER UNIVERSITY CLUSTERS

This report differs in one respect from previous annual reports. In our four previous reports we compared the URC's performance to a group of peer university clusters in other states. Due to changes in the release dates of data we use for these comparisons, we are not able to provide similar comparisons in this report. We will issue a separate report later this year that contains these peer comparisons.

Map 1. URC's Presence in Michigan



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

II. URC Students

An important way the URC institutions contribute to Michigan's economy is by educating and training the state's future workforce. Last year, URC students made up 25% of full-time students attending a higher education institution (including community colleges, for-profit institutions, and traditional 4-year colleges and universities).[4] This section discusses the students who attend the URC.

URC STUDENT ENROLLMENT

The University Research Corridor had 137,583 students enrolled in the fall of 2010. This represents a slight increase in enrollment from the fall of 2009, when total URC enrollment was 137,152. From 2009 to 2010 the number of undergraduates declined 4.3%. The number of graduate students, however, concurrently increased by 13.8%. See Table 4 below.

TABLE 4. URC Enrollment, Fall 2006-2010

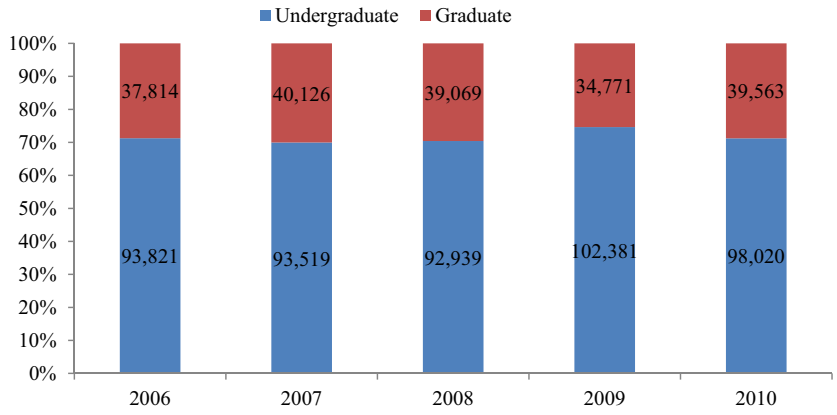
	2006	2007	2008	2009	2010	Change 2009-10
Undergraduate	93,821	93,519	92,939	102,381	98,020	-4.3%
Graduate	37,814	40,126	39,069	34,771	39,563	13.8%
TOTAL	131,635	133,645	132,008	137,152	137,583	0.3%

Source: IPEDS fall enrollment for degree-seeking, 2006-2008; URC Registrar offices for 2010
Analysis: Anderson Economic Group, LLC

The ratio of undergraduate to graduate students remained fairly constant between 2006 and 2010, as shown in Figure 2. In 2010, undergraduate students made up approximately 71% of total enrollment while graduate students (including doctoral and professional) made up 29%.

4. According to IPEDS, 434,286 full-time students were enrolled at a public or private higher education institution in Michigan last year. We report the head count of degree-seeking students in the fall for the URC universities, but use full-time enrollment to calculate this share.

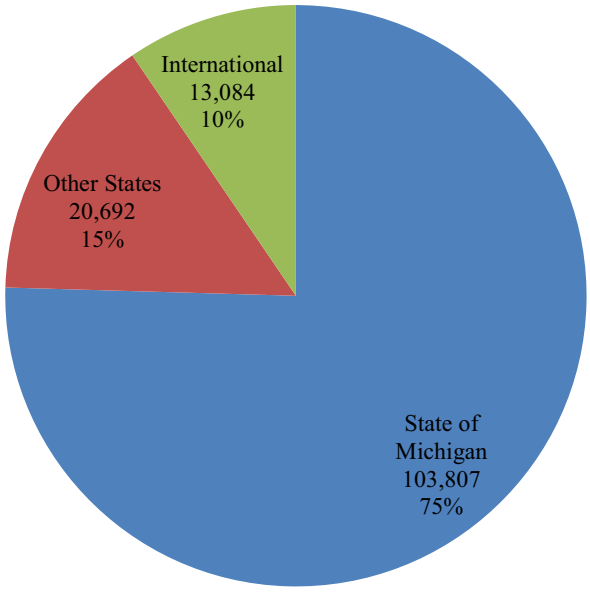
FIGURE 2. URC Student Enrollment 2006-2010



Data: Offices of the Registrar URC Universities, 2006-2010
Analysis: Anderson Economic Group, LLC

Students who attend URC universities are drawn from throughout the state, across the United States, and around the world. Many of the talented students that the URC helps draw to Michigan spend their working careers in the state. In fall of 2010, students from the state of Michigan accounted for the majority (75%) of total enrollment in URC universities. About 15% came from elsewhere in the United States and 10% came from other countries, as shown below in Figure 3.

FIGURE 3. Origin of URC Students, Fall 2010

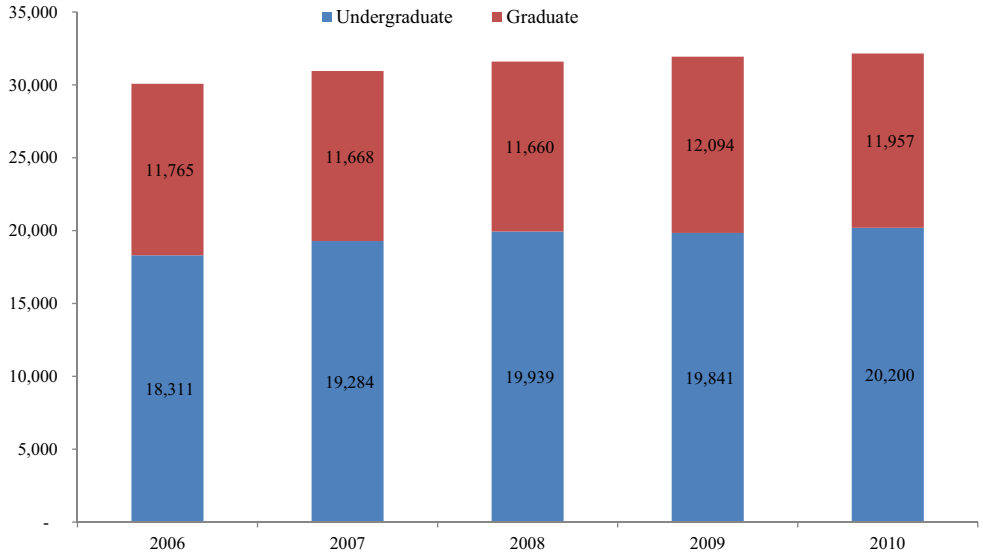


Data: Offices of the Registrar URC Universities 2010
Analysis: Anderson Economic Group, LLC

TOTAL DEGREES GRANTED

The URC granted 32,157 undergraduate and graduate degrees in 2010, which is a 7% increase from 2006.[5] As shown in Figure 4 on page 5, the URC conferred the largest number of undergraduate degrees to date (20,200) in 2010. This is a 10% increase since 2006. The number of graduate degrees awarded fell slightly between 2009 and 2010; however, the overall number of graduate degrees awarded increased 1.6% between 2006 and 2010.

FIGURE 4. Completions by Type of Degree, 2006-2010



Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

DEGREES BY PROGRAM AREA

In this section we discuss the number of degrees granted by the URC universities by subject area. We first discuss the academic programs and then the number of undergraduate and graduate degrees conferred by the URC 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. CIP codes were changed this year and we used the updated codes for our 2010 analysis.[6] The composition of each program area follows.

5. The completions data contained in this section may not perfectly match the numbers in our previous report. We use completion data from the Integrated Postsecondary Education Data System (IPEDS) for this analysis. As the definitions of degrees (CIP codes) changed in 2010, we pulled new data for previous years (2006-2009) to remain consistent.
6. All CIP two-digit codes remained the same except for code 43. This change does not affect our analysis.

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

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

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

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

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

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

Specialized Program Areas

In addition to these academic fields, we define two specialized program areas that include the following.

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.

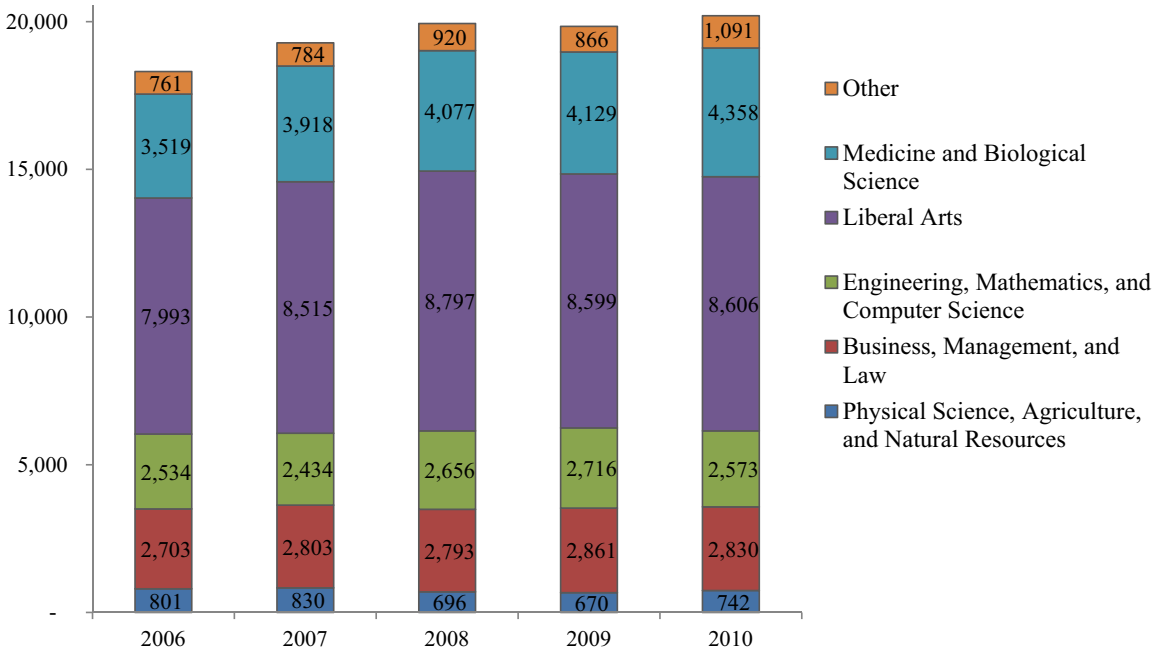
High Demand Degrees include: business, management, marketing, and related support services, which we label as “business”; computer and information sciences and

support services, which we label as "computer science"; and engineering and engineering technologies/technicians, which we label the "engineering" category.

Undergraduate Degrees Conferred

As shown in Figure 5 below, the URC awarded more undergraduate degrees in 2010 than 2006 in every area, except for *Physical Sciences, Agriculture and Natural Resources.* Since 2006, the number of undergraduate degrees awarded in *Medicine and Biological Science* increased 23.8%, *Liberal Arts* degrees increased 7.7% and *Business, Management, and Law* degrees increased 4.7%. Despite these increases since 2006, only *Medicine and Biological Science,* and *Liberal Arts* showed an increase between 2009 and 2010. Additionally, *Physical Science*, which has dropped 7.4% overall since 2006, showed a 10.7% increase between 2009 and 2010.

FIGURE 5. Undergraduate Degrees Conferred by Area, 2006-2010



Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

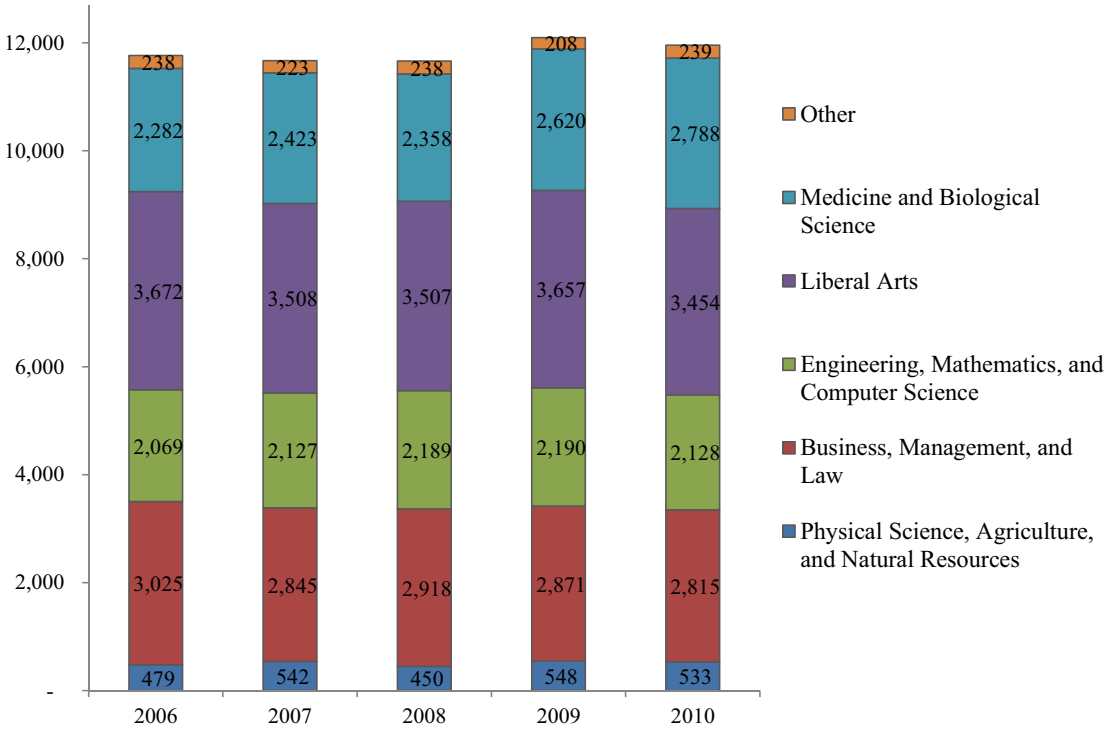
Graduate Degrees Conferred

Graduate degrees represented 37.2% of all degrees granted by the URC in 2010. Though the number of graduate degrees conferred in 2010 fell slightly from 2009, there was overall growth in graduate completions between 2006 and 2010.

In Figure 6 on page 8 we show the composition of graduate degrees conferred by the URC over the past five years. The only areas that fell in number of degrees

awarded below 2006 levels were *Business, Management, and Law* (6.9%) and *Liberal Arts* (5.9%). The areas that increased the number of graduate degrees conferred in 2010 from the previous year were *Medicine and Biological Sciences* (6%) and *Other* (15%).

FIGURE 6. Graduate Degrees Conferred by Area, 2006-2010

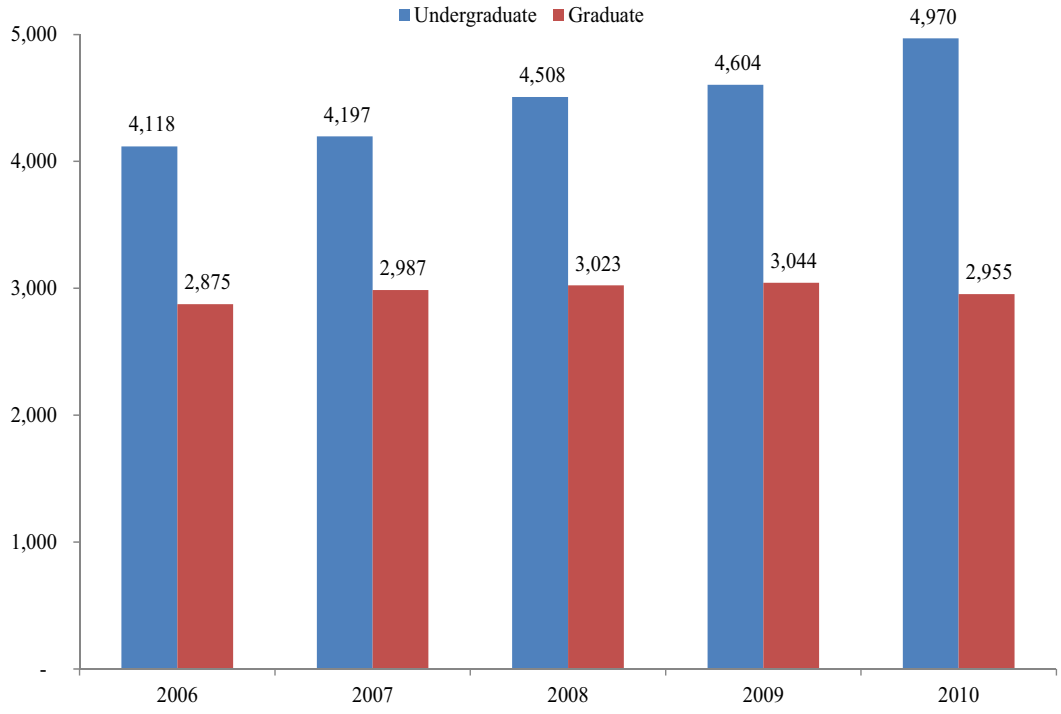


Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

HIGH-TECH AND HIGH DEMAND DEGREES

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. Since 2006, the number of URC graduates with high-tech degrees has increased every year. In 2006, almost 7,000 graduates received a degree in a high-tech field. In 2010 the number had increased by 13.3% to almost 8,000 total degrees. Figure 7 on page 9 shows that between 2006 and 2010 the number of high-tech bachelor's degrees increased by 20.7% from 4,118 to nearly 5,000.

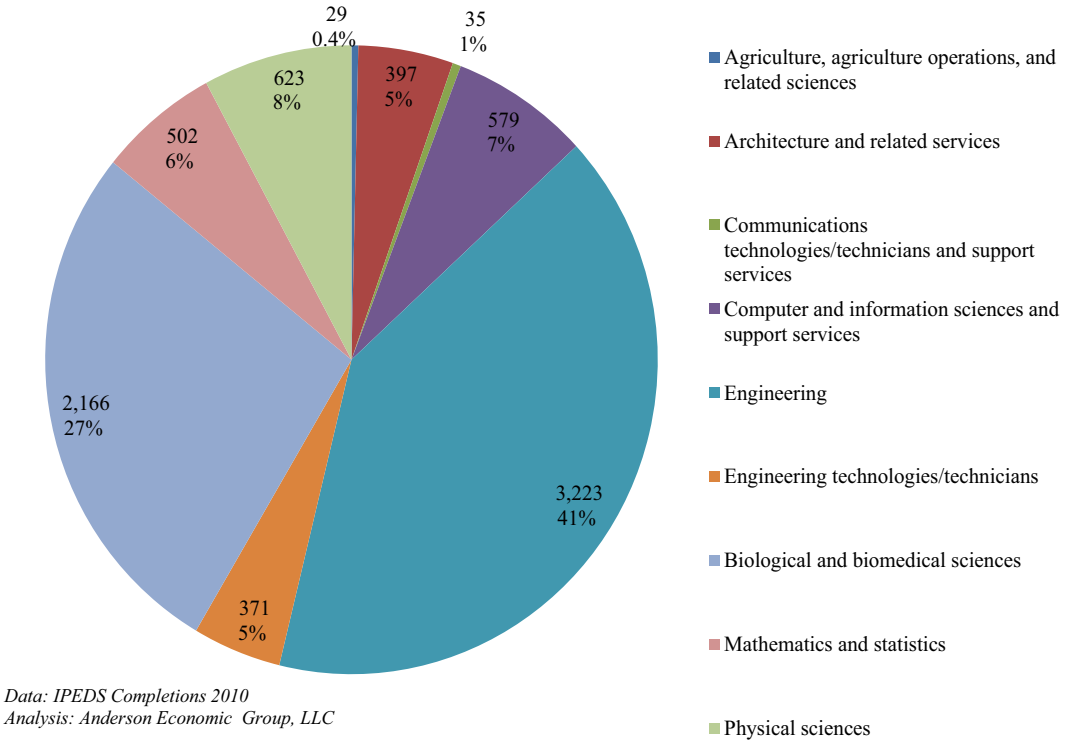
FIGURE 7. Completion of High-Tech Degrees 2006-2010



Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

Figure 8 on page 10 shows the number and share of high-tech degrees awarded by each specific field of study included in our definition of high-tech. *Engineering* (41%) and *Biological and Biomedical Sciences* (27%) represent the largest share of high-tech degrees awarded by the URC.

FIGURE 8. Completion of High Tech Degrees by Field of Study 2010



Data: IPEDS Completions 2010
Analysis: Anderson Economic Group, LLC

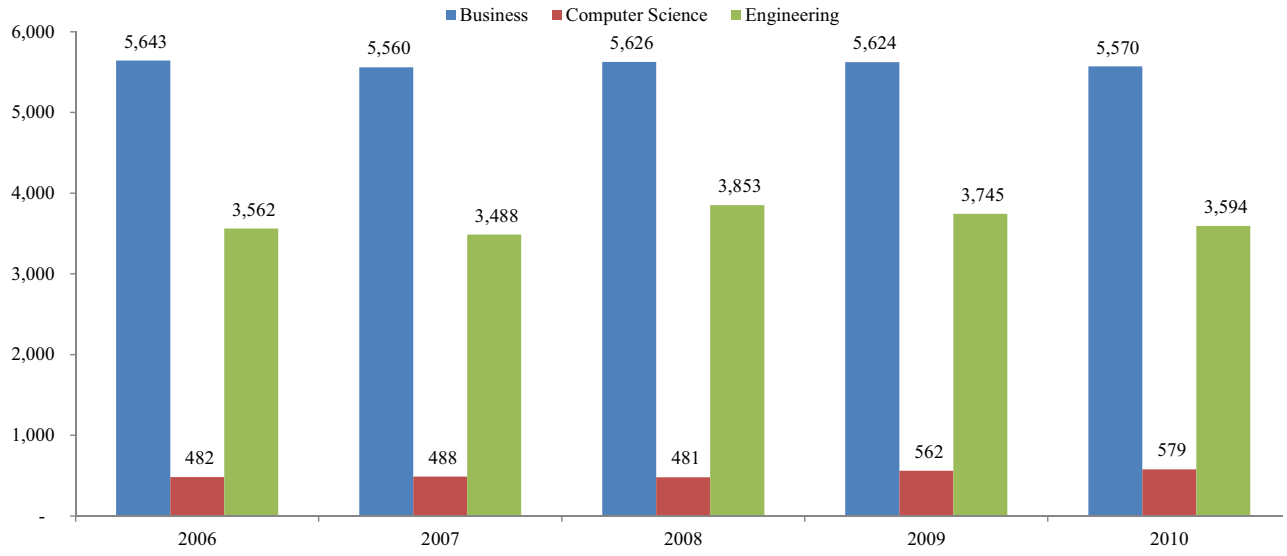
Degrees in High Demand Among Employers

The three fields of study with the highest demand among employers are Business, Computer Science, and Engineering, according to a survey done by the National Association of Colleges and Employers.[7] We analyzed the number of degrees awarded at the undergraduate and graduate levels in these fields.

Figure 9 on page 11 shows high demand degrees by field of study over the past five years. In 2010, the URC awarded 9,743 degrees in high demand fields. Business and engineering represent the largest share of these degrees. Degrees awarded in both of these fields of study have declined since 2008. However, computer science has risen steadily since 2006, except for a slight drop in 2008.

7. The National Association of Colleges and Employers' *Job Outlook 2011 Report* surveyed approximately 200 employers from a variety of sectors. We describe the degree categories in "Degree Completions" on page A-1.

FIGURE 9. High Demand Degrees by Field of Study 2006-2010



Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

As shown in Table 5 below, the share of degrees awarded in high demand fields was about 30% of all degrees awarded by URC universities in 2010.

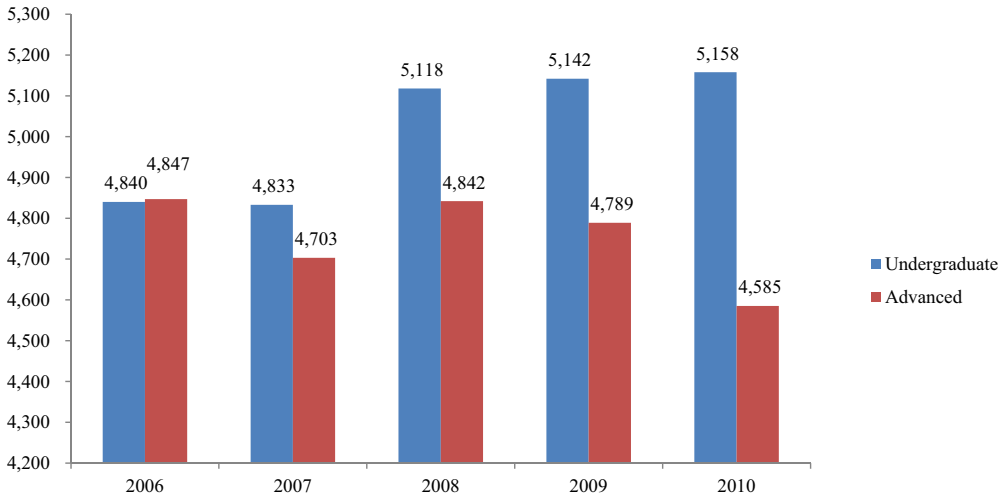
TABLE 5. High Demand Share of Total URC Degrees 2006-2010

	2006	2007	2008	2009	2010
High Demand Degrees	9,687	9,536	9,960	9,931	9,743
All Degrees	30,076	30,952	31,599	31,935	32,157
Share High Demand	*32.2%*	*30.8%*	*31.5%*	*31.1%*	*30.3%*

Data: IPEDS Completions, 2006-2010
Analysis: Anderson Economic Group, LLC

Figure 10 on page 12 shows the breakdown of undergraduate and graduate high demand degrees. Since 2006, undergraduate degrees conferred by the URC have risen 6.6%. Graduate degrees that are in high demand rose steadily until 2009, then dropped below 2006 levels in 2010.

FIGURE 10. High Demand Degrees by Type 2006-2010



Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

MEDICAL EDUCATION IN THE URC

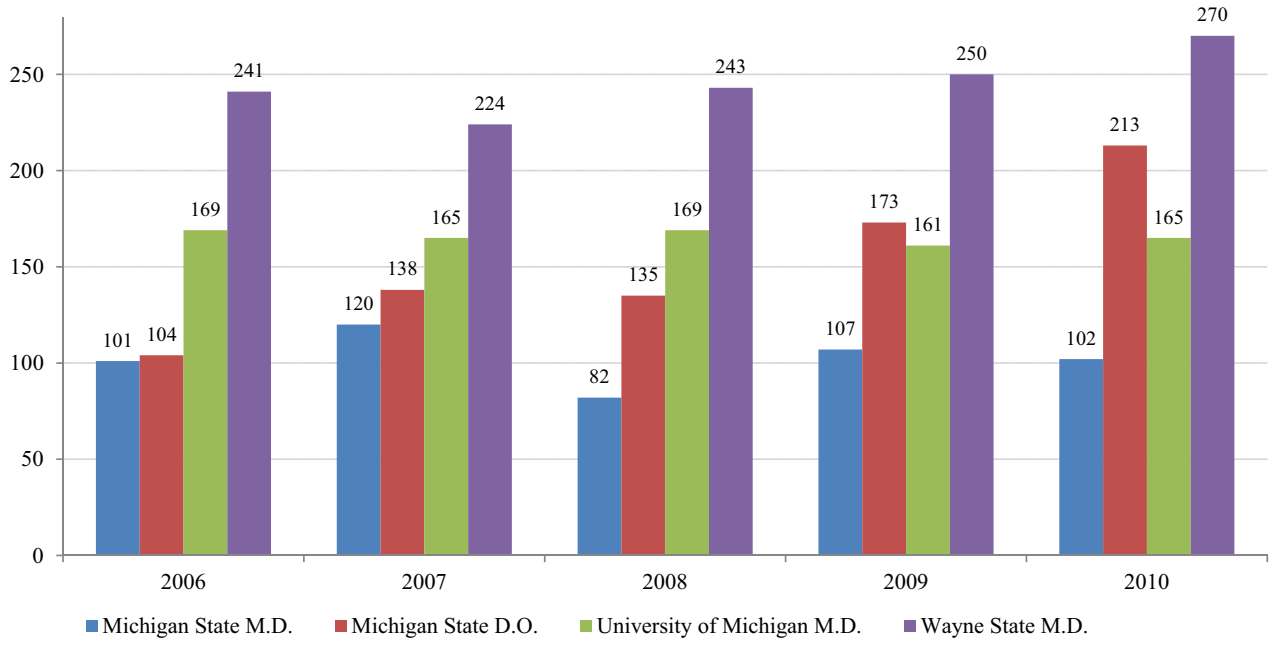
Michigan's URC is home to four of Michigan's five medical schools. All three URC universities have an allopathic (M.D.) medical school and Michigan State also has an osteopathic (D.O.) medical school.

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 28 affiliated hospital training sites in which they place third- and fourth-year medical students.[8] 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.

Figure 11 on page 13 shows the total number of medical graduates from each URC medical program for each year between 2006 and 2010. Wayne State has the largest program, while Michigan State's D.O. program has more than doubled its graduating class since 2006.

8. See "Statewide Campus System" at MSU's College of Osteopathic Medicine's website at http://www.scs.msu.edu/hospitals.

FIGURE 11. URC Medical Graduates by School 2006-2010



Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

Table 6 below shows the total number of medical degrees conferred between 2006 and 2010. In 2010, the most recent year data was available, Michigan's URC graduated 750 students from its medical schools, an 8.5% increase from 2009. The overall growth in number of degrees between 2006 and 2010 was 22%. Michigan State's D.O. program shows the fastest growth at almost 105% since 2006. The University of Michigan's and Michigan State's M.D. programs are both virtually the same size as in 2006 during that period. Wayne State's M.D. program has grown 12% since 2006.

TABLE 6. URC Medical Graduates by School and Field of Study 2006-2010

University	Degree Granted	2006	2007	2008	2009	2010	% Change 2006-2010
MSU	M.D.	101	120	82	107	102	*1.0%*
MSU	D.O.	104	138	135	173	213	*104.8%*
U-M	M.D.	169	165	169	161	165	*-2.4%*
WSU	M.D.	241	224	243	250	270	*12.0%*
URC Total	**M.D. and D.O.**	**615**	**647**	**629**	**691**	**750**	*22.0%*

Source: National Center for Education Statistics, IPEDS Completions 2011
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.[9] 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 2009 and 2010, the University of Michigan School of Dentistry program graduated a total of 223 students with a DDS degree. During the same two-year time period, 65 students graduated with a dental hygienist degree. Since 2006 the number of dental degrees conferred at the University of Michigan has increased 10.4%. See Table 7 below.

TABLE 7. University of Michigan School of Dentistry 2006-2010

Program	2006	2007	2008	2009	2010	% Change 2006-2010
Dentistry (DDS)	99	111	111	111	112	*13.1%*
Dental Hygiene (Bachelor's and Master's)	36	30	28	28	37	*2.8%*
Total Degrees Granted	**135**	**141**	**139**	**139**	**149**	***10.4%***

Source: National Center for Education Statistics, IPEDS Completions 2011
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 College 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.[10]

As seen in Table 8 on page 15, the college issued to 101 students a Doctorate in Veterinary Medicine in 2010. 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

9. 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.

10. Information provided by MSU's College of Veterinary Medicine.

than 136,000 animals annually (23,000 on-site and an additional 113,000 in the field).

TABLE 8. Michigan State University Veterinary Medical Degrees 2006-2010

Program	2006	2007	2008	2009	2010	% Change 2006-2010
Veterinary Medicine (DVM)	100	104	107	107	101	1.0%
Veterinary Biomedical and Clinical Sciences (Cert, MS, PhD)	5	7	7	5	5	0.0%
Total Degrees Granted	**105**	**111**	**114**	**112**	**106**	**1.0%**

Source: National Center for Education Statistics, IPEDS Completions 2011
Analysis: Anderson Economic Group, LLC

The College of Veterinary Medicine 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 handles more than 220,000 cases and runs over 1.5 million tests a year. This allows the Center 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 problems in animal health management, ensuring that they are safe for human consumption. The program is currently researching Johnes Disease, Avian Influenza, and Mad Cow Disease.[11]

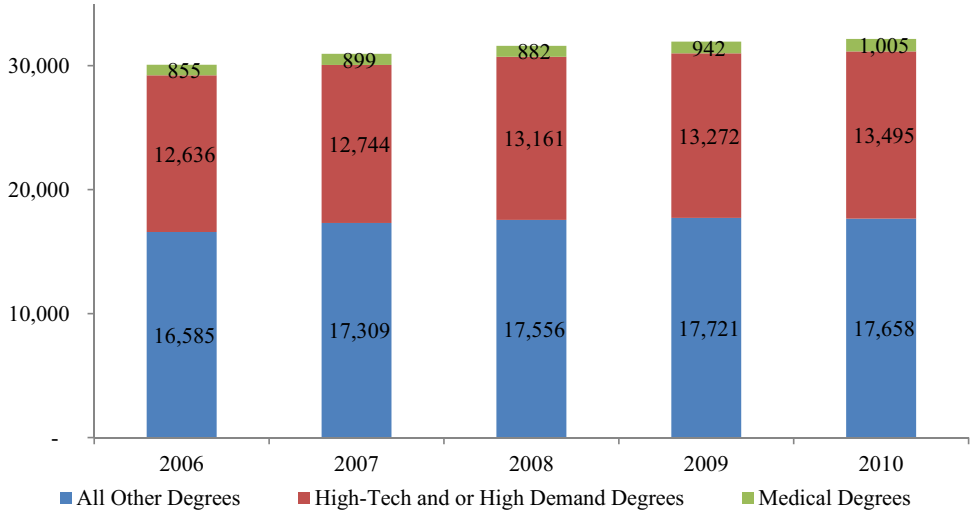
SUMMARY OF HIGH-TECH, HIGH DEMAND, AND MEDICAL DEGREES

Many students pursue an education to maximize their employment prospects. We show the number of degrees awarded to URC students in high-tech, high-demand, and medical fields.[12] As shown in Figure 12 on page 16, since 2006 the number of URC degrees have increased across the board, and the share of degrees in these fields has remained roughly constant at approximately 43% of total degrees awarded.

11. Information provided by MSU's College of Veterinary Medicine.

12. A 2008 Michigan Department of Community Health survey of 4,546 physicians found that around 62% of Michigan's doctors are at patient capacity (in comparison to 42% in 2005). According to the survey the percentage of physician in primary care, especially those who treat Medicaid patients is declining despite the increase in need. See michigan.gov/mdch/ for more information on Michigan's physicians.

FIGURE 12. High-Tech, High Demand, and Medical Degrees, 2006-2010



Data: IPEDS Completions 2006-2010
Analysis: Anderson Economic Group, LLC

III. Research and Technology Transfer

Universities serve an important role in the development of new ideas, products, and services. The URC universities spend billions of dollars annually on basic and applied research. A portion of this research leads to new technologies that have commercial potential. In this section, we discuss a few indicators of this activity.

ACADEMIC R&D EXPENDITURES

Using the most recent data available from each university, and past data from the National Science Foundation, we compared the research and development (R&D) expenditures for the URC during the past five years.

In 2010, the URC universities spent almost $1.9 billion on research and development, as shown in Table 9 below. This is an 8% increase from the previous year, when the universities spent over $1.7 billion. Over the last five years (2006 to 2010), the URC universities increased their R&D spending by 29%. Research and development funds go primarily to science and engineering fields (such as life sciences, physics, math, and computer sciences), but there is almost $100 million in R&D funding for non-science and non-engineering fields (such as business, law, and the humanities), as well.

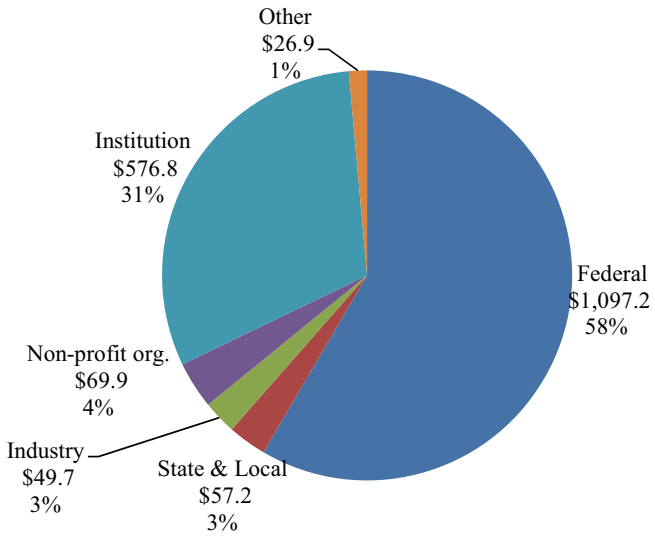
TABLE 9. Total URC R&D Expenditures (in millions), 2006-2010

	2006	2007	2008	2009	2010	% Growth 2006-2010
Science & Engineering R&D	$1,379.3	$1,404.8	$1,482.4	$1,632.2	$1,783.4	*29.3%*
Non-Science & Non-Engineering R&D	$72.1	$78.0	$79.3	$101.5	$94.4	*30.9%*
Total R&D Expenditures	$1,451.4	$1,482.8	$1,561.7	$1,733.7	$1,877.8	*29.4%*

Source: National Science Foundation database, Tech transfer offices of URC universities, 2010
Analysis: Anderson Economic Group, LLC

The majority of funding for research and development at URC universities comes from the federal government. In FY 2010, total funding from the federal government for R&D at the URC surpassed $1.0 billion for the first time. State and local governments, nonprofits, and private industry also make significant contributions to R&D at the universities, combining to account for 10% of all research and development funds. Almost all of the remaining funds come at the discretion of the universities themselves. The universities of the URC provided $577 million in funds to researchers on their campus in 2010. See Figure 13 on page 18.

FIGURE 13. Funding Sources for Research & Development (in millions) All Fields, FY2010



Source: URC Universities NSF Submissions, 2010
Analysis: Anderson Economic Group, LLC

R&D EXPENDITURES BY FIELD

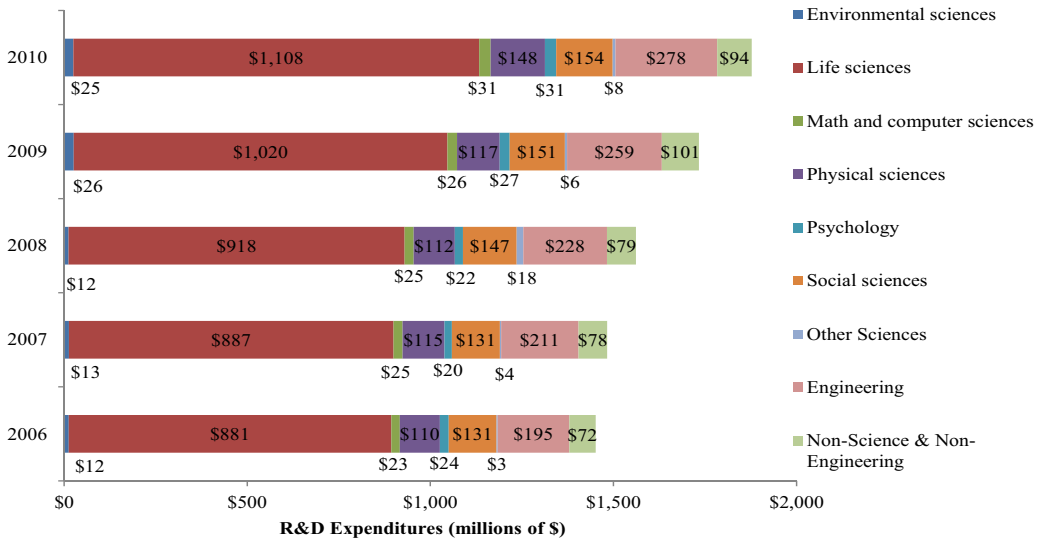
Figure 14 on page 19 illustrates how the URC universities have prioritized their R&D expenditures over the past five years. We show the following categories along with their share of total R&D spending:

- *Environmental sciences* includes atmospheric and earth sciences, oceanography, and other miscellaneous sciences.
- *Life sciences* includes agricultural, biological, medical, and other miscellaneous life sciences.
- *Math and computer sciences* includes algebra, analysis, applied mathematics, foundations and logic, geometry, numerical analysis, operations research, statistics, topology, computer systems analysis, data processing, information sciences, information technology, and management information systems.
- *Physical sciences* includes astronomy, chemistry, physics, and other miscellaneous physical sciences.
- *Psychology* includes animal behavior, art therapy, clinical psychology, educational and experimental psychology, human development and personality, school psychology, and social psychology.
- *Social sciences* includes economics, political sciences, sociology, and other miscellaneous social sciences.
- *Engineering* includes aeronautical, biomedical, bioengineering, chemical, civil, electrical, mechanical, metallurgical, and other.
- *Other Sciences* includes multidisciplinary R&D involving science and engineering.
- *Non-science and non-engineering* includes education, law, humanities, visual and performing arts, business and management, communications, journalism, library science, social work, and other non-science and engineering fields.

Research and development expenditures in science and engineering went up across the board from 2009 to 2010; every scientific field except environmental sciences saw an increase in R&D funding at the URC, as did engineering. (Environmental sciences R&D funding went down by $1.1 million, but it had more than doubled from 2008 to 2009.) Life sciences, already the largest field for R&D at over 60% of the total, grew by $88 million in 2010 to attain R&D funding of $1.1 billion at URC universities. The field that saw the largest percentage increase in funding from 2009 to 2010 was the physical sciences. The funding for physical sciences R&D at URC universities increased from $117 million in 2009 to $148 million in 2010, an increase of 26%.

This is in line with the trend since 2006, where, with few exceptions, each field has experienced at least a small increase in funding each year. R&D spending has accelerated particularly over the last couple years. From 2008 to 2009, the total level of R&D spending on the science and engineering fields at URC universities increased by $150 million. From 2009 to 2010, it increased by another $150 million. R&D in non-science and non-engineering fields was $94 million in 2010. This is somewhat lower than the 2009 level of $101 million but still well above the 2008 level of $79 million. When we add this total to our science and engineering totals, we find that R&D expenditures by URC universities were almost $1.9 billion in 2010.

FIGURE 14. URC R&D Expenditures by Field, 2006-2010



Source: NSF database; URC universities
Analysis: Anderson Economic Group, LLC
Note: This figure includes science and engineering fields, and non-science and non-engineering fields. The URC spent a total of $94.4 million in non-science and non-engineering R&D in 2010.

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. We describe the number of patents granted, inventions disclosed, number of licenses or options entered into, and the number of new start-ups in this section.

Patents and Licensing. Patent and licensing activity includes invention disclosure, patents issued, and agreements of licensing and options entered into. As shown in Table 10 on page 20, the URC issued more patents and entered into more licensing/options in 2010 than their five-year average, although there were slightly fewer invention disclosures in 2010 than the five-year average.

In all three categories, the more recent average (2006-2010) is higher than the long-term average (2002-2010). Patents issued and licensing/options were fairly close to the long run trend, which shows that innovation at the URC is stable and trending upwards.

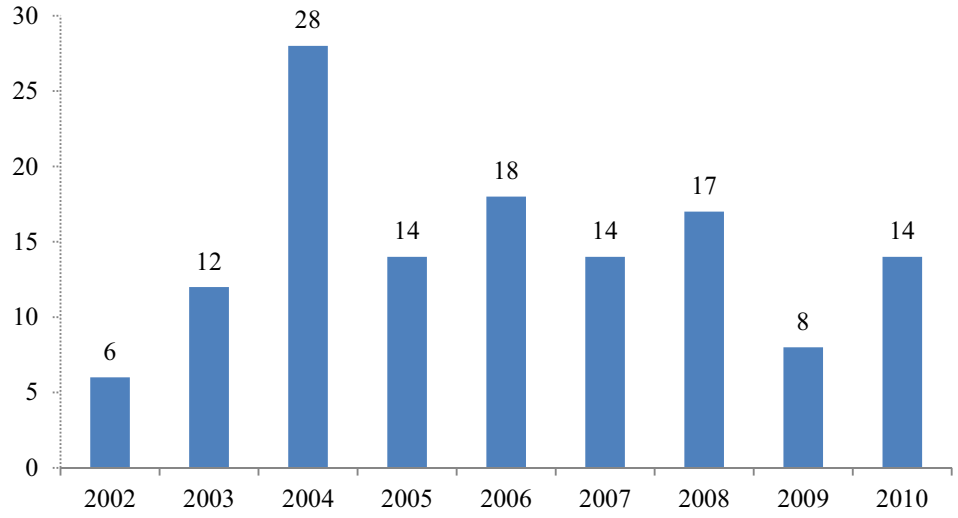
TABLE 10. URC's Annual Patent and Licensing Activity, 2006-2010

	2006	2007	2008	2009	2010	Average (06-10)	Average (02-10)
Invention Disclosures	494	535	448	484	443	481	455
Patents Issued	112	132	130	159	140	135	132
Licensing/Options	151	135	123	99	135	129	121

Source: Tech Transfer offices at each of the URC universities
Analysis: Anderson Economic Group, LLC

Number of Cultivated Start-Ups. Another measure of a university's success are the start-up companies that are cultivated within the research and development process. In 2010, the URC produced 14 start-ups, which is the same as their longer-run trend of 14 start-ups annually. Since 2002, the URC has cultivated 131 start-up companies, 71 of which have formed within the past five years. In Figure 15 on page 21, we show how many start-ups the URC universities have cultivated over the past nine years.

FIGURE 15. URC Start-ups, 2002-2010



Source: Tech transfer offices at each of the URC universities
Analysis: Anderson Economic Group, LLC

EFFECTIVENESS OF R&D

Most university research does not have an immediate commercial potential. However, some R&D does result in a new technology that can be licensed to a private business. The university then receives revenue from this license. To measure the success of efforts to license new technologies, we examined the amount of licensing revenue generated by each dollar of R&D expenditure. Last year, the URC universities received $55 million in licensing revenue or an amount equal to 2.9% of total R&D expenditures of almost $1.9 million. This percentage is higher than the previous five years except for 2008, as shown below in Table 11.

Since licensing revenue can have large year-to-year variations caused by the sale of a large license, we also show the 5-year average. Between 2006 and 2010, the URC universities received licensing revenue equal to 2% of expenditures. This analysis compares the fruits of past research to today's R&D expenditures. It does not show the outcome of current R&D expenditures, of which the URC is spending a greater amount than in previous years.

TABLE 11. URC Licensing Revenue as a Percentage of R&D Expenditures, 2006-2010

	2006	2007	2008	2009	2010	Average (06-10)
Licensing Revenue (in millions)	$28.7	$23.0	$53.3	$24.8	$55.0	$31.9
Total R&D Expenditures (in millions)	$1,451.4	$1,482.8	$1,561.7	$1,733.7	$1,878.8	$1,621.5
Revenue Per Expenditures	2.0%	1.6%	3.6%	1.4%	2.9%	2.0%

Source: URC universities' Technology Transfer Office
Analysis: Anderson Economic Group, LLC

IV. Impact on Jobs and Income

URC EXPENDITURES IN FY 2010

The University Research Corridor makes significant contributions to the state's economy. URC institutions spent over $7.7 billion on operations in FY 2010 and employed 50,531 full-time-equivalent faculty and staff throughout Michigan.[13] About a quarter (23%) of expenditures paid for instruction of students, while 15% of expenditures went towards university research, as shown in Table 12 below. About a third (30%) of all expenditures paid for equipment, supplies, salaries, and maintaining U-M Hospital facilities.

TABLE 12. Operational Expenditures by the URC, FY 2010

	Expenditures ($ in millions)	% of Total
Instruction	$1,770	23%
Research[a]	$1,169	15%
Public Services, Academic Support, Student Services, and Institutional Support	$1,361	18%
Operation and Maintenance of Plants, Auxiliary Enterprises, and Other Expenses	$1,107	14%
University of Michigan Hospital	$2,299	30%
Total Operational Expenditures[b]	**$7,705**	**100%**

Data Source: IPEDS Finance FY 2010
Analysis: Anderson Economic Group, LLC

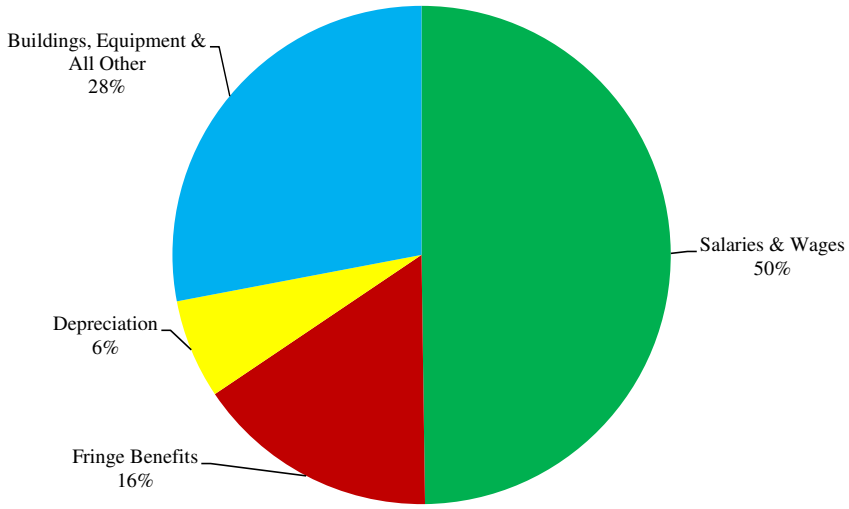
a. The data reported to IPEDS for research expenditures are lower than the research expenditures reported to the National Science Foundation. Research expenditures reported to IPEDS only include direct research costs. Indirect costs, while included in NSF reporting, are counted in other spending categories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

b. American Recovery and Reinvestment Act (ARRA) funds awarded to URC universities accounted for $98.1 million or 1.3% of operational expenditures.

We also examined URC expenditures by function, as shown in Figure 16 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 7%. 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 2010. Figure includes the University of Michigan Hospital doctors and staff. FY 2010 is the fiscal year for each university. For U-M and MSU this was July 1, 2009 to June 30, 2010. For WSU this was October 1, 2009 to September 30, 2010.

FIGURE 16. URC Operational Expenditures by Function, FY 2010



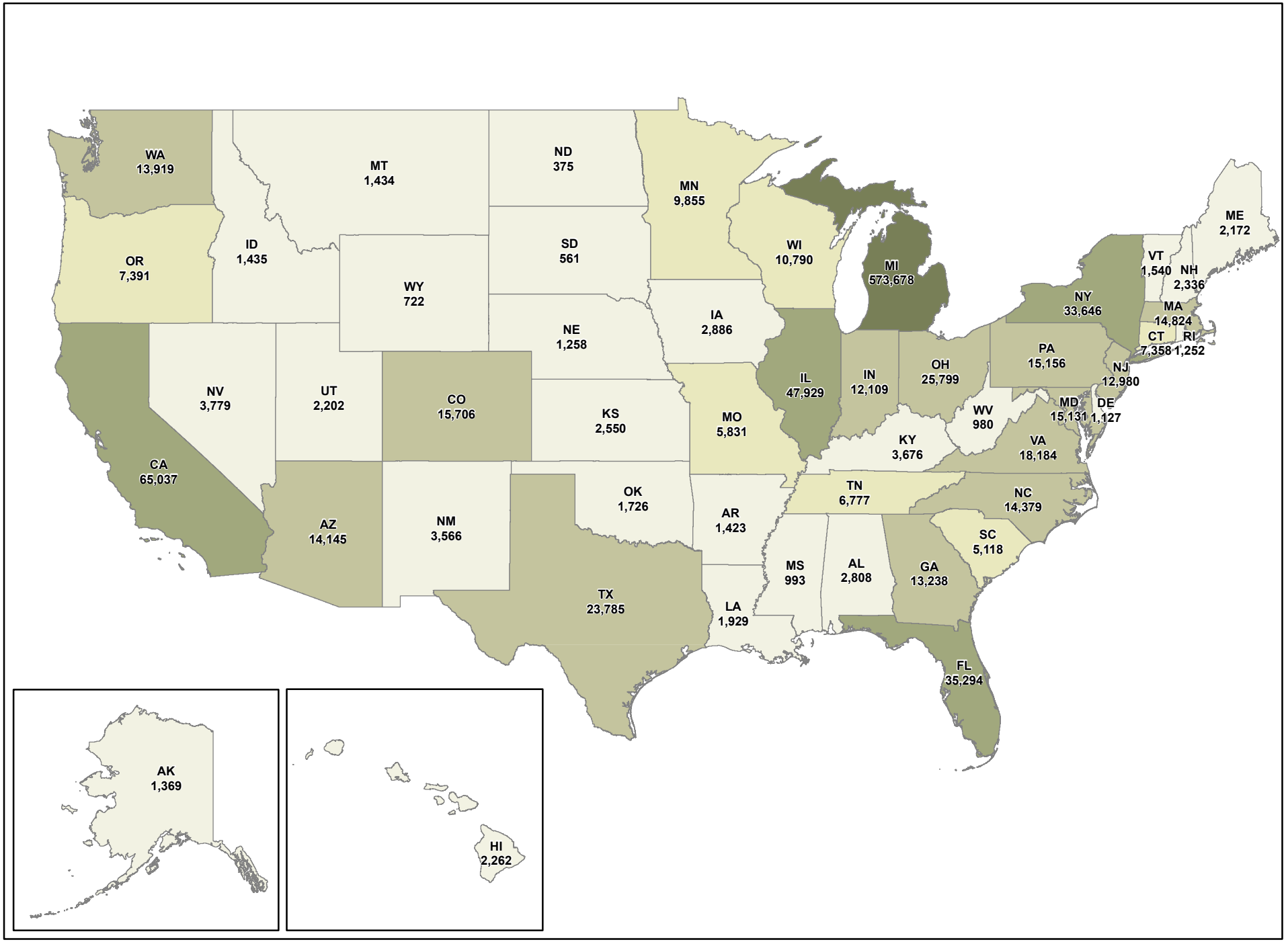
Data Source: National Center for Education Statistics, IPEDS Finance
Analysis: Anderson Economic Group, LLC

URC ALUMNI PRESENCE IN MICHIGAN

As of summer 2011, the URC had over 1.1 million alums worldwide. There were 573,621 URC alumni living in Michigan, making up approximately 7.6% of Michigan's population over the age of 18 years.[14] URC universities currently have alumni in every state in the U.S. (see "URC Alumni by State, 2010" on page 24), and in every county in Michigan (see "URC Alumni in Michigan by Zip code, 2010" on page 25.) URC alumni also live in more than a 170 countries.

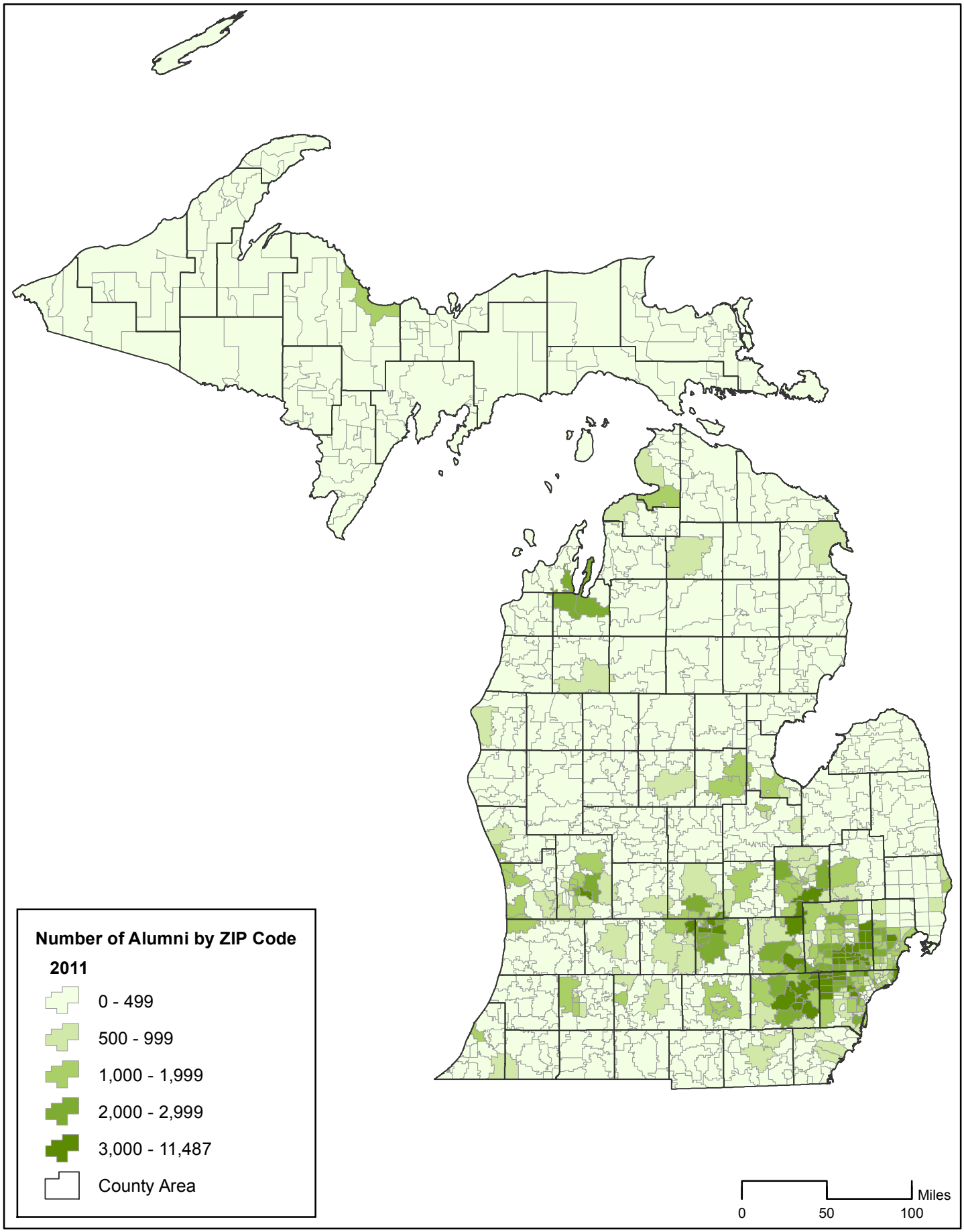
14. According to the U.S. Census Bureau, Michigan had an estimated 7,539,572 residents over the age of 18 years in 2010.

Map 2. URC Alumni by State, 2011



Data: ESRI, Inc.; University Alumni Associations.
Source: Anderson Economic Group, LLC, 2011.

Map 3. URC Alumni by ZIP Code, 2011



Data: ESRI, Inc.; University Alumni Association.
Source: Anderson Economic Group, LLC 2011.
Note: Data include alumni with known ZIP codes.

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 12 on page 22. The money that the URC spends on supplies, equipment, and employee 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 operational expenditures shown in Table 12 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 respent 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. After accounting for expenditures that went to businesses located outside Michigan and substitution, we estimate that the URC spent $1.5 billion directly on these items in Michigan in FY 2010. Once we've accounted for indirectly-generated activity, the total economic impact of nonpayroll expenditures in the state is $3.3 billion, as shown in Table 14 on page 28.

Payroll Expenditures for Faculty and Staff

The URC universities spent $5.1 billion on salary, wages, and fringe benefits for their employees in FY 2010. After taxes and substitution for wages that would have been earned in Michigan in the absence of the URC, we estimate that faculty and

staff spent $2.7 billion directly in Michigan.[15] Once we account for indirectly generated expenditures in the state, we estimate the total net economic impact of faculty and staff earnings is $4.5 billion.

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 or come to 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 were $1.7 billion in FY 2010. We estimate the indirect earnings from these expenditures were $614 million for a total economic impact of $2.3 billion. See Table 14 on page 28.

Alumni Expenditures

Alumni of URC universities contribute greatly to the state's economy. We calculated the earnings in 2010 of the 573,621 URC alums that live 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 URC alumni in Michigan earned over $28.6 billion in 2010, or 16.4% of all wage and salary income in the state. While much of these earnings cannot be said to have been *caused* by the URC universities, this figure shows the scale of the URC's role in attracting and educating Michigan's workforce.

TABLE 13. Michigan Earnings of URC Alumni by Age and Degree, 2010 (in millions)

	21-24 Years	25-34 Years	35-44 Years	45-64 Years	Over 65 Years	Total
Bachelor Degree	$3,869	$4,603	$4,063	$2,609	$328	$16,697
Advanced Degree	$3,071	$3,408	$2,712	$2,249	$485	$11,953
Total Earnings	$6,940	$8,011	$6,776	$4,858	$813	$28,649
Memo: Earnings as a percentage of wages & salary income in Michigan						*16.4%*

Note: Numbers may not add up due to rounding.
Source: URC Universities, U.S. Census Bureau, U.S. Bureau of Economic Analysis
Analysis: Anderson Economic Group, LLC

In addition to the gross earnings of URC alumni, we estimate the incremental earnings to URC graduates that are a result of their education at a URC university. Like all educational institutions, URC universities strive to increase the knowledge and

15. We corrected our analysis to apply an average tax rate of 15% to faculty earnings in FY 2010. This is higher than the average tax rate applied to earnings in the previous year. Therefore, the impact of payroll expenditures in FY 2010 is lower than in FY 2009.

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. 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 2010, we estimate that URC alums living in Michigan in 2010 earned $4.35 billion more due to the URC. Once we account for taxes on these earnings, expenditures outside Michigan, and savings, we estimate that alumni spent $3.1 billion in Michigan last year. Applying a conservative multiplier to this amount, we estimate that the total impact of alumni earnings was $5.2 billion.

TOTAL NET ECONOMIC IMPACT

In FY 2010, the total net economic impact of the URC in Michigan was $15.2 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 over $15 billion last year. This net economic impact figure does not include any economic activity that would have occurred in Michigan even without the URC.

TABLE 14. Net Economic Impact of URC in Michigan, FY 2010 (in billions)

Impact Category	Direct Impact	Indirect Impact	Net Economic Impact
Non-payroll Operating Expenditures for Instruction, Research, and U-M Hospital	$1.5	$1.8	$3.3
Faculty & Staff Wages and Benefits	$2.7	$1.8	$4.5
URC Student Expenditures	$1.7	$0.6	$2.3
Incremental Alumni Earnings	$3.1	$2.1	$5.2
TOTAL ECONOMIC IMPACT	**$8.9**	**$6.3**	**$15.2**

Note: Numbers may not add up due to rounding.
Source: Anderson Economic Group, LLC

JOBS IMPACT OF URC OPERATIONS

We estimate that 72,713 jobs in Michigan in 2010 were directly or indirectly caused by the URC's operations in Michigan.This jobs figure includes 11,227 faculty members and 39,303 staff directly employed by the URC universities. It also includes 22,183 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.[16] 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 *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 $2.9 billion in wages of URC employees in Michigan was *caused by* the URC in 2010. 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 2010 earned $4.35 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, which we have used since 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 15 on page 31.

16. 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 Michigan taxes depends on whether their additional income due to the URC represents a pay boost (for graduates who would still be working in Michigan without the URC) or if their entire Michigan income is due to the URC (for graduates who otherwise would not be working in Michigan). As described below, we apply different effective tax rates to "average" and "marginal" income.

EFFECTIVE TAX RATES ON INCOME

This analysis recognizes that average and marginal income are taxed and spent differently. To account for this difference, we estimate an "effective rate" for each type of income that is taxed, which is the amount we anticipate people will pay in taxes divided by their income.[17] Table 15 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 15. 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 2010. 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%.[18]

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.[19] We estimate that consumers in the middle 20% of earners (making between $33,381 and $53,358 in income)

17. 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%.

18. Base data source for the income tax in 2007 was the Michigan Senate Fiscal Agency. Revenue from income tax in 2007 was $7.3 billion. According to the U.S. Bureau of Economic Analysis, personal income was $345.9 billion 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%.[20] 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,[21] 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

Of the additional income in Michigan, we estimate that $1.21 billion is "marginal," and $6.03 billion is "average" income ($3.14 billion from alumni and $2.89 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 15 of the preceding section. Table 16 below shows the results of this analysis: $426 million in additional tax revenue to the state of Michigan paid by URC graduates and employees in 2010.

19. 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.

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

21. 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.

TABLE 16. Additional Tax Revenue to State of Michigan Caused by URC, 2009

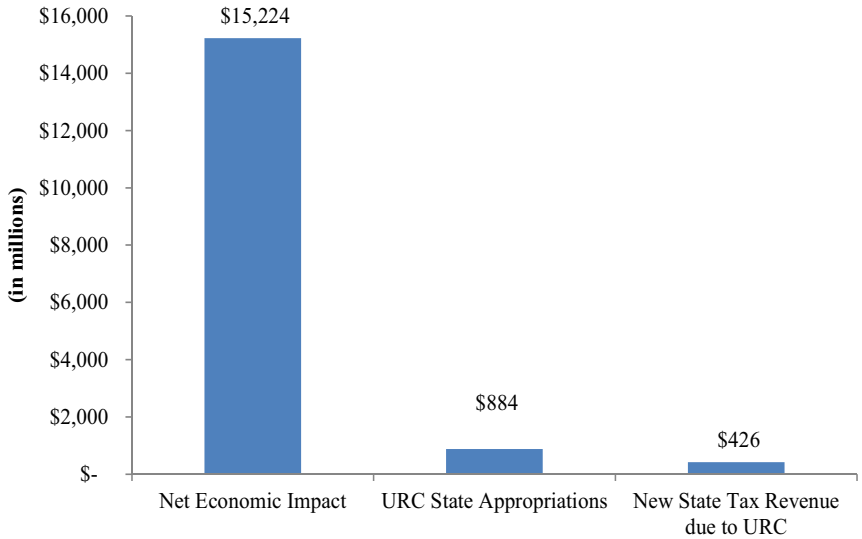
	Effective Tax Rate on Marginal Income	Marginal Income and Tax Receipts (million)	Effective Tax Rate on Average Income	Average Income and Tax Receipts (million)
Total Additional Income		$1,214		$6,029
Personal Income	4.35%	$52.8	2.36%	$142.4
Sales and Use Tax	1.70%	$20.7	2.62%	$157.7
Property Tax	0.38%	$4.7	0.47%	$28.2
Gasoline Tax	0.13%	$1.6	0.30%	$17.9
Subtotal		$79.8 (A)		$346.3 (B)
			Total Tax Receipts (A+B)	$426.0

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 19 below, the $15.2 billion in net economic impact is over 17 times greater than the state's funding for the URC universities in FY 2010 of $884 million. In addition, the State of Michigan received an estimated $426 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 19. URC Net Economic Impact vs. State Appropriations



Data Sources: AEG Estimates; Senate Fiscal Agency and House Fiscal Agency, "FY 2010 Higher Education Appropriations Report"
Analysis: Anderson Economic Group, LLC

Appendix A. Methodology

DEGREE COMPLETIONS

Degree Completions 2010 Update

Our analysis of number of degrees conferred uses data from the National Center for Education Statistics in the IPEDS database. In past years, we used the CIP code definitions from 2000 to assign degrees to several academic areas. In 2010, NCES updated the CIP code definitions. Only one of the two-digit codes that we use has changed definition. Code 43 in 2000 was "Security and Protective Services." The 2010 definition of code 43 states "Homeland Security, Law Enforcement, Fire fighting, and Related Protective Services." This definition change does not affect our analysis.

We updated the 2006-2010 completions analysis using the most recent data available by academic area. This data is different than past years and reflects revisions to the numbers of degrees conferred by URC university.

Degrees in "High Demand" Among Employers

The three fields of study with the highest demand among employers are Business, Computer Science and Engineering, according to a survey done by the National Association of Colleges and Employers. Their 2011 *Job Outlook Report* surveyed approximately 200 employers from a variety of sectors and found that Computer Science, Engineering, Accounting, Finance and Business Administration were in the most demand by employers. For the purposes of this analysis we combined the three business related majors into one category due to substantial overlap between these degrees at the undergraduate level in many universities. Specifically, our data source (IPEDS) does not distinguish clearly between them.

Additionally, for engineering degrees awarded, we included "engineering" and "engineering technologies/technicians." These degrees signal similar skill sets in the entry level job market.

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 2010 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. We updated this information using room and board information for 2010 provided by the URC universities.

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 URC Students	10%
Instruction of Non-resident URC 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-2 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-2 on page A-5.

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 2010 Caused by URC

We estimated the additional 2010 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-2. Net Economic Impact of URC's Operations

Fiscal Year 2010

				Net Economic Impact in Michigan
Direct Expenditures In-State, After Likely Substitution				
A. Instruction of In-State Students (Non-payroll)		$	1,097,486,970	
less: expenditures out of state	*40%*	$	(438,994,788)	
Subtotal: Expenditures in state		$	658,492,182	
less: substitution of higher expenditures by other MI colleges & univ.	*10%*	$	(65,849,218)	
				$ 592,642,964
B. Instruction of Out-of-State Students (Non-payroll)		$	359,375,773	
less: expenditures out of state	*40%*	$	(143,750,309)	
Subtotal: Expenditures in state		$	215,625,464	
less: substitution of out-of-state students to other MI colleges & univ.	*0%*	$	-	
				$ 215,625,464
C. Research Expenditures (Non-payroll)		$	506,103,379	
less: expenditures out of state	*50%*	$	(253,051,689)	
Subtotal: Expenditures in state		$	253,051,689	
less: substitution of more research dollars coming into other MI colleges & univ.	*2%*	$	(5,061,034)	
				$ 247,990,656
D. Student Living Expenses (excludes tuition and fee expenditures)		$	1,865,524,254	
less: expenditures out of state	*5%*	$	(93,276,213)	
Subtotal: Expenditures in state		$	1,772,248,041	
less: likely substitution of students to other colleges in MI	*6%*	$	(106,334,882)	
				$ 1,665,913,159
E. URC Employee Earnings & Fringe Benefits, After Taxes (excluding Hospital)		$	3,122,512,394	
less: expenditures out of state, savings	*20%*	$	(624,502,479)	
Subtotal: Expenditures in state		$	2,498,009,915	
less: likely substitution to jobs with other universities in Michigan	*30%*	$	(749,402,975)	
				$ 1,748,606,941
F. Hospital Expenditures (Non-payroll)		$	757,256,000	
less: expenditures out of state	*20%*	$	(151,451,200)	
Subtotal: Expenditures in state		$	605,804,800	
less: likely substitution of higher spending by other MI hospitals	*30%*	$	(181,741,440)	
				$ 424,063,360
G. Hospital Employee Earnings & Fringe Benefits, After Taxes		$	1,364,155,950	
less: expenditures out of state, savings	*20%*	$	(272,831,190)	
Subtotal: Expenditures in state		$	1,091,324,760	
less: likely substitution to jobs with other health care systems in Michigan	*14%*	$	(152,785,466)	
				$ 938,539,294
Total Direct Expenditures (in state, after substitution)				**$ 5,833,381,836**

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*	$	720,001,937
B. Instruction of Out-of-State Students (Non-payroll)	*2.2149*	$	261,963,376
C. Research Expenditures (Non-payroll)	*2.2149*	$	301,283,848
D. Student Living Expenses (excludes tuition and fee expenditures)	*1.369*	$	614,721,956
E. URC Employee Earnings & Fringe Benefits, After Taxes (excluding Hospital)	*1.6781*	$	1,185,730,367
F. Hospital Expenditures (Non-payroll)	*2.225*	$	519,477,616
G. Hospital Employee Earnings & Fringe Benefits, After Taxes	*1.6781*	$	636,423,495
Total Indirect Expenditures (in state, after substitution)		**$**	**4,239,602,593**

Table A-2. Net Economic Impact of URC's Operations (continued)

				Impact in State of Michigan
Total Direct & Indirect Expenditures In-State, After Likely Substitution				
A.	Instruction of In-State Students (Non-payroll)			$ 1,312,644,901
B.	Instruction of Out-of-State Students (Non-payroll)			$ 477,588,840
C.	Research Expenditures (Non-payroll)			$ 549,274,503
D.	Student Living Expenses (excludes tuition and fee expenditures)			$ 2,280,635,114
E.	URC Employee Earnings & Fringe Benefits, After Taxes (excluding Hospital)			$ 2,934,337,307
F.	Hospital Expenditures (Non-payroll)			$ 943,540,976
G.	Hospital Employee Earnings & Fringe Benefits, After Taxes			$ 1,574,962,789
	TOTAL NET ECONOMIC IMPACT OF UNIVERSITY OPERATIONS			**$ 10,072,984,430**
Jobs Impact on the State, After Likely Substitution				
A.	Number of FTE Faculty, Excluding Hospital		9,122	
	less likely substitution to other jobs in Michigan	*12%*	(1,095)	
	Subtotal: New faculty jobs in Michigan		8,028	
	** Indirect Employment Multiplier*	*2.20*	9,633	
	Total Faculty in Michigan Caused by URC Operations			17,661
B.	Number of FTE Faculty, Hospital		2,105	
	less likely substitution to other jobs in Michigan	*8%*	(168)	
	Subtotal: New faculty jobs in Michigan		1,937	
	** Indirect Employment Multiplier*	*1.93*	1,809	
	Total Faculty in Michigan Caused by URC Operations			3,746
C.	Number of FTE Staff, Excluding Hospital		27,379	
	less likely substitution to other jobs in Michigan	*40%*	(10,952)	
	Subtotal: New staff jobs in Michigan		16,428	
	** Indirect Employment Multiplier*	*2.00*	16,428	
	Total Staff in Michigan Caused by URC Operations			32,855
D.	Number of FTE Staff in Hospital		11,924	
	less likely substitution to other jobs in Michigan	*20%*	(2,385)	
	Subtotal: New staff jobs in Michigan		9,539	
	** Indirect Employment Multiplier*	*1.93*	8,912	
	Total Staff in Michigan Caused by URC Operations			18,452
	Total Direct & Indirect Jobs Caused by URC			**72,713**

Appendix B: About the Authors

CAROLINE M. SALLEE

Ms. Sallee is a Senior Consultant and Director of the Public Policy and Economic Analysis practice area.

Ms. Sallee's recent work includes preparing the report *Dollars and Sense*, a 2011 citizen's guide to Michigan's financial health released by Governor Rick Snyder. Ms. Sallee also completes an annual economic impact assessment for Michigan's University Research Corridor (Michigan State University, University of Michigan, and Wayne State University), and has done work for a number of other universities including the University of Chicago. She is also the lead author of the firm's annual 50-state business tax burden study.

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 has also 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 Anderson Economic Group in 1996, and serves as a Principal and Chief Executive Officer in the company.

Mr. Anderson has taken a leading role in several major public policy initiatives in his home state; he was the author of the 1992 Term Limit Amendment to the Michigan Constitution, and also the author of the 2006 initiated law that repealed the state's 4-decade-old Single Business Tax. Before founding Anderson Economic Group, Mr. Anderson was the deputy budget director for the State of Michigan under Governor John Engler, and Chief of Staff for the Michigan Department of State.

Mr. Anderson has written over 100 published works, including the book *Business Economics and Finance* and the chapter on business valuation in the book *Litigation Economics*. He is also the executive editor of three editions of the *State Economic Handbook*. His 2004 article "Pocketbook Issues and the Presidency" and his 2009 paper "The Value of Private Businesses in the United States" have each been awarded for outstanding writing from the National Association of Business Economics. Anderson's views on the economy are often cited by national news media including *The Wall Street Journal, New York Times, National Public Radio,* and *Fox Business News.*

Anderson is a graduate of the University of Michigan, where he earned a Master of Public Policy degree and a Bachelor of Arts 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 Economic Analysis practice areas. Mr. Rosaen's background is in applied economics and public finance.

Mr. Rosaen's recent work includes several economic and fiscal impact analyses, including of proposed real estate developments, power plants, and infrastructure projects; analysis of tax incentives; an analysis of the impact of federal tax incentives on the freight rail industry; and an analysis of the economic contribution that research universities make in the State of Michigan.

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 has also worked as a mechanical engineer for Williams International in Walled Lake, Michigan.

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

Erin Grover

Ms. Grover is a Senior Analyst at Anderson Economic Group. Her background is in applied economics and communicating economic ideas.

Ms. Grover's recent work consists of several economic and fiscal impact analyses of counties and business ventures throughout the U.S.; evaluating policy changes and potential public funding mechanisms; as well as an analysis of the economic contribution research universities make in Michigan. She is also currently contributing to the book, Economics of Business Valuation, a forthcoming publication of Stanford Press.

Prior to joining AEG, Ms. Grover worked as a contract consultant providing research and detailed data analysis to economic and finance consulting firms in Michigan and Ohio. She was also one of four students selected as a graduate fellow 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. Grover 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.

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Colby W. Spencer

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