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ANDERSON ECONOMIC GROUP

Empowering Michigan

11th Edition of the University Research Corridor Economic Impact Report

Commissioned by Michigan's University Research Corridor

Michigan State University
University of Michigan
Wayne State University

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I.Executive Summary

The University Research Corridor is an alliance of Michigan's three largest higher education 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.

In 2007, the University Research Corridor hired Anderson Economic Group to perform the first independent analysis of its economic impact in Michigan and to benchmark its performance against peer universities across the nation. This report is the 11th economic impact study in the series.

The University Research Corridor has also commissioned several reports on its contribution to key economic sectors in Michigan. For more on these reports see "Appendix B. Summary of URC Sector Reports" on page B-1.

PURPOSE OF REPORT

The University Research Corridor (URC) retained Anderson Economic Group (AEG) to perform an analysis of its economic impact on the state of Michigan. The purposes of this report are to:

- Estimate the economic impact of the URC in Michigan, accounting for additional spending in the state by the university and its students, as well as incremental earnings for alumni of URC institutions; and
- Estimate the impact of the URC on tax revenues for the State of Michigan.

OVERVIEW OF APPROACH

Economic impact. We evaluated the net economic impact of the URC in Michigan using a conservative methodology that avoids exaggerating benefits and double-counting spending. We define *net economic impact* as economic activity that is directly or indirectly caused by the URC. We expressed the economic impact in terms of output (sales) and employment. We estimated the economic impact for two sets of geographic regions:

1. The state of Michigan, and
2. Ten economic regions in Michigan, as defined by the Michigan Economic Development Corporation (MEDC).

We refer to economic activity that would not have taken place in Michigan without the URC universities as "net new" to the state. We estimate the economic impact based on three sources of economic activity:

- University operations and construction spending;
- Student spending; and
- Incremental earnings by URC alumni.

State tax revenue impact. We relied on our economic impact estimates to evaluate the additional tax revenues generated for the State of Michigan due to the URC. These revenues are generated from spending in Michigan by URC employees and alumni that would not otherwise take place if not for the URC. We estimate revenues from the following sources:

- Individual income tax;
- Sales and use taxes;
- Property tax; and
- Motor fuel tax.

Data sources. We relied on URC member institutions for university spending, employment, enrollment, and alumni data. We used the U.S. Bureau of Economic Analysis RIMS II multipliers to estimate the economic impact.

For further discussion of our methodology and data sources, see "Appendix A. Methodology" on page A-1.

KEY INDICATORS

The URC universities' combined performance is summarized in Table 1 below. The remainder of this executive summary lays out these results in greater detail.

TABLE 1. Key Indicators of the URC

	2007 Report (FY 2006 indicators)	2018 Report (FY 2017 indicators)	Change Since 2007
Operational and Construction Expenditures	$7.0 billion[a]	$11.3 billion	+ $4.3 billion
Fall Enrollment	124,586	140,285	+15,699
Net Economic Impact	$12.8 billion[b]	$18.7 billion	+$5.9 billion
Tax Revenue Impact on State of Michigan	$343 million[b]	$579 million	+$236 million

Source: AEG analysis using base data from URC Universities; U.S. Bureau of Economic Analysis; U.S. Census Bureau

a. The expenditures reported here account for construction expenditures and athletics. They are not the same numbers published in the 2007 report. In previous years, we included depreciation and scholarships and fellowships in our analysis. Our updated methodology uses construction expenditures instead of depreciation and excludes scholarships and fellowships.

b. The net economic and tax revenue impacts reported here rely on an updated methodology. These estimates are not the same numbers published in the 2007 report. The impacts reported here also do not account for construction expenditures.

SUMMARY OF FINDINGS

1. The URC universities collectively spent $11.3 billion in FY 2017 to support university operations and construction activities.

The URC universities are the largest research universities in Michigan. We summarize the size of the URC in 2017, including number of students, employees, alumni, and amount of operational expenditures in Table 2 below.

TABLE 2. Operations and Alumni of the URC in FY 2017

Category	Value
Number of Enrolled Students	140,285
Number of Employees	65,254
Number of Known Alumni Living in Michigan	669,274
University Operational and Construction Spending[a]	$11.3 billion
Total Wage and Salary Earnings of Alumni in Michigan	$43.6 billion

Source: AEG analysis using base data from IPEDS Finance, FY 2017; URC Universities

a. Beginning in 2013, we included construction spending, which accounts for expenditures on capital, land acquisitions, and equipment associated with capital additions.

See "Overview of URC Operational and Student Spending" on page 8 and "URC Alumni in Michigan" on page 13 for further details.

2. The URC generated $18.7 billion in spending and created nearly 79,000 jobs in FY 2017, reaching every county in Michigan.

The URC universities make a significant contribution to Michigan's economy in the course of educating students, undertaking research, and serving their communities. In addition to university spending to support operations and construction, the main drivers of this economic impact are spending by URC students and incremental earnings by alumni. Crucially, much of this spending is funded by revenue sources that bring new funds to the state. Such sources include research grants that would have gone to research universities in other states and students who would have attended an out-of-state school.

In FY 2017, the URC contributed $18.7 billion to the state economy, as shown in Table 3 on page 4. The total impact includes both direct and indirect impacts. The URC's university operations generated 78,845 jobs in Michigan.[1]

The URC spends money in every Michigan county, extending its economic presence to every part of the state. The output and jobs impact of the URC reaches every region in Michigan, as shown in Table 4 on page 4.

1. We estimated the jobs impact using headcount employment at the URC member institutions. The estimate in this year's report is not directly comparable to those presented in previous reports since we relied on full-time equivalent (FTE) employment in prior years. See "Jobs Impact" on page A-12 for further discussion.

TABLE 3. Net Economic Impact of URC in Michigan, FY 2017

Impact Category	Output Impact (billions)
Non-payroll Operating Expenditures	$3.96
Faculty & Staff Wages and Benefits	$6.38
Student Expenditures	$3.10
Incremental Alumni Earnings[a]	$5.22
TOTAL NET ECONOMIC IMPACT	**$18.66**

Note: Values may not sum to the total figure due to rounding.
Source: AEG analysis using base data from URC Universities; BEA; AEG estimates; see Table 7 on page 20 for further details.

a. "Incremental alumni earnings" refers to additional earnings, less taxes and savings, available for spending in Michigan.

TABLE 4. Economic Impact of URC in Michigan, by Region, FY 2017

Economic Development Collaboratives	Output Impact (millions)	Employment Impact
Upper Peninsula Region	$56	81
Northwest Region	$166	181
Northeast Region	$53	91
West Michigan Region	$612	544
East Central Region	$160	195
East Michigan Region	$701	2,124
South Central Region	$3,925	12,687
Southwest Region	$220	265
Southeast Michigan Region	$5,871	42,823
Detroit Metro Region	$6,900	19,853
State of Michigan	**$18,663**	**78,845**

Note: Values may not sum to the total figure due to rounding.
Source: AEG analysis using base data from URC universities; BEA; AEG estimates

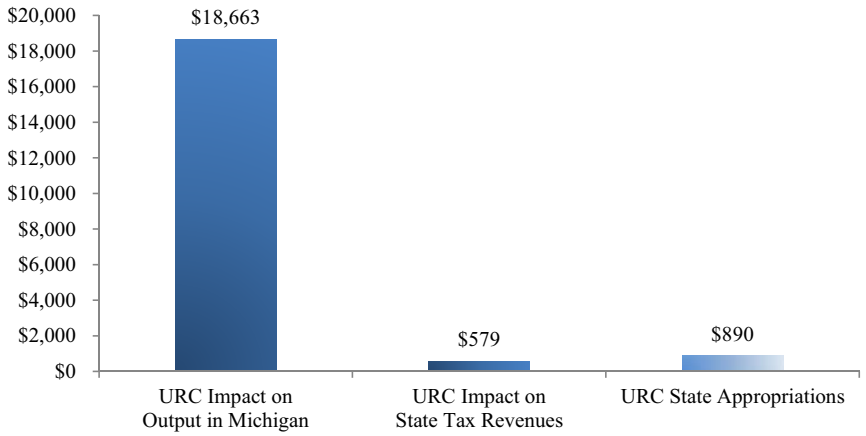
See "Economic Impact of the URC in Michigan" on page 18 for further details.

3. The URC increased tax revenues for the State of Michigan by $579 million in FY 2017.

In 2017, we estimate that $3.6 billion in wages of URC employees and $6.3 billion of URC alumni earnings in Michigan would not otherwise exist if not for the URC. Of these alumni earnings, $4.4 billion can be counted as direct economic activity in Michigan when taxes and money spent outside of the state are considered. All in all, we estimate that the tax revenue the State received in 2017 because of these additional earnings was $579 million.

While the main goal of these universities is not to generate economic activity and tax revenues for the state, it is noteworthy that the $18.7 billion in net economic impact is more than 20 times the state's $890 million in funding for URC universities.[2,3] Figure 1 below compares the URC economic impact, state appropriations, and fiscal impact.

FIGURE 1. Fiscal Impact of the URC in Michigan, 2017 (millions)



Source: AEG analysis using base data from AEG estimates, Michigan House Fiscal Agency

See "URC Impact on State Tax Revenue" on page 23 for further discussion.

ABOUT ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC is a boutique consulting firm, with offices in East Lansing, Michigan; Chicago, Illinois; and New York, New York. The experts at AEG specialize in strategy, business valuation, public policy, and market analyses. They have conducted nationally-recognized economic and fiscal impact studies for private, public, and non-profit clients across the United States.

The consultants at Anderson Economic Group have extensive experience in evaluating the economic benefits of higher education institutions in Michigan and across the country. Our previous clients include institutions that together represent all nonprofit and public colleges and universities in Michigan. For more information, please see "Appendix C. About Anderson Economic Group" on page C-1 or visit www.AndersonEconomicGroup.com.

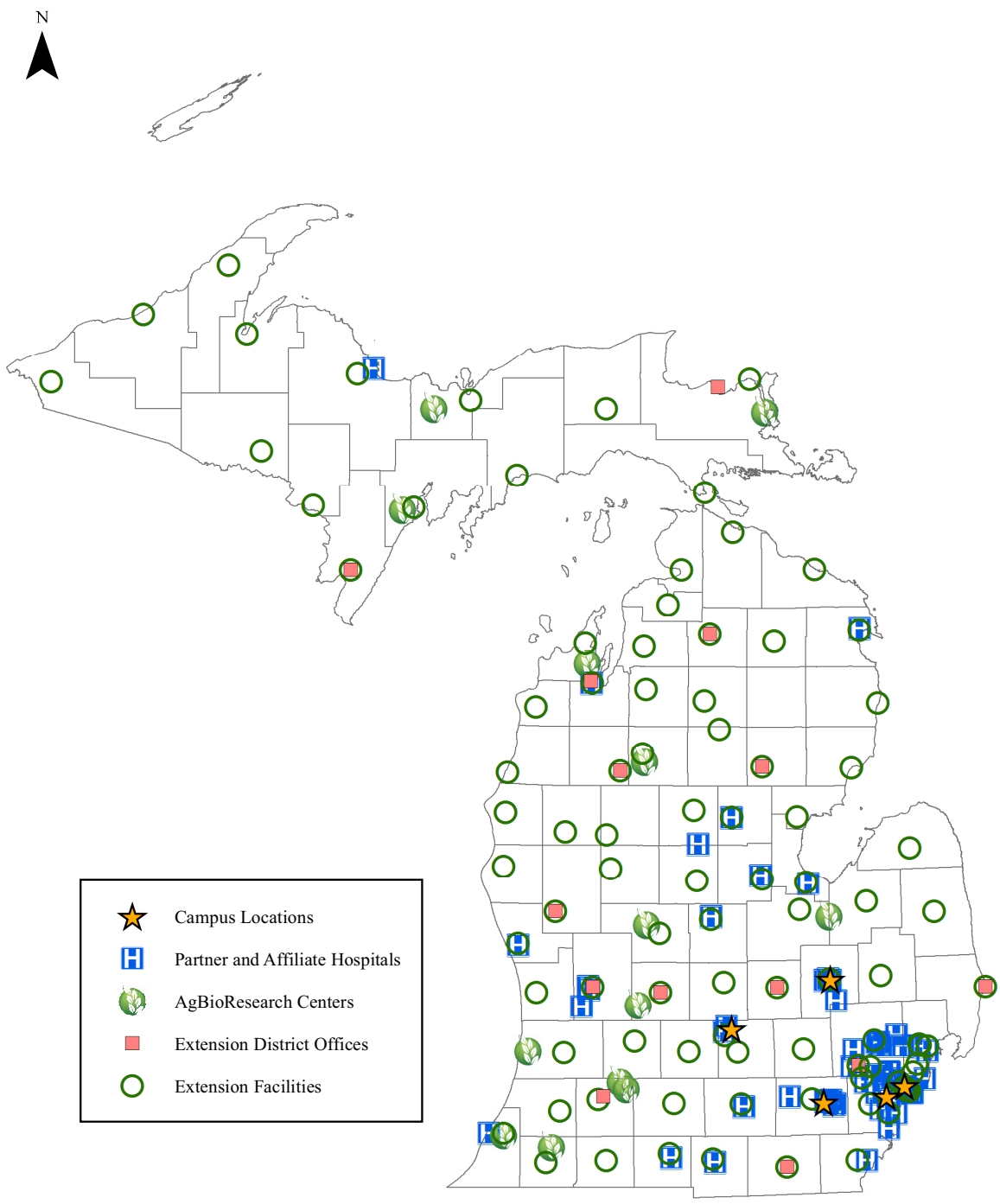
2. Note that this is a comparison of the *total* impact vs. *total* appropriations; each additional dollar of appropriations would not necessarily generate a full $21 in economic impact.
3. State appropriations are the State of Michigan 2016-2017 fiscal year appropriations.

II.Michigan's University Research Corridor

Michigan's University Research Corridor is one of the nation's top academic research clusters and the leading engine for innovation in Michigan and the Great Lakes region. An alliance of Michigan State University, the University of Michigan, and Wayne State University, the URC universities are focused on increasing economic prosperity and connecting Michigan to the world. The URC universities educate Michigan residents, attract talented workers to Michigan, support innovation, and encourage the transfer of new technology to the private sector.

The URC universities have main campuses in East Lansing, Ann Arbor, Flint, Dearborn, and Detroit, and their reach extends to all areas of the state. Each URC university has research, teaching locations, and hospitals located throughout the state, as shown on Map 1 on page 7.

Map 1. URC Presence in Michigan, 2017



Source: AEG map using base data from URC Universities

III. Overview of URC Operational and Student Spending

In this section, we discuss the spending of the URC universities and its students, which impact jobs and income throughout Michigan. We start with a summary of operations and spending by URC universities in Michigan in 2017. We then provide a summary of student origins and spending.

URC SPENDING

The URC makes significant contributions to Michigan's economy through its direct spending on goods and services in the state. URC institutions spent almost $10.2 billion on operations in FY 2017 and employed 65,254 faculty and staff throughout Michigan.[4] More than a fifth (21%) of expenditures were for student instruction, while 13% of expenditures were for university research, as shown in Table 5 below.[5]

TABLE 5. Operational Spending by the URC, FY 2017

	Spending[a] (millions)	% of Total
Instruction	$2,138	21%
Research	$1,341	13.2%
Public Services, Academic Support, Student Services, and Institutional Support	$1,664	16.4%
Athletics[b]	$205	2%
Operation and Maintenance of Plants, Auxiliary Enterprises, and Other Expenses	$846	8.3%
University of Michigan Hospital	$3,976	39.1%
Total Operational Spending	**$10,171**	**100%**
Construction Spending[c]	$1,166	

Source: AEG analysis using base data from IPEDS, URC Universities, NCAA

a. Since 2013, we have accounted for spending on capital using actual construction spending. Previously, we included depreciation in operational spending.

b. Athletics spending includes spending on salaries and wages, operating (game-day) expenses, recruiting expenses, and unallocated expenses.

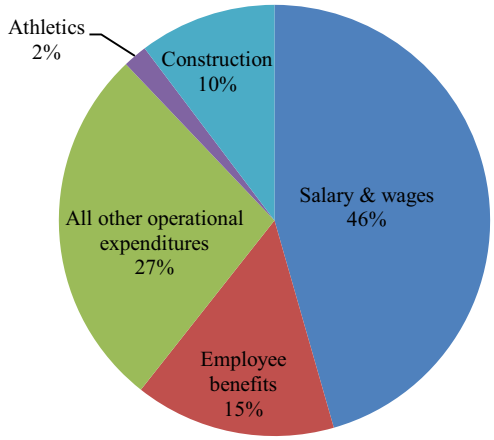
c. Construction spending is not included in operational spending.

4. Faculty and staff counts reflect positions in Fall 2017, and include the U-M Hospital doctors and staff. FY 2017 data for U-M and MSU is from July 1, 2016 to June 30, 2017 and WSU's is from October 1, 2016 to September 30, 2017.

5. The data reported to the National Center for Education Statistics Integrated Postsecondary Education Data System (IPEDS) for research expenditures differ from the R&D expenditures reported to the National Science Foundation (NSF). IPEDS requests the data on any expense that is specific to R&D only. NSF collects data on any expense that is budgeted toward R&D.

We also examined URC spending by function, as shown in Figure 2 below. When including construction costs in addition to operating costs, nearly half of all expenditures paid for the salaries and wages of university faculty and staff. Employee benefits made up 15% of spending. Athletics salaries and expenditures were 2% of spending. Just over a quarter of all spending paid for supplies, equipment, maintenance of plant, and any other operational expenditure not included in the previous categories.

FIGURE 2. URC Spending by Function, FY 2017



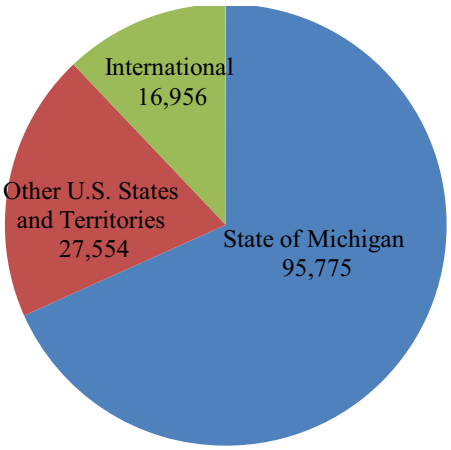
Source: AEG analysis using base data from URC Universities; NCAA

See "Operational Expenditures Methodology" on page A-3 for details on how we estimated student spending.

STUDENT SPENDING

The URC brings in students from every county in Michigan, every state in the U.S., and more than 100 countries across the globe. In fall 2017, 68% of enrolled URC students were from Michigan. An additional 20% were from other U.S. states and territories, and the remaining 12% were international students. Figure 3 on page 10 and Map 2 on page 12 show the breakdown of the origins for enrolled students in fall 2017.

FIGURE 3. Origin of URC Students, Fall 2017



Source: AEG analysis using base data from URC Universities

These students spend money on and off campus, contributing significantly to the regional and state economies. Students spend money not only on tuition, but also on the following categories that we include in our economic impact estimates:[6]

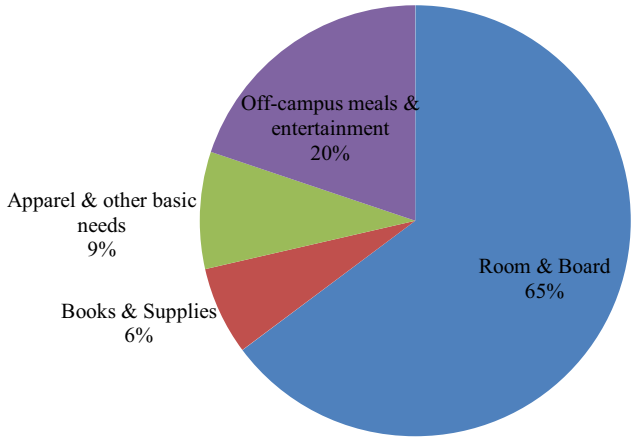
1. Off-campus room and board;[7]
2. Books and supplies;
3. Apparel and other basic needs; and
4. Off-campus meals and entertainment.

We estimate that in 2017, URC students spent almost $2.2 billion on these categories of expenditures. The largest share of student spending was on room and board, at more than 65% of total spending. Figure 4 on page 11 shows the shares of student spending in the four different categories of analysis. A large portion of this student spending stays in the state of Michigan and contributes to its economy; this portion is estimated in "Economic Impact of the URC in Michigan" on page 18.

See "Student Spending Methodology" on page A-5 for details on how we estimated student spending.

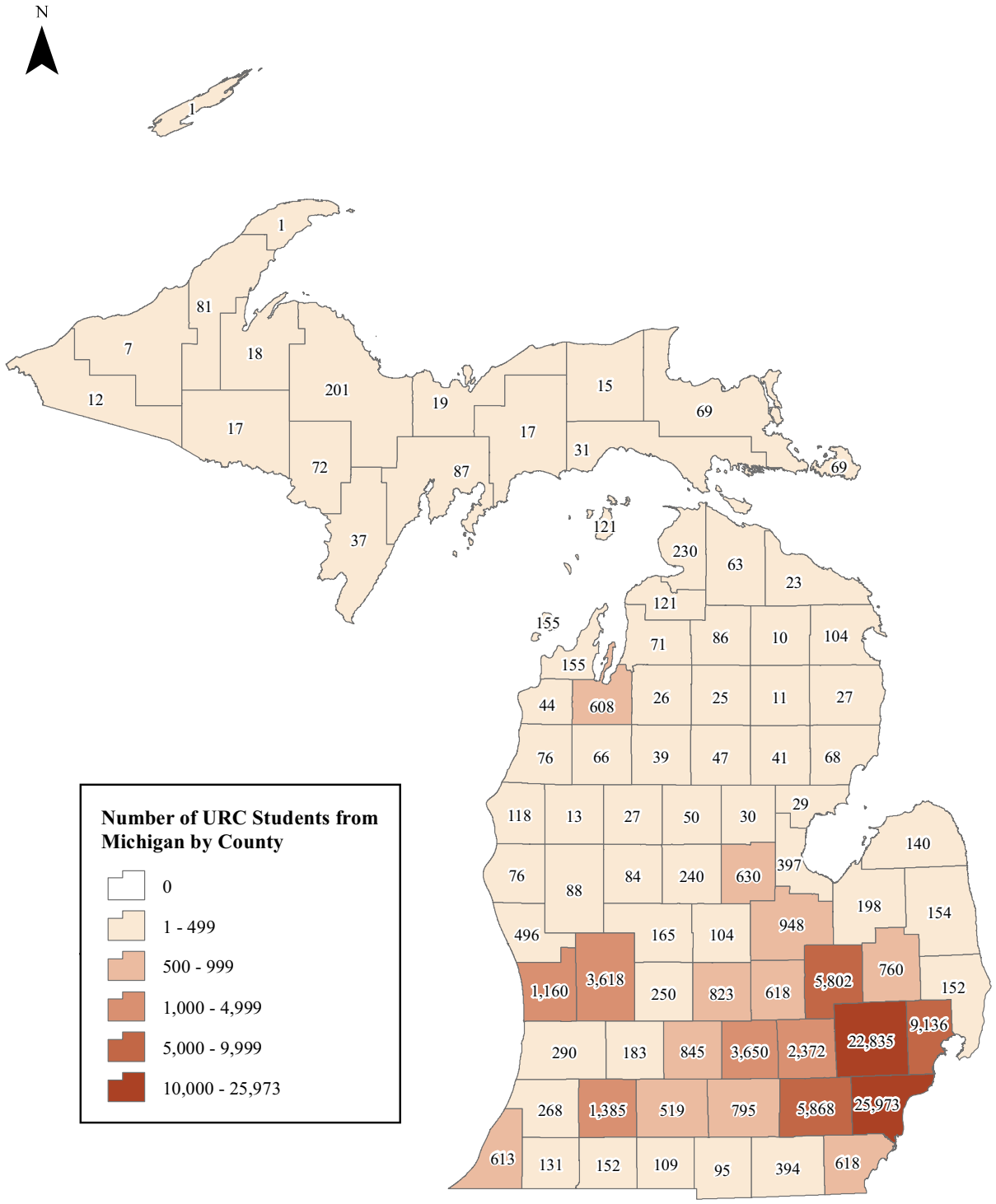
6. We do not include tuition in our student spending and economic impact because that money is then spent by the university and is captured in university operations.
7. We do not include on-campus room and board in our student spending and economic impact because that money is then spent by the university and is captured in university operations.

FIGURE 4. URC Student Spending, FY 2017



Source: AEG analysis using base data from URC Universities, BLS Consumer Expenditure Survey 2017, College InSight

MAP 2. URC Students by County, 2017



Source: AEG map using base data from URC Universities

VI. URC Alumni in Michigan

An important way the URC institutions contribute to Michigan's economy is by educating and training the state's future workforce. Attending and graduating from a URC university increases earning power for alumni, and many of these alumni live and work in Michigan. This section discusses the number of alumni in the state and the earnings in Michigan attributable to these alumni.

NUMBER OF URC ALUMNI

As of spring 2018, the URC had more than 1.2 million alumni worldwide. The nearly 670,000 URC alumni living in Michigan account for 10.2% of the state's population over the age of 24.[8] URC universities have alumni in every county in Michigan (see Map 3 on page 16) and every state in the U.S. (see Map 4 on page 17). URC alumni also live in more than 200 countries across the world.

ALUMNI EARNINGS

Alumni of URC universities contribute to the state's economy, as university graduates with bachelors and graduate degrees produce and earn more than the average worker. We estimated that URC alumni earnings in 2017 were $43.6 billion, after accounting for wages and the year of graduation for each URC alumnus.[9] This accounts for almost 19% of all wage and salary income in the state.[10] While much of these earnings cannot be said to have been *caused* by the URC universities, this figure shows the scale of the URC's role in preparing and educating Michigan's workforce.

Table 6 on page 14 shows our estimates of how URC alumni earnings are distributed across Michigan's 10 regions based on the current location of alumni. Since alumni are located all across the state, each region in Michigan benefits from alumni earnings. The South Central, Southeast, and Detroit Metro regions have a larger share of URC alumni earnings than their respective shares of state population. The West Michigan region, which includes the Grand Rapids area, has a significantly lower share of URC alumni earnings than state population. Not coincidentally, the West Michigan region is the most populous region that does not contain a URC university. While URC alumni are located across the state, they make up the largest percentage of population in the South Central (13.0%), Detroit Metro (9.3%) regions, and Southeast (7.9%) regions. Mean-

8. According to the U.S. Census Bureau, Michigan had 6,565,683 residents over the age of 24 years on July 1, 2016.
9. While 669,274 URC alumni live in Michigan, we had valid information on the graduation year for only 667,975 alumni, which is an important input to the alumni earnings analysis. See "Estimating Current Alumni Earnings" on page A-6 for further discussion of our methodology.
10. Wage and salary income data for Michigan taken from the U.S. Bureau of Economic Analysis "Personal Income and Employment by Major Employment."

while, URC alumni are only 1.9% of the population of the Upper Peninsula Region.

TABLE 6. Share of 2017 URC Alumni Earnings in Michigan by Economic Development Collaborative Region

Region number	Regions - Economic Development Collaboratives	Number of URC Alumni[a]		Share of URC Alumni Earnings (millions)[b]		*2017 Population*
		Total	% of Total	Total	% of Total	*% of Total MI Population*
1	Upper Peninsula Region	5,808	0.9%	$378	0.9%	*3.0%*
2	Northwest Region	18,452	2.8%	$1,201	2.8%	*3.1%*
3	Northeast Region	5,937	0.9%	$383	0.9%	*2.0%*
4	West Michigan Region	51,377	7.7%	$3,337	7.7%	*16.0%*
5	East Central Region	16,241	2.4%	$1,057	2.4%	*5.6%*
6	East Michigan Region	47,428	7.1%	$3,144	7.2%	*8.5%*
7	South Central Region	62,090	9.3%	$3,970	9.1%	*4.8%*
8	Southwest Region	21,155	3.2%	$1.377	3.2%	*7.9%*
9	Southeast Region	79,623	11.9%	$5,301	12.2%	*10.1%*
10	Detroit Metro Region	361,147	54.0%	$23,429	53.8%	*38.9%*
	Total:	**669,258**	***100.0%***	**$43,579**	***100.0%***	***100.0%***

Note: Sum of regions may not equal the total due to rounding.

Source: AEG analysis using base data from URC university alumni offices, BLS, U.S. Census Bureau

a. While 669,274 URC alumni live in Michigan, we had valid ZIP codes of residence for 669,258 alumni.

b. While 669,274 URC alumni live in Michigan, we had valid information for the year of graduation—which allowed us to estimate the alumni ages and earnings—for 667,975 alumni.

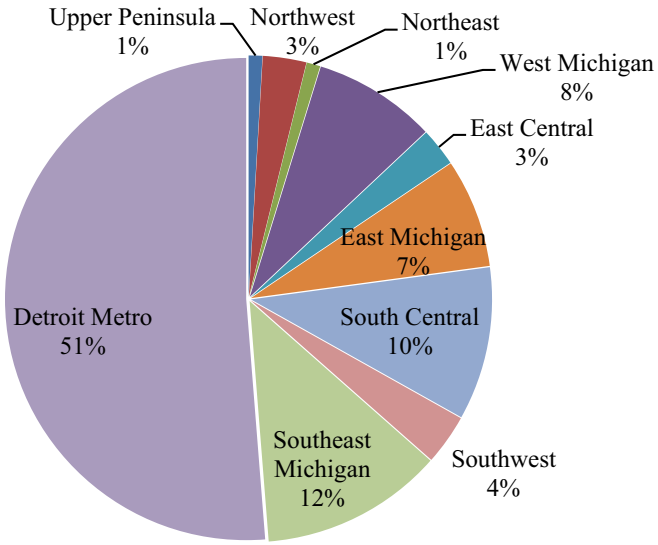
We also estimate the incremental earnings to URC graduates that are a result of their education at a URC university. We estimate that the URC directly generated $6.3 billion in earnings for Michigan residents in 2017 due to the presence of alumni in the state.[11]

Through alumni alone, the URC directly boosted annual earnings for Michigan residents by $6.3 billion.

We show each region's share of alumni incremental earnings in the state in Figure 5 on page 15. The Detroit Metro, Southeast, and South Central regions lead the state in share of incremental URC alumni earnings, with other populous regions such as the West Michigan and East Michigan regions also benefitting from hundreds of millions of additional earnings.

11. Using this methodology assumes that most of the current earnings of URC alumni living in Michigan are earnings they would have had earned even without the URC. These additional earnings contribute to the URC's economic impact, which we discuss in the following section.

FIGURE 5. Share of Incremental Alumni Earnings in Michigan by Region, FY2017

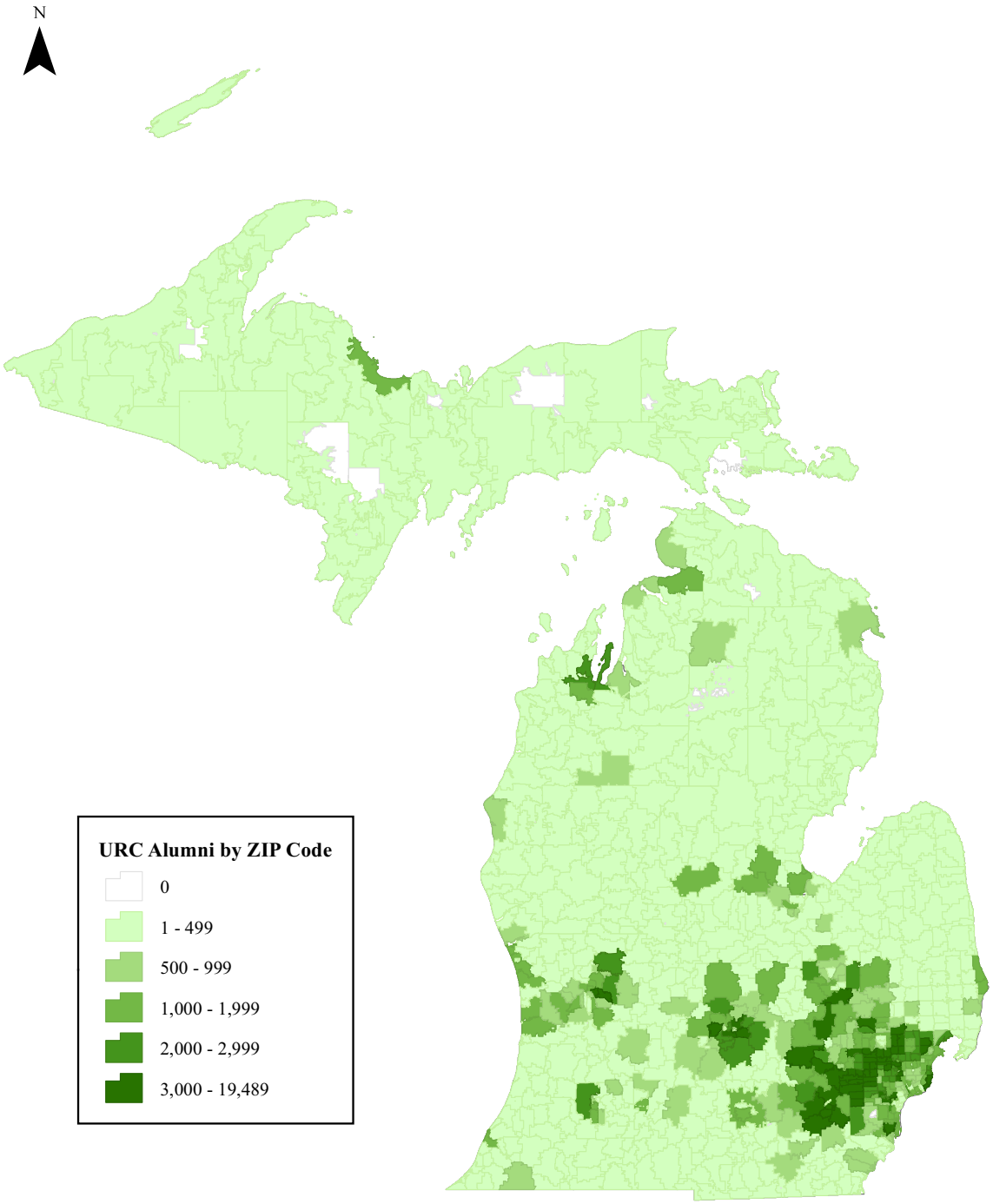


Source: AEG analysis using base data from URC university alumni offices; BLS; U.S. Census Bureau

After accounting for savings, taxes on these earnings, and spending outside Michigan, we estimate that alumni spent $4.4 billion in Michigan in 2017. We estimate the economic impact of these additional earnings in the following section.

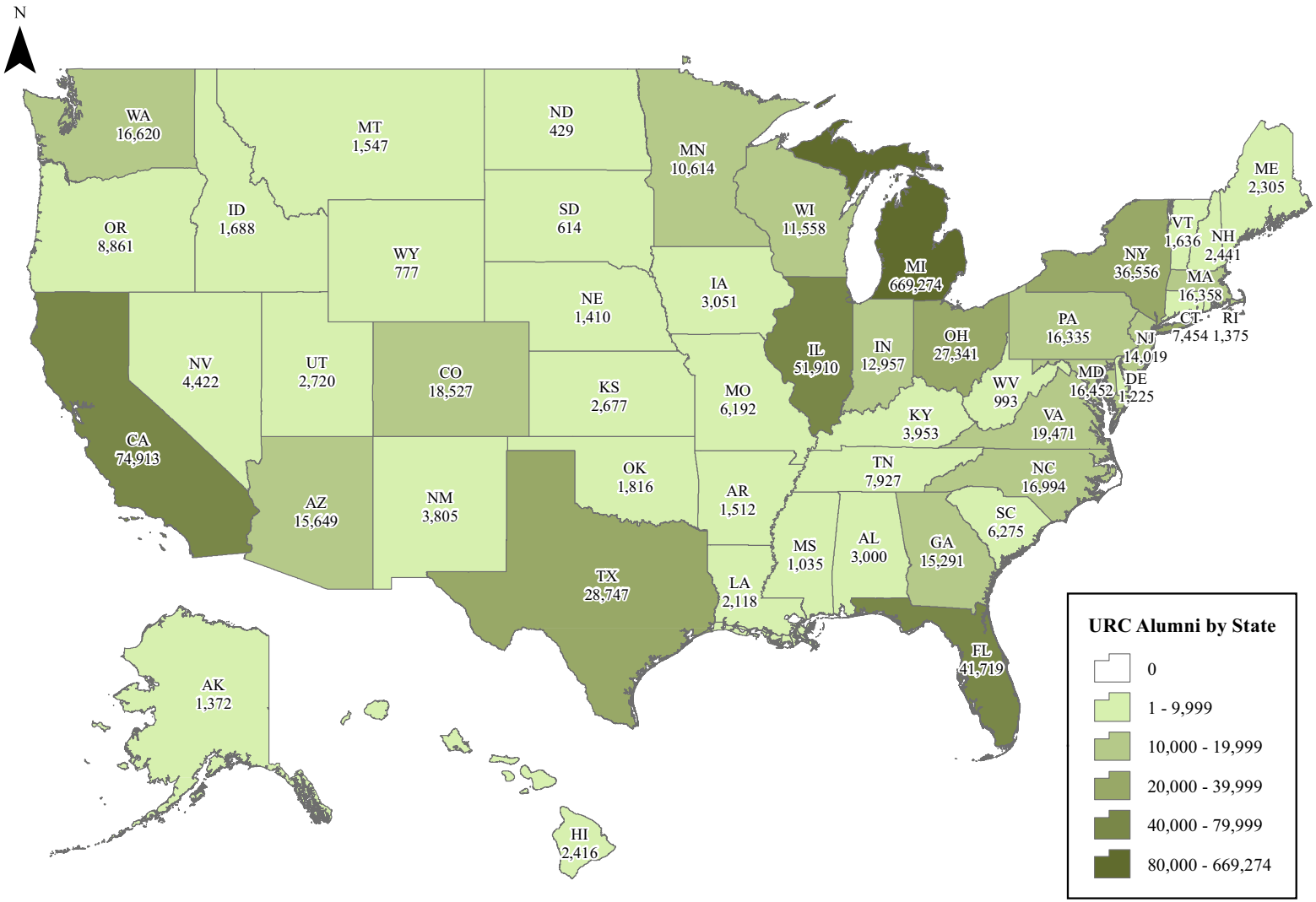
URC alumni spent $4.4 billion in Michigan in 2017.

MAP 3. URC Alumni by ZIP Code, 2017



Source: AEG map using base data from URC Universities

MAP 4. URC Alumni by State, 2017



Source: AEG map using base data from URC Universities

VII. Economic Impact of the URC in Michigan

In this section, we discuss the impact of the URC universities on output and jobs throughout the state of Michigan. We begin with the definition of "economic impact" that we use to assess the state-level impacts, and summarize the results of the total statewide economic impact. We then summarize the statewide impact by region, estimating the economic impact and jobs for 10 separate regions in the state. The net economic impact of the URC includes the following sources of economic activity:

- URC operations (payroll and non-payroll);
- Student expenditures; and
- Alumni earnings.

ECONOMIC IMPACT DEFINED

We define the *net economic impact* of the URC as the *additional* activity that occurs in a region directly and indirectly caused by the URC. We are focused on activities that would not otherwise exist in the state without the URC's presence. Economic activity from URC operations, student expenditures, and URC alumni have direct impacts, as well as indirect impacts, generating more economic activity in Michigan as it recirculates throughout the state. We express the economic impact in terms of output (gross sales) and employment. Further details about our methodology for estimating the URC's economic impact are in "Economic Impact Analysis" on page A-2.

SOURCES OF ECONOMIC IMPACT

We describe the components of the URC's economic impact on Michigan and its 10 regions below. Further discussion of our methodology can be found in "Economic Impact Analysis" on page A-2 and see "Regional Economic Impact" on page A-13.

Nonpayroll Operating Expenditures

The spending shown in Table 5 on page 8 includes expenditures on supplies, equipment, maintenance of university buildings, services, athletics, U-M's hospital services, as well as the salaries of professors, researchers, doctors, and administrative staff.[12] We estimate that in FY 2017, the URC's nonpayroll expenditures brought $1.9 billion in direct net new spending to businesses in Michigan, as shown on Table 7 on page 20.

12. Starting in 2013, we estimate the economic impact of athletics as its own category of spending. In previous years, spending on athletics was included in operations spending.

Payroll Operating Expenditures

The URC universities spent $6.9 billion on salary, wages, and benefits for their employees in FY 2017, and we estimate that $4.8 billion was net new in Michigan. The Southeast Michigan and Detroit Metro Regions comprised the largest proportion of this spending, representing 53% and 20% of expenditures, respectively. This is unsurprising, as staff and faculty live in these regions, which are near to the URC universities and heavily populated.

Student Spending

The URC universities have students from every county in Michigan, every state in the U.S., and more than 100 countries. Some of these students would not have remained in or come to the state of Michigan for a college degree if it were not for the URC universities. We count spending by students who moved to or stayed in the state because of the URC as new economic activity. We estimate that new student direct spending in Michigan due to the URC was $1.9 billion in FY 2017. Of this spending, the South Central and Southeast Regions account for the greatest proportions, with 33% and 40%, respectively. We primarily allocated student spending to the region with the university that they attended in 2017.

Alumni Incremental Earnings

As discussed in "URC Alumni in Michigan" on page 13, the URC has nearly 670,000 living alumni in Michigan, who earned $44 billion in 2017.[13] After considering earnings that would otherwise have occurred in the state (e.g., if URC graduates had attended other Michigan universities instead of a URC university), $5.2 billion of these earnings are net new earnings because alumni who could have lived elsewhere stayed in Michigan or alumni earned marginally more due to their education at a URC university. We estimate that the direct expenditures caused by these earnings (after considering savings and out-of-state spending) is $4.4 billion. The greatest impact occurs in the Detroit Metro region, accounting for 51% of the state's alumni economic impact.

13. While 669,274 URC alumni live in Michigan, we had valid information for the graduation year for only 667,975 alumni, which is an important input to the alumni earnings analysis. We use this figure to provide a conservative estimate for economic impact.

TOTAL ECONOMIC IMPACT IN MICHIGAN

In FY 2017, we estimate that the value of the economic activity that the universities generated in the state, benefiting households and businesses, was $18.7 billion. See the components of the total net economic impact of the URC for the state below in Table 7. This net economic impact figure does not include any economic activity that would have occurred in Michigan even without the URC.

The URC generated $18.7 billion in annual spending at Michigan companies and 78,845 jobs for Michigan residents.

TABLE 7. Net Output Impact of URC in Michigan, FY 2017 (billions)

Impact Category	Direct Impact	Indirect Impact	Net Output Impact
Non-payroll Operating Expenditures for Instruction, Research, Construction, and U-M Hospital	$1.89	$2.07	$3.96
Faculty & Staff Wages and Benefits	$1.19	$5.19	$6.38
URC Student Expenditures	$1.85	$1.25	$3.10
Incremental Alumni Earnings[a]	$0.00	$5.22	$5.22
TOTAL OUTPUT IMPACT	**$4.93**	**$13.73**	**$18.66**

Note: Values may not sum to the total figure due to rounding.

Source: AEG analysis using base data from URC Universities; BEA RIMS II 2016 Multipliers; IPEDS; U.S. Census Bureau, AEG Estimates; see Table A-4 on page A-10 for further details.

a. "Incremental alumni earnings" refers to additional earnings, less taxes and savings, available for spending in Michigan.

Jobs Impact of URC Operations

We estimate that 78,845 jobs in Michigan in 2017 were directly or indirectly created by the URC's operations in Michigan. This jobs figure includes 14,375 faculty members and 50,879 staff directly employed by the URC universities and hospitals. It also includes indirectly-generated jobs in other industries in the state due to expenditures by the URC universities and their faculty, staff, and students.

ECONOMIC IMPACT BY MICHIGAN REGION

In addition to estimating the URC's net economic impact on the state of Michigan, we present its impact for the 10 economic regions in Michigan as defined by the MEDC, the significance of which is detailed on page 1. These regions and their estimated economic impacts are shown in Map 5 on page 22.

In general, the Detroit Metro, Southeast, and South Central Regions, which are the regions in which the universities are located, had the greatest additional economic activity from the URC. This is also true for the jobs created by the URC universities' activities, as shown below in Table 8.

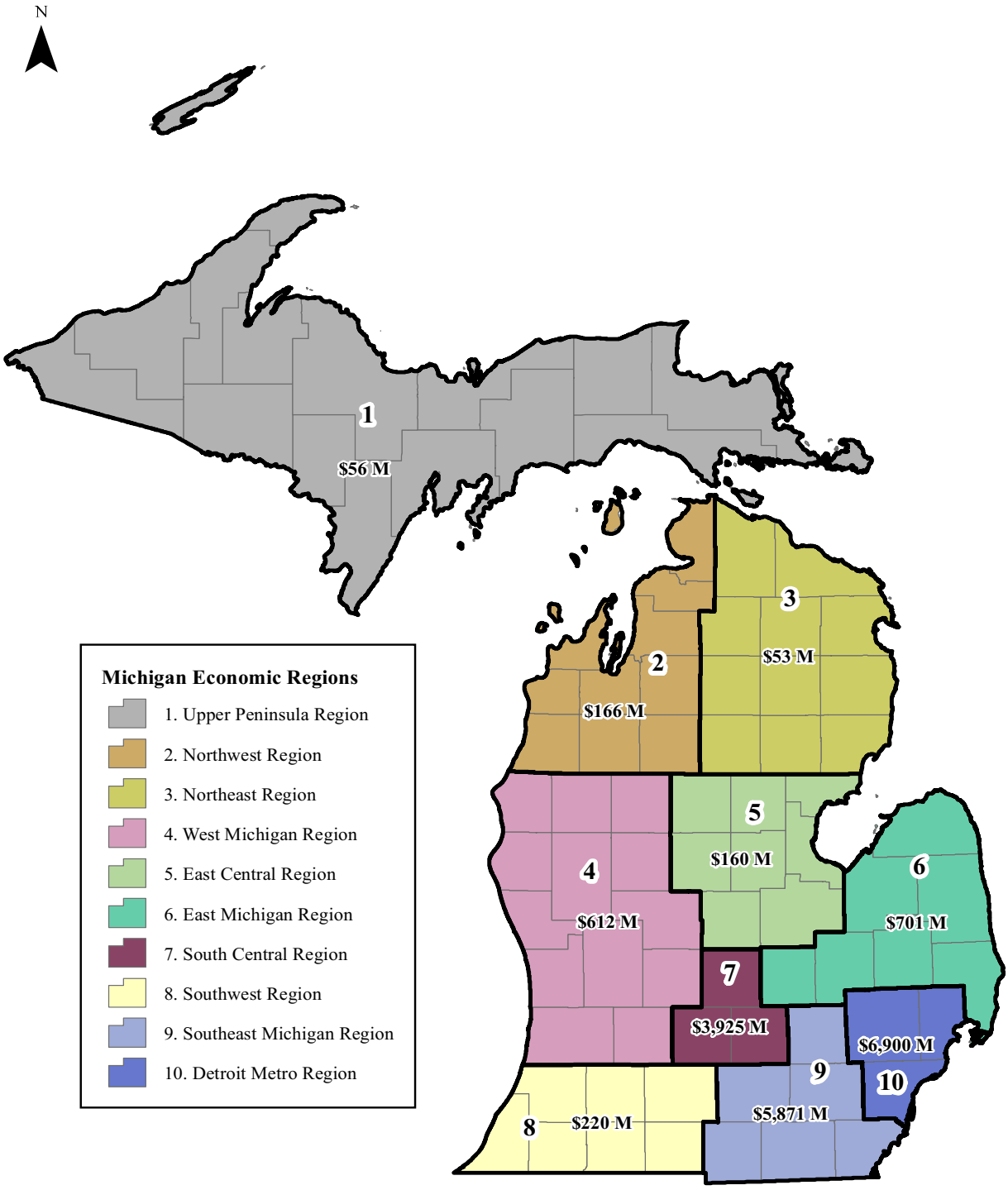
TABLE 8. Net Economic Impact of URC by Region, FY 2017

Region number	Economic Development Collaboratives	Output Impact (millions)	Employment Impact
1	Upper Peninsula Region	$56	81
2	Northwest Region	$166	181
3	Northeast Region	$53	91
4	West Michigan Region	$612	544
5	East Central Region	$160	195
6	East Michigan Region	$701	2,124
7	South Central Region (MSU)	$3,925	12,687
8	Southwest Region	$220	265
9	Southeast Michigan Region (U of M)	$5,871	42,823
10	Detroit Metro Region (WSU)	$6,900	19,853
	State of Michigan	**$18,663**	**78,845**

Note: Values may not sum to the total figure due to rounding.

Source: AEG analysis using base data from URC Universities; BEA RIMS II 2016 Multipliers; IPEDS; U.S. Census Bureau, AEG Estimates

MAP 5. Net Economic Impact of URC by Region, FY 2017 (millions)



Source: AEG map using base data from URC Universities

VIII. URC Impact on State Tax Revenue

This section provides an estimate of tax revenue the State of Michigan receives because of the URC's presence in Michigan. We estimate new tax revenue by first calculating the new wage and salary income that URC employees and alumni receive because of the URC. Then, we estimate the additional tax revenue to the state for several important state-level taxes: income, sales, property, and transportation taxes.

TOTAL ADDITIONAL STATE TAX REVENUES

Additional Income in Michigan Due to the URC

We estimate that $3.6 billion in wages of URC employees in Michigan were *caused by* the URC in 2017. This figure accounts for the fact that at least some URC employees might earn wages in Michigan in the absence of the URC. We also estimate that the URC directly increased earnings for Michigan residents by $6.3 billion more due to the presence of alumni in the state, as shown in "Alumni Earnings" on page 13.

Additional State Tax Revenues Due to the URC

Of the additional income in Michigan, $3.6 billion is from URC employees and $6.3 billion is from URC alumni. As we show in Table 9 below, the State of Michigan received $579 million in additional tax revenue from URC graduates and employees in FY 2017. See "Appendix A. Methodology" on page A-1 for further discussion of our methodology.

TABLE 9. Additional Tax Revenue to State of Michigan Due to URC, FY 2017 (millions)

Tax	Total Additional Paid
Personal Income	$267.8
Sales and Use Tax	$229.2
Property Tax	$46.1
Gasoline Tax	$35.9
Total Additional Tax Revenue	**$578.9**

Source: AEG analysis using base data from 2017 Consumer Expenditure Survey, Michigan House Fiscal Agency

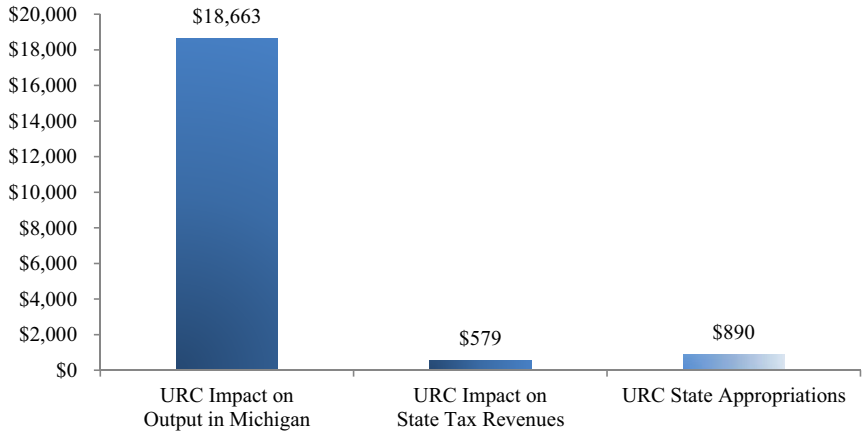
COMPARISON WITH ECONOMIC IMPACT AND STATE APPROPRIATIONS

Clearly the main goal of the URC universities is not to generate economic impact and tax revenue for the state. Nevertheless, since the state government provides funding for these universities, it is natural to compare the URC's net economic impact on the state to the state's appropriations for universities.

In 2017, the URC generated an additional $579 million in tax revenues for the State of Michigan.

As shown in Figure 6 below, the $18.7 billion in net economic impact is more than 20 times greater than the state's $890 million in funding for the URC universities.[14,15] The State of Michigan received an estimated $579 million in tax revenue from URC employees and alumni that it would otherwise not have received if the URC did not exist in Michigan.

FIGURE 6. URC Net Economic Impact vs. State Appropriations (millions), 2017



Source: AEG analysis using base data from AEG estimates, Michigan House Fiscal Agency

14. Note that this is a comparison of the *total* impact vs. *total* appropriations; each additional dollar of appropriations would not necessarily generate a full $21 in economic impact. Analysis of the economic impact of a marginal change in state appropriations is beyond the scope of this report.
15. The FY 2016-2017 state appropriations figure includes state funding for both the URC universities and MSU extension services.

Appendix A. Methodology

This appendix describes the following:

- How data sources were used to create the maps included in this report;
- The methods used to benchmark the URC against its peer clusters in terms of education and research metrics; and
- The methodology AEG used to complete our economic impact analysis.

The methodology used this year is consistent with the methodology used last year, except that we used updated multipliers in this year's analysis. We discuss this change further in "Updated Multipliers" on page A-2.

DATA AND ANALYSIS FOR MAPS

All of the maps in this report were created using Geographic Information Software (GIS). When data were incomplete or imperfect in terms of geographies, we used professional judgement and GIS to make estimations.

Map 1, "URC Presence in Michigan, 2017," on page 7 is derived from locations found primarily on the websites of URC universities, partners, and affiliates. Where addresses for affiliate hospitals, extension locations, and partner hospitals were missing, careful research was done to find them.

Map 2, "URC Students by County, 2017," on page 12 is based on data from the URC that details student enrollment by Michigan county for the cohorts entering the universities in Fall 2017. We took the number of URC students by county from the universities and estimated the share of students per county based on the total given to us.

Map 3, "URC Alumni by ZIP Code, 2017," on page 16 and Map 4, "URC Alumni by State, 2017," on page 17 were created using zip code and state data, respectively from the URC alumni offices. Using this data, we estimated the number of alumni per county, which we used in our regional incremental alumni earnings analysis. This is discussed further in "Alumni Earnings Methodology" on page A-5.

Map 5, "Net Economic Impact of URC by Region, FY 2017 (millions)," on page 22 is based on data provided by the URC universities and the economic collaborative regions created by the MEDC. We present our economic impact estimates of output and employment for those regions in "Economic Impact by Michigan Region" on page 20.

ECONOMIC IMPACT ANALYSIS

We define *net economic impact* as the new economic activity that occurs in a defined geographic region directly or indirectly caused by the URC. To quantify the economic impact of URC universities' operational expenditures, we asked, in effect, "What would be the loss to the state if the three University Research Corridor universities closed their doors?"

A direct impact stems from initial spending, while indirect and induced impacts stem from the recirculation of dollars within the defined geographic region. URC expenditures are at the foundation of the URC's impact on the state economy, but the full impact goes further than simply summarizing spending, for two reasons.

First, an economic impact analysis should count only net new spending, which accounts for spending that would have occurred in the state even without the URC universities, as well as spending that is crowded out by URC spending. For example, we exclude expenditures by students who would have otherwise attended another college and spent money in the state. We also exclude all expenditures by URC universities that go to firms outside Michigan.

Second, as the URC makes these expenditures, the money is then re-spent throughout the Michigan economy, creating a "multiplier" effect. These indirect effects are also a significant contributor to Michigan's economy, and are thus included in the total net economic impact.

For each of the following categories, we estimate the *direct impact*, which accounts for what is net new spending, and *indirect impacts*, which take the multiplier effect into account to incorporate the additional economic activity caused by the URC. We estimated the *indirect* economic impact of URC's expenditures by multiplying the direct expenditures by final demand output multipliers based on those released by the U.S. Department of Commerce's Regional 2016 Multipliers (RIMS II).

Updated Multipliers

The U.S. Bureau of Economic Analysis releases regional input-output multipliers for regions across the U.S. These multipliers are updated annually using regional data in order to provide the estimates for the economic impact in any given region. In previous reports, we used multipliers that were based on:

- 2003 regional information (FY 2006 through FY 2008);
- 2006 regional information (FY 2009 through FY 2011);
- 2010 regional information (FY 2012 through FY 2014);
- 2013 regional information (FY 2015).

For this year's report, we updated the multipliers using 2016 regional information, which is the most recent year available.

Table A-1 below displays how we assigned multipliers to different classes of URC spending and the industry multipliers we used to estimate economic impact. As shown in the table, the 2016 multipliers are generally higher than the 2013 multipliers, indicating that more money is exchanged between industries in Michigan than in prior years.

TABLE A-1. Industrial Classification of URC and Student Expenditures, FY 2015 and FY 2017

	Industry Classification	Final-demand Multiplier (Output) for Michigan	
Spending Category	**FY 2015 and FY 2017**	**2013**	**2016**
URC Spending			
Salaries and Wages	Households	1.165	1.174
Employee Benefits	Insurance Carriers*	1.779	1.765
Instruction & Academic Support	Educational Services	2.034	2.050
Research	Scientific research and development services	2.177	2.184
Public Service, Student Services, Institutional Support, Auxiliary Expenses, and Other Expenses and Deductions	Colleges*	2.010	2.025
Operation & Maintenance	Facilities support services*	1.983	2.003
Hospital Services	Hospitals*	2.081	2.089
Athletics	Spectator sports *	2.031	2.035
Construction	Construction	2.128	2.149
Student Spending			
Room and Board	Accommodations/ Households**	1.498	1.507
Books and Supplies	Food and beverage stores/General merchandise stores***	1.923	1.929
Apparel, Food & Grocery, and Other Basic Needs	Food and beverage stores/General merchandise stores***	1.923	1.929
Off-campus Meals & Entertainment	Food services and drinking places	2.033	2.054

** Industries using the multipliers for "detail" industries; the rest use multipliers for "aggregate" industries.*

*** AEG estimated an average of the accommodation and household multipliers for student room and board expenditures.*

**** AEG estimated an average of the food and beverage stores and general merchandise stores multipliers.*

Source: BEA RIMS II 2016 Multipliers

Operational Expenditures Methodology

We did the following to estimate the net economic impact of the URC:

Determined In-State Expenditures. The first step in estimating the net economic impact of the URC's operational expenditures was to determine the payroll and non-payroll expenditures by the URC that went to employees and vendors in the state. We did this in the following steps:

1. We obtained salary, benefit, and non-payroll expenditures for the URC universities for FY 2017 from IPEDS.
2. We obtained spending on athletics from NCAA Equity in Athletics reports, and removed it from the proper IPEDS categories so as not to double-count the spending.
3. We relied on information provided by the universities to determine the percentage of expenditures that went to businesses located outside of Michigan.
4. We obtained the spending occurring between universities, and removed it from the proper IPEDS categories, so as not to double-count the spending. Based on the available data and university resources, we assumed that 75% of this type of spending was in research, while the other 25% was in categories such as student services and institutional support.
5. We used data from the universities and the 2017 Consumer Expenditure Survey from the U.S. Bureau of Labor Statistics to estimate URC student expenditures in Michigan, and to account for a percentage of expenditures that go to firms outside Michigan. We updated this information using room and board information for the 2017-2018 school year provided by the URC universities.[16]

Accounting for what is "Net New" in Michigan. After calculating the non-payroll and payroll expenditures by the URC and student expenditures, we accounted for the spending that was considered net new in Michigan, and therefore do not include spending that would have occurred even if the URC were not part of the state's economy. We show our estimates for the percentage of spending that stays in the state and is net new spending below. See our analysis for the net impact of this spending in Table A-4 on page A-10.

We followed these steps for each of the categories detailed in the URC's economic impact. We used the following methods for these categories of spending:

- **Salaries and Wages:** We used URC data on employment to estimate that close to 100% of employee wages and benefits remain in the state, and that 66% of faculty and staff worked in Michigan because of the URC.
- **Research:** Most research dollars come from out-of-state sources. URC universities are responsible for 92% of academic R&D expenditures in the state, and receive 94% of all federal research dollars in Michigan. We estimate that 75% of spending remains in the state, and that 95% of that spending is net new in Michigan.[17]
- **Hospital spending:** Using UMHS data, we assumed that less than half of spending remains in Michigan, and that around 70% of that spending is net new.

16. Student spending was based on the percentage of students who live on- and off-campus, and their estimated spending on room and board; books and supplies; apparel, food and grocery, and other basic needs; and meals and entertainment away from campus.

17. More information on these values can be found in:
Traci Giroux, "Empowering Michigan: Eleventh Annual Benchmarking Report of Michigan's University Research Corridor," Anderson Economic Group, April 2018.

- **Athletics:** Since URC universities have extensive athletic programs that travel across the country to compete and recruit, we estimated that 44% of spending remained in Michigan, but 100% of that spending was net new.
- **Construction:** We estimate that 70% of construction spending remained in Michigan, and 85% of that is net new.
- **Other spending:** For student services, instruction and academic support, institutional support, and other expenses, we estimate that about 75% of spending remains in state, and more than 85% of that spending is net new.

In addition to these assumptions, we used actual expenditure data from the schools. Using these fixed ratios of percent spending in Michigan, we calibrated the percent of each category that was spent in Michigan to ensure that the total spending in Michigan from our model is equal to the total spending reported by the each university.

Student Spending Methodology

To estimate the net new students in Michigan, we obtained the number of students from in- and out-of-state at the URC universities, and estimated the percent of students who attend university in Michigan *because of the URC.* We assumed that overall, 80% of in-state students attend universities in Michigan because of the URC. We assume that 100% of out-of-state students are net new students in Michigan because of the URC.

One way to think about this is that 20% of URC students from Michigan would remain in Michigan for their college degree if the URC never existed, and that the spending associated with their education would also remain in the state. Thus, this is not *new* economic activity caused by the URC. It is unlikely that most out-of-state students would come to Michigan for their bachelor's or advanced degree if the URC were not in operation. We counted the expenditures on the instruction of and spending by these students as new economic activity caused by the URC.

See our analysis for the net impact of this spending in Table A-4 on page A-10.

Alumni Earnings Methodology

In this section, we describe the data and methodology used to estimate the final component of net economic impact of the incremental alumni earnings attributable to the URC universities. Like all educational institutions, URC universities strive to increase the knowledge and skills of the students they teach. How this knowledge impacts a student's lifetime earnings often depends on the student.[18]

Our estimate of the incremental earnings of URC alumni attributable to the URC universities is, at its heart, a comparison of what the alumni currently earn with an estimate of what they would have earned in the state if not for the URC.

We used the following methodology to estimate the economic impact of incremental earnings of URC alumni:

1. We estimated the current earnings of URC alumni living in Michigan. We relied on wage data by education level for 2016, and adjusted for inflation using BLS inflation figures to bring it to 2017 dollars.

   We describe this further in "Estimating Current Alumni Earnings" below.

2. We estimated the proportion of URC alumni in each counterfactual group. A "counterfactual group" is a group of students who would have exhibited the same labor market outcome without attending the URC, such as working outside the state, attaining less education, or attending another university in the state. We further assumed that all past years' graduating classes exhibited the same behavior as our estimates for the current year's graduating class, so the current set of alumni in the state are all characterized by the same set of assumptions about their earnings without the URC.

   We describe these counterfactual groups in "Estimating Incremental Alumni Earnings" on page A-8.

3. We used census and workforce participation data to estimate each counterfactual group's total earnings.

4. We subtracted the current earnings from the counterfactual earnings to find the *additional* earnings of current URC alumni due to the URC.

5. We subtracted the portion of incremental alumni earnings that goes toward taxes, savings, and spending out of state.

See our analysis for the net impact of this spending in Table A-4 on page A-10.

Estimating Current Alumni Earnings. We used individual and aggregate alumni data provided by Michigan State University, University of Michigan, and Wayne State University to estimate alumni earnings. We excluded from our analysis recipients of honorary degrees and certificates. We estimated the 2017 earnings by URC alumni in three steps:

1. **Estimate Age Distribution**

   We divided the existing alumni into seven age brackets, using data from each school on the number of graduates by year in their current alumni databases.[19] We were given the number of alumni by graduation year and highest degree earned at the university. We used these characteristics to approximate the age of the graduates. We used average age by graduation year for each school using survey data collected in the course of writing our URC-commissioned 2013

18. For a small share of the URC's students, having access to a research university in Michigan is the difference between going to college and not. For others, it is the difference between remaining in the state for a college degree or pursuing an education outside Michigan. For the remainder of the students, the existence of URC universities means finding the right mix of features, location, and price, whatever their specific reasons for choosing MSU, U-M or WSU.

19. 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.

report “Michigan's University Research Corridor: Embracing Entrepreneurship.” Based on this data, we used the assumptions for the average age at graduation presented in Table A-2 below.

TABLE A-2. Average Age at Graduation Used in Analysis

	Bachelors	Advanced Degree
Michigan State University	22	27
University of Michigan	22	26
Wayne State University	24	28

Sources: URC university alumni offices; Alumni survey cited in “Michigan's University Research Corridor: Embracing Entrepreneurship.”

2. **Estimate Workforce Participation and Wage**

We estimated the workforce participation rate using our professional judgment based on data from the 2000 Decennial Census, the 2010 Decennial Census, and information from the American Community Survey. We estimated the average wage of URC alumni in each age bracket using data from the 2017 Current Population Survey Tables for Personal Income. This data provides separate, age-bracketed estimates for U.S. workers with bachelor’s degrees and with advanced degrees. We used the following assumptions in conjunction with this data:

- We adjusted the average wage in each age bracket by the relative difference in the average wage in Michigan and the average wage in the U.S. using 2016 data from the U.S. Bureau of Labor Statistics.
- We assumed that wages grew in Michigan at either the rate of inflation between 2016 and 2017 or stayed constant, whichever is higher. We used the U.S. Bureau of Labor Statistics’ Detroit-Ann Arbor-Flint Consumer Price Index (CPI).
- We assumed that alumni who are not in the labor force have no personal income.
- We assumed that some URC alumni earned a higher wage than the average wage for Michigan workers with bachelor and advanced degrees for each age bracket. This assumption is a professional estimate based on these universities’ reputations for higher-than-average admissions standards within Michigan (improving their graduates’ reputation among potential employers), and the fact that URC students’ choices to attend a URC university reveals that they believe it will improve their employment prospects more than their next-favorite school. 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 alumni 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. We show the earnings of Michigan URC alumni by age and degree in Table A-3 on page A-8.

TABLE A-3. Michigan Earnings of URC Alumni by Age and Degree, 2017 (millions)

	21-24 Years	25-34 Years	35-44 Years	45-64 Years	Over 65 Years	Total
Bachelor Degree	$1,576	$5,702	$5,681	$11,363	$932	$25,253
Advanced Degree	$0	$3,861	$5,019	$8,316	$1,129	$18,326
Total Earnings	**$1576**	**$9,563**	**$10,700**	**$19,679**	**$2,061**	**$43,579**
Memo: Earnings as a percentage of wages & salary income in Michigan						*19%*

Note: Numbers may not add up due to rounding.

Source: AEG analysis using base data from URC Universities; U.S. Census Bureau; BLS; BEA

Estimating Incremental Alumni Earnings. In order to estimate what portion of URC alumni earnings were caused by the URC, we must consider what the graduates' earnings would have been without the URC. To do this, we place all URC graduates in one of three categories that allows us to compare their lifetime earnings with their URC education to their likely lifetime earnings without their URC education.

1. Graduates Earning No Wages in Michigan Without the URC
   This includes:
   - In-state URC students who otherwise would have gone to a college outside Michigan, as a result would have stayed outside of Michigan to work. Without the URC universities, these graduates would have earned no wages in Michigan.
   - Out-of-state URC students who will work in Michigan when they graduate, but would not work in Michigan if they did not attend a URC university. If not for the URC universities, these students would earn no lifetime wages in Michigan.
2. Graduates Earning Lower Wages Without the URC
   This includes:
   - In-state students who otherwise would have gone to another college or university in Michigan. If not for the URC universities, these graduates would earn the average wage for a person of their age and the same level of education. These college- and graduate-school-bound students chose their school because it fit their educational needs and goals better than other schools. Without it, they would attain the same level of education, but would earn slightly less throughout their careers.
   - In-state URC students who otherwise would not have completed the degree they are currently seeking (i.e. a bachelor's degree for undergraduates, an advanced degree for graduate students). If not for their URC university, these graduates would earn the average wage for a person of their age with one level less education: a high school graduate's wage for undergraduates, and a bachelor's degree wage for graduate students.

3. Graduates Earning Identical Wages Without the URC

   This includes:

   - In-state URC students who otherwise would have gone to an out-of-state college similar to a URC university, and returned to Michigan to work, earning the same wage in either case. The school therefore has no impact on their lifetime wages earned in Michigan.
   - Out-of-state URC students who will work outside Michigan when they graduate whether or not they would attend another Michigan college if the URC universities did not exist. The URC universities therefore have no impact on their lifetime wages earned in Michigan.

Total Economic Impact

We present a detailed summary of our analysis of the economic impact of operations spending, student spending and incremental alumni earnings in Table A-4 on page A-10. Table A-5 on page A-11 provides a summary of the direct, indirect, and total impacts by source of economic activity.

TABLE A-4. URC Net Economic Impact, FY 2017

	Category	2017 Expenditures	% Net New in Michigan	Net New $ in Michigan	Output Multiplier	Net Economic Impact (Direct and Indirect)	*Memo:Indirect Impact*
URC Payroll Expenditures							
	Salaries and Wages	$ 5,238,324,734	70%	$ 3,648,389,381	1.17	$ 4,281,384,939	$ 4,281,384,939
	Employee Benefits	$ 1,709,205,106	70%	$ 1,190,712,857	1.76	$ 2,101,370,050	$ 910,657,193
	Subtotal: Econ Impact from Payroll Expenditures	*$ 6,947,529,840*		*$ 4,839,102,238*		*$ 6,382,754,989*	*$ 5,192,042,132*
URC Nonpayroll Expenditures							
	Instruction & Academic Support	$ 432,359,377	49%	$ 213,095,331	2.05	$ 436,909,357	$ 223,814,026
	Research	$ 449,606,242	63%	$ 281,553,747	2.18	$ 614,913,383	$ 333,359,636
	Public Service, Student Services, Institutional Support, Auxiliary Enterprises, & Other Expenses	$ 410,858,692	57%	$ 235,268,277	2.03	$ 476,418,261	$ 241,149,984
	Operation and Maintenance of Plant	$ 438,358,021	52%	$ 226,337,458	2.00	$ 453,286,028	$ 226,948,569
	Hospital Services	$ 1,373,846,000	15%	$ 210,067,091	2.09	$ 438,914,180	$ 228,847,089
	Athletics	$ 135,836,390	62%	$ 84,777,241	2.04	$ 172,547,119	$ 87,769,878
	Construction	$ 1,166,280,319	55%	$ 636,432,820	2.15	$ 1,367,821,416	$ 731,388,596
	Subtotal: Econ Impact from Institutional Expenditures	*$ 4,407,145,041*		*$ 1,887,531,965*		*$ 3,960,809,744*	*$ 2,073,277,779*
Student Spending							
	Room and Board	$ 1,424,308,034	87%	$ 1,232,467,029	1.51	$ 1,857,142,942	$ 624,675,913
	Books and Supplies	$ 145,339,376	61%	$ 88,168,722	1.93	$ 170,055,422	$ 81,886,700
	Apparel, Food & Grocery, and other basic needs	$ 193,015,969	87%	$ 168,165,037	1.93	$ 324,348,316	$ 156,183,279
	Meal & Entertainment-away from campus	$ 436,070,507	84%	$ 364,700,117	2.05	$ 749,239,921	$ 384,539,804
	Subtotal: Econ Impact from Student Expenditures	*$ 2,198,733,886*		*$ 1,853,500,905*		*$ 3,100,786,601*	*$ 1,247,285,696*

	Category	2017 Incremental Earnings	% After Taxes and Savings	Net New $ in Michigan	Output Multiplier	Net Economic Impact (Direct and Indirect)	*Memo:Indirect Impact*
Alumni Earnings							
(a)	Incremental Alumni Earnings	$ 6,303,440,174	71%	$ 4,447,077,043	1.17	$ 5,218,644,910	$ 5,218,644,910
	Subtotal: Econ Impact from Alumni Earnings	*$ 6,303,440,174*		*$ 4,447,077,043*		*$ 5,218,644,910*	*$ 5,218,644,910*

Source: AEG analysis using base data from URC Universities; BEA RIMS II 2016 Multipliers; AEG Estimates

(a) "Incremental alumni earnings" refers to additional earnings, less taxes and savings, available for spending in Michigan.

TABLE A-5. URC Net Economic Impact Summary, FY 2017

	Category	2017 Expenditures or Incremental Earnings	Direct Impact *(a)*	Indirect Impact *(b)*	Direct and Indirect Impact *(c)*
Total Economic Impact					
	URC Payroll Expenditures	$ 6,947,529,840	$ 1,190,712,857	$ 5,192,042,132	$ 6,382,754,989
	URC Nonpayroll Expenditures	$ 4,407,145,041	$ 1,887,531,965	$ 2,073,277,779	$ 3,960,809,744
	Student Spending	$ 2,198,733,886	$ 1,853,500,905	$ 1,247,285,696	$ 3,100,786,601
(d)	Incremental Alumni Earnings	$ 6,303,440,174	$ -	$ 5,218,644,910	$ 5,218,644,910
	Total Economic Impact of the URC		***$ 4,931,745,727***	***$ 13,731,250,516***	***$ 18,662,996,243***

Source: AEG analysis using base data from URC Universities; BEA RIMS II 2016 Multipliers; AEG Estimates

(a) "Direct impact" is taken from the "Net New $ in Michigan" from Table A-4 on p. A-10. The direct impact excludes spending to households (e.g., direct salaries and wages and direct incremental alumni earnings) since this spending does not represent gross sales for businesses.

(b) "Indirect impact" is taken from the "Memo: Indirect Impact" from Table A-4 on p. A-10.

(c) "Direct and Indirect Impact" is taken from the "Net Economic Impact (Direct and Indirect)" from Table A-4 on p. A-10.

(d) "Incremental alumni earnings" refers to additional earnings, less taxes and savings, available for spending in Michigan.

Jobs Impact

To estimate the jobs impact of the URC, we estimated the number of net new employees by headcount that work for the URC universities, and UMHS. This year we relied on headcount employment to estimate the jobs impact to be consistent with the definition of employment used by the U.S. Bureau of Economic Analysis, which is the source of the economic multipliers. The jobs impact estimates in this report are not directly comparable to those presented in previous reports since we relied on FTE employment in prior years. We then applied the direct-effect employment multipliers from the Bureau of Economic Analysis (BEA) to estimate the additional indirect impact the URC has on employment. The multipliers we used for school faculty and staff were for the junior colleges, colleges, universities, and professional schools category. For hospital faculty and staff, we used the hospitals multiplier. Table A-6 below shows the net jobs impact for the URC.

TABLE A-6. Net Jobs Impact of the URC, FY 2017

Category	2017 Employment (Headcount)	% Net New in Michigan	Direct Jobs Impact	Employment Multiplier	Total Net New Employment	*Memo: Indirect Jobs Impact*
URC Non-Hospital Faculty	11,328	89%	10,099	1.50	15,149	5,050
URC Non-Hospital Staff	32,642	64%	20,815	1.50	31,224	10,410
URC Hospital Faculty	3,047	92%	2,803	2.22	6,210	3,407
URC Hospital Staff	18,237	65%	11,854	2.22	26,261	14,407
Total Faculty and Staff Jobs Impact	**65,254**	**70%**	**45,571**	**1.73**	**78,845**	**33,274**

Source: AEG analysis using base data from URC Universities, BEA RIMS II 2016 Multipliers, AEG Estimates

Revisions to Previously Published Economic Impact Estimates

The economic impact estimates that were published in the 2014, 2015, 2016, and 2017 reports have been revised since these reports were published. There are two reasons for these revisions:

1. Errors in data provided by two of the URC universities, effectively overestimating expenditures; and
2. An error in estimating the amount of URC operations spending in Michigan.

One of the universities found an accounting error in the expenditure data they provided for the 2015 and 2016 reports. This accounting error results in overestimating the university's non-payroll spending for FY 2013 and FY 2014. Another university found a data collection error in the expenditure data they provided for the 2014, 2015, 2016, and 2017 reports. This error results in overestimating the university's non-payroll spending for FY 2012 through FY 2015. We re-estimated the economic impact for the relevant years using the corrected data.

AEG identified an error in how we estimated the amount of university non-payroll expenditures in Michigan in the 2014 and 2015 reports. As we describe in "Operational Expenditures Methodology" on page A-3, we calibrate our estimates for the non-payroll expenditures in Michigan using expenditure data provided by each university. We found that we inconsistently applied this calibration method, which affected our estimates for this spending in FY 2012 and FY 2013. We re-estimated the economic impact using the appropriate calibration method for these two years.

See Table A-7 below for a comparison of the published and corrected economic impact estimates.

TABLE A-7. Economic Impact of the URC, FY2012 - FY2015 (billions)

Report Year	Fiscal Year	Published	Corrected
2014	FY 2012	$16.6	$16.3
2015	FY 2013	$16.8	$16.2
2016	FY 2014	$17.5	$16.7
2017	FY 2015	$16.5	$16.4

Source: AEG analysis using base data from URC Universities, BEA RIMS II Multipliers, AEG Estimates

REGIONAL ECONOMIC IMPACT

Our regional economic impact analysis is meant to give the magnitude of economic impact on a more local level, and is a conservative estimate. To perform the regional economic impact analysis, we include the same expenditures as in the state economic impact, except at a county level. While the universities had county-by-county data, the expenditures were accounted for slightly differently than in IPEDS. We discuss how the direct economic impact by region was estimated below.

Operational Expenditures. Using data provided by the URC universities on wages and vendor payments by county, we estimated the percentage of payroll and non-payroll expenses in each county. We used the university expenditures (after substitution), which we used in the state economic impact, and allocated expenditures by county using these shares. This gives a rough estimate of university spending in each Michigan county.

Student Local Spending. We used our statewide estimates of URC student expenditures and after accounting for substitution, we attributed a portion of that spending to the counties in which the URC universities are located. We apportioned 100% of spending for students living on campus to the counties in which the schools are located. No data were available that directly report where off-campus students live and spend money. We apportioned spending by students who live off campus based on our knowledge of the campuses and our professional judgment. We distributed 70% of spending by MSU off-campus students to Ingham County, and 30% to Clinton County. We distributed U-M Ann Arbor student expenditures between Washtenaw (97%), Wayne (2%), and

Jackson (1%). We apportioned spending from U-M Flint students to Genesee County, U-M Dearborn to Wayne (80%), and Oakland (20%), and for Wayne State, we assumed that 60% of spending was in Wayne County, and 40% was in Oakland County.

Regional Alumni Earnings and Incremental Earnings Estimates. An analysis of where URC alumni currently live reveals that different regions of the state account for differing shares of this total. The largest driver of these differences comes from the number of URC alumni living in different parts of the state, but the distribution is also affected by whether the alumni have bachelor's or advanced degrees.

We apportioned alumni earnings based on where they were reported to reside. The best data of this at a local level was zip code data provided by each university's alumni office. We used GIS software to assist us in attributing alumni into a county when a zip code spanned more than one county.

Indirect Economic Impact. We then estimated the regional *indirect* economic impact of URC's expenditures by multiplying the direct expenditures by the U.S. Department of Commerce's Regional Multipliers (RIMS II). It would be a highly complex analysis (and prohibitively expensive) to use the individual set of multipliers for each of Michigan's 83 counties. Instead, we purchased only the county multipliers for the three counties that had the largest share of expenditures, which were also the counties in which the URC universities are located: Washtenaw, Wayne, and Ingham. For these counties, we used the multipliers provided by RIMS II. The remaining counties were put into categories of low, medium, or high population and we estimated those multipliers accordingly. See Table A-8 on page A-15 for the list of multipliers used in the regional economic impact analysis.

Economic activity is not contained within the region it occurs. Spending in one region generates activity in nearby regions when that money is re-spent. Therefore, the state's indirect activity generated by the URC is larger than the sum of regional estimates. To correct for this and apportion all indirectly-generated activity to a region, we estimated a factor of economic activity that goes beyond each county's borders. This allows our analysis of indirect economic impact by region in Michigan to sum to the state's economic impact, providing the magnitude of the total impact in Michigan, by region. Each direct expenditure was multiplied by that spending factor, as well as the multiplier.

We show the economic impact of URC operations and student spending by region in Table A-9 on page A-16. We then show the economic impact of additional URC alumni earnings by region in Table A-10 on page A-18. We show the total economic impact of the URC by region in Table A-11 on page A-19.

TABLE A-8. Multipliers Used in Regional and County-by-County Economic Impact, FY 2017

Spending Category	Multiplier Category	Ingham County	Wash-tenaw County	Wayne County	Low Pop. (<50k)	Medium Pop. (50k-120k)	High Pop. (>120k)
URC Spending							
Salaries and Wages	Households	0.7283	0.6540	0.7004	0.5098	0.5232	0.6540
Employee Benefits	Insurance Carriers*	1.5105	1.2442	1.3080	1.0574	0.9954	1.2442
Instruction & Academic Support	Educational Services	1.5324	1.5393	1.4997	1.0727	1.2314	1.5393
Research	Scientific research and development services	1.5652	1.6437	1.5810	1.0956	1.3150	1.6437
Public Service	Civic organizations*	1.3846	1.3879	1.4783	0.9692	1.1103	1.3879
Student Services, Inst. Support, Auxiliary Enterprises, & Other Expenses	Colleges*	1.5306	1.5347	1.4786	1.0714	1.2278	1.5347
Operation and Maintenance of Plant	Facilities support services*	1.4495	1.4377	1.5616	1.0147	1.1502	1.4377
Hospital Services	Hospitals*	1.5359	1.4610	1.4871	1.0751	1.1688	1.4610
Athletics	Spectator sports *	1.4098	1.3416	1.4927	0.9869	1.0733	1.3416
Construction	Construction	1.3554	1.3415	1.5380	0.9488	1.0732	1.3415
Student Spending							
Room and Board	Accommodations/ Households**	1.0815	1.0131	1.0906	0.7570	0.8104	1.0131
Books and Supplies	Food and beverage stores/General merchandise stores***	1.4660	1.4042	1.5351	1.0262	1.1233	1.4042
Apparel, Food & Grocery, and Other Basic Needs	Food and beverage stores/General merchandise stores***	1.4660	1.4042	1.3531	1.0262	1.1233	1.4042
Off-campus Meals & Entertainment	Food services and drinking places	1.4926	1.4260	1.5692	1.0448	1.1408	1.4260

** Note: Industries using the multipliers for "detail" industries; the rest use multipliers for "aggregate" industries*

*** AEG estimated an average of the accommodation and household multipliers for student room and board expenditures.*

**** AEG estimated an average of the food and beverage stores and general merchandise stores multipliers*

Source: BEA RIMS II 2016 Multipliers

TABLE A-9. Economic Impact of URC Operations and Student Spending in Michigan, by Region, FY 2017

Direct Impact of Student and URC Expenditures & Employment in Michigan, by Region

	Net New Payroll Expenditures		Net New Nonpayroll Expenditures		Net New Student Spending		Net New Employment	
	Total	Share	Total	Share	Total	Share	Total	Share
Upper Peninsula Region	$ 1,097,790	0.1%	$ 2,826,952	0.1%	$ -	0.0%	64	0.1%
Northwest Region	$ 1,864,767	0.2%	$ 3,708,573	0.2%	$ -	0.0%	136	0.3%
Northeast Region	$ 948,493	0.1%	$ 880,867	0.0%	$ -	0.0%	68	0.1%
West Michigan Region	$ 9,248,045	0.8%	$ 67,752,711	3.6%	$ -	0.0%	366	0.8%
East Central Region	$ 2,328,837	0.2%	$ 8,576,022	0.5%	$ -	0.0%	136	0.3%
East Michigan Region	$ 25,016,352	2.1%	$ 28,558,466	1.5%	$ 75,116,277	4.1%	1,211	2.7%
South Central Region	$ 276,116,283	23.2%	$ 500,970,758	26.5%	$ 612,855,077	33.1%	8,341	18.3%
Southwest Region	$ 3,013,406	0.3%	$ 14,222,651	0.8%	$ -	0.0%	167	0.4%
Southeast Michigan Region	$ 633,062,336	53.2%	$ 283,796,348	15.0%	$ 735,730,895	39.7%	23,478	51.5%
Detroit Metro Region	$ 238,016,547	20.0%	$ 976,238,617	51.7%	$ 429,798,656	23.2%	11,605	25.5%
State of Michigan	$ 1,190,712,857		$ 1,887,531,965		$ 1,853,500,905		45,571	

Indirect Impact of Student and URC Expenditures & Employment in Michigan, by Region

	Net New Payroll Expenditures		Net New Nonpayroll Expenditures		Net New Student Spending		Net New Employment	
	Total	Share	Total	Share	Total	Share	Total	Share
Upper Peninsula Region	$ 2,913,274	0.1%	$ 1,690,583	0.1%	$ -	0.0%	17	0.1%
Northwest Region	$ 5,515,895	0.1%	$ 2,296,378	0.1%	$ -	0.0%	45	0.1%
Northeast Region	$ 2,755,026	0.1%	$ 428,768	0.0%	$ -	0.0%	24	0.1%
West Michigan Region	$ 30,769,203	0.6%	$ 73,914,059	3.6%	$ -	0.0%	178	0.5%
East Central Region	$ 7,862,993	0.2%	$ 6,978,441	0.3%	$ -	0.0%	60	0.2%
East Michigan Region	$ 105,559,420	2.0%	$ 31,263,578	1.5%	$ 54,195,064	4.3%	913	2.7%
South Central Region	$ 1,102,939,331	21.2%	$ 476,043,145	23.0%	$ 420,348,402	33.7%	4,346	13.1%
Southwest Region	$ 11,059,976	0.2%	$ 15,515,804	0.7%	$ -	0.0%	98	0.3%
Southeast Michigan Region	$ 2,773,070,221	53.4%	$ 324,903,012	15.7%	$ 481,870,774	38.6%	19,345	58.1%
Detroit Metro Region	$ 1,149,596,794	22.1%	$ 1,140,244,010	55.0%	$ 290,871,455	23.3%	8,247	24.8%
State of Michigan	$ 5,192,042,132		$ 2,073,277,779		$ 1,247,285,696		33,274	

TABLE CONTINUED

Total Impact of Student and URC Expenditures & Employment in Michigan, by Region

	Net New Payroll Expenditures		Net New Nonpayroll Expenditures		Net New Student Spending		Net New Employment	
	Total	Share	Total	Share	Total	Share	Total	Share
Upper Peninsula Region	$ 4,011,064	0.1%	$ 4,517,535	0.1%	$ -	0.0%	81	0.1%
Northwest Region	$ 7,380,662	0.1%	$ 6,004,951	0.2%	$ -	0.0%	181	0.2%
Northeast Region	$ 3,703,519	0.1%	$ 1,309,635	0.0%	$ -	0.0%	91	0.1%
West Michigan Region	$ 40,017,248	0.6%	$ 141,666,770	3.6%	$ -	0.0%	544	0.7%
East Central Region	$ 10,191,830	0.2%	$ 15,554,464	0.4%	$ -	0.0%	195	0.2%
East Michigan Region	$ 130,575,772	2.0%	$ 59,822,044	1.5%	$ 129,311,341	4.2%	2,124	2.7%
South Central Region	$ 1,379,055,614	21.6%	$ 977,013,903	24.7%	$ 1,033,203,479	33.3%	12,687	16.1%
Southwest Region	$ 14,073,383	0.2%	$ 29,738,455	0.8%	$ -	0.0%	265	0.3%
Southeast Michigan Region	$ 3,406,132,557	53.4%	$ 608,699,361	15.4%	$ 1,217,601,670	39.3%	42,823	54.3%
Detroit Metro Region	$ 1,387,613,340	21.7%	$ 2,116,482,628	53.4%	$ 720,670,111	23.2%	19,853	25.2%
State of Michigan	$ 6,382,754,989		$ 3,960,809,744		$ 3,100,786,601		78,845	

Source: AEG analysis using base data from URC Universities, BEA RIMS II 2016 Multipliers, AEG Estimates

TABLE A-10. Economic Impact of Additional URC Alumni Earnings in Michigan by Region, FY 2017

Impact of URC Alumni in Michigan, by Region

	URC Alumni *(a)*		Share of URC Alumni Earnings *(b)*		Share of Incremental URC Alumni Earnings		2017 Michigan Population	
	Total	Share	Total	Share	Total	Share	Total	Share
Upper Peninsula Region	5,808	0.9%	$ 377,985,414	0.9%	$ 57,667,301	0.9%	302,077	3.0%
Northwest Region	18,452	2.8%	$ 1,200,753,852	2.8%	$ 184,119,822	2.9%	303,996	3.1%
Northeast Region	5,937	0.9%	$ 385,347,223	0.9%	$ 58,178,450	0.9%	202,993	2.0%
West Michigan Region	51,377	7.7%	$ 3,336,775,347	7.7%	$ 519,257,812	8.2%	1,595,965	16.0%
East Central Region	16,241	2.4%	$ 1,057,187,037	2.4%	$ 161,746,143	2.6%	562,597	5.6%
East Michigan Region	47,428	7.1%	$ 3,144,435,333	7.2%	$ 460,068,900	7.3%	848,668	8.5%
South Central Region	62,090	9.3%	$ 3,969,693,381	9.1%	$ 647,101,374	10.3%	477,656	4.8%
Southwest Region	21,155	3.2%	$ 1,376,983,301	3.2%	$ 213,019,791	3.4%	782,463	7.9%
Southeast Michigan Region	79,623	11.9%	$ 5,300,547,043	12.2%	$ 771,157,316	12.2%	1,010,069	10.1%
Detroit Metro Region	361,147	54.0%	$ 23,429,199,201	53.8%	$ 3,231,123,266	51.3%	3,875,827	38.9%
State of Michigan	669,258		$ 43,578,907,131		$ 6,303,440,174		9,962,311	

Total Impact of URC Alumni in Michigan, by Region

	URC Alumni Incremental Earnings After Taxes and Savings		Total Impact of URC Alumni Incremental Earnings	
	Total	Share	Total	Share
Upper Peninsula Region	$ 40,684,281	0.9%	$ 47,743,003	0.9%
Northwest Region	$ 129,896,534	2.9%	$ 152,433,583	2.9%
Northeast Region	$ 41,044,896	0.9%	$ 48,166,186	0.9%
West Michigan Region	$ 366,336,386	8.2%	$ 429,895,749	8.2%
East Central Region	$ 114,111,904	2.6%	$ 133,910,319	2.6%
East Michigan Region	$ 324,578,609	7.3%	$ 380,892,998	7.3%
South Central Region	$ 456,530,020	10.3%	$ 535,737,978	10.3%
Southwest Region	$ 150,285,463	3.4%	$ 176,359,990	3.4%
Southeast Michigan Region	$ 544,051,486	12.2%	$ 638,444,419	12.2%
Detroit Metro Region	$ 2,279,557,464	51.3%	$ 2,675,060,684	51.3%
State of Michigan	$ 4,447,077,043		$ 5,218,644,910	

Source: AEG analysis using base data from URC Universities, BEA RIMS II 2016 Multipliers, AEG Estimates, ACS 5 Year Estimates

(a) Alumni population includes only alumni with valid zip codes.

(b) Alumni earnings include only alumni with valid graduation year information.

TABLE A-11. Economic Impact of URC in Michigan by Region, FY 2017

Total Impact of URC in Michigan, by Region

	Net New Economic Impact		Total Jobs Impact	
	Total	Share	Total	Share
Upper Peninsula Region	$ 56,271,602	0.3%	81	0.1%
Northwest Region	$ 165,819,196	0.9%	181	0.2%
Northeast Region	$ 53,179,340	0.3%	91	0.1%
West Michigan Region	$ 611,579,767	3.3%	544	0.7%
East Central Region	$ 159,656,613	0.9%	195	0.2%
East Michigan Region	$ 700,602,155	3.8%	2,124	2.7%
South Central Region	$ 3,925,010,973	21.0%	12,687	16.1%
Southwest Region	$ 220,171,828	1.2%	265	0.3%
Southeast Michigan Region	$ 5,870,878,007	31.5%	42,823	54.3%
Detroit Metro Region	$ 6,899,826,763	37.0%	19,853	25.2%
State of Michigan	**$ 18,662,996,244**		**78,845**	

Source: AEG analysis using base data from URC Universities, BEA RIMS II 2016 Multipliers, AEG Estimates

TAX REVENUE IMPACT ANALYSIS

We estimate new tax revenue by first calculating the new wage and salary income that URC employees and alumni receive because of the URC. Then we estimate the additional tax revenue to the state for several important state-level taxes: income, sales, property, and transportation taxes.

Additional Employee and Alumni Earnings

We estimate that $3.6 billion in wages of URC employees in Michigan were *caused by* the URC in 2017. This figure accounts for substitution of URC employees for other Michigan wages that would have been paid in the absence of the URC. After taxes and savings, we estimate the new alumni earnings in Michigan to be $4.4 billion in the state due to the URC.

Average vs. Marginal Income. We categorize the earnings of employees and alumni caused by the URC into *marginal* and *average* income. The portion of alumni earnings that is earned *in addition to* what would have been earned without the URC is treated as "marginal income." We treat entire new salary and wage income for an employee or alumnus that is earned only because of the URC as "average income." This distinction matters because people spend their first $1,000 of income differently than their last, and the state government taxes this income differently because of exemptions.

Employee Earnings. The income of URC employees is treated as average income. The earnings of URC employees come largely from out-of-state income sources, so it is reasonable as a first approximation to treat URC employee jobs as jobs that would not exist without the URC, meaning each employee's entire income generates net new tax revenue.[20] While it is possible that some of the income of URC employees could be treated as marginal income, treating it as average income is more conservative because average income is taxed at a lower average rate than is marginal income, as shown in Table A-12 on page A-21.

Alumni Incremental Earnings. For some graduates, attending a URC university likely had no impact on their annual Michigan earnings (and therefore to the taxes they pay to the State of Michigan). Other graduates will earn extra income due to the URC, and therefore will pay additional taxes to the state. The proportion of their additional income that goes to Michigan taxes depends on whether their additional income due to the URC represents a pay boost (for graduates who would still be working in Michigan without the URC) or if their entire Michigan income is due to the URC (for graduates who otherwise would not be working in Michigan). As described below, we apply different effective tax rates to "average" and "marginal" income.

Effective Tax Rates on Income

This analysis recognizes that average and marginal income are taxed and spent differently. To account for this difference, we estimate an "effective rate" for each type of income that is taxed, which is the amount we anticipate people will pay in taxes divided by their income.[21]

Table A-12 on page A-21 shows the percentage of income we assume is paid to the State of Michigan. Note that our analysis includes major taxes such as income, sales, state-level property, and gasoline taxes, but does not consider additional, non-sales taxes on alcohol and tobacco, or other state taxes and fees.

20. The out-of-state income sources we refer to as supporting instruction and research expenses for URC employees includes tuition from out-of-state students and R&D funding (60% of which comes from the federal government).

21. For example, if someone makes $10,000 and spends $7,000 of that on items subject to the 6% state sales and use tax, he or she will pay 6% of $7,000, or $420 in taxes. His or her effective sales tax rate is $420 divided by $10,000, or 4.2%.

TABLE A-12. Percentage of Income Paid to the State of Michigan

Tax	On Additional Marginal Income	On Additional Average Income
Personal Income Tax	4.25%	2.14%
Sales and Use Tax	1.43%	2.61%
Property Tax	0.36%	0.50%
Transportation Tax	0.20%	0.42%

Source: AEG analysis using base data from 2017 Consumer Expenditure Survey

Income Tax. In October 2012, the personal income tax rate changed from 4.35% to 4.25%. For our analysis, we used the income tax rate of 4.25%. We do not attempt to estimate the proportion of marginal income going toward tax exempt expenditures. To calculate the 2.14% income tax rate on average income, we divided the state's revenue from the income tax in FY 2016-17 by the state's personal income.[22]

Sales and Use Tax. We estimate the sales and use tax burden using data from the U.S. Bureau of Labor Statistics' Consumer Expenditure Survey. First, we identified spending categories subject to the sales and use tax.[23] We estimate that consumers in the middle 20% of earners spend approximately 43.5% of their income on goods subject to the sales and use tax, yielding an effective rate on *income* of 43.5% times the 6% sales tax rate, or 2.61% of their entire income. This is the effective sales tax rate on additional average income.

To estimate the effective rate on marginal income, we estimated the proportion subject to sales tax of the additional spending done by people in the middle 20% of earners and the second-highest 20% of earners. We estimate that 23.8% of this additional income is spent in sales-taxable categories, resulting in an effective sales tax on marginal income of 23.8% times the 6% sales tax, or 1.43%.

Property Tax. We estimate the proportion of expenditures that goes toward property taxes on average using the 2017 Consumer Expenditure Survey. We find that, on average, people in the middle 20% of income spend 2.99% of their income on property taxes. We multiply 2.99% by the ratio of state property taxes to all state and local property taxes (16.7%) to arrive at an effective rate on

22. Base data source for the income tax in FY 2016-2017 was the Michigan Senate Fiscal Agency. Revenue from income tax in 2017 was $10.2 billion. According to the U.S. Bureau of Economic Analysis, personal income was $450.8 billion in 2017.

23. We identified 15 such spending categories, including travel; alcoholic beverages; housing maintenance; repairs, and other household expenses; postage and stationery; clothing; vehicles and vehicle maintenance; entertainment; personal care products, and others. Although we are aware that some expenditures currently are subject to the state's sales and use tax, but are not reported, we did not account for evasion or avoidance in this analysis.

income of 0.50%.[24] We also find that 2.8% of the additional income earned by earners in the second-highest quintile goes toward property taxes. Again multiplying by 16.7% of taxes going to the state government, we estimate the effective property tax rate on marginal income to be 0.36%.

Transportation Taxes. We estimate the proportion of expenditures that goes toward gasoline using the Consumer Expenditure Survey. We find that, on average, people in the middle 20% of income spend 3.68% of their income on gasoline. We multiply this rate by 11.4%, the effective rate of the gasoline tax,[25] resulting in an effective rate on income of 0.42%. We also find that 1.73% of the additional income earned by earners in the second-highest quintile goes toward fuel. Again multiplying by the 11.4% effective gas tax rate, we estimate the effective gas tax rate on marginal income to be 0.2%.

24. U.S. Census of Governments State and Local Finance data.

25. Gasoline is not taxed as a percentage of its price, but rather at a per-unit rate of $0.26 per gallon. The gasoline tax of $0.26 per gallon is divided by $2.31 per gallon of gasoline to yield a 11.4% effective rate. This information comes from the U.S. Energy Information Administration in 2017.

Appendix B. Summary of URC Sector Reports

In addition to the economic impact and benchmarking reports, the URC has also commissioned annual reports on the contributions of the URC to key economic sectors. Key findings from those reports include:

INFRASTRUCTURE (2018)

Foundation for the Future: URC Contributions to Infrastructure Improvement, Public Sector Consultants

- The URC universities have and continue to contribute to infrastructure innovation through R&D, talent development, transfer of technology from the lab to the marketplace, and utilization of campuses for testing best practices for the real world.
- From 2012 through 2016, the URC conducted more than $1.6 billion in infrastructure-related R&D, defined as energy, water, mobility and communications.
- The URC universities granted more than 34,000 degrees in infrastructure-related fields from 2012 through 2016, representing 51% of all related degrees at the bachelor's level or higher awarded in Michigan.

LIFE, MEDICAL & HEALTH SCIENCES (2017)

Leading Discovery: URC Contributions to the Life, Medical & Health Sciences, Public Sector Consultants

- The URC awarded 44,422 degrees in the life, medical, & health sciences from 2011-2015, which was best among its peer clusters.
- There are more than 3 million patient care visits each year to URC institutions.
- From 2012-2016, the URC launched 32 new startup companies tied to the life, medical, & health sciences.
- In 2015, URC institutions conducted $1.2 billion in academic research & development connected with the life, medical, & health sciences.

ENGAGING DETROIT (2016)

Engaging Detroit: URC's Contributions to Resurgence in the Motor City, Public Sector Consultants

- The URC accounts for one in twenty jobs in Detroit and had a $958 million economic impact in 2015.
- More than 340 URC programs are in Detroit focused on community building, economic revitalization, public education, and public health.
- There are more than 28,000 URC students being educated in Detroit, contributing to economic activity and retention.
- The URC conducted $263 million in Detroit-related research in 2015.

TALENT FOR THE GLOBAL ECONOMY (2015)

Attracting, Fostering, and Inspiring Talent for the Global Economy, Alex L. Rosaen and Patrick L. Anderson, Anderson Economic Group

- Among eight top research university clusters in 2013, URC universities ranked first in enrollment, degrees awarded, and medical degrees awarded.
- The URC produces more than 32,000 talented graduates each year and has over 617,000 known alumni in Michigan.
- The URC universities sustain almost 12,000 world-class faculty and more than 35,000 graduate students with over $2.1 billion in annual research and development expenditures. As a result, the URC universities are a similar asset for Michigan as other notable research clusters, such as those in California and Texas.
- The URC universities maintain the state's connection to a broad, global network of talented individuals. The schools have significant alumni networks in several notable talent destinations in the U.S., with over 582,000 alumni outside the state.

BLUE ECONOMY (2014)

Innovating for the Blue Economy: Water Research at the URC, Alex L. Rosaen, Anderson Economic Group

- 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)

Embracing Entrepreneurship: The URC's Growing Support for Entrepreneurs in Michigan and Throughout the World, Erin A. Grover, Colby S. Cesaro, Samantha Superstine and Patrick L. Anderson, Anderson Economic Group

- URC alumni entrepreneurs started or acquired businesses at double the national average rate among college graduates since 1996.
- Fifty percent 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's Contributions to Automotive Innovation, Caroline M. Sallee, Alex L. Rosaen and Erin A. Grover, Anderson Economic Group

- 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:
    - 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 promises improved 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 University Research Corridor's Support for Information and Communication Technology in Michigan, Caroline M. Sallee, Erin Agemy, and Patrick L. Anderson, Anderson Economic Group

- 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)

The University Research Corridor's Support for Advanced Manufacturing in Michigan, Caroline M. Sallee, Erin Agemy, Alex L. Rosaen and Patrick L. Anderson, Anderson Economic Group

- 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)

Life Sciences Industry in Michigan and the University Research Corridor, Caroline M. Sallee, Hilary A. Doe and Patrick L. Anderson, Anderson Economic Group

- 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% since the founding of the Life Sciences Corridor in 1999.

ALTERNATIVE ENERGY RESEARCH AND DEVELOPMENT (2008)

Preliminary Report: Alternative Energy Research and Development in the URC, Caroline M. Sallee, Rebecca A. Cohen and Patrick L. Anderson, Anderson Economic Group

- 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.

These reports can be found at the URC's website at www.urcmich.org. For further information on the authors the URC commissioned for these reports, see www.AndersonEconomicGroup.com and www.pscinc.com.

Appendix C. About Anderson Economic Group

ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC is a boutique consulting firm founded in 1996, with offices in East Lansing, Chicago, and New York. Our team has a deep understanding of advanced economic modeling techniques and extensive experience in several industries in multiple states and countries. We are experts across a variety of fields in tax policy, strategy and business valuation, public policy and economic analysis, and market and industry analysis.

Relevant publications from our team include:

- *University Research Corridor Economic Impact Reports,* published since 2007. This series of reports benchmarks Michigan's research universities (Wayne State University, Michigan State University, and the University of Michigan) against peer clusters across the country, as well as evaluates the collective economic impact on the state of Michigan.
- "Higher Education Performance Tracker", *Business Leaders for Michigan*, published in 2016.
- "2014 Study on Higher Education in the Loop and South Loop," published in 2014.
- "America's Urban Campus: The Economic, Social, and Cultural Contributions of Chicago's Colleges and Universities," published in 2014.
- "The Economic Footprint of Michigan's Fifteen Public Universities," published in 2013.

Past clients of Anderson Economic Group include:

- *Governments:* The government of Canada; the states of Michigan, North Carolina, and Wisconsin; the cities of Detroit, Cincinnati, and Sandusky; counties such as Oakland County, and Collier County; and authorities such as the Detroit-Wayne County Port Authority.
- *Corporations:* Ford Motor Company, First Merit Bank, Lithia Motors, Spartan Stores, Nestle, and InBev USA; automobile dealers and dealership groups representing Toyota, Honda, Chrysler, Mercedes-Benz, General Motors, Kia, and other brands.
- *Nonprofit organizations:* Convention and visitor bureaus of Lansing, Ann Arbor, Traverse City, and Detroit, and Experience Grand Rapids; higher education institutions including Michigan State University, Wayne State University, and University of Michigan; trade associations such as the Michigan Manufacturers Association, Service Employees International Union, Automation Alley, the Michigan Chamber of Commerce, and Business Leaders for Michigan.

Please visit www.AndersonEconomicGroup.com for more information.

AUTHORS

Traci Giroux.

Ms. Giroux is a Consultant with Anderson Economic Group, working in the Public Policy and Economic Analysis practice area. Her background is in applied economics.

While at AEG, Ms. Giroux has performed research and analysis for a wide range of clients, including universities, trade associations, and businesses. Her recent work includes multi-scenario analysis of pending energy regulation; economic and fiscal impact analyses of major investments; analyses of new tourism activity due to policy changes as well as special events; benchmarking studies; and analyses of tax reform proposals.

Ms. Giroux holds a Master of Science in Agricultural, Food, and Resource Economics and a Bachelor of Science in Chemical Engineering, both from Michigan State University.

CONTRIBUTORS

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Judy Zhang was an Senior Analyst with Anderson Economic Group, working in the Public Policy and Economic Analysis practice area. Ms. Zhang assisted with the alumni earnings and state revenue impact analyses, as well as the regional economic impact analysis. Her work at AEG included an impact study of state business tax incentives, a survey analysis related to real estate closing costs, and an assessment of pension reforms and alternative investments. Ms. Zhang holds a Master of Public Policy from the Harris School of Public Policy at the University of Chicago and a Bachelor of Arts in Business Economics and Accounting from the University of California Los Angeles.

Additional Contributors

Tyler Thur assisted with the university and student spending analyses. Mr. Thur is an Analyst at Anderson Economic Group and is working towards a master's degree in public policy at Michigan State University. He graduated from Michigan State's James Madison College with a degree in International Relations and minors in Jewish Studies and Science, Technology, Environment, and Public Policy.