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ANDERSON ECONOMIC GROUP

Attracting, Fostering, and Inspiring Talent for the Global Economy

A Report from Michigan's University Research Corridor

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I. Executive Summary

OVERVIEW OF APPROACH

The 21st-century economy relies heavily on talented individuals. Many of the growing sectors of the modern economy require talented individuals as much, or more than, raw materials. As a result, thought leaders and policymakers at the national, state, and local levels are putting a greater emphasis on ensuring their region has the talent to compete. The dynamics of regional talent are affected by economic history and geography, private decisions by families and businesses, and public policies that affect talent directly and indirectly.

For this report, we considered talented individuals as the central focus of the economy of the future, and examined the role Michigan's research universities play in creating, attracting, and nurturing that talent. This approach is different than the standard manner of simply examining the productivity of higher education. Indeed, the University Research Corridor (URC) institutions, including Wayne State University, the University of Michigan, and Michigan State University, have been pioneers in providing independently-prepared, rigorous benchmarking reports that document their number of graduates, expenditures on research, and economic impact of their operations.[1] Such benchmarking is extremely valuable in establishing accountability to Michigan taxpayers and other stakeholders in these universities, and we make use of much of the data gathered in these exercises here. However, our focus in this report is on the universities' effects on the talent pool available to Michigan employers, entrepreneurs, and residents. This requires a different approach.

THE UNIVERSITY AS A CORNERSTONE OF A TALENT-BASED ECONOMY

We start by recognizing the modern research university as a cornerstone of a society that attracts, produces, and nurtures networks of talent. The talent available in the state of Michigan is the result of decisions by millions of individuals and thousands of firms acting in their own best interest. In many ways, the activities of research universities affect those decisions. We attempt to document these activities, where possible, in this report.

We focused our efforts on three main categories of activities:

1. *Enlarging the base of talent*, by pursuing its traditional mission of educating individuals in undergraduate and graduate degree programs.
2. *Attracting talented people*, including those working as faculty and staff in the universities, as well as those who work in businesses and other organizations that desire proximity to research universities or collaboration with their researchers.
3. *Nurturing a network of talented people* who are connected through their shared experiences and affiliations with these Michigan institutions, and therefore have

1. Each of the past eight benchmarking reports are available on the websites of the URC http://urcmich.org/reports, and Anderson Economic Group http://www.andersoneconomicgroup.com.

the opportunity to work cooperatively to start new businesses, find new jobs, contract with other firms, and share ideas, as well as to enjoy social and professional relationships.

Not all of these activities are amenable to quantification. However, we were able to identify and quantify multiple indicators in each of these categories. For these indicators, we used data from the following sources:

- Operating, graduation, and alumni data from the URC universities;
- Recent reports commissioned by the URC on entrepreneurship and economic activity among alumni;
- Data from social and professional networks, such as LinkedIn network connections among college graduates;
- Data on migration among states from government sources such as the U.S. Census Bureau and the U.S. Department of Education; and
- Economic and fiscal data from past economic impact and benchmarking studies commissioned by the URC.

We describe these data and related analytical methods in "Appendix A. Data and Methodology."

PURPOSE OF THIS REPORT

This report examines the contributions of Michigan's URC institutions to the talent pool in Michigan. In particular:

- We discuss the URC universities' role in producing a talented workforce, including skilled graduates;
- We outline the URC universities' role in attracting, and retaining, talented workers and entrepreneurs in Michigan; and
- We examine the URC universities' role in developing and nurturing a network of talented business leaders, scientists, and other influential individuals throughout the United States, as well as in countries around the world.

SUMMARY OF FINDINGS

1. Producing a Talented Workforce

The most direct, tangible way that the URC universities support a talented workforce is by "producing" it through the education of its students. Building a network of talented and capable individuals was the original purpose of higher education in Michigan. Indeed, the Northwest Ordinance of 1787, which brought the territory later making up the States of Michigan, Ohio, Indiana, and Wisconsin into the nation, recognized more than two centuries ago the importance of ensuring that each state's leaders in industry and government had the broad education needed to foster economic success and to build a civil society.[2]

2. See discussion of the Northwest Ordinance of 1787 and Article VIII of the 1963 Constitution of Michigan, in "Producing a Talented Workforce" on page 7.

Key findings in our analysis of efforts by the URC to produce a talented workforce include:

- The URC produces more than 32,000 graduates each year, including more than 19,000 bachelor's and nearly 13,000 advanced degrees. Of these degrees, more than a third are in high-demand fields such as medicine and engineering.
- There are 617,319 URC alumni with known addresses living in the state, accounting for 34% of the state's population with a bachelor's or greater level of education.
- Communities with more college graduates have economies that grow faster, as shown by several high-quality empirical studies. This holds for recent decades and for longer periods, in a century-long scale. See "Importance of Educational Attainment" on page 8.
- Among eight top research university clusters in the U.S., the URC ranks highly in several indicators of talent production in 2013; the URC ranks:[3]
  - 1st in enrollment,
  - 1st in degrees awarded,
  - 2nd in advanced degrees in high-tech fields such as engineering and sciences, and
  - 1st in medical degrees.
- In a survey of alumni asking how their education has aided their careers, URC graduates were even more likely to cite important broad-based skills acquired during their education than specific knowledge.[4] Over 99% of respondents cited at least one important skill such as communication, entrepreneurship, ethics, and leadership, and over half cited at least eight out of the 16 survey choices.

In "Producing a Talented Workforce" on page 7 of this report, we highlight the URC universities' contributions to Michigan's pool of talent through education. We also summarize initiatives at each university designed to attract, and support through graduation, talented students from around the globe.

2. Attracting and Retaining Talent

The URC universities attract and retain talent in the state in at least two critical ways. First, students educated at Michigan universities are much more likely to develop both economic and personal ties to the state than those outside of it, and also capture a glimpse of the quality of life the state has to offer. Second, by pro-

3. Research clusters include groups of universities in Michigan (the URC), Northern California, Southern California, Illinois, Massachusetts, North Carolina, Pennsylvania, and Texas. See "Peer University Clusters" on page A-1 For a complete list of the research universities in each cluster.
4. Data from the "Alumni Impact Survey" conducted in conjunction with our 2013 report "Embracing Entrepreneurship: The URC's Growing Support for Entrepreneurs in Michigan and Throughout the World."

viding a concentrated cluster of advanced research and development, the URC universities attract businesses to the surrounding communities.

The annual URC benchmarking reports measure the attraction of talent, to an extent, by documenting the number of faculty and graduates, as well as the amount of research spending.

Key findings in our analyses of attracting and retaining a talented workforce include:

- The URC universities spend $2.1 billion annually on research and development. This activity attracts and sustains many of the almost 12,000 world-class faculty and more than 35,000 graduate students enrolled at the universities.[5]
- Analysis of census data shows that the communities surrounding the URC universities have a high concentration of residents with bachelors and advanced degrees. The communities surrounding the URC universities have 1.4% of the state's population, but 4.3% of the state's residents with bachelors or advanced degrees. This confirms other evidence that research universities are anchors for talented communities, where high-tech companies can find talented workers that may be in short supply in other areas.
- Analysis of national Department of Education data shows that the likelihood that in-state students lived in Michigan later in life was 60 percentage points higher if they attended a Michigan-based institution. Even during the recession, the likelihood of both in-state students and out-of-state students staying in Michigan one year later was about 20 percentage points higher than the likelihood for students who did not attend a college or university in Michigan. See "URC Alumni and Choice to Live in Michigan" on page 18.
- Although there is no authoritative list of high-tech clusters in the United States, it is clear that both the URC and many of its peer clusters of research universities are co-located with recognized high-tech hubs.[6] Several URC campuses, including the main campuses of the University of Michigan and Wayne State University, as well as the University of Michigan's Flint and Dearborn Campuses, are located largely within Automation Alley, which has approximately the same number of high-tech workers (171,380) as Silicon Valley (179,690), and produces significantly more graduates with STEM degrees.[7]
- Silicon Valley is itself closely associated with Stanford University and the Northern California university cluster. Other prominent U.S. high-tech hubs and their associated university clusters include "Route 128" (Harvard, MIT); Austin (University of Texas); and Chicago (Northwestern, University of Chicago).[8]

5. Data reported by URC universities to AEG. Includes medical faculty.
6. The *Automation Alley* report, cited below, compares metro Detroit against Silicon Valley, Seattle, Minneapolis, Austin, Dallas-Fort Worth, Grand Rapids, Atlanta, Chicago, St. Louis, Pittsburgh, Cincinnati, and Indianapolis. Similar reports have been prepared by Anderson Economic Group using a consistent methodology and set of data definitions since 2005.

These areas, along with other high-tech hubs such as North Carolina's "Research Triangle," use their research universities as strategic assets in the competition for business investment and attraction of entrepreneurs.[9] The URC institutions are similar assets for Michigan, and are working to create a similar brand.

In "Attracting and Retaining Talent" on page 14 of this report, we highlight the URC universities' contributions to Michigan's pool of talent through attraction and retention of talent.

3. Nurturing Talent Networks

In addition to helping the state produce, attract, and retain talent, modern research universities contribute to the state's talent assets another way: by fostering access to a national and global network of talented people. As these networks have become more important in the modern economy, the role of nurturing such a talent network has also becomes more important to Michigan.

URC alumni living outside of the state typically have strong connections to Michigan, and to other graduates of the URC universities. These connections make them much more likely to think of Michigan's strengths when making business location and investment decisions.

Key findings of our analysis of talent networks and the URC include:

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7. The *Automation Alley* reports quantify both occupation-based and employer-based employment numbers. The numbers cited in the text are occupation based. Employer-based figures are higher, and are also comparable for metro Detroit (224,257) and Silicon Valley (299,746). STEM stands for "Science, Technology, Engineering, and Mathematics."
8. Automation Alley includes the eight-county metropolitan Detroit area. This includes most University of Michigan and Wayne State University operations, and some Michigan State University operations (although not its East Lansing main campus). The annual technology reports commissioned by Automation Alley thus understate the contribution of the URC as it does not include MSU graduates. Even with this understatement, the 2015 report identifies metro Detroit as first among 14 tech hubs in the U.S. in advanced auto jobs; first in engineering technology degrees earned, second in the Midwest among utility patents issued, and 3rd nationally in STEM degrees earned.

   See *Automation Alley 2015 Technology Industry Report,* and previous annual reports prepared by Anderson Economic Group, which can be found at: http://www.automationalley.com and http://www.andersoneconomicgroup.com.
9. As noted above, we include Michigan, Northern California, Massachusetts, and North Carolina in our peer university clusters for benchmarking the URC. See "Peer University Clusters" on page A-1.

- The URC universities have more than 1.2 million alumni with known addresses, 582,000 of whom live outside the state. This total represents one of the largest talent networks of any cluster of research universities in the United States.
- There is a significant URC university alumni presence in several metro areas that are notable talent destinations of the U.S., several of which host research university clusters. These metro areas are dominant influences on buying, hiring, and investing behavior in the U.S. economy. See "Evidence from Social Networks" on page 27.
- In the modern economy, a talent network is a strategic advantage, and a cluster of research universities that nurtures and expands such a network is an effective strategic asset.
- In a 2013 report for the URC we estimated there are more than 380,000 businesses started by URC alumni.[10] Many of these alumni entrepreneurs cite skills they learned while at a URC university as contributors to their success. While there are no comparable data available from other clusters of research universities, it is clear that encouraging entrepreneurship has emerged as a critical emphasis among both colleges and civic organizations across the country.

In "Developing and Nurturing Talent Networks" on page 25 of this report, we highlight the URC universities' extraordinary contributions to Michigan's network of national and global talent.

ABOUT THIS SERIES

This report is part of a series of studies that began in 2007 documenting the impact of Michigan's University Research Corridor institutions—Michigan State University, University of Michigan, and Wayne State University—on specific sectors of the Michigan economy. Past reports have highlighted the life sciences industry, advanced manufacturing, alternative energy, the "blue economy," and the automobile industry. See "Appendix B. Summary of Past URC Sector Reports" on page B-1.

ABOUT THE AUTHORS

Patrick L. Anderson founded Anderson Economic Group in 1996, and is the author of more than 100 published works. Alex Rosaen is the Director of Public Policy for the firm.

Anderson Economic Group is a research and consulting firm with expertise in public policy, economics, market research, and business valuation. AEG's clients include private, public, and non-profit organizations.

AEG has offices in East Lansing, Michigan; Chicago, Illinois; and Istanbul, Turkey. See "Appendix C. About the Authors" on page C-1.

10."Embracing Entrepreneurship: The URC's Growing Support for Entrepreneurs in Michigan and Throughout the World," University Research Corridor and Anderson Economic Group, May 24, 2013.

II. Producing a Talented Workforce

Educating and producing talent is the core mission of any university. "Producing" talent through the education of its students is the most direct way that the URC universities contribute to a talented workforce in Michigan. Indeed, this is the original purpose of higher education in Michigan: to ensure that the state's leaders in industry and government have the broad education and technical know-how to foster the state's success.[11]

The URC's production of talent makes a special contribution to the base of talent in Michigan in two ways. First, the sheer size of the schools' graduating classes and alumni account for a significant portion of the state's base of educated workers. Second, the URC universities make a particular contribution in their role as research universities: producing graduates with advanced degrees, particularly in high-tech, medical, and other high-demand fields.

INDICATORS OF TALENT PRODUCTION

TABLE 1. Key Indicators of Contribution to Talent Production

Indicator (2013 values)	Value	Rank Among Eight Research University Clusters
Number of Graduates—Bachelors	19,676	3
Number of Graduates—Advanced and Professional	12,887	3
Total Number of Graduates	32,563	1
Enrollment	138,936	1
Number of Graduates with High-Demand Degrees[a]	9,185	3
Number of Graduates with High-Tech Degrees[b]—Bachelors	5,486	4
Number of Graduates with High-Tech Degrees—Advanced	3,568	2
Total Number of Graduates with High-Tech Degrees	9,054	4
Number of Graduates with Medical Degrees[c]	2,186	1

Source: AEG analysis of data from the URC universities and other sources.
See "Appendix A. Data and Methodology" on page A-1.

a. Includes business, computer science, and engineering degrees awarded.
b. Includes science, mathematics, and engineering degrees.
c. Includes MD, DO, Nursing, PA, and Dentistry degrees.

IMPORTANCE OF EDUCATIONAL ATTAINMENT

Educational attainment is an important factor in economic development, and is one of the reasons people focus on talent as an economic development strategy. In particular, human capital contributes to growth because of knowledge spillovers. These knowledge spillovers result in increasing productivity of all workers. This longstanding belief traces back to the late 1800s but has recently been studied in more detail.

Several high-quality empirical studies have confirmed the relationship between educational attainment and growth. Specific findings supporting this view include:

- A one year increase in median years of schooling was associated with a 2.4% increase in per capita income growth rates.[12]
- An increase in one percentage point in the percent of college graduates in a metropolitan area was associated with a 1.4% increase in growth from 1970 to 1986.[13]
- A 7.2 percentage point increase in the percentage of college educated residents was related with a 20% increase in city size, suggesting that city growth rates are related to local human capital growth rates.[14]
- A 0.77 percentage point increase in the percentage of college graduates was related with a 0.42 percentage point increase in the average annual employment growth rate.[15]

In addition to the quantitative studies, several studies have looked in-depth at the role of human capital in the economic growth of specific cities. Glaeser (2004)[16] looks at how human capital in Boston helped the city reinvent itself

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11. The words of the Northwest Ordinance of 1787, which brought the territory later admitted as the State of Michigan into the nation, are memorable on this point:

    > Religion, morality, and knowledge, being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged.

    Many historians consider the Northwest Ordinance to be one of the most important documents in U.S. history, as it set forth guarantees of freedom of religion and other civil liberties such as trial by jury and protection of private property; established a republican government structure; and outlawed slavery in the new territories. These words listed above, from section 14 of the Northwest Ordinance, were adopted into the Michigan Constitution and are the first section of Article VIII, the education article, of the 1963 Constitution.

12. Edward L Glaeser, Jose Scheinkman, Andrei Shleifer, "Economic Growth in a Cross-Section of Cities," *Journal of Monetary Economics*, 36, 1995, pp. 117-143.

13. Curtis J Simon, "Human Capital and Metropolitan Employment Growth," *Journal of Urban Economics*, 43, 1998, pp 223-224.

14. Duncan Black and Vernon Henderson, "A Theory of Urban Growth," Journal of *Political Economy*, 1999, vol. 107, issue 2, pp 252-284.

15. Curtis J Simon and Clark Nardinelli, "Human Capital and the Rise of American Cities, 1900-1990." *Regional Science and Urban Economics*, 32, 2002, pp. 59-96.

multiple times between 1630 and 2003. In addition, Piiparinen, Post, and Russell (2014)[17] look at educational attainment in young adults to examine how Pittsburgh has started its economic comeback. In particular, they point to the fact that Pittsburgh ranks third in terms of percentage of young adults with advanced degrees, behind only Boston and Washington D.C.

NUMBER OF URC UNIVERSITY GRADUATES

The URC universities awarded more than 32,000 degrees in 2013. As noted in our 8th Annual Economic Impact and Benchmark study, this was the most among the URC and peer clusters of research universities, including clusters in California, Texas, North Carolina, Massachusetts, and Pennsylvania.

This number of graduates represents a significant contribution to the state's pool of talent. The number of graduates who choose to work in Michigan after graduation varies from year to year based on many factors, including economic trends. Nevertheless, more graduates from URC universities clearly means more available talent for Michigan businesses trying to fill open high-skill positions.

To put these figures into perspective, if there were enough job openings in the state, URC graduates could add 1.8% to the stock of college degree holders in the state of Michigan every year. This means that within a 25-year period, URC universities alone produce enough college graduates to replace 40-50% of the state's current residents with bachelor's degrees.

The URC universities have played this important role throughout their history, including in the development of the state's current workforce. The 617,319 URC alumni living in the state of Michigan represent more than a third of the 1.8 million degree holders aged 25 and over in the state.[18]

URC alumni live in all areas of the state, including every major metro area, as shown in Map 1 on page 10.

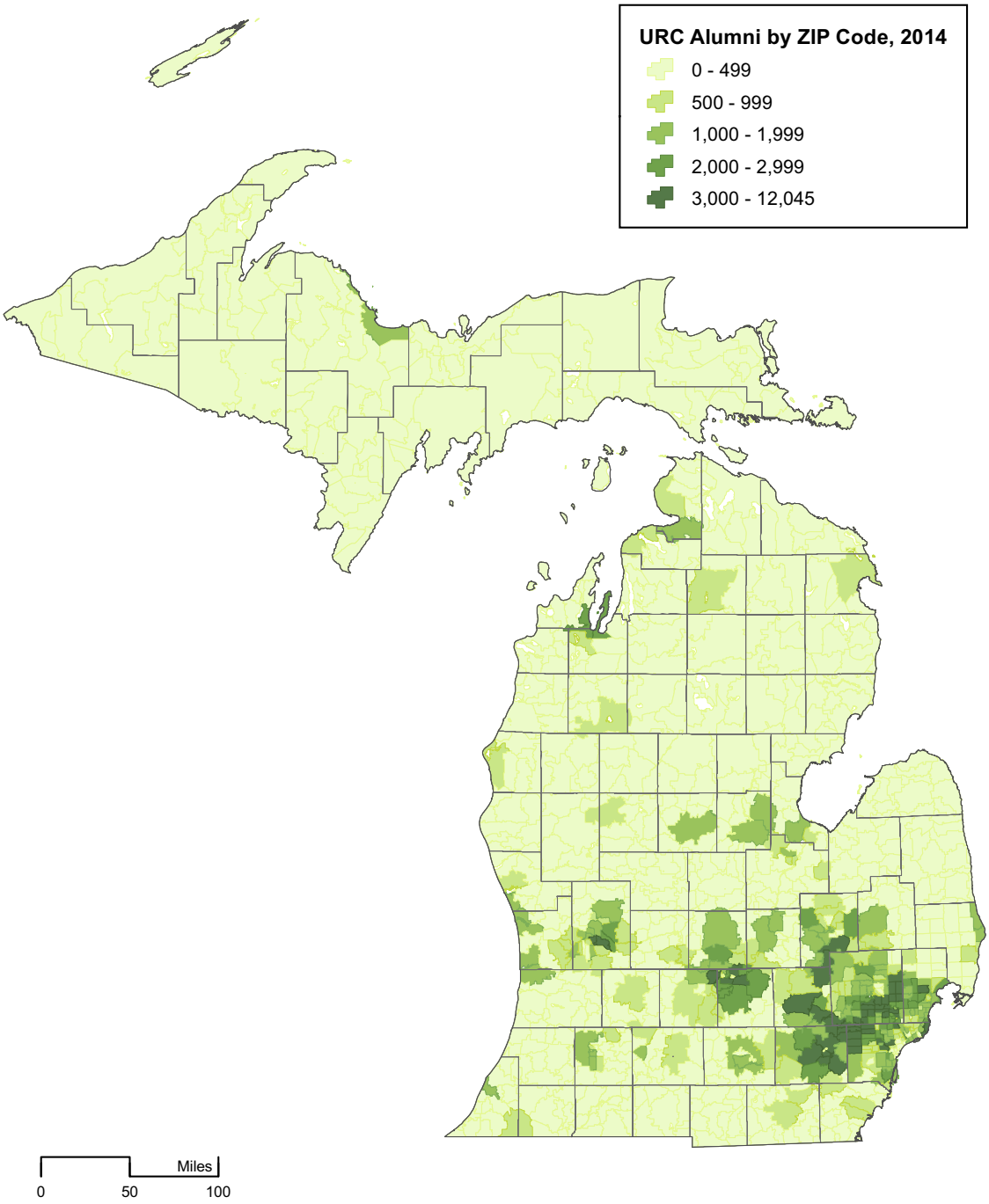
In-state URC students come from all areas of the state. Map 2 on page 11 shows that each county in the state produced students enrolled in a URC university in 2013.

16. Edward L Glaeser, "Reinventing Boston: 1630-2003," *Journal of Economic Geography,* 5, 2005, pp. 119-153.

17. Richey Piiparinen, Charlie Post, and Jim Russell, "Ranking America's Top Young Adult Labor Forces: A Rust Belt Rising?" *Urban Publications*, Paper 1177, 2014.

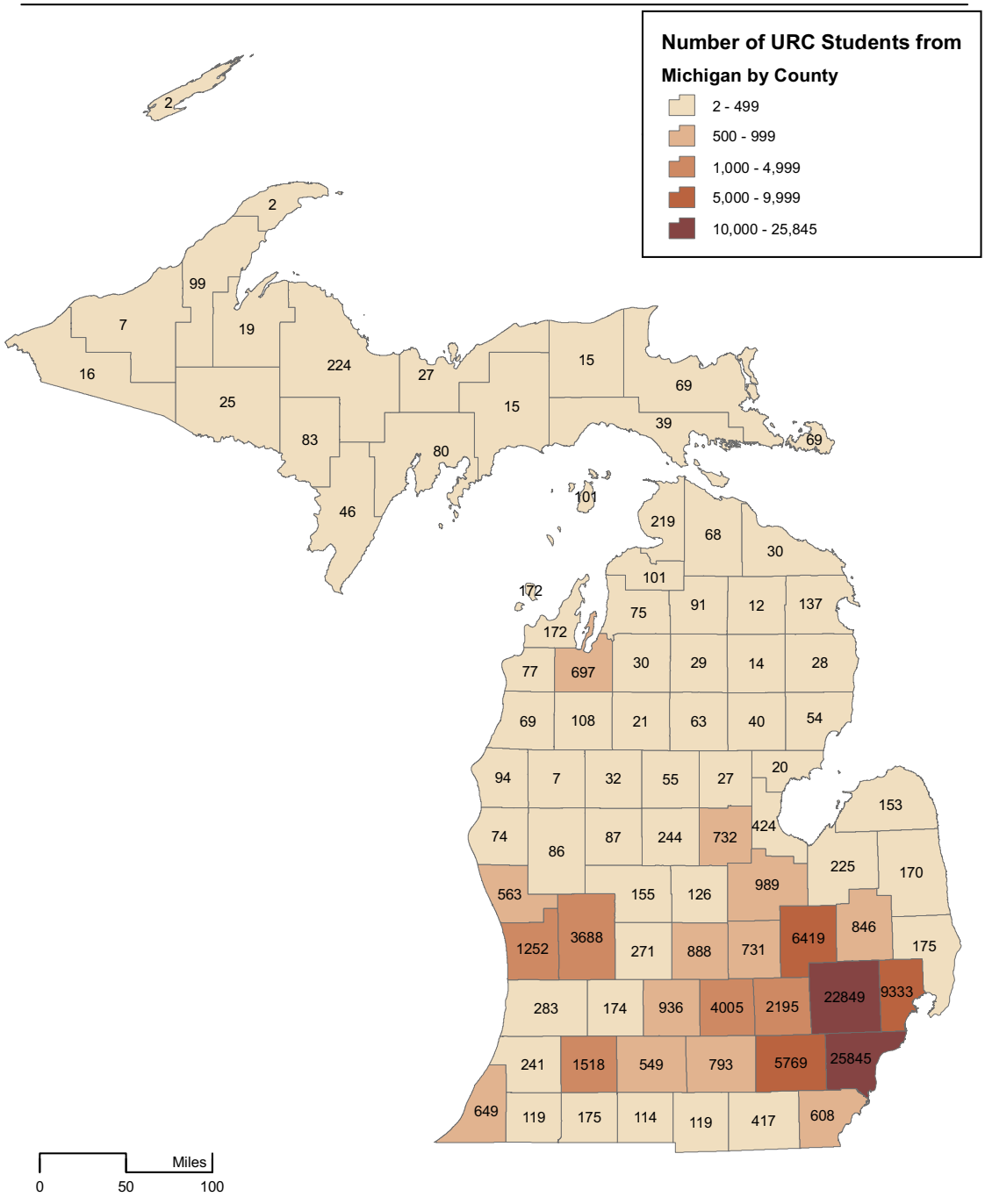
18. 2013 figures from American Communities Survey, U.S. Census Bureau.

Map 1. URC Alumni by ZIP Code, 2014



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

Map 2. URC Students from the State of Michigan by County, 2013



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

FOCUS ON ADVANCED DEGREES

All colleges and universities contribute to the state's pool of available talent differently based on their particular missions and histories. As the three biggest research universities in the state of Michigan, the URC universities make a particular contribution to producing graduates with advanced degrees, including degrees in high-demand and technical fields.

The URC universities produced more than 12,800 graduates with advanced degrees in 2013—a number equivalent to two percent of all Michigan residents with advanced degrees over age 25. There are more than 217,000 URC alumni who received advanced degrees from a URC university living in Michigan, accounting for over a third of the state's 659,000 residents over the age 25 with an advanced degree.[19]

The URC universities fare well in talent production compared to peer research university clusters elsewhere in the country due to their combined size and particular areas of specialization. Out of eight peer clusters in 2013, the URC ranks:

- 3rd in graduates with advanced degrees.
- 2nd in high-tech advanced degrees awarded.
- 1st in medical degrees awarded.

GRADUATES PREPARED FOR THE MODERN ECONOMY

While raw educational attainment is a useful indicator for producing thriving state and metropolitan economies, it is also useful to consider what makes the education received by URC graduates, in particular, special. One useful source of information on this topic is a survey of URC alumni conducted by the universities in 2013.[20] The responses of URC alumni are telling; thousands of graduates cited specific *skills* gained at a URC university that were useful to their careers—even more than cited the importance specific subject matter knowledge.

- Almost 34% said they acquired knowledge while at the university that was required in their first job, such as knowledge for engineering or teaching jobs.
- Over 40% said they acquired skills that were directly related to their job, including communication, critical thinking, and teamwork skills.

19. This figure likely understates the URC universities' contribution to workers with advanced degrees in the state. It does not include residents who received a URC bachelors degree but pursued their advanced degree from another institution. For many such workers, their connection to the URC played a role in their choice to live in Michigan, and their undergraduate education at a URC university prepared them for graduate study.

20. This survey was cited extensively in our 2013 study on the URC and entrepreneurship. See "Appendix B. Summary of Past URC Sector Reports" on page B-1.

- URC alumni were asked about important skills they developed while pursuing their education at a URC university. Presented with a list of 16 specific skills cited as important by employers, including critical thinking, leadership, planning and organization, and entrepreneurship, over 50% of URC graduates cited eight or more from the list as skills they gained or improved during their URC university education, and 99% of respondents chose at least one.[21]

21. The list of skills explored in the alumni survey were inspired by two studies connecting worker skills to the needs of business: the "AMA 2012 Critical Skills Survey" (American Management Association, 2012) and "Critical Skills Needs and Resources for the Changing Workforce," (Society for Human Resource Management, 2007).

III. Attracting and Retaining Talent

In addition to producing talented workers, research universities attract and retain talented people in the state. They employ talented faculty and graduate students engaged in cutting-edge research. They shape the local communities that host them in ways that attract and retain college graduates. They give talented workers a chance to connect with people, places, and businesses in Michigan during their years of study, making them more likely to choose to live in the state later in life.

When students are educated in Michigan rather than elsewhere, they are more likely to develop both economic and personal ties to the state through internships, research opportunities, friendships, and simply seeing the quality of life the state has to offer. By hosting so many talented people in one place, the universities make their cities more attractive to talented people seeking like-minded neighbors and co-workers. Furthermore, by providing a concentrated cluster of advanced research and development, the URC universities attract businesses to the surrounding communities.

INDICATORS OF TALENT ATTRACTION

TABLE 2. Key Indicators of Contribution to Talent Attraction

Research Expenditures, 2013	$2.1 billion
Number of Faculty and Researchers[a]	11,867
Number of Graduate Students Enrolled	35,659
Percentage of Population Living in URC Communities with Bachelors Degree or Higher[b]	75.7%
Memo: Proportion of Michigan's Population with Bachelors or Higher	27.2%

Source: AEG analysis of data from the URC universities and other sources. See "Appendix A. Data and Methodology" on page A-1.

a. Includes medical faculty.

b. "URC Communities" include Ann Arbor, East Lansing, and the Midtown neighborhood of Detroit. See Appendix A.

TALENTED RESEARCHERS: FACULTY, GRADUATE STUDENTS, AND OTHER STAFF

The most direct way that the URC universities attract talented people to the state is by employing them, a contribution strongly linked to their role as major research institutions. By securing $2.1 billion in 2013 research awards (accounting for 94% of all federally-funded R&D in the state, and 93% of all academic R&D in the state), the URC universities are able to employ thousands of faculty, many among the most talented in their fields, that would otherwise not be working in the state of Michigan.[22]

The universities' 11,867 faculty and research staff pursue fundamental research, as well as applied research in partnership with Michigan industries, educate the 35,659 graduate students enrolled in 2013-14, and provide undergraduate students with exposure to research. Many of these students would likely have pursued higher education outside the state if not for the URC universities.

These researchers represent a resource in Michigan's economic development in high-tech fields, producing ideas and students in key economic sectors. In past studies of URC research, we have found that URC researchers pursue research in many fields of particular interest to Michigan's advanced industries, including:[23]

- $300 million in water-related research awards between 2009 and 2013.
- $300 million in advanced automotive research awards between 2007 and 2011.
- $74 million in IT-focused research in FY2010.
- $101 million in advanced manufacturing research and development in 2009.
- $887 million in life sciences research and development in 2008.
- $79.5 million in research and development related to alternative energy in 2007.

UNIVERSITIES AS ANCHORS FOR TALENTED COMMUNITIES

In addition to directly employing highly educated workers, the URC universities shape their surrounding communities in ways that attract and retain other talented residents. We analyzed the populations of these communities, including the city of Ann Arbor, the city of East Lansing, and the Midtown neighborhood in Detroit.[24] We compared the educational attainment levels of these communities to the state as a whole, and in the case of Wayne State, to the city of Detroit as a whole.

Our analysis shows that the communities with URC universities have significantly higher college degree attainment overall, and advanced degree attainment in particular. In East Lansing, for example, more than 85% of residents had a college degree, and 38% had an advanced degree, in 2013.

This analysis is summarized in Table 3 on page 16.

22. AEG analysis of 2013 data from the National Science Foundation's HERD survey.

23. Here we cite figures for either research awards or research spending based on what was reported in the original study. See "Appendix B. Summary of Past URC Sector Reports."

24. This analysis focuses on the main campuses of each university, and so does not, for example, assess Michigan State's Grand Rapids medical campus nor the University of Michigan's branch campuses in Flint and Dearborn. We selected the Midtown neighborhood in Detroit as the "surrounding community" for Wayne State because, unlike the other two cities hosting URC universities, the city of Detroit is not primarily a "university town." See "Analysis of Census Data" on page A-2 for census tracts used in definition of Midtown neighborhood.

TABLE 3. Educational Attainment in URC Host Communities

		All Degrees (2013)		Advanced Degrees (2013)	
	2013 Pop. Age 25+	Pop. Age 25+ with Degree	Percent of Pop. Age 25+ with Degree	Pop. Age 25+ with Degree	Percent of Pop. Age 25+ with Degree
Reference Communities					
Michigan	6,594,586	1,791,957	27.2%	659,459	10.0%
City of Detroit	439,589	58,970	13.4%	22,859	5.2%
URC Host Communities					
Ann Arbor	63,963	52,288	81.7%	26,673	41.7%
Difference: Ann Arbor - Michigan			+54.6 pp		+31.7pp
East Lansing	14,781	12,567	85.0%	5,661	38.3%
Difference: East Lansing - Michigan			+57.8pp		+28.3pp
Midtown Detroit	11,886	3,719	31.3%	1,697	14.3%
Difference: Midtown - City of Detroit			+17.9pp		+9.1pp
URC Communities Total	90,630	68,574	75.7%	34,031	37.5%

Note: In this table, "pp" refers to "percentage points," as two values expressed in "percent" are compared to each other.
Source: Anderson Economic Group analysis of data from the U.S. Census Bureau's American Communities Survey

Not only is the concentration of educated people higher in URC communities, the growth in number of people with degrees is higher as well. As shown in Table 4 below:

- The level of educational attainment has grown faster in the URC host communities as the state economy has recovered since 2009 than in the state of Michigan and city of Detroit as a whole. This shows that these communities are an asset to the state as talented workers decide what communities they would like to live in.
- In the midst of a difficult economic period for Detroit, the Midtown community surrounding Wayne State University weathered the storm better than the city as a whole. Midtown lost fewer educated residents than the rest of the city over the last five years, seeing a 13.4% decline in population with degrees, compared to 18.7% citywide.

TABLE 4. Change in Number of Residents with Degree, 2009-2013

	Change in Number of People with Any Degree, 2009-2013	Change in Number of People with Advanced Degree, 2009-2013
Reference Communities		
Michigan	5.3%	7.2%
City of Detroit	-18.7%	-14.3%
URC Host Communities		
Ann Arbor	7.1%	10.0%
Difference - Ann Arbor and Michigan	+1.8pp	+2.7pp
East Lansing	11.3%	28.9%
Difference - East Lansing and Michigan	+6.0pp	+21.6pp
Midtown Detroit	-13.4%	-13.4%
Difference - Midtown and City of Detroit Total	+5.4pp	+0.9pp

Source: Anderson Economic Group analysis of data from the U.S. Census Bureau's American Communities Survey

This relationship between university campuses and educational attainment holds in many other communities across the U.S., as shown in Table 5 on page 18. The URC universities' roles as anchors for attracting and retaining talent at the local level is at the upper end of a list of comparison universities.

TABLE 5. Educational Attainment in URC Host Communities and Selected Comparison College Towns

College (City)	% of Population over 25 with College Degree	Difference from Statewide Total	% of Population over 25 with Advanced Degree	Difference from Statewide Total
URC Universities				
University of Michigan (Ann Arbor, MI)	81.7%	+54.6pp	41.7%	+31.7%
Michigan State University (East Lansing, MI)	85.0%	+57.8pp	38.3%	+28.3pp
Wayne State University (Detroit, MI)*	31.3%	+17.9pp[a]	14.3%	+9.1pp
Comparison Universities[b]				
Cornell University (Ithaca, NY)	63.7%	+30.5pp	37.8%	+23.5pp
Texas A&M (College Station, TX)	56.0%	+29.4pp	28.0%	+19.1pp
University of Colorado (Boulder, CO)	71.8%	+34.8pp	37.0%	+23.6pp
University of Florida (Gainesville, FL)	43.3%	+16.9pp	21.7%	+12.2pp
University of North Carolina (Chapel Hill, NC)	74.0%	+46.7pp	45.1%	+35.8pp
University of Virginia (Charlottesville, VA)	49.8%	+14.6pp	27.1%	+12.4pp
University of Wisconsin (Madison, WI)	53.8%	+27.0pp	24.1%	+15.0pp
Virginia Tech (Blacksburg, VA)	69.5%	+34.3pp	42.8%	+28.1pp
Western Michigan University (Kalamazoo, MI)	31.9%	+4.7pp	13.4%	+3.4pp
Average Comparison University	57.1%	+26.5pp	30.8%	+19.2pp

Note: In this table, "pp" refers to "percentage points," as two values expressed in "percent" are compared to each other.
Source: Anderson Economic Group analysis of data from the U.S. Census Bureau's American Communities Survey

a. "Reference community" for Midtown neighborhood is the city of Detroit.

b. This is a selection of comparison university host.

URC ALUMNI AND CHOICE TO LIVE IN MICHIGAN

College graduates base their decisions on where to live after graduation on many factors, including job prospects, the cost of living, which industry they want to work in, and personal and family connections. Talent-rich areas don't get that way by retaining 100% of their college graduates. Indeed, one study of college graduate location behavior by the Federal Reserve Bank of Boston showed that the New England area's graduating class of 2008 was the least likely of any region to be living in the same area one year after graduation (63.6% compared to 70.5% of all graduates nationwide), but that the region made up for this loss by attracting graduates from outside the region, with over a third of its college students not from the region.[25] Producing and retaining some graduates, while attracting others to the area are both part of the mix of

25. Alicia Sasser Modesto, "Retaining Recent College Graduates in New England: an Update on Current Trends", Federal Reserve Bank of Boston, May 2013.

factors that cause a state or metro area to have a talented workforce. And for the New England Region, giving students from outside the region an opportunity to connect to the region plays a role in their high educational attainment.

In the discussion of talent retention, one important role played by the URC universities is sometimes overlooked: for in-state students who are seeking research experience and teaching by top researchers, attending a research university in Michigan may keep them in the state for their education. By keeping talented students in Michigan during their years in school, URC universities give their students an opportunity to deepen connections to the people, lifestyle, and work opportunities that Michigan has to offer.

While not all graduates of URC universities live in Michigan for their whole lives, our analysis shows that attending a university in Michigan makes a difference. High school graduates are more likely to live in Michigan 10 years after receiving their bachelors from a university in Michigan than if they attended universities in another state using data from the National Center for Education Statistics' (NCES) Baccalaureate and Beyond Longitudinal Study (B&B), which tracks graduating college seniors through the early part of their careers.[26]

In Table 6 on page 20, we show the proportion of 1993 graduating seniors ("graduates") who were from Michigan that lived in Michigan in 2003 based on where they went to college or university.[27] About 86% of students from Michigan that attended college in Michigan stayed in the state. By contrast, only 26% of students from Michigan that attended college elsewhere remained in Michigan. In other words, there was a 60 percentage-point difference between the likelihood that a Michigan college graduate lived in Michigan 10 years later if they attended a Michigan institution than if they attended an out-of-state institution.

26. This is the same dataset used in the Federal Reserve Bank of Boston study cited in footnote 25. Note that this analysis is for all colleges and universities in Michigan, including URC institutions, as the survey's sample size does not allow institution-level comparisons.

27. Throughout this section, we refer to these graduating seniors as "graduates." This sample did not include graduates from a graduate or professional program.

TABLE 6. Proportion of 1993 Graduates Living in Michigan in 2003, by Institution Location

State of legal residence in 1992-93[a]	Attended College in Michigan	Attended College Elsewhere	*Increased Likelihood of living in Michigan from Attending Michigan University*
Michigan	86.2%	26.4%*	*59.8pp*

**Statistic was flagged due to large standard error.*

Source: AEG analysis of NCES, Baccalaureate and Beyond Longitudinal Study, (1993/2003)

a. We were unable to make comparisons for out-of-state graduating college seniors since some data did not meet the NCES reporting standards.

We observe similar trends based on more recent data from the B&B. In Table 7 below, we show the proportion of 2008 graduating seniors that live in Michigan based on both where they were from and where they attended college or university.[28] About 75% of Michigan graduates who attended a Michigan-based institution lived in Michigan a year later compared to 57% who attended an out-of-state institution. This indicates that there was a 19 percentage-point difference between the likelihood that a Michigan-based graduate lived in Michigan one year later if they attended an in-state institution compared to if they attended an out-of-state institution.

While only 19% of out-of-state graduates that attended college in Michigan lived in Michigan one year later, this dwarfs the proportion of out-of-state graduates that attended college elsewhere that migrated to Michigan later. Attending a Michigan-based institution increased the likelihood of an out-of-state graduate living in Michigan by about 19 percentage points.

TABLE 7. Proportion of 2008 Graduates Living in Michigan in 2009, by Residence Status and Institution Location

State of Legal Residence in 2007-08	Attended College in Michigan	Attended College Elsewhere	*Increased Likelihood of living in Michigan from Attending Michigan University*
Michigan	75.4%	56.5%	*18.9pp*
Out-of-State/Foreign	19.3%*	0.3%	*19.0pp*

**Statistic was flagged due to large standard error.*

Source: AEG analysis of NCES, Baccalaureate and Beyond Survey, (2008/2012)

28. We report estimates based on the set of all institutions rather than only the very high research universities due to data availability.

While some of this result could reflect prior interest or connections to family or friends in Michigan, or to Michigan industries, these students are surely also affected by the connections they develop in class, in friendships, and in internships in the state.

Comparing Alumni Retention Against Peers

We can also compare alumni retention in Michigan against the states in which URC peer clusters are located. Based on the B&B survey, Michigan ranked first out of the six other states with URC peer clusters in terms of the share of 1993 in-state graduates that stayed in the state of their respective institution 10 years later. Texas and California trailed closely behind with about 84% of in-state graduates living in those respective states in 2003.

See Table 8 on page 21 for the other peer states and their rankings.

TABLE 8. Proportion of 1993 Graduates Living in the Same State as Bachelor Institution in 2003

State of Bachelor Institution	In-State Graduates[a]	Rank
Michigan	86.2%	1
California	84.2%	3
Illinois	75.7%	5
Massachusetts	77.2%	4
North Carolina	69.2%	6
Pennsylvania	68.7%	7
Texas	84.4%	2

Source: AEG analysis of NCES, Baccalaureate and Beyond Survey, (1993/2003)

a. We were unable to make comparisons for out-of-state graduating college seniors since some data did not meet the NCES reporting standards.

Based on more recent data, about 75% of 2008 in-state graduates and about 19% of out-of-state graduates of institutions in Michigan lived in Michigan one year after graduating. Michigan ranked 6th out of the states with URC peer clusters for in-state graduates and ranked 4th based on out-of-state graduates. This result took place in the context of difficult economic times for the state: in both 2008 and 2009, Michigan had the highest unemployment rate out of not only the peer

states, but out of all states in the U.S. Table 9 on page 22 shows the estimates and rankings for other states with URC peer clusters.

TABLE 9. Proportion of 2008 Graduates Living in the Same State as Bachelor Institution in 2009

State of Bachelor Institution	In-State Graduates	Rank	Out-of-State/ Foreign Graduates	Rank
Michigan	75.4%	6	19.3%*	4
California	89.8%	1	37.4%	2
Illinois	87.7%	3	9.9%*	7
Massachusetts	74.9%	7	21.4%	3
North Carolina	80.1%	5	14.9%	6
Pennsylvania	81.6%	4	16.9%	5
Texas	88.5%	2	54.4%	1

**Statistic was flagged due to large standard error.*

Source: AEG analysis of NCES, Baccalaureate and Beyond Survey, (2008/2012)

ATTRACTING COMPANIES TO MICHIGAN

URC universities attract businesses to Michigan, both because of their role in producing and attracting talented workers to the state and because the research activity at the universities. Examples from recent years include:

- Google and Barracuda opened offices in downtown Ann Arbor, near the campus of the University of Michigan.
- IBM and Michigan-based Jackson Life opened locations in East Lansing that are highly visible and accessible to Michigan State University students.
- Amazon, Microsoft, and Twitter joined Michigan-based companies, such as Quicken Loans and Compuware, to locate in Detroit's urban core, which is within close proximity of Wayne State University and serves as an attractive hub to talent from all three URC universities.

In a number of cases, leaders from these firms had ties to the region as alums of the URC universities, or they grew up in the region, or are connected to a large network of URC-affiliated individuals.

HIGH-TECH EMPLOYMENT CLUSTERS AND RESEARCH UNIVERSITIES

Although there is no authoritative list of high-tech clusters in the United States, we produced an annual analysis since 2005 that defines a set of high-tech sectors and tracks employment in several notable metro areas, including Detroit, Silicon Valley, Seattle, Minneapolis, Austin, Dallas-Fort Worth, Grand Rapids, Atlanta, Chicago, St. Louis, Pittsburgh, Cincinnati, and Indianapolis.[29]

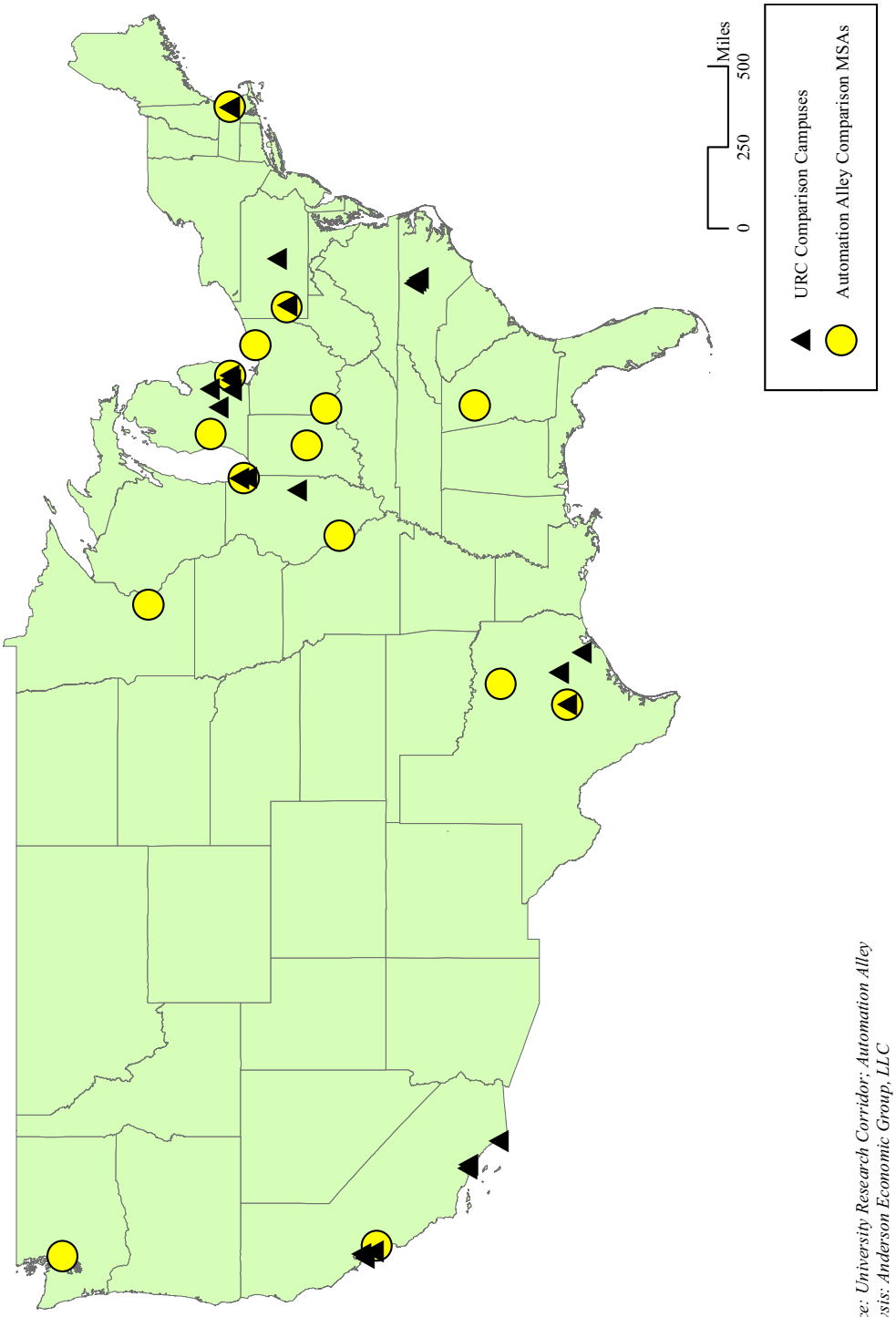
Many of the centers of high-tech employment tracked in that data series have significant overlap with the research university clusters cited in our annual

benchmarking study for the URC, as shown in Map 3, "URC Comparison Campuses and Automation Alley Comparison MSAs," on page 24. Several URC campuses, including the main campuses of the University of Michigan and Wayne State University, as well as the University of Michigan's Flint and Dearborn campuses, are located largely within Automation Alley, which has approximately the same number of high-tech workers (171,380) as Silicon Valley (179,690), and produces nearly 80% more graduates with STEM degrees.

The co-location of research clusters and centers of high-tech employment is not a coincidence, as higher education, tech employment, and research activity feed and attract each other within a region.

29. This is analysis is used in series of reports published by Automation Alley, a technology business association in Southeast Michigan. See *Automation Alley 2015 Technology Industry Report,* and previous reports prepared by Anderson Economic Group, which can be found at: http://www.automationalley.com and http://www.andersoneconomicgroup.com.

Map 3. URC Comparison Campuses and Automation Alley Comparison MSAs



Source: University Research Corridor; Automation Alley
Analysis: Anderson Economic Group, LLC

IV. Developing and Nurturing Talent Networks

Modern research universities play an important role in developing the state's access to talent beyond producing and attracting talent. They foster access to a national and global network of talented people. URC alumni living outside the state have connections to Michigan that allow them to think of Michigan's strengths when making business location decisions. Universities develop and nurture these connections by producing graduates and engaging with alumni.

INDICATORS OF TALENT NETWORK DEVELOPMENT

TABLE 10. Key Indicators of Contribution to Talent Networks

Number of Alumni in Michigan	617,319
Number of Alumni in other states and abroad	582,441
Number of New Businesses in U.S. started by URC Alumni[a]	380,000

Source: AEG analysis of data from the URC universities and other sources. See "Appendix A. Data and Methodology" on page A-1.

a. See "Embracing Entrepreneurship: The URC's Growing Support for Entrepreneurs in Michigan and Throughout the World," Anderson Economic Group, 2013.

AN EXTRAORDINARY NETWORK

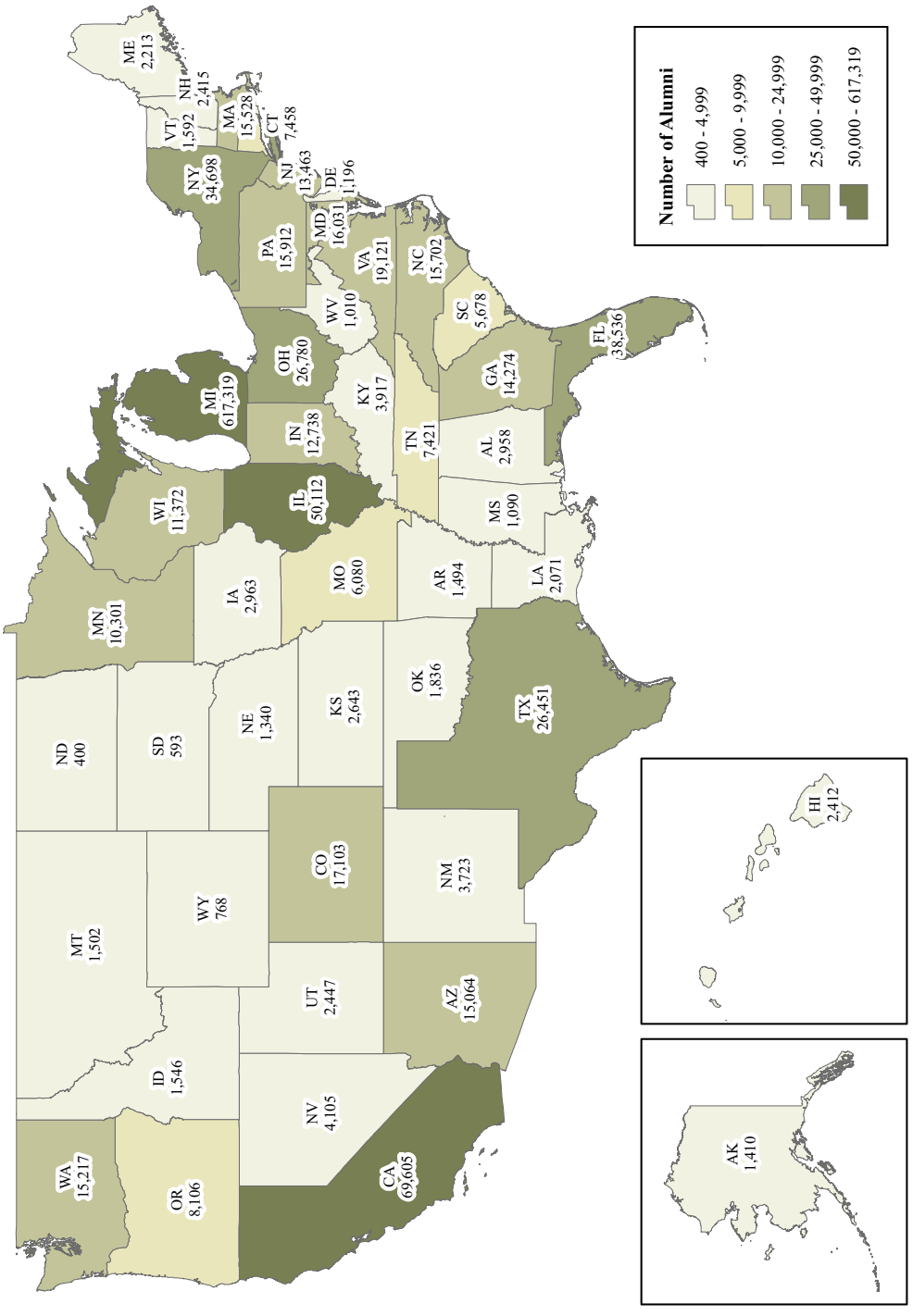
Each of the URC universities have active alumni bases that stay connected through social networks, campus events, sporting events, and personal relationships. These connections add to the vitality of each university, with engaged alumni supporting their alma mater throughout their lives. The URC universities have almost 1.2 million alumni, including 582,441 alumni with known addresses living outside the state in all 49 other states and 180 countries. Though they live and work outside the state, these alumni represent a significant resource for the state. They represent professional contacts for Michigan workers who got to know them or worked with them during their time in Michigan, and they maintain an affinity for their school and their time in the state.

This network includes many alumni in positions of influence within their current employer's organization. More than 21% of surveyed alumni provided job titles that indicated leadership roles, such as Owner, Partner, CEO, President, and Director.[30] While data aren't available to directly compare URC alumni base to its peer research university clusters, the URC's enrollment ranks first among the eight clusters.[31]

30. Data from 2013 URC alumni survey commissioned by the URC. Figure is from 31,360 survey respondents who provided an answer to an open-ended question asking for their job title.

31. See "Empowering Michigan: Eighth Annual Economic Impact Report of Michigan's University Research Corridor," Anderson Economic Group, forthcoming 2015.

Map 4. URC Alumni by State, 2014



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

EVIDENCE FROM SOCIAL NETWORKS

One way to get a glimpse of this network is by examining social networking sites where people disclose their university affiliations. A detailed analysis of alumni locations from the professional social networking site LinkedIn shows significant URC university alumni presence in several top metro areas of the U.S., including a significant presence in the Detroit area

TABLE 11. URC Alumni in Selected Michigan and U.S. Cities

City[a]	URC Alumni in LinkedIn	Top Industries Employing URC Alumni	Selected Top Employers of URC Alumni
Detroit[b]	169,705	Automotive	Ford, General Motors, Chrysler
Lansing	32,081	Higher Education	Michigan State University, State of Michigan, Sparrow Hospital
Grand Rapids	17,173	Hospital and Health	Spectrum Health, GVSU, Meijer, and Amway
Chicago	31,209	Marketing and Advertising	Deloitte, Northwestern University, University of Chicago
New York City	26,424	Financial Services	IBM, Citibank, JP Morgan Chase
San Francisco	17,641	Computer Software	Google, Apple, Cisco
Washington, DC	14,910	Law Practice	U.S. Department of State, Food and Drug Administration, National Institutes of Health
Boston	8,363	Computer Software	MIT, Harvard, Massachusetts General
Atlanta	7,056	Information Technology	Centers for Disease Control and Prevention, AT&T, Coca-Cola
Dallas	4,846	Information Technology	Texas Instruments, Lockheed Martin, AT&T
Raleigh-Durham	3,126	Information Technology	IBM, GlaxoSmithKline
Austin	2,766	Computer Software	Dell, IBM, National Instruments

Source: Anderson Economic Group analysis of data from LinkedIn, Accessed in December 2014

a. Based on LinkedIn profile; may include metro area residents. Cities and metro areas selected to include several top population centers as well as other selected "talent destination" cities.

b. The greater Detroit area includes Ann Arbor, which is not reported separately here.

These networked alumni work in many of the leading industries in each region, including software development and IT in San Francisco, Boston, and Austin; entertainment in Los Angeles; and law and government in Washington, D.C.

Appendix A. Data and Methodology

PEER UNIVERSITY CLUSTERS

This report cites several rankings of the URC among top research university clusters from our annual benchmarking report. For reference, the complete list of universities included in each cluster is as follows:

TABLE 12. Comparison Peer University Clusters

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

Source: "Empowering Michigan: Eighth Annual Economic Impact Report of Michigan's University Resaerch Corridor," Anderson Economic Group, 2015

UNIVERSITY OPERATIONS AND ALUMNI DATA

Data on university operations such as research expenditures and faculty are from the Integrated Postsecondary Education Data System (IPEDS) at the National Center for Education Statistics, the Higher Education Research and Development Survey by the National Science Foundation, and the universities' alumni offices.

Several figures from these sources are cited from our analysis in the report "Empowering Michigan: Eighth Annual Economic Impact Report of Michigan's University Research Corridor," (Anderson Economic Group, forthcoming in 2015).

OTHER DATA SOURCES

Other data sources cited in this report include:

- Educational attainment data by city and census block from the U.S. Census Bureau's American Communities Survey.
- Student migration data from the 1993/2003 and the 2008/2012 Baccalaureate and Beyond Longitudinal Study from the U.S. Department of Education.

- The "Alumni Impact Survey" conducted in conjunction with our 2013 report "Embracing Entrepreneurship: The URC's Growing Support for Entrepreneurs in Michigan and Throughout the World."

ANALYSIS OF CENSUS DATA

Analysis of educational attainment by community used American Communities Survey data from the U.S. Census Bureau.

Analysis of Wayne State University considered the Midtown neighborhood surrounding the university to be its "local community," as Wayne State does not play the same role for the city of Detroit as Michigan State's main campus does for East Lansing or the University of Michigan's Ann Arbor campus does for the city of Ann Arbor. We used the following census tracts to define "Midtown" for the purposes of this analysis."

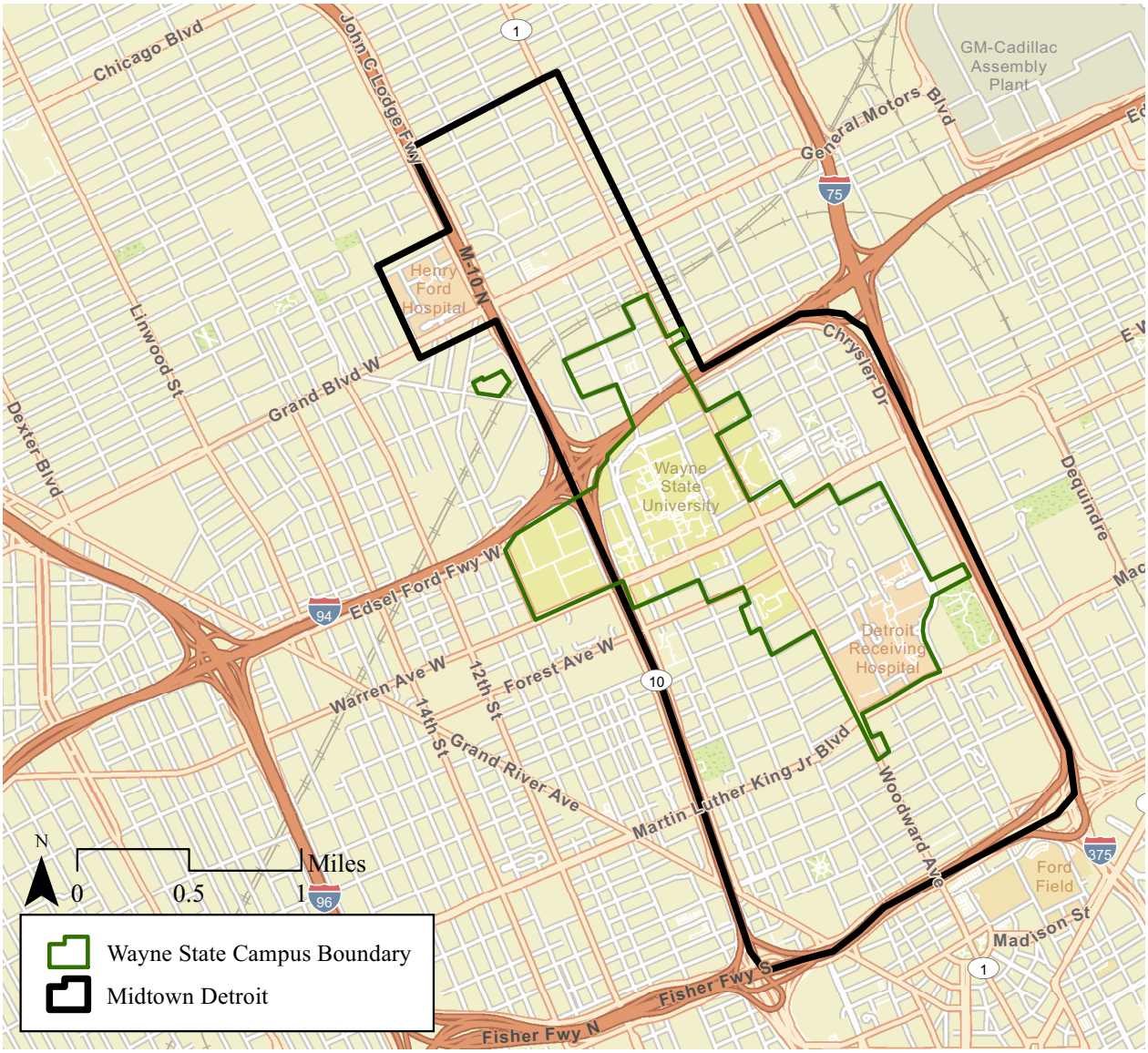
Census tracts for data from the 2000-2009 census. 5175, 5180, 5202, 5203, 5204, 5174, 5176, 5201, 5205, 5206, 5325, 5326.

Census tracts for data from the 2000-2009 census. 5175, 5180, 5202, 5203, 5204, 5173, 5225, 5326, 5339.

Note that the census tract definitions changed between the 2000 census and 2010 census. Nevertheless, the area we analyzed is spatially identical; the 2010 census consolidated several tracts from the prior census.

Map 1, "Wayne State University and Midtown Detroit," on page A-3, shows the relevant area used in this analysis.

Map A-1. Wayne State University and Midtown Detroit



Source: Wayne State University
Analysis: Anderson Economic Group, LLC

Appendix B. Summary of Past URC Sector Reports

In 2013 the URC commissioned a study exploring the impact alumni entrepreneurs of MSU, U-M, and WSU have on the Michigan, U.S. and global economies. The URC has also commissioned annual industry sector reports, which can be found on the URC and Anderson Economic Group websites.[32] The key findings from those reports can be found below.

BLUE ECONOMY (2014)

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

ALUMNI ENTREPRENEURSHIP (2013)

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

AUTOMOTIVE INNOVATION (2012)

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

32. URC http://www.urcmich.org/reports, and Anderson Economic Group http://www.andersoneconomicgroup.com.

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

INFORMATION AND COMMUNICATION TECHNOLOGY (2011)

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

ADVANCED MANUFACTURING (2010)

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

LIFE SCIENCES (2009)

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

ALTERNATIVE ENERGY RESEARCH AND DEVELOPMENT (2008)

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

Appendix C. About the Authors

AUTHORS

Alexander L. Rosaen. Mr. Rosaen is a Senior Consultant at Anderson Economic Group, and the Director of Public Policy and Economic Analysis. 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; and several analyses of the economic impact of higher education institutions.

Prior to joining Anderson Economic Group, Mr. Rosaen worked as a mechanical engineer for Williams International in Walled Lake, Michigan.

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

Patrick L. Anderson. Mr. Anderson founded Anderson Economic Group in 1996, and serves as a Principal and Chief Executive Officer in the company.

Anderson Economic Group is one of the most recognized boutique consulting firms in the United States, and has been a consultant for states such as Michigan, Kentucky, North Carolina, Wisconsin, and Ohio; the Province of Ontario; manufacturers such as General Motors, Ford, DaimlerChrysler, Honda; retailers such as Meijer, Inc. and Kmart; telecommunications companies such as SBC and AT&T; utilities like ITC; the University of Michigan, University of Chicago, and other colleges; and franchisees of Anheuser-Busch, Molson, Coors, Miller, Harley-Davidson, Mercedes-Benz, Suzuki, Cadillac, Chevrolet, Ford, Lincoln, and Avis.

Mr. Anderson has written more than 100 published works, including E*conomics of Business Valuation* from Stanford University Press. Three of his journal articles, "Pocketbook Issues and the Presidency," "The Value of Private Businesses in the United States," and "Policy Uncertainty and Persistent Unemployment," have each been awarded for outstanding writing from the National Association of Business Economics.

Mr. 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. The University of Michigan Ford School of Public Policy awarded him its Neil Staebler Award for civic participation in 2014.

ANDERSON ECONOMIC GROUP

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