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ANDERSON ECONOMIC GROUP

Preliminary Report: The Economic Benefits of the University Research Corridor

Commissioned by the University Research Corridor:

Michigan State University
University of Michigan
Wayne State University

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I. Introduction & Summary

PURPOSE OF THE URC

The University Research Corridor (URC) is an alliance of Michigan's three largest academic institutions: Michigan State University, the University of Michigan, and Wayne State University. The purpose of this alliance is to accelerate economic development in Michigan by educating students, attracting talented workers to Michigan, supporting innovation, and encouraging the transfer of technology to the private sector.

ANNUAL REPORT & PREVIEW CONTENTS

The URC asked Anderson Economic Group to undertake a comprehensive study to quantify the economic impact of the Research Corridor universities' activities on Michigan's economy. The first annual report will answer the question: What would the loss be to the state if the Research Corridor universities left Michigan? The report will then measure and benchmark the URC's economic contributions to the state in terms of jobs, earnings, economic development activities, and tax revenue.

This document is a *preview* to the first annual report and lays the foundation for the economic impact analysis in that report. Specifically, this preliminary report:

1. Describes the scale of the URC's operations in Michigan
2. Calculates the earnings of URC alumni in Michigan in 2006
3. Compares the URC's research and development activities with peer universities in other states

URC'S PRESENCE IN MICHIGAN

The University Research Corridor partners collectively spent $6.5 billion on operations in FY 2006. This figure—$6.5 billion—is about 2% of all economic activity in the state, as measured by Michigan's gross state product. Most expenditures went towards instruction ($1.37 billion), research ($916 million), and operating the University of Michigan's Hospital ($1.8 billion). In FY 2006 the URC employed 46,398 full-time faculty and staff throughout the state.[1] See "URC's Operations & Expenditures" on page 4.

The Research Corridor universities are among the top nationally in research and development (R&D) expenditures. In 2005, the URC members spent 94% ($1.37 billion) of the $1.45 billion that academic institutions in Michigan spent on R&D. All three Research Corridor universities were in the top 75 nationally (out of over 600 universities) in total research spending. Furthermore, almost two-thirds (61%) of the R&D expenditures were funded by federal sources. In other words, the URC brought $832 million in federal dollars to Michigan in 2005. See "Academic Research & Development Expenditures" on page 5.

1. Full-time equivalent (FTE) employment for URC. Data is from the Michigan State, University of Michigan, and Wayne State reports to the Integrated Postsecondary Education Data System (IPEDS) at the U.S. Department of Education.

EARNINGS OF URC ALUMNI

Currently there are 617,957 URC alumni living in Michigan.[2] There is at least one URC alum living in every county. URC alums earned an estimated $24.3 billion or 7.1% of all personal income in Michigan last year.[3] See "URC Alumni in Michigan" on page 8.

COMPARISON WITH PEER UNIVERSITY CLUSTERS

To judge how the universities in the URC compare with other university clusters in the nation, we selected a handful of the best-known groups of universities in North Carolina, Massachusetts, and Pennsylvania. See Table 1 below for our comparison university clusters.

TABLE 1. Comparison Research University Clusters

Michigan (URC)	North Carolina	Massachusetts	Pennsylvania
Michigan State University	Duke University	Harvard University	Penn State University
University of Michigan (all campuses)	University of North Carolina (Chapel Hill)	Massachusetts Institute of Technology (MIT)- Excludes Lincoln Lab	University of Pittsburgh (all campuses)
Wayne State University	North Carolina State University	Tufts University	Carnegie Mellon University

Source: Anderson Economic Group, LLC

The URC spends about the same amount on research and development as the comparison university clusters (over $1 billion), but the composition of the funding source of R&D expenditures is very different among the university groups. The Pennsylvania and Massachusetts clusters receive more funding from the federal government than the URC, while the URC spends more of its own (institutional) money on research. See Table 2 below.

TABLE 2. R&D Expenditures and Sources for Comparison University Clusters (in millions), 2005

	Total R&D Expenditures	Federal Government	State & Local Government	Industry	Institution	Other
URC	**$1,369**	**61%**	**5%**	**4%**	**25%**	**5%**
North Carolina	$1,374	59%	10%	13%	16%	3%
Massachusetts	$1,159	82%	0%	8%	2%	8%
Pennsylvania	$1,337	71%	6%	8%	12%	2%
memo:						
All U.S. Universities	*$45,750*	*64%*	*6%*	*5%*	*18%*	*7%*

Source: National Science Foundation: Integrated Science and Engineering Resources Data System

Analysis: Anderson Economic Group, LLC

2. Information is based on the records of the alumni associations at each of the University Research Corridor partners.
3. The estimate is conservative because it includes only the alumni whose residence in Michigan we could confirm. Our data set also excludes recipients of honorary degrees and certificates.

Changes in R&D Expenditures. During the past five years, the URC has increased spending on R&D at a slower rate on average than the other university groups. Between 2000 and 2005, the URC spending on R&D increased at an average annual rate of 7.7%, compared to Pennsylvania's 9.2% and North Carolina's 8.7%. Between 2004 and 2005, spending increased 3.7% for the URC compared to 5.5% for the Pennsylvania university cluster and 11.7% for the North Carolina universities. See Table 11 on page 10.

Patents and Licenses. As a measure of how university research and development translates into economic activity, we present statistics on patents, licenses, and license revenue for the URC and comparison groups. Since these measures often vary widely from one year to the next, we calculated the average annual activity between 2002 and 2006. See "Comparison of URC Research & Development with Peer Universities" on page 9.

The URC had on average 122 patents granted annually between 2002 and 2006, which was more than the North Carolina and Pennsylvania universities, but less than the Massachusetts universities received. The URC also had a lower rank in number of licenses. However, licensing revenue for the URC was above that of both the Pennsylvania and North Carolina university clusters, as shown by Table 3. Though the URC did not outrank Massachusetts in any category, it did outrank the Pennsylvania and North Carolina clusters in number of patents granted and in amount of licensing revenue.

TABLE 3. Average Annual Patent and Licensing Activity for URC and Comparison Universities, 2002-2006

	Patent Grants	Licenses/Options	Licensing Revenue (in millions)
URC	**122**	**116**	**$38**
North Carolina	98	129	$11
Massachusetts	208	213	$58
Pennsylvania	112	132	$12

Sources: Universities' websites, AUTM for Penn State, Duke data

II. URC's Economic Presence in Michigan

The University Research Corridor makes significant contributions to the state's economy. In this section we discuss the direct impact of the URC's operations on earnings and employment statewide.

URC'S OPERATIONS & EXPENDITURES

The University Research Corridor spent $6.5 billion on operations in FY 2006 (July 1, 2005 to June 30, 2006) and employed 46,398 full-time faculty and staff throughout Michigan.[4] Most operational spending went towards instruction (21% of total), research (14%), and the University of Michigan's hospital (29%). See Table 4 below.

TABLE 4. Operational Expenditures by the URC, FY 2006

	Expenditures ($ in millions)	% of Total
Instruction	1,369	21%
Research[a]	916	14%
Public Services	322	5%
Academic Support	310	5%
Student Services and Scholarships and Fellowships	245	4%
Institutional Support	248	4%
Operation and Maintenance of Plants	422	7%
Auxiliary Enterprises	378	6%
Depreciation and Other Expenses	397	6%
University of Michigan Hospital	1,844	29%
Total Operational Expenditures	**$6,452**	100%

Data Source: IPEDS Finance FY 2006

a. The data reported to IPEDS for research expenditures is lower than the research expenditures reported to the National Science Foundation. For reporting to IPEDS, indirect costs for research are included in other line items of the budget, thus lowering the expenditures in the research category.

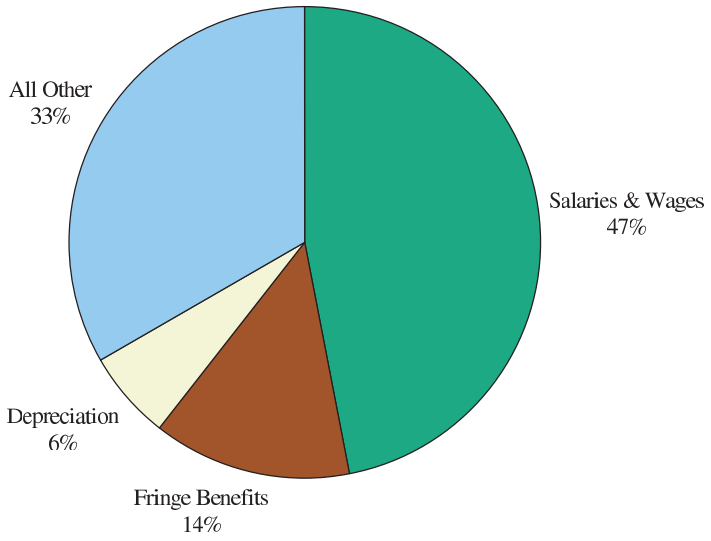
Within the categories in Table 4, almost half (47%) of all operational expenditures went towards the salaries and wages for faculty and staff. Fringe benefits made up 14% of expenditures, while depreciation accounted for 6%. The remaining 33% went to pay for supplies, equipment, and any other expenditure not included in the previous categories. See Figure 1 on page 5.

URC expenditures encourage even more economic activity throughout the state of Michigan than indicated by total spending listed in Table 4. The dollars the URC

4. Faculty and staff count is full-time-equivalent positions in fall 2005. Figure includes the University of Michigan Hospital doctors and staff.

spends on supplies, equipment, and salaries of staff and faculty are then re-spent as businesses and households throughout Michigan purchase other goods and services. The first annual report will include an estimate of the indirect economic activity that the URC operational expenditures directly cause.

FIGURE 1. URC Operational Expenditures by Function, FY 2006



ACADEMIC RESEARCH & DEVELOPMENT EXPENDITURES

An important component of the URC's mission is R&D. Counting all research and development expenditures, academic institutions in Michigan spent $1.45 billion in 2005.[5] As shown in Table 5, the URC accounted for 94% of this amount or $1.37 billion. $832 million, or approximately 61% of this sum, was financed by federal sources.

TABLE 5. URC Research & Development Expenditures in 2005 (in millions)

	Total R&D Expenditures	Federally Funded R&D Expenditures
All Academic Institutions in Michigan	$1,456	$880
Michigan State University	$334	$156
University of Michigan	$809	$555
Wayne State University	$226	$121
URC Total	$1,369	$832
URC % of All Michigan Expenditures	94%	94%

Source: National Science Foundation, Integrated Science and Engineering Resources Data System

Analysis: Anderson Economic Group, LLC

5. The "research" category in Table 4 on page 4 includes only the direct costs of research.

In 2005, the University of Michigan was in the top 10 academic institutions nationally for total R&D expenditures (ranked 2nd) and federally funded expenditures (ranked 4th). Only John Hopkins University had higher total expenditures and only John Hopkins University, the University of Washington at Seattle and Stanford University had higher federally funded expenditures. Furthermore, Michigan State and Wayne State both ranked in the top 80 of all academic institutions (over 600 nationally) for total and federally funded expenditures.[6] See Table 6.

TABLE 6. 2005 URC Members Ranking for Expenditures for all U.S. Institutions

	Rank: Total R&D Expenditures (out of over 600 universities)	Rank: Federally Funded R&D Expenditures (out of over 600 Universities)
University of Michigan	2	4
Michigan State	42	59
Wayne State	72	78

Source: National Science Foundation, Integrated Science & Engineering Resources Data System

Table 7 shows the sources of funds for the URC by university. On average, they had lower expenditures, as a percent of total, from federal funding than the national average, primarily offset by higher expenditures of institutional funds.

TABLE 7. Source of Funds for URC Research and Development Expenditures, 2005

	Total R&D Expenditures (in millions)	Federal Government[a]	State & Local Government[b]	Industry[c]	Institution[d]	Other[e]
Michigan State	$334	47%	13%	3%	32%	4%
University of Michigan	$809	69%	1%	4%	21%	5%
Wayne State	$226	53%	7%	6%	28%	6%
URC Total	**$1,369**	**61%**	**5%**	**4%**	**25%**	**5%**
memo:						
All U.S. Universities	*$45,750*	*64%*	*6%*	*5%*	*18%*	*7%*

Source: National Science Foundation: Integrated Science and Engineering Resources Data System

Analysis: Anderson Economic Group, LLC

a. Includes funds from federal agencies which have been specifically designated for R&D.

b. Includes funds from state and local governments which have been specifically designated for R&D.

c. Includes funds from for-profit organizations which have been specifically designated for R&D.

d. Includes funds from the institution to finance organized research expenditures and indirect costs. These funds can come from any unrestricted source that were not included in another category as specifically designated for R&D.

e. Includes funds from non-profit organizations and individual donors which have been specifically designated for R&D.

6. National Science Foundation, Integrated Science and Engineering Resources Data System

EARNINGS BY URC ALUMNI

The University Research Corridor partners awarded degrees to 26,832 students in 2006. According to the alumni associations of the member universities, currently 617,957 URC alums live in Michigan. URC alumni make up 8.1% of Michigan's population over the age of 18 years. As shown in Figure 2 on page 8, URC alums live in every county in Michigan.

Like all educational institutions, the URC strives to increase the knowledge and skills of the students they teach. An increase in the usable knowledge and skills often allows the person to earn a higher wage. We calculated the earnings of URC alums for 2006, using a model that accounts for the higher wages of URC alums over the average college graduate's salary.

Using a restricted data set that excluded recipients of honorary degrees or certificates, and excluded recent 2007 graduates, we calculated the earnings of 538,254 URC alumni living in Michigan. We detail our methodology in "Alumni Earnings Methodology" on page 16.

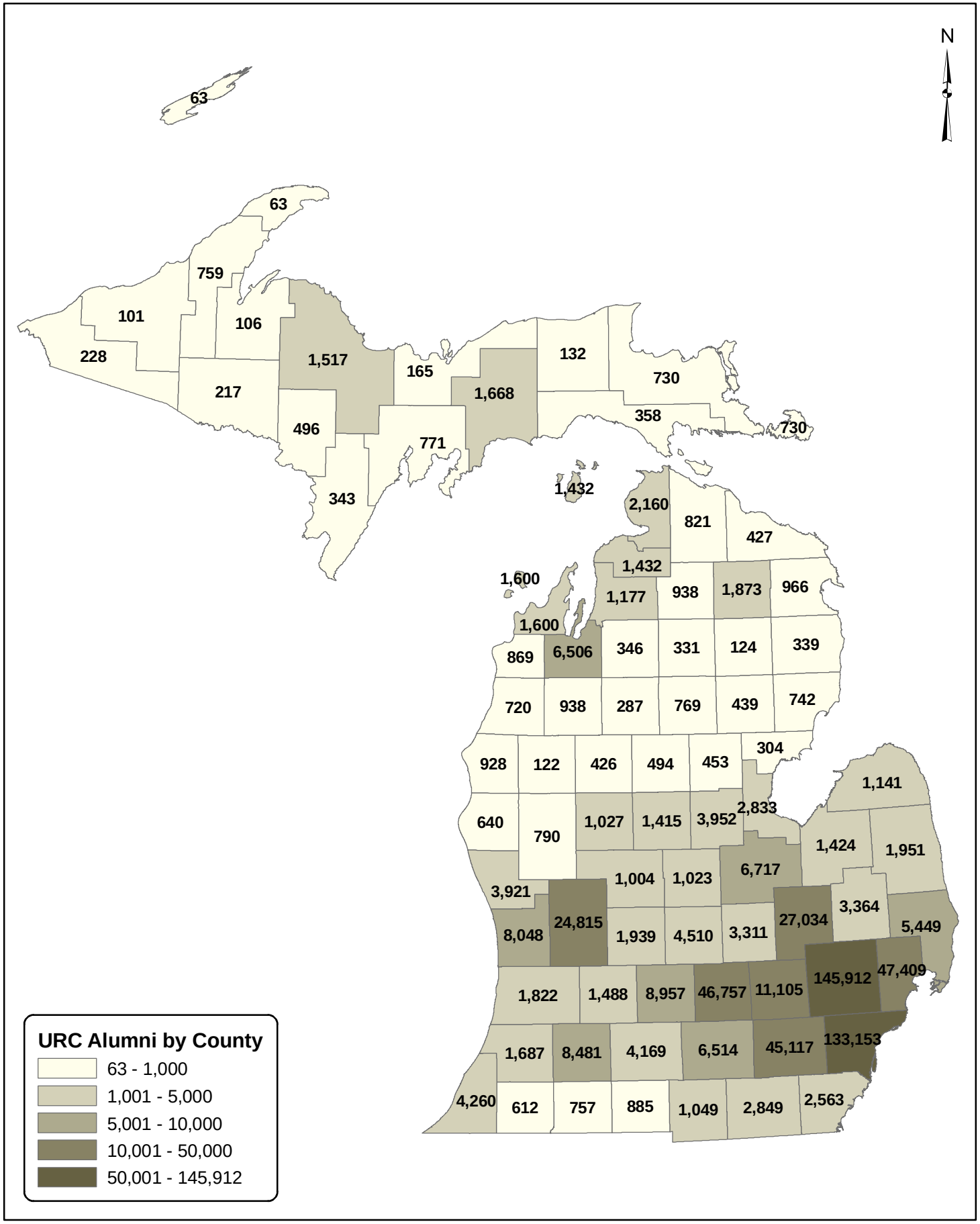
We estimate that in 2006 URC alumni earned over $24.3 billion, or 7.1% of all personal income in Michigan. While much of these earnings can not be said to have been *caused* by the URC universities, this figure shows the scale of the URC's role in attracting and educating Michigan's workforce.

TABLE 8. Earnings of URC Alumni by Age and Degree, 2006 ($ Millions)

	21-24 Years	25-34 Years	35-44 Years	45-64 Years	Over 65 Years	Total
Bachelor Degree	523	3,074	4,363	6,872	353	15,184
Advanced Degree	1	1,444	2,567	4,676	472	9,162
Total Earnings	524	4,518	6,929	11,549	826	$24,346
memo: % of Personal Income in Michigan						7.1%

Source: Anderson Economic Group, LLC

URC Alumni by County



Data: ESRI, Inc. 2007; analysis by Anderson Economic Group, LLC

III. Comparison of URC Research & Development with Peer Universities

The University Research Corridor spends billions of dollars on research and development annually and encourages the transfer of new technologies to the private sector. In this section we compare these activities of the URC with leading public and private university clusters in other states.

COMPARISON PEER UNIVERSITY CLUSTERS

To judge how the URC compares with other university clusters in the nation, we selected a handful of the best-known groups of universities in North Carolina, Massachusetts, and Pennsylvania. Each of these has three universities from the same state and are well known for their research and development activities. See Table 9 below.

TABLE 9. Comparison Research University Clusters

Michigan (URC)	North Carolina	Massachusetts	Pennsylvania
Michigan State University	Duke University	Harvard University	Penn State University
University of Michigan (all campuses)	University of North Carolina (Chapel Hill)	Massachusetts Institute of Technology (MIT) - Excludes Lincoln Lab	University of Pittsburgh (all campuses)
Wayne State University	North Carolina State University	Tufts University	Carnegie Mellon University

Source: Anderson Economic Group, LLC

ACADEMIC R&D EXPENDITURES

In 2005, academic institutions in the U.S. spent over $45 billion on research and development.[7] According to the National Science Foundation (NSF), academic institutions accounted for 33% of all research and 14% of all research and development conducted in the U.S. in 2004.[8] The amount of funding for academic research has increased significantly in the past four decades. Research and development adds billions of dollars to the economy and creates hundreds of thousands of jobs in the U.S.

In relation to the comparable university clusters, the URC has received less federal funding as a percentage of total than the Massachusetts and Pennsylvania clusters and relies on institutional funds for a significantly higher proportion of its R&D spending than all three comparison clusters. See Table 10 on page 10.

7. National Science Foundation, Integrated Science and Engineering Resources Data System.

8. Information is from the National Science Foundation, *Science and Engineering Indicators 2006*, Chapter 5, Academic Research and Development. We use the following definition of development: "the systematic use of the knowledge or understanding gained from research or practical experience directed toward the production or significant improvement of useful products, services, processes, or methods."

TABLE 10. Source of Funding for R&D Expenditures (in millions), 2005

	Total R&D Expenditures	Federal Government	State & Local Government	Industry	Institution	Other
URC	**$1,369**	**61%**	**5%**	**4%**	**25%**	**5%**
North Carolina	$1,374	59%	10%	13%	16%	3%
Massachusetts	$1,159	82%	0%	8%	2%	8%
Pennsylvania	$1,337	71%	6%	8%	12%	2%
All U.S. Universities	*$45,750*	*64%*	*6%*	*5%*	*18%*	*7%*

Source: National Science Foundation: Integrated Science and Engineering Resources Data System

Analysis: Anderson Economic Group, LLC

In 2004, the URC had the highest R&D spending of the four university clusters at $1.32 billion.[9] In 2005, however, North Carolina had surpassed the URC's spending of $1.37 billion by $5 million.[10] The URC's fall from first to second place can be explained by North Carolina's significant growth in R&D expenditures between 2004 and 2005. The university clusters had similar levels of expenditures in 2004, but as shown in Table 11, the North Carolina cluster increased expenditures 11.7% while the URC increased expenditures only 3.7%.

TABLE 11. Growth in Total Academic R&D Expenditures

	Annual Growth 2000 - 2005 (CAGR)	Annual Growth 2004 - 2005
URC	**7.7%**	**3.7%**
North Carolina	8.7%	11.7%
Massachusetts	5.8%	3.1%
Pennsylvania	9.2%	5.5%
All U.S. Universities	*8.8%*	*6.5%*

Source: NSF, Integrated Science and Engineering Resources Data System

Analysis: Anderson Economic Group, LLC

Spending by the field of science and engineering for the URC is fairly consistent with the U.S. averages. As shown in Table 12 on page 11, there was slightly higher than average spending for life and social sciences and slightly lower

9. Data is from the National Science Foundation Integrated Science and Engineering Resources Data System.

10. The spending reported by the Massachusetts Institute of Technology to the NSF does not include spending for the Lincoln Lab, which is approximately $500 million but is not classified as academic research and development. Information provided by MIT's Technology Licensing Office. Lincoln Lab includes communications, space surveillance, missile defense, tactical surveillance systems, and air traffic control.

spending for environmental sciences. All three comparison university clusters deviated significantly from the U.S. average for life sciences: the North Carolina cluster spent significantly more and the other two university clusters spent significantly less.

TABLE 12. Share of Total R&D Expenditures by Science and Engineering Fields, 2004

	Environmental Sciences[a]	Life Sciences[b]	Math & Computer Sciences	Physical Sciences[c]	Psychology	Social Sciences[d]	Sciences, Other	Engineering[e]
URC	**1%**	**63%**	**2%**	**8%**	**2%**	**10%**	**0%**	**15%**
North Carolina	4%	73%	3%	5%	1%	6%	0%	9%
Massachusetts	4%	52%	5%	14%	1%	3%	2%	20%
Pennsylvania	3%	48%	12%	8%	3%	3%	1%	22%
All U.S. Universities	*5%*	*60%*	*4%*	*8%*	*2%*	*4%*	*2%*	*15%*

Source: National Science Foundation, Survey of Research and Development Expenditures at Universities and Colleges, FY 2004.

Analysis: Anderson Economic Group, LLC

a. Environmental Sciences includes Atmospheric and Earth Sciences, Oceanography and other miscellaneous Environmental Sciences.

b. Life Sciences includes Agricultural, Biological, Medical and other miscellaneous Life Sciences.

c. Physical Sciences includes Astronomy, Chemistry, Physics other miscellaneous Physical Sciences.

d. Social Sciences includes Economics, Political Sciences, Sociology and other miscellaneous Social Sciences.

e. Engineering includes Aeronautical, Biomedical, Bioengineering, Chemical, Civil, Electrical, Mechanical. Metallurgical, and Other.

TECHNOLOGY TRANSFERS

Beyond the direct impact of the initial R&D spending, these innovations also lead to the production and sale of new products and services that have further economic impacts. The pharmaceutical, medical, computer technology, consumer electronic, telecommunication, agricultural products, and manufacturing industries are among the many industries benefiting from research and development conducted at universities. Research and development is also important to universities for the role that it plays in attracting and retaining high quality professors and students, which in turn benefits business enterprises that are in need of a high quality workforce and research partnerships.

Although the academic community has always been involved in technology transfer in the U.S., it was not until the U.S. Congress passed the Bayh-Dole Act (USC Title 35, Chapter 18) in 1980, that institutions were able to patent and retain ownership of their inventions. Prior to the passage of the Act, inventions borne out of federally-funded research became the property of the federal government.

The ability to own a patent enables an institution to directly profit from the innovation. Specifically, institutions sell the rights to the innovation in the form of a license or option to an existing or start-up commercial enterprise. They receive royalties in the form of a lump sum payment or an annuity over the life of the patent. According to the U.S. Patent and Trade Office (USPTO), academic sources accounted for approximately 1.5% of patenting by U.S. private and nonprofit (non-

governmental) sectors in 1981. By 2003, they accounted for almost 4.5%.[11] Patents can translate into large sources of revenue. According to data from the NSF, academic patents generated net royalties of $866 million in 2003, a more than four-fold increase from the $195 million net royalties generated in 1993.[12]

The success of academic research and development activities is often measured in terms of its impact on technology transfer. Common indicators include R&D expenditures, the number of patent applications filed and the number of inventions disclosed in a given year. While these statistics show activity, they do not necessarily indicate the effectiveness of the activity. Other statistics, such as the number of patents granted, the number of licenses or options entered into, the royalty revenue and the number of new start-ups are perhaps more telling indicators of technology transfer. We investigate all of these indicators and attempt to find others to demonstrate the performance of the URC relative to the average U.S. institution and our comparison groups.

Since we have already examined expenditures, we will begin with invention disclosures, which is the process by which the university becomes aware of an innovation and decides whether to apply for a patent. In exchange for the disclosure, the inventor receives some assurance that if his or her idea is successful, the inventor will also benefit.

Table 13 on page 13 shows a large number of average disclosures at URC universities relative to the comparison universities. Some invention disclosures result in the filing of a patent application. The URC lags behind the other groups, except Pennsylvania, in the number of new patent applications filed.[13]

11. U.S. Patent Office, U.S. Colleges and Universities, Utility Patent Grants 1969-2003.

12. National Science Foundation, Science and Engineering Indicators 2006.

13. Figures on patent applications can be unreliable and vary widely from year to year because schools are not explicit about whether they are reporting new or total applications filed.

TABLE 13. Average Annual Invention Disclosures and Patent Applications Filed,[a] 2002-2006

	Invention Disclosures	New Patent Applications Filed[b]
URC	**437**	**243**
North Carolina	383	298
Massachusetts	706	398
Pennsylvania	387	212

Sources: Universities' websites, AUTM 2005 report [cdef]

a. Average includes 2002-2006 data where available. Some universities and some reported statistics are based on averages of less than 5 years. See source for limitations.

b. The statistics on the patent applications filed have limitations, as it is often unstated whether universities are reporting all applications filed or new applications filed.

c. Michigan State, the University of Michigan, and Wayne State information was obtained from the URC website. Five year averages were available for all schools except Wayne State for which we have used a 2002-2005 average.

d. UNC Chapel Hill has a five year average for all statistics from their website. NC State University has a 2002-2005 average for all statistics from their website. Duke does not report statistics on their website - we have used their 2002 - 2005 AUTM submissions.

e. MIT, Harvard and Tufts reported 2002-2006 data on their websites with the exception of the number of startups for Harvard which was taken from the 2005 AUTM report.

f. Penn State provided all statistics for 2002-2006. The University of Pittsburgh published statistics on their website for 2002-2006, except patent applications and startups which were obtained from the 2005 AUTM report. CMU's website provided statistics for 2002-2005.

In 2003, the USPTO issued approximately 170,000 utility patents, of which over 3,000 were assigned to universities (2%). Table 14 on page 14 shows the top 10 universities in terms of the numbers of patent granted in 2003. The University of Michigan ranked 8th nationally.

TABLE 14. Top 10 Grant Receiving Universities by First Named Assignee, 2003[a]

	2003 Patent Grants	Rank
University of California, The Regents Of	437	1
California Institute of Technology	138	2
Massachusetts Institute of Technology	127	3
University of Texas	94	4
Stanford University, Leland Junior, The Board of Trustees of	85	5
Wisconsin Alumni Research Foundation	84	6
Johns Hopkins University	70	7
University of Michigan	*63*	*8*
Columbia University	61	9
Cornell Research Foundation Inc.	59	10

Source: USPTO, "U.S. Colleges and Universities - Utility Patent Grants 1969-2003"

Analysis: Anderson Economic Group, LLC

a. These numbers may differ slightly from the numbers reported by Universities as the USPTO only captures the first named assignee.

The URC as a whole also performed well against the comparison university clusters, lagging only behind the Massachusetts group in licensing revenue and patent grants. In terms of the numbers of new licenses/options, the URC ranked 4th. See Table 15 below.

TABLE 15. Average Annual Patent and Licensing Activity,[a] 2002-2006

	Patent Grants	Licenses/Options	Licensing Revenue (in millions)
URC	**126**	**118**	**39**
North Carolina	111	143	10
Massachusetts	204	206	59
Pennsylvania	123	134	13

Sources: Universities' websites, AUTM [b]

a. Average includes 2002-2006 data where available. Some universities and some reported statistics are based on averages of less than 5 years. See footnotes in Table 13 for data limitations.

b. See footnotes in Table 13 for data limitations.

The URC has helped cultivate an average of 15 start-ups annually between 2002 and 2006. As shown in Table 16 on page 15, this is more than was cultivated by the North Carolina cluster, equal to that of the Pennsylvania cluster, and lower than that of the Massachusetts cluster.

TABLE 16. Average Annual Number of Start-ups[a] Cultivated at University Clusters, 2002-2006

URC	**15**
North Carolina	11
Massachusetts	29
Pennsylvania	15

Sources: Universities' websites, AUTM [b]

a. Average includes 2002-2006 data where available. Some universities and some reported statistics are based on averages of less than 5 years. See footnotes in Table 13 for data limitations.

b. See footnotes in Table 13 for data limitations.

In order to measure the success of each University's research and development spending, we examined the amount of licensing revenue generated by each dollar of spending. Since licensing revenue can have large year-on-year changes caused by the sale of a large license, we compared the average revenue over a five year period (2002-2006) to the 2005 expenditures. We used 2003 data for the U.S. averages. Table 17 shows that the URC was above the U.S. average, the North Carolina cluster, and the Pennsylvania cluster in the revenues per R&D dollar spent.

TABLE 17. 2002-2006 Average Annual Revenue as a Percent of 2005 Expenditures (in millions)

	Licensing Revenue[a]	Total Expenditures[b]	Revenues per Expenditures
URC	**$39**	**$1,369**	**2.9%**
North Carolina	$10	$1,374	0.8%
Massachusetts	$59	$1,159	5.1%
Pennsylvania	$13	$1,337	1.0%
U.S. Average (2003 Figures)	$880	$40,057	2.2%

Sources: Universities' websites, AUTM, National Science Foundation, Integrated Science and Engineering Resources Data System

Analysis: Anderson Economic Group, LLC

a. See footnotes in Table 13 for data limitations. Revenue for U.S. is 2003.

b. Total Expenditures for URC and other groups is 2005. Total expenditures for U.S. is 2003.

IV. Report Purpose, Methodology & Authors

PURPOSE OF STUDY

The University Research Corridor (URC) is an alliance of Michigan's three largest research institutions: Michigan State University, the University of Michigan, and Wayne State University. The purpose of this alliance is to encourage economic development by educating students, attracting talented workers to Michigan, supporting innovation, and encouraging the transfer of technology to the private sector.

The University Research Corridor hired Anderson Economic Group to undertake a comprehensive study that quantifies the economic impact of the Research Corridor universities' activities on the State of Michigan's economy. This report is meant to provide the residents of Michigan with a credible and independent assessment of the economic contributions of the URC to the state.

The final report will be released later in 2007 and will contain additional sections and analyses including: the impact of the URC's activities on employment in the state, qualitative descriptions of the research and technology transfer activities of the URC, a quantitative assessment of the economic benefits of the URC's medical schools and graduate medical education programs, and an estimate of the tax revenue to state and local governments due to the URC. This document contains some of the preliminary findings of our analysis that will be included in the final report.

ALUMNI EARNINGS METHODOLOGY

We used individual and aggregate alumni data provided by Michigan State, University of Michigan, and Wayne State to estimate alumni earnings. We excluded from our analysis recipients of honorary degrees and certificates. We also excluded alums whose residence in Michigan we could not confirm. We performed our analysis using 538,245 URC alums.

We estimated the 2006 earnings by URC alums in 3 steps:

1) Estimate Age Distribution. We divided the existing alums into 7 age brackets using microdata supplied by the alumni offices of Wayne State and Michigan State, and summary data provided by the alumni office of the University of Michigan.[14] There were tens of thousands of graduates for whom complete data was not available. In order to estimate their age distribution, we made the following assumptions:

- Data on age was not available for University of Michigan alums. We used the year of graduation to estimate the age distribution, assuming that all University of Michigan graduates with bachelors degrees are 22 years old, and all graduates with advanced degrees are 25 years old.
- We were missing the age, but had the year of graduation, for 54,454 Wayne State University graduates known to live in Michigan. Similarly, we were missing the year, but had the year of graduation for 18,504 Michigan State University graduates known to live in Michigan. We estimated the age distribution of these alums by

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

assuming that the age distribution for alums of any given graduation year (calculated using alums for whom we had both the age and graduation year) also applied to the missing-age-data alums. There were several years for which there were no alums for whom we knew the age; since each of these had a graduation year before 1940, we assumed each of these alums to be over the age of 75.

- There were 3,900 alums of Michigan State University (3,985 with bachelors degrees, 5 with advanced degrees) for whom we had neither their age nor their year of graduation. We conservatively assumed that these alums were between the ages of 21 and 24 in 2006. This is a conservative assumption when estimating the 2006 earnings of URC alums because workers age 21 to 24 have lower wages on average than do older workers.

2) Estimate Workforce Participation and Wage. We estimated the workforce participation rate and average wage of URC alums in each age bracket using data from the 2000 Decennial Census. This data provides separate, age-bracketed estimates for Michigan workers with bachelors degrees and with advanced degrees. We used the following assumptions in conjunction with this data:

- We assumed that workforce participation for Michigan workers with bachelors and advanced degrees was the same in 2006 as it was in 2000.
- The Census Bureau does not provide an estimate of wages or workforce participation for workers under the age of 21 or over the age of 75. We assumed that alums under the age of 21 exhibit the same workforce participation and earnings as alums aged 21-24, and that workforce participation is zero for alums over the age of 75.
- We assumed that wages grew in Michigan at the rate of inflation between 2000 and 2006. We used the U.S. Bureau of Labor Statistics' Detroit-Ann Arbor-Flint Consumer Price Index (CPI), which grew by a total of 15.78% between 2000 and 2006.
- We assumed that alums that are not in the labor force have no personal income.
- We assumed that some URC alums earned a higher wage than the average wage for Michigan workers with bachelors and advanced degrees for each age bracket. Specifically, we assumed that University of Michigan graduates earned 10% more than average, and that Michigan State University alums earned 5% more than average in 2006. This assumption is a professional estimate based on these universities' reputation for higher-than-average admissions standards within Michigan. Our assumption implies that the higher admissions standards of these schools translates to higher earning power throughout the graduates' careers.

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

ABOUT ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC (AEG) was started in 1996 and today has offices in East Lansing, Chicago, Dallas, and Oklahoma City. AEG is a consulting firm that specializes in economics, public policy, financial valuation, market research, and land use economics. AEG's past clients include:

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For additional information see our website at: www.AndersonEconomicGroup.com.

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