Economic and Fiscal Impact of the Arizona Public University Enterprise

Prepared for:

ARIZONA BOARD OF REGENTS
ASU ◆ NAU ◆ UA

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Prepared by:

Elliott D. Pollack & Company
7505 East 6th Avenue, Suite 100
Scottsdale, Arizona 85251

--and—

The Maguire Company
1300 E Missouri Ave # 210
Phoenix, AZ 85014

TABLE OF CONTENTS

Executive Summary			i
1.0	**Introduction**		**1**
2.0	**Assumptions & Methodology**		**3**
	2.1	Analysis Assumptions	3
	2.2	Economic Impact Methodology	6
	2.3	Fiscal Impact Methodology	6
3.0	**Impact of Operations**		**9**
	3.1	Economic Impact of Operations	9
	3.2	Fiscal Impact of Operations	15
4.0	**Incremental Impact of Operations**		**21**
	4.1	Incremental Economic Impact	21
	4.2	Incremental Fiscal Impact	23
5.0	**The Benefits of Tier 1 Research Universities**		**24**
REFERENCES			**32**

Executive Summary

Elliott D. Pollack & Company, in cooperation with The Maguire Company, has been retained by the Arizona Board of Regents to perform an economic and fiscal impact study of Arizona's Public University Enterprise composed of Arizona State University, Northern Arizona University, and the University of Arizona. The analysis calculates the economic and fiscal impacts in Arizona of annual operations of the universities, as well as the impacts of the spending of the university and vendor employees and students, and the impacts of out-of-state visitors to the universities. Furthermore, the analysis reviews the benefits of Tier 1 research universities and quantifies the estimated impact from research activities for the Arizona Public University Enterprise. Impacts are based on data provided by the universities for Fiscal Year 2017 (FY17).

The purpose of the impact study is to quantify the impacts of the universities in terms of jobs, wages, value added, and economic output (collectively, the economic impact) along with the resulting government revenues in Arizona (the fiscal impact). The assumptions for the analysis are based on standard economic analyses methods, findings from student spending surveys, visitor exit surveys, and other industry standards.

Multipliers were utilized to estimate the indirect and induced impacts of various direct economic activities. The IMPLAN Group, LLC developed the multipliers used in this study. The economic impact is categorized into four types of impacts:

- **Employment impact** – total jobs in a region including part-time and full-time workers.
- **Earnings Impact** – the personal income, earnings or wages, of the employees.
- **Value Added** - The difference between the total output and the cost of its intermediate inputs. It consists of compensation of employees, indirect business taxes and nontax payments, and gross operating surplus.
- **Economic Output** – the economic output relates to the gross receipts for goods or services generated by the operations. It represents the total value of industry production.

The results of the impact analysis are substantial and significant. However, the careful methodology employed ensures that they are more likely to slightly understate the impacts rather than overstate them.

The State's universities provide many additional cultural and societal benefits, some of which are intangible or immeasurable, that have not been calculated as part of the impact analysis and their dollar amounts are not included in the report. Quality universities are foundational to economic development. Their quality instruction enhances the communities' human capital by producing highly qualified and trained workers for employers existing, expanding, and entering the community. The benefits of Arizona Public University Enterprise affect communities throughout the state, not just those communities adjacent to the main campuses. Individuals

with higher educational attainment are able to gain employment in higher paying jobs and thereby earn significantly higher incomes throughout their lifetimes, further positively impacting Arizona's economy and culture. Universities, especially through some of their research activities, are often able to partner with the private businesses through technology transfer programs and other activities that increase those businesses' efficiency, effectiveness, and product offerings and benefiting the Arizona economy and the community at large.

It is important to note that the analysis of the overall Public University Enterprise is based on spending and activities necessary to meet the needs of all students of the system – both those from Arizona and those from outside the state (see incremental impact described in Section 4.0). No attempt was made to estimate the economic opportunity costs of students' choice to attend one of the universities, rather than engage in other economic activity.

Economic Impacts

- The economic impacts generated by the universities in FY17 are outlined in the following table. The three universities employed a total of 36,725 people, excluding student workers, on a full-time or part-time basis. FY 2017 payroll was $2.6 billion with wages and salaries accounting for $1.9 billion and $679.8 million being employee related expenses.

- Student spending on items such as housing, utilities, groceries, retail merchandise, personal services and vehicle maintenance also impact the economy. The 136,239 traditional students (those attending in person, not online) in the Arizona Public University system spent an estimated $2.0 billion in FY17.

- Purchases of goods and services (within Arizona) by the universities for operating expenses, excluding payroll and construction, totaled $600.8 million in FY17.

- Construction outlays in FY17, excluding soft costs, totaled $323.7 million for all three universities.

- The spending of the university faculty & staff generated additional economic impact throughout the Arizona economy. Indeed, an estimated 11,393 jobs were generated in FY17 with wages of $489.6 million, value added of $750.5 million and total economic output of $1.7 billion.

- Student spending generated an estimated 19,743 total jobs with wages of $758.2 million, value added of $1.2 billion and economic output of $3.0 billion in the Arizona economy.

- The universities' purchases generated a total impact of 10,308 jobs, $472.4 million in wages, $688.0 million in value added and $1.2 billion in economic output.

- Construction spending generated a total of 4,047 direct, indirect and induced jobs with wages of $210.2 million, value added of $315.4 million and economic output of $571.7 million.

- In addition to the activities and spending described above, the universities draw visitors to Arizona for sporting events, family weekend, commencement, conferences, campus tours, and various other university sponsored events. Out-of-state visitors at these events bring outside dollars into the local economy generating jobs and creating additional economic impacts. In total, an estimated 2,139 jobs were created in FY17 with $69.6 million in wages, $104.5 million in value added and $181.4 million in economic output.

- **In total, the Arizona Public University Enterprise is estimated to generate 84,355 jobs with $4.6 billion in wages, $6.0 billion in value added and $11.1 billion in economic output for the Arizona economy.**

Economic Impact Summary
Arizona Public University Enterprise Impact
(Fiscal Year 2017)

	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Total Impact				
University Payroll & Employment	36,725	$2,582.9	$2,858.0	$4,395.9
Non-Payroll Operating Expenditures	10,308	$472.4	$688.0	$1,198.9
University Construction	4,047	$210.2	$315.4	$571.7
Spending by Faculty & Staff	11,393	$489.6	$750.5	$1,716.9
Student Spending	19,743	$758.2	$1,249.5	$2,990.5
Visitor Spending	2,139	$69.6	$104.5	$181.4
Total	**84,355**	**$4,582.9**	**$5,965.8**	**$11,055.3**

1/ The total may not equal the sum of the impacts due to rounding.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

Fiscal Impacts

The annual operations of the universities (including faculty, student and visitor spending) generate a wide range of taxable activities and in turn tax revenues for the State, counties, cities, and other local governments. Revenues have been defined in this analysis as either primary or secondary, depending on their source and how the dollars flow through the economy into tax accounts. Taxes paid directly by the university and sales taxes and bed taxes paid by students and visitors are described as Direct or Primary tax revenues. Secondary tax revenues, on the other hand, are those resulting from taxes on the wages and spending of the employees – direct, indirect and induced – supported by the system, living throughout the State.

The following table outlines the total fiscal impacts generated by all three universities' operations and the spending of faculty, students and visitors, including the secondary impact of those employees.

- During ongoing operations, the universities remitted an estimated $64.9 million in taxes to the State, county, city and other local entities in FY17. This figure excludes the direct sales taxes remitted by the university at the bookstore and restaurants to avoid double counting from the impacts generated by the spending of faculty, staff and students.

- Taxable spending by faculty and staff generated an estimated $41.5 million in state, county, city and other local government sales taxes in FY17 while student spending generated an estimated $67.5 million.

- Visitors generated an estimated $4.7 million in sales taxes and $2.1 million in bed tax (including the lodging sales tax).

- Secondary impacts generated by employee spending totaled an estimated $270.8 million. This includes the impact from the estimated 47,630 direct, indirect and induced employees and excludes the impacts accounted for in faculty and staff spending.

- **In total, the Arizona Public University Enterprise generated $451.7 million in state, county, city and other local taxes from both Primary and Secondary sources.**

Fiscal Impact Summary
Arizona Public University Enterprise
(Fiscal Year 2017)
($ Millions)

Primary Fiscal Impacts	**Total**
Direct taxes remitted by University	$64.9
Faculty & staff spending sales tax	$41.5
Student spending sales tax	$67.5
Visitor spending sales tax	$4.7
Visitor spending bed tax	$2.1
Sub-Total	**$180.8**
Secondary Fiscal Impacts	**Total**
Direct	$207.9
Indirect	$24.9
Induced	$38.0
Sub-Total	**$270.8**
Total Fiscal Impact	**$451.7**

NOTE: Impact includes state, county and local government revenues.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

Incremental Economic and Fiscal Impact Driven by Out of State Funding Sources

This report further breaks down the total impact (described above) by estimating the *incremental* impact being generated by the three public universities in Arizona derived by spending and other economic activity funded only by monies from sources outside Arizona. This includes federal government sources, and other out-of-state sources such as out-of-state tuition, fees, scholarships, grants, loan program revenues, private gifts, and contract revenue from out-of-state sources, including the federal government. This incremental analysis provides a defensible and conservative economic and fiscal impact estimate of the dollars "imported" into the state as a result of the Arizona Public University Enterprise operations. That is, the incremental impact represents the estimated share of the total impact that is generated by out-of-state dollars.

The incremental economic impact of the Arizona Public University Enterprise is estimated to have generated 31,760 jobs with $1.7 billion in wages, $2.2 billion in value added and $3.8 billion in economic output in FY17.

Incremental Economic Impact Summary from Out-of-State Dollars
Arizona Public University Enterprise Impact
(Fiscal Year 2017)

	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Total Impact				
University Payroll & Employment	13,230	$931.0	$1,030.2	$1,584.6
Non-Payroll Operating Expenditures	3,747	$171.7	$250.1	$435.8
University Construction	1,465	$76.1	$114.1	$206.9
Spending by Faculty & Staff	4,101	$176.3	$270.2	$618.5
Student Spending	7,078	$271.9	$448.0	$807.7
Visitor Spending	2,139	$69.6	$104.5	$181.4
Total	**31,760**	**$1,696.6**	**$2,217.1**	**$3,834.9**

1/ The total may not equal the sum of the impacts due to rounding. The net impact estimates the portion of the total impact that is genrated by out-of-state dollars.
Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

The related incremental fiscal impact of the three public universities is estimated to be $171.5 million for FY17. This includes primary revenues of $69.5 million and secondary revenues of $102.0 million.

Incremental Fiscal Impact Summary
Arizona Public University Enterprise Impact
(Fiscal Year 2017)
($ Millions)

Primary Fiscal Impacts	**Total**
Direct taxes remitted by University	$23.4
Faculty & staff spending sales tax	$14.9
Student spending sales tax	$24.3
Visitor spending sales tax	$4.7
Visitor spending bed tax	$2.1
Sub-Total	**$69.5**
Secondary Fiscal Impacts	**Total**
Direct	$77.9
Indirect	$9.6
Induced	$14.5
Sub-Total	**$102.0**
Total Fiscal Impact	**$171.5**

NOTE: Impact includes state, county and local government revenues.
Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

Benefits of Research Universities

Spending at universities on research related activities, most notably funded by the federal government, result in spending in the region. The total research expenditures at Arizona's three public universities exceeded $1.2 billion in fiscal year 2017. This represents about 26.1% of their total cumulative expenditures.

The Enterprise's research expenditures include spending for personnel salaries and benefits as well as spending on equipment, supplies, contracts and other spending. This spending impacts the region's and the state's economy. That spending, in turn, drives other economic activity in the state. In total, the statewide economic impact of the research expenditures of the Arizona Public University Enterprise exceed $2.0 billion dollars.

The estimated impacts from research spending activities are not in addition to the total impacts described above, but instead, the figures represent research spending's estimated share of total impacts.

1.0 Introduction

Elliott D. Pollack & Company, in cooperation with The Maguire Company, has been retained by the Arizona Board of Regents to perform an economic and fiscal impact study of the Arizona Public University Enterprise comprised of Arizona State University (ASU), Northern Arizona University (NAU) and the University of Arizona (UA). The analysis includes the impact of direct employment and wages as well and the impacts generated by university expenditures, the spending of faculty, staff and students and the additional impacts generated by the spending of out-of-state visitors within Arizona. Results of the analysis were based on data from Fiscal Year 2017 (FY17).

Economic impact analysis examines the regional implications of an activity in terms of four basic measures: output, value added, earnings, and job creation. Fiscal impact analysis evaluates the public revenues created by a particular activity. In a fiscal impact analysis, the primary revenue sources of a city, county, or state government are analyzed to determine how the activity may financially affect them. The fiscal impact figures outlined in this report focus on the taxes that will accrue to the State of Arizona, its counties, cities and other local governments.

The results of the impact analysis are substantial and significant. However, the careful methodology employed ensures that they are more likely to slightly understate the impacts rather than overstate them.

This study is subject to the following considerations and limiting conditions.

- This study is for the client's due diligence and other planning purposes. Neither the report, nor its contents, nor any of underlying work are intended to be included and, therefore, may not be referred to or quoted in whole or in part, in any registration statement, prospectus, public filing, private offering memorandum, or loan agreement without our prior written approval.

- The reported economic and fiscal impact findings outlined in this report represent the considered judgment of the authors based on the assumptions, analyses, and methodologies described in the report.

- Except as specifically stated to the contrary, this study does not give consideration to the following matters to the extent they exist: (i) matters of a legal nature, including issues of legal title and compliance with federal, state and local laws and ordinances; and (ii) environmental and engineering issues, and the costs associated with their correction. The users of this study will be responsible for making his/her own determination about the impact, if any, of these matters.

- This study is intended to be read and used as a whole and not in parts.

- This analysis does not consider the costs associated with providing services to the campuses. Such analysis is beyond the scope of this study. In addition, the analysis is based on the current tax structure and rates imposed by the affected municipalities. Changes in those rates would alter the findings of this study.

- The analysis outlined in this study is based on currently available information and estimates and assumptions about long-term future trends. Such estimates and assumptions are subject to uncertainty and variation. Accordingly, the authors do not represent them as results that will be achieved. Some assumptions inevitably will not materialize and unanticipated events and circumstances may occur; therefore, the actual results achieved may vary materially from the forecasted results. The assumptions disclosed in this market study are those that are believed to be significant to the projections of future results.

The following section will describe the assumptions and methodologies used to estimate the economic and fiscal impacts. Section 3.0 will detail the impacts of the ongoing operations of each university including spending of faculty, staff, students and visitors while Section 4.0 will describe the estimated incremental impact generated by out-of-state dollars. Section 5.0 will address the added benefits to the State of Arizona due to Research 1 universities and separately quantify the economic impacts of research spending.

2.0 Assumptions & Methodology

2.1 Analysis Assumptions

The inputs used to estimate the economic and fiscal impacts were provided by each university and then reviewed and compared for reasonableness. These operating inputs included the number of students, a headcount of employed faculty and staff and their respective wages, university expenditures for goods and services purchased within Arizona, and the estimated number of out-of-state visitors to university sponsored events. All estimates were provided for fiscal year 2017.

In addition to direct university inputs, the analysis used information from existing national and locally administered surveys to calculate the spending of the faculty and staff by income range, the monthly student spending estimates and the total spending of out-of-state visitors to Arizona.

The model also uses various industry average standards to run the secondary impacts of employees. For example, the Consumer Expenditure Survey findings were used to determine the spending patterns of employees based on their respective wages and Census survey results were used for calculating the percentage of employees that live within the county or city in which they work.

The following table summarizes the data inputs for each university. In total, there were 136,239 traditional seated students in FY17 and an additional 49,666 online students for a total of 185,905 students at the three public universities in Arizona.

In terms of the operating assumptions for the analysis, there were a total of 36,725 non-student workers at the three universities with $1.9 billion in wages and an additional $679.8 million in employee related expenses. These direct jobs include both full and part time employees as well as adjunct faculty, but not student workers.

University expenditures on items such as services, materials and equipment, advertising, utilities, rentals and travel totaled $1.5 billion, excluding salaries and capital expenditures. Of this total, an estimated $600.8 million was to local Arizona vendors. The local Arizona spend was used to estimate the jobs impact for the State of Arizona.

Capital expenditures totaled an estimated $373.0 million in FY17. This spending data was used to estimate the direct construction jobs generated in the local economy.

Analysis Assumptions
University Operating Data
Arizona Public University Enterprise Impact
(Fiscal Year 2017)

Students	**ASU**	**NAU**	**UA**	**Total**
In-State Undergrad	40,405	15,433	19,617	**75,455**
In-State Grad Student	5,399	1,810	4,674	**11,883**
Out-of-State Undergrad	18,793	8,268	10,200	**37,261**
Out-of-State Grad Student	7,231	762	3,647	**11,640**
Total Traditional Students	**71,828**	**26,273**	**38,138**	**136,239**
Online Students	31,702	8,281	9,683	**49,666**
Total Students	**103,530**	**34,554**	**47,821**	**185,905**
Employment	**ASU**	**NAU**	**UA**	**Total**
Total	24,212	9,771	21,993	**55,976**
Student workers	7,220	5,094	6,937	**19,251**
Total less student worker	**16,992**	**4,677**	**15,056**	**36,725**
Wages ($ mil)	**ASU**	**NAU**	**UA**	**Total**
Total	$906.1	$243.5	$865.9	**$2,015.4**
Student workers	$72.9	$14.9	$24.5	**$112.3**
Total wages less student worker	**$833.2**	**$228.6**	**$841.4**	**$1,903.1**
Employee related expense	$289.0	$76.1	$314.6	**$679.8**
Wages + employee related expense	**$1,122.2**	**$304.7**	**$1,156.0**	**$2,582.9**
Other Operating Expenditures ($ mil)	**ASU**	**NAU**	**UA**	**Total**
Total	$646.6	$142.9	$724.0	**$1,513.5**
Total Arizona spend	**$298.7**	**$71.8**	**$230.3**	**$600.8**
Construction Expenditures ($ mil)	**ASU**	**NAU**	**UA**	**Total**
Total	**$171.4**	**$61.0**	**$140.6**	**$373.0**

NOTE: Students represent a headcount. Employment estimates include both full and part time workers. Total expenditures exclude salaries and contract spending. Construction expenditures represent a five-year average for each university.

Sources: Elliott D. Pollack & Co.; ASU; NAU; UA

Surveys conducted by ASU and NAU (and extrapolated for UA) were used to estimate monthly student expenditures. Each category of student spending is then run through the model using the corresponding multiplier set to estimate total jobs and wages.

Student Spending Assumptions
Arizona Public University Enterprise Impact

Average Monthly Spending	ASU	NAU	UA
Housing	$561	$857	$504
Utilities	$159	$156	$143
Telecommunications	$114	$57	$103
Groceries	$221	$347	$250
Eating Out	$132	$124	$150
Entertainment	$85	$47	$63
Nonfood retail	$107	$88	$79
Personal services	$79	$142	$58
Vehicle maintenance & repair	$123	$137	$150
Total	**$1,581**	**$1,955**	**$1,500**

Sources: Elliott D. Pollack & Co.; ASU; NAU; UA

To estimate the impact of visitor spending, the total number of out-of-state visitors was calculated based on information provided by each university regarding sporting event attendance, parent weekend visitors, campus tours, conferences, orientation, and other special visitor generating events. The project team then estimated the length of stay for each type of event to generate an estimate of total out-of-state visitor days. Data on spending per person per day as well as average daily room rates was then used to calculate total spending and run the data through the visitor spending model. The following table provides the estimated direct spending for each university.

Visitor Spending Assumptions
Arizona Public University Enterprise Impact

	ASU	NAU	UA
Total out-of-state visitors	128,179	54,915	135,830
Average length of stay	2.0	1.9	1.8
Persons per room	2.5	2.5	2.5
Percent of visitors stay in hotel	70%	70%	70%
Total non-lodging expenditures ($mil)	$39.1	$15.6	$35.8
Total lodging expenditures ($mil)	$9.2	$3.4	$7.0

Sources: Elliott D. Pollack & Co., ASU; NAU; UA

2.2 Economic Impact Methodology

Economic impact analysis examined the economic implications of an activity in terms of output, earnings, and employment. For this study, the analysis focused on the jobs and corresponding jobs and wages for each of the various operations at the universities as well as impacts from faculty, student and visitor spending.

The different types of economic impacts are known as direct, indirect, and induced, according to the manner in which the impacts are generated. For instance, direct employment consists of permanent jobs held by the university employees. Indirect employment includes those jobs created by businesses that provide goods and services essential to the operations of the universities. Finally, the spending of the wages and salaries of the direct and indirect employees on items such as food, housing, transportation, and medical services creates induced employment in all sectors of the economy, throughout the state.

Multipliers have been developed to estimate the indirect and induced impacts of various direct economic activities. The IMPLAN Group, LLC developed the multipliers used in this study. The economic impact is categorized into four types of impacts:

(1) Employment Impact – the total wage, salary and self employed jobs in a region. Jobs include both part time and full time workers, though the figure is expressed in full time equivalents.

(2) Earnings Impact – the personal income, earnings or wages, of the direct, indirect and induced employees. Earnings include total wage and salary payments as well as benefits of health and life insurance, retirement payments and any other non-cash compensation.

(3) Value Added - The difference between the total output and the cost of its intermediate inputs. It consists of compensation of employees, indirect business taxes and nontax payments, and gross operating surplus.

(4) Economic Output – the economic output relates to the gross receipts for goods or services generated by the operations. It represents the total value of industry production.

Economic impacts are by their nature regional in character. The impact will be felt throughout all of Arizona.

2.3 Fiscal Impact Methodology

Fiscal impact analysis quantifies the public revenues associated with a particular economic activity. The primary revenue sources of local, county, and state governments (i.e. taxes) were analyzed to determine how an activity may affect the various jurisdictions. This report focuses on the taxes that will accrue to the State, counties, cities, and other local governments.

Fiscal impact figures cited in this report have been generated from information provided by a variety of sources including the U.S. Bureau of the Census, the U.S. Department of Labor, the Internal Revenue Service, the State of Arizona, the Arizona Tax Research Association, and the U.S. Consumer Expenditure Survey. Elliott D. Pollack & Company relied upon data provided by each university for estimates of operations.

Fiscal impacts are categorized by type in this study, similar to the economic impact analysis. The major sources of revenue generation for governmental entities are related to ongoing impacts from the operations, faculty & staff spending, monthly student spending, and estimated visitor spending. Revenues were generated through sales tax, bed taxes, income tax and State shared revenue.

The following is a description of the applicable revenue sources that will be considered for this analysis.

- Prime Contracting Tax

  The State, counties, and cities levy a sales tax on materials used in the construction of buildings and land improvements. That tax is calculated by State law under the assumption that 65% of the construction cost of the facility and its land improvements are related to construction materials with the remaining 35% as a deduction for labor. The sales tax rate is then applied to the 65% materials figure.

  The prime contracting tax is a one-time collection by the governmental entity. The State currently levies a 5.6% sales tax on construction activity (a portion of which is shared with local governments). Maricopa County's rate is 0.7%, Coconino's rate is 1.3% and Pima County's rate is 0.5%. The weighted average rate for counties is 0.71% and the weighted tax rate for cities and other local governments contracting is 2.38%.

- Transaction Privilege (Sales) Tax

  The State, counties, and local cities in Arizona levy a tax on the privilege of transacting business. Often referred to as a sales tax, the tax is levied on retail goods, restaurant and bar sales, utilities, commercial leases (at the city level), and other various categories. The tax rate for the State is 5.6%. Portions of this tax are redistributed through revenue sharing to counties and cities throughout Arizona based on population and other factors. Maricopa County's rate is 0.7%, Coconino's rate is 1.3% and Pima County's rate is 0.5%. The weighted average sales tax rates for counties and local governments are 0.71% and 2.21%, respectively.

  These tax rates are applied to the direct sales on each campus as well as to the estimated spending of faculty & staff, visitors and the indirect and induced employees calculated in the report.

- Bed Tax

  The State, counties, and local cities in Arizona charge sales and bed tax on room revenues. The bed tax rate for the State is 5.5%. Maricopa County's rate is 1.77%, Coconino County's

bed tax rate is 1.4% and Pima County's rate is 0.55%. The cities and other local governments throughout Arizona levy a weighted average bed tax rate, including sales tax, of 5.68%.

- State Income Tax
  The State of Arizona collects taxes on personal income. The tax rate used in the analysis averages about 1.9% for earnings. These percentages are based on the most recently available income tax data from the State and the projected wage levels of jobs created by the construction and operations impact. This tax is applied to the wages and earnings of direct, indirect, and induced employees. Portions of this tax are redistributed through revenue sharing to cities and towns throughout Arizona based on population.

- Property Taxes
  Property taxes will be collected on the homes occupied by the employees throughout Arizona. This estimated taxable value assumes that employees will occupy units in a pattern similar to the current inventory of housing in the State. The average county rate is $2.201 per $100 of assessed value. Assessed value is 10% of the valuation for tax purposes, roughly the market value. The rate for the cities and other local governments (excluding school and special districts) is calculated at $1.6053 per $100 of assessed value.

- Highway User Revenue Fund Taxes
  The State of Arizona collects specific taxes for the Highway User Revenue Fund (HURF). Both the registration fees and the motor vehicle fuel tax (gas tax) are considered in this analysis. The motor vehicle fuel tax is $0.18 per gallon and is calculated based on a vehicle traveling 12,000 miles per year at 20 miles per gallon. Registration fees average $66 per employee in the State of Arizona. These factors are applied to the projected direct, indirect, and induced employee counts.

- Vehicle License Taxes
  The vehicle license tax (VLT)is a personal property tax on vehicles that is paid at the time of annual vehicle registration. This factor is applied to the projected direct, indirect, and induced employee count. The average tax used in this analysis is $325 per employee. VLT collections are distributed through the Highway User Revenue Fund and shared with counties and cities based on statutory formulas.

- State Shared Revenues
  Each city in Arizona receives a portion of State revenues from four different sources - state sales tax, state income tax, VLT, and the HURF. Counties also receive state shared revenues from sales tax, VLT and HURF (but not from the state income tax). The formulas for allocating these revenues are primarily based on population.

The above tax categories represent the largest sources of revenues that will be generated for the State, counties, cities and other local governments. This analysis considers gross tax collections and does not differentiate among dedicated purposes or uses of such gross tax collections.

3.0 Impact of Operations

Each year, operations of each university generate jobs and tax revenue. The impacts are generated by direct employment as well as the direct spending in the economy. Furthermore, the additional impacts are generated by the spending of the faculty & staff, the spending of the students who live in the area about nine months of the year, and the spending of visitors that spend out-of-state dollars in the local economy.

3.1 Economic Impact of Operations

The economic impact of operations of each university is outlined in the following tables.

Direct Employment and Wages

The universities directly affect the economy by employing 36,725 full and part-time employees including faculty, faculty associates, graduate assistants, support staff, university administration and other workers (excluding students) as of FY17. Wages for these positions totaled an estimated $2.6 billion, including employee related expenses. This translates to an estimated $2.9 billion in value added and $4.4 billion in economic output for the State of Arizona.

Direct Employment and Wages
Arizona Public University Enterprise Impact
(Fiscal Year 2017)

University	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Arizona State University	16,992	$1,122.2	$1,241.7	$1,909.9
Northern Arizona University	4,677	$304.7	$337.2	$518.6
University of Arizona	15,056	$1,156.0	$1,279.1	$1,967.4
Total	**36,725**	**$2,582.9**	**$2,858.0**	**$4,395.9**

1/ The total may not equal the sum of the impacts due to rounding.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

Non-Payroll Operating Expenditures

The purchases of goods and services used for university operations also generate an economic impact in the State of Arizona. Excluding payroll wages and construction spending, the three public universities spent an estimated $600.8 million in the Arizona economy in FY17 generating an estimated 6,280 direct jobs. In total, this spending supported 10,308 direct, indirect, and induced jobs with $472.4 million in wages, $688.0 in value added and $1.2 billion in economic output.

Non-Payroll Operating Expenditures
Arizona Public University Enterprise Economic Impact
(Fiscal Year 2017)

Impact Type	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Arizona State University				
Direct	3,122	$137.7	$174.8	$298.7
Indirect	796	$40.8	$66.1	$120.2
Induced	1,206	$56.4	$101.1	$177.2
Total	**5,124**	**$234.8**	**$342.0**	**$596.0**
Northern Arizona University				
Direct	751	$33.1	$42.0	$71.8
Indirect	192	$9.8	$15.9	$28.9
Induced	290	$13.6	$24.3	$42.6
Total	**1,233**	**$56.5**	**$82.3**	**$143.4**
University of Arizona				
Direct	2,407	$106.2	$134.8	$230.3
Indirect	614	$31.4	$51.0	$92.7
Induced	930	$43.5	$77.9	$136.6
Total	**3,951**	**$181.1**	**$263.7**	**$459.6**
Total				
Direct	6,280	$277.0	$351.6	$600.8
Indirect	1,602	$82.0	$133.0	$241.7
Induced	2,426	$113.4	$203.3	$356.4
Total	**10,308**	**$472.4**	**$688.0**	**$1,198.9**

1/ The total may not equal the sum of the impacts due to rounding.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

Construction

University construction outlays can vary from year to year. For this analysis, a five year average was used to smooth out the varying annual outlays. The five-year average construction spending for all three public universities was $373.0 million. Of this amount, $49.3 million was estimated as soft costs such as legal fees and design fees that are captured in the indirect construction impact and, thus, excluded from the calculation of direct jobs. The $323.7 million of hard costs generated an estimated 2,506 direct construction jobs in Arizona. The ripple effect from this activity generated an additional 1,541 jobs for a total of 4,047 direct, indirect and induced jobs with $210.2 million in wages, $315.4 million in value added and $571.7 million in economic output.

Construction

Arizona Public University Enterprise Economic Impact

(Fiscal Year 2017)

Impact Type	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Arizona State University				
Direct	1,128	$58.7	$80.3	$145.7
Indirect	207	$13.1	$20.9	$40.1
Induced	487	$22.8	$40.8	$71.5
Total	**1,821**	**$94.6**	**$141.9**	**$257.3**
Northern Arizona University				
Direct	406	$21.1	$28.9	$52.4
Indirect	74	$4.7	$7.5	$14.4
Induced	175	$8.2	$14.7	$25.7
Total	**655**	**$34.0**	**$51.1**	**$92.6**
University of Arizona				
Direct	972	$50.6	$69.2	$125.6
Indirect	179	$11.3	$18.0	$34.6
Induced	419	$19.6	$35.2	$61.6
Total	**1,570**	**$81.6**	**$122.4**	**$221.8**
Total				
Direct	2,506	$130.5	$178.4	$323.7
Indirect	460	$29.1	$46.4	$89.1
Induced	1,081	$50.6	$90.6	$158.9
Total	**4,047**	**$210.2**	**$315.4**	**$571.7**

1/ The total may not equal the sum of the impacts due to rounding.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

Faculty & Staff Spending

The 36,725 employees of the three public universities spend their income on goods and services throughout Arizona. Based on the Consumer Expenditure Survey by income range, estimates for spending by category were calculated and run through their respective multipliers in order to estimate the jobs created from this spending. Categories range from various retail stores, to restaurants, amusement and recreation, transportation, auto repair, insurance, health care, utilities, and personal services.

Over $1.0 billion in spending by faculty & staff generated an estimated 7,242 direct jobs in FY17. Ripple effects of this spending generated an additional 4,151 indirect and induced jobs throughout Arizona with wages of $489.6 million, value added of $750.5 million, and $1.7 billion in total economic output.

Faculty & Staff Spending

Arizona Public University Enterprise Economic Impact

(Fiscal Year 2017)

Impact Type	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Arizona State University				
Direct	3,835	$141.8	$191.4	$470.4
Indirect	795	$42.4	$74.3	$144.1
Induced	1,240	$58.0	$103.9	$182.2
Total	**5,871**	**$242.2**	**$369.7**	**$796.7**
Northern Arizona University				
Direct	1,053	$39.0	$52.6	$129.2
Indirect	219	$11.7	$20.4	$39.6
Induced	341	$15.9	$28.6	$50.1
Total	**1,613**	**$66.5**	**$101.6**	**$218.9**
University of Arizona				
Direct	2,353	$103.9	$142.9	$450.2
Indirect	631	$33.7	$58.8	$115.3
Induced	925	$43.3	$77.5	$135.9
Total	**3,910**	**$180.8**	**$279.2**	**$701.4**
Total				
Direct	7,242	$284.7	$386.9	$1,049.8
Indirect	1,645	$87.8	$153.6	$298.9
Induced	2,506	$117.2	$210.0	$368.1
Total	**11,393**	**$489.6**	**$750.5**	**$1,716.9**

1/ The total may not equal the sum of the impacts due to rounding.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

Student Spending

A total of 136,239 traditional students attended ASU, NAU and UA during FY17. Based on surveys produced by each university on average monthly student expenditures and taking into account the nine months of the fall and spring semester, a total of $2.0 billion was spent throughout Arizona on student living expenses.

The student spending impact takes into account that some students live on campus and, thus, their housing impact is accounted for in university operations. In addition, the spending on housing is further reduced by a factor to consider the share of rental income spent on labor and other direct community operations.

In total an estimated 13,487 direct jobs are created in the State of Arizona from student spending. This spending created a ripple effect of 6,256 indirect and induced jobs. In total, an estimated 19,743 jobs were created in FY17 with wages of $758.2 million, value added of $1.2 billion and $3.0 billion.

Student Spending
Arizona Public University Enterprise Economic Impact
(Fiscal Year 2017)

Impact Type	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Arizona State University				
Direct	7,007	$236.9	$364.6	$1,022.0
Indirect	1,246	$62.2	$117.1	$222.7
Induced	2,020	$94.4	$169.3	$296.7
Total	**10,274**	**$393.6**	**$651.0**	**$1,541.4**
Northern Arizona University				
Direct	2,932	$97.8	$151.6	$462.3
Indirect	500	$24.4	$46.8	$86.6
Induced	825	$38.5	$69.1	$121.1
Total	**4,256**	**$160.8**	**$267.5**	**$669.9**
University of Arizona				
Direct	3,547	$124.0	$184.9	$514.9
Indirect	618	$30.9	$58.4	$110.5
Induced	1,047	$48.9	$87.7	$153.7
Total	**5,212**	**$203.9**	**$331.0**	**$779.1**
Total				
Direct	13,487	$458.7	$701.1	$1,999.2
Indirect	2,364	$117.5	$222.3	$419.8
Induced	3,892	$181.9	$326.1	$571.5
Total	**19,743**	**$758.2**	**$1,249.5**	**$2,990.5**

1/ The total may not equal the sum of the impacts due to rounding.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

Visitor Spending

Each of the three universities provided data on the estimates of FY17 out-of-state attendees to sporting events, family weekend, campus tours, conferences, cultural events and other university specific events (such as Gammage at ASU or Centennial Hall at UA). In total, an estimated 318,924 out-of-state visitors came to Arizona for an average of 1.9 nights. Total spending, excluding lodging, equated to about $90.6 million. Taking into account an estimated

2.5 persons per room and that not all visitors stayed in a hotel, total spending on lodging was estimated to have been $19.6 million in FY17.

This spending generated an estimated 1,563 direct jobs with $41.1 million in wages in the tourism industry and $93.3 million in direct economic output. The ripple effect of this spending generated an additional 576 jobs with $28.4 million in wages. In total, visitor spending generated an estimated 2,139 jobs with $69.6 million in wages, $104.5 million in value added and $181.4 in economic output for FY17.

Visitor Spending
Arizona Public University Enterprise Economic Impact
(Fiscal Year 2017)

Impact Type	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Arizona State University				
Direct	754	$20.1	$26.0	$44.3
Indirect	104	$5.6	$9.3	$16.9
Induced	174	$8.1	$14.5	$25.5
Total	**1,031**	**$33.8**	**$49.8**	**$86.7**
Northern Arizona University				
Direct	299	$8.0	$10.2	$17.5
Indirect	41	$2.2	$3.7	$6.7
Induced	69	$3.2	$5.8	$10.1
Total	**409**	**$13.4**	**$19.7**	**$34.2**
University of Arizona				
Direct	509	$13.1	$18.9	$31.5
Indirect	74	$4.0	$6.5	$12.0
Induced	115	$5.4	$9.7	$16.9
Total	**699**	**$22.4**	**$35.1**	**$60.5**
Total				
Direct	1,563	$41.1	$55.1	$93.3
Indirect	219	$11.7	$19.4	$35.6
Induced	358	$16.7	$30.0	$52.5
Total	**2,139**	**$69.6**	**$104.5**	**$181.4**

1/ The total may not equal the sum of the impacts due to rounding.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

3.2 Fiscal Impact of Operations

The following table provides the estimated tax revenues that were generated by the operations of the universities and collected by the State, counties, cities and other local governments. Revenues have been defined in this analysis as either primary or secondary, depending on their source and how the dollars flow through the economy into tax accounts. For instance, some revenues, such as direct taxes paid by the university or sales and bed taxes paid by visitors, are straightforward calculations based on the value of the good purchased. These revenues are described as direct or Primary revenues. Secondary revenues, on the other hand, flow from the wages of those direct, indirect, and induced employees who are supported by the project, living throughout the State. Revenue projections are based on typical wages of the employees working in the project, their spending patterns, and projections of where they might live.

Primary Revenues

During ongoing operations the universities remitted an estimated $64.9 million in taxes to State, counties, cities, and other local governments in FY17. This figure excludes the direct sales taxes remitted by the university at the bookstore and restaurants to avoid double counting from the impacts generated by the spending of faculty, staff and students. Tax data provided by the universities represents total tax collections by all jurisdictions and was not broken down by State, county, city or other local government.

Faculty & Staff Spending

Taxable spending by faculty and staff generated an estimated $25.2 million for the State of Arizona, $3.3 million for counties and $13.0 million for local governments. The analysis assumes that majority of the spending for each university occurs within its respective county and, thus, uses that county's sales tax rates. In total, an estimated $41.5 million in sales revenues was generated for state, county, city, and other local governments in FY17.

Student Spending

Sales taxes generated by students are based on student spending survey results for categories that are taxable for each jurisdiction. Residential rental tax, for example, is not levied by the State of Arizona nor its counties, but is levied by most cities. Similarly, groceries are not taxed by State or county governments. Thus, total "taxable" spending varies between jurisdictions. Student spending of all three universities generated an estimated $29.2 million for the State, $4.1 million for the respective counties and $34.2 million for city governments.

Visitor Spending

The visitors to university sponsored events generated an estimated $2.9 million in sales taxes for the State of Arizona, $388,400 for counties and $1.5 million for city governments. Taxes on lodging (including both the specific bed tax and the associated sales tax on lodging), paid by those visitors generated an estimated $779,600 for the State of Arizona, $248,700 for counties and $1.1 million for city governments.

Total Primary Impact

The university, associated faculty & staff, their students, and the out-of-state visitors generated an estimated $58.1 million in direct primary taxes for the State of Arizona in FY17, $8.0 million for the

associated counties and $49.8 million for city governments. Total Primary fiscal impact for all jurisdictions was $180.9 million in FY17.

Primary Fiscal Impact of Operations
Arizona Public University Enterprise Impact
Fiscal Year 2017

Direct Primary Taxes Paid by University	Arizona State University	Northern Arizona University	University of Arizona	Total
Sales, use and lease tax	$25,947,400	$5,996,200	$32,849,600	$64,793,200
Property tax	$54,100	$0	$85,800	$139,900
Sub-Total	**$26,001,500**	**$5,996,200**	**$32,935,400**	**$64,933,100**
Other Primary Taxes by Spending Category				**Total**
State				
Faculty & staff sales tax	$11,291,200	$3,102,200	$10,791,000	$25,184,400
Student spending sales tax	$16,555,700	$4,787,700	$7,903,700	$29,247,100
Visitor spending sales tax	$1,241,500	$496,400	$1,136,900	$2,874,800
Visitor spending bed tax	$338,700	$216,200	$224,700	$779,600
Sub-Total	**$29,427,100**	**$8,602,500**	**$20,056,300**	**$58,085,900**
County				
Faculty & staff sales tax	$1,620,300	$619,800	$1,058,700	$3,298,800
Student spending sales tax	$2,161,200	$1,160,700	$737,000	$4,058,900
Visitor spending sales tax	$162,100	$120,300	$106,000	$388,400
Visitor spending bed tax	$162,100	$47,900	$38,700	$248,700
Sub-Total	**$4,105,700**	**$1,948,700**	**$1,940,400**	**$7,994,800**
Local Governments				
Faculty & staff sales tax	$5,822,200	$1,599,600	$5,564,300	$12,986,100
Student spending sales tax	$17,954,100	$7,197,300	$9,079,400	$34,230,800
Visitor spending sales tax	$640,200	$255,900	$586,200	$1,482,300
Visitor spending bed tax	$520,200	$194,500	$399,800	$1,114,500
Sub-Total	**$24,936,700**	**$9,247,300**	**$15,629,700**	**$49,813,700**
Total				
Faculty & staff sales tax	$18,733,700	$5,321,600	$17,414,000	$41,469,300
Student spending sales tax	$36,671,000	$13,145,700	$17,720,100	$67,536,800
Visitor spending sales tax	$2,043,800	$872,600	$1,829,100	$4,745,500
Visitor spending bed tax	$1,021,000	$458,600	$663,200	$2,142,800
Sub-Total	**$58,469,500**	**$19,798,500**	**$37,626,400**	**$115,894,400**
Total Primary Fiscal Impact	**$84,471,000**	**$25,794,700**	**$70,561,800**	**$180,827,500**

1/ The total may not equal the sum of the impacts due to rounding. All of the above figures are representative of the major revenue sources for the State and are based on current economic structure and tax rates.

Source: ASU; NAU; UA; Elliott D. Pollack & Co.; ADOR; ATRA

Secondary Revenues from Employee Spending

Secondary revenues from employees are calculated based on the spending estimates of direct, indirect, and induced employees described in the economic impact section of this report. In total, there were an estimated 46,273 jobs created in FY17. This figure excludes the direct faculty and staff jobs accounted for in primary revenue estimates.

State of Arizona Revenues

Secondary impacts generated by employee spending totaled an estimated $135.8 million for the State of Arizona in FY17. This includes $29.7 million in estimated sales tax collections and $71.3 million in personal income taxes.

Secondary Fiscal Impact
Arizona Public University Enterprise Impact
State of Arizona
(Fiscal Year 2017)
($ Millions)

Impact Type	Employee Spending Sales Tax	Personal Income Tax	Unempl. Tax	Vehicle License Tax	Highway User Tax	Total Revenues
Arizona State University						
Direct	$9.3	$27.1	$6.2	$4.8	$2.5	**$49.9**
Indirect	$2.3	$2.6	$0.6	$0.5	$0.2	**$6.1**
Induced	$3.4	$3.5	$1.0	$0.7	$0.4	**$9.1**
Total	**$14.9**	**$33.2**	**$7.8**	**$6.0**	**$3.2**	**$65.1**
Northern Arizona University						
Direct	$3.1	$7.4	$1.9	$1.5	$0.8	**$14.7**
Indirect	$0.7	$0.8	$0.2	$0.1	$0.1	**$2.0**
Induced	$1.1	$1.2	$0.3	$0.2	$0.1	**$3.0**
Total	**$5.0**	**$9.4**	**$2.4**	**$1.9**	**$1.0**	**$19.7**
University of Arizona						
Direct	$6.0	$24.6	$4.7	$3.6	$1.9	**$40.8**
Indirect	$1.5	$1.8	$0.4	$0.3	$0.2	**$4.2**
Induced	$2.3	$2.4	$0.6	$0.5	$0.3	**$6.1**
Total	**$9.8**	**$28.7**	**$5.7**	**$4.4**	**$2.3**	**$51.0**
Total						
Direct	$18.4	$59.1	$12.8	$9.9	$5.2	**$105.4**
Indirect	$4.5	$5.2	$1.2	$0.9	$0.5	**$12.3**
Induced	$6.9	$7.0	$1.9	$1.5	$0.8	**$18.1**
Total	**$29.7**	**$71.3**	**$15.9**	**$12.3**	**$6.5**	**$135.8**

1/ The figures are intended only as a general guideline as to how the State could be impacted by the project. The above figures are based on the current economic structure and tax rates

Source: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN; AZ Dept. of Revenue; ATRA

County Revenues

County governments received an estimated $59.6 million in tax revenues from the projected FY17 employee spending. Sales tax on local goods purchased was about $6.1 million. Estimated property tax collections on homes employee occupied homes totaled another $34.5 million and state shared revenues were about $19.1 million.

Secondary Fiscal Impact
Arizona Public University Enterprise Impact
County Governments
(Fiscal Year 2017)
($ Millions)

Impact Type	Employee Spending Sales Tax	Employee Property Tax	State Shared Revenues	Total Revenues
Arizona State University				
Direct	$1.9	$13.4	$7.0	**$22.3**
Indirect	$0.5	$1.3	$0.9	**$2.7**
Induced	$0.7	$2.1	$1.5	**$4.3**
Total	**$3.1**	**$16.8**	**$9.4**	**$29.2**
Northern Arizona University				
Direct	$0.6	$4.1	$2.2	**$7.0**
Indirect	$0.1	$0.4	$0.3	**$0.9**
Induced	$0.2	$0.7	$0.5	**$1.4**
Total	**$1.0**	**$5.2**	**$3.0**	**$9.3**
University of Arizona				
Direct	$1.2	$10.2	$5.1	**$16.5**
Indirect	$0.3	$0.9	$0.6	**$1.8**
Induced	$0.5	$1.4	$1.0	**$2.9**
Total	**$2.0**	**$12.4**	**$6.7**	**$21.1**
Total				
Direct	**$3.8**	**$27.7**	**$14.3**	**$45.8**
Indirect	**$0.9**	**$2.6**	**$1.9**	**$5.3**
Induced	**$1.4**	**$4.2**	**$2.9**	**$8.5**
Total	**$6.1**	**$34.5**	**$19.1**	**$59.6**

1/ The figures are intended only as a general guideline as to how the counties could be impacted. The above figures are based on the current economic structure and tax rates of the counties.

Source: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN; AZDOR

Local Government Revenues

Cities, towns and other local governments collected an estimate $75.4 million in FY17 from the spending of the direct, indirect and induced employees described in this analysis. This includes $19.1 million in sales taxes, $26.1 million in property taxes and $30.2 million in state shared revenues.

Secondary Fiscal Impact
Arizona Public University Enterprise Impact
Cities and Other Local Governments
(Fiscal Year 2017)
($ Millions)

Impact Type	Employee Spending Sales Tax	Employee Property Tax	State Shared Revenues	Total Revenues
Arizona State University				
Direct	$6.0	$10.2	$11.4	**$27.5**
Indirect	$1.4	$1.0	$1.2	**$3.7**
Induced	$2.2	$1.6	$1.9	**$5.7**
Total	**$9.6**	**$12.7**	**$14.5**	**$36.8**
Northern Arizona University				
Direct	$2.0	$3.1	$3.4	**$8.5**
Indirect	$0.5	$0.3	$0.4	**$1.2**
Induced	$0.7	$0.5	$0.6	**$1.9**
Total	**$3.2**	**$4.0**	**$4.4**	**$11.6**
University of Arizona				
Direct	$3.8	$7.7	$9.2	**$20.7**
Indirect	$1.0	$0.7	$0.8	**$2.5**
Induced	$1.5	$1.1	$1.3	**$3.8**
Total	**$6.3**	**$9.4**	**$11.3**	**$27.0**
Total				
Direct	$11.8	$21.0	$24.0	**$56.8**
Indirect	$2.9	$1.9	$2.5	**$7.3**
Induced	$4.4	$3.2	$3.8	**$11.3**
Total	**$19.1**	**$26.1**	**$30.2**	**$75.4**

1/ The figures are intended only as a general guideline as to how the local governments could be impacted by the activity. The above figures are based on the current economic structure and tax rates.

Source: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN; AZ Dept. of Revenue; ATRA

In total, the Arizona Public University Enterprise generated an estimated $451.7 million in primary and secondary revenues for the State of Arizona, county, city and other local governments in FY17.

Fiscal Impact Summary
Arizona Public University Enterprise Impact
(Fiscal Year 2017)
($ Millions)

	Arizona State University	Northern Arizona University	University of Arizona	Total
Primary revenues	$84.5	$25.8	$70.6	$180.8
Secondary Revenues	$131.2	$40.5	$99.1	$270.8
Total Fiscal Impact	**$215.7**	**$66.3**	**$169.7**	**$451.7**

NOTE: Impact includes State, County, City and other local government revenues.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

4.0 Incremental Economic and Fiscal Benefits

Section 3.0 of this report describes the ***total*** impact of the Arizona Public University Enterprise, including in-state and out-of-state funding of university operations.

This section of the report further breaks the total impact down by estimating the ***incremental*** impact being generated by the three public universities in Arizona derived by spending and other economic activity funded only by monies from sources outside Arizona. This includes federal government sources, and other out-of-state sources such as out-of-state tuition, fees, scholarships, grants, loan program revenues, private gifts and contract revenues from out-of-state sources, including the federal government.

This incremental analysis provides a defensible and conservative economic and fiscal impact estimate of the dollars "imported" into the state as a result of the Arizona Public University Enterprise operations. That is, the incremental impact represents the estimated share of the total impact that is generated by out-of-state dollars.

Each impact category was reviewed to determine its incremental impact. Indeed, visitor impacts remain unchanged from the total impact to the incremental impact, as the dollars used in the analysis already take into account only out-of-state visitor spending. To calculate the incremental student spending impact, only the estimated spending of the out-of-state students was utilized. For university operations, sources of funds from each university were reviewed and an overall factor for the out-of-state sources was calculated based on information provided by each university.

This incremental impact was calculated to provide a defensible and conservative economic and fiscal impact estimate of the dollars imported into the state as a result of the Enterprise's operations. However, care should be taken when comparing impact results between the Arizona Public University Enterprise and other universities throughout the U.S. Indeed, most existing university impact studies completed by other firms only provide the total impact without calculating these incremental impacts.

4.1 Incremental Economic Impact

The incremental economic impact of the Arizona Public University Enterprise is estimated to have generated 31,760 jobs with nearly $1.7 billion in wages, over $2.2 billion in value added and over $3.8 billion in economic output in FY17.

Incremental Economic Impact Summary from Out-of-State Dollars
Arizona Public University Enterprise Impact
(Fiscal Year 2017)

	Employment	Labor Income ($ mil)	Value Add ($ mil)	Economic Output ($ mil)
Arizona State University				
University Payroll & Employment	6,156	$406.6	$449.9	$692.0
Non-Payroll Operating Expenditures	1,871	$85.7	$124.9	$217.6
University Construction	665	$34.5	$51.8	$94.0
Spending by Faculty & Staff	2,127	$87.8	$133.9	$288.6
Student Spending	3,722	$142.6	$235.9	$427.1
Visitor Spending	1,031	$33.8	$49.8	$86.7
Total	**15,573**	**$791.0**	**$1,046.2**	**$1,806.0**
Northern Arizona University				
University Payroll & Employment	1,607	$104.7	$115.9	$178.2
Non-Payroll Operating Expenditures	404	$18.5	$27.0	$47.0
University Construction	215	$11.2	$16.7	$30.3
Spending by Faculty & Staff	554	$22.9	$34.9	$75.2
Student Spending	1,463	$55.3	$91.9	$160.6
Visitor Spending	409	$13.4	$19.7	$34.2
Total	**4,653**	**$225.9**	**$306.1**	**$525.7**
University of Arizona				
University Payroll & Employment	5,466	$419.7	$464.4	$714.3
Non-Payroll Operating Expenditures	1,472	$67.4	$98.2	$171.2
University Construction	585	$30.4	$45.6	$82.6
Spending by Faculty & Staff	1,419	$65.7	$101.4	$254.6
Student Spending	1,893	$74.0	$120.2	$220.0
Visitor Spending	699	$22.4	$35.1	$60.5
Total	**11,534**	**$679.7**	**$864.8**	**$1,503.2**
Total Impact				
University Payroll & Employment	13,230	$931.0	$1,030.2	$1,584.6
Non-Payroll Operating Expenditures	3,747	$171.7	$250.1	$435.8
University Construction	1,465	$76.1	$114.1	$206.9
Spending by Faculty & Staff	4,101	$176.3	$270.2	$618.5
Student Spending	7,078	$271.9	$448.0	$807.7
Visitor Spending	2,139	$69.6	$104.5	$181.4
Total	**31,760**	**$1,696.6**	**$2,217.1**	**$3,834.9**

1/ The total may not equal the sum of the impacts due to rounding. The net impact estimates the portion of the total impact that is genrated by out-of-state dollars.

Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

4.2 Incremental Fiscal Impact

The incremental fiscal impact of the three public universities is estimated to be $171.5 million for FY17. This includes primary revenues of $69.5 million and secondary revenues of $102.0 million.

Incremental Fiscal Impact Summary from Out-of-State Dollars
Arizona Public University Enterprise Impact
(Fiscal Year 2017)
($ Millions)

Primary Fiscal Impacts	Arizona State University	Northern Arizona University	University of Arizona	Total
Direct taxes remitted by University	$9.4	$2.1	$12.0	$23.4
Faculty & staff spending sales tax	$6.8	$1.8	$6.3	$14.9
Student spending sales tax	$13.4	$4.4	$6.4	$24.3
Visitor spending sales tax	$2.0	$0.9	$1.8	$4.7
Visitor spending bed tax	$1.0	$0.5	$0.7	$2.1
Sub-Total	**$32.6**	**$9.7**	**$27.2**	**$69.5**
Secondary Fiscal Impacts	Arizona State University	Northern Arizona University	University of Arizona	Total
Direct	$37.6	$10.9	$29.4	$77.9
Indirect	$4.8	$1.5	$3.3	$9.6
Induced	$7.3	$2.3	$4.9	$14.5
Sub-Total	**$49.7**	**$14.7**	**$37.6**	**$102.0**
Total Fiscal Impact	**$82.4**	**$24.3**	**$64.8**	**$171.5**

NOTE: Impact includes state, county and local government revenues.
Sources: ASU; NAU; UA; Elliott D. Pollack & Co.; IMPLAN

5.0 Benefits of Tier 1 Research Universities

Contemporary American universities have evolved over the last century to address multiple missions and, consequently, have taken on an enlarged role in civic and economic matters. The changes have been most dramatic for the large public, doctoral degree awarding universities with vigorous research activities. The most active of these research universities are often referred to as Research 1 institutions.

The 100 plus research universities designated as Research 1 award significant numbers of doctoral degrees annually and are engaged in significant research as measured by dollar value of research grants received. These generally include the largest universities in the country and include both public and private, non-profit institutions. The designation is assigned as a part of the Carnegie Classification of Institutions of Higher Education which is currently administered by the Indiana University Center for Postsecondary Research. Generally, these institutions have varied and complex research missions in addition to their core mission of teaching and training students.

Role of Research at Universities

As externally funded research grants have grown since the end of World War II, the importance on university research has increased dramatically. University based research especially that undertaken in close collaboration with private businesses and industry, has facilitated much of the explosion of technological improvements in almost every conceivable aspect of modern life – from improved agriculture to modern high-tech devices that only a generation ago were only science fiction. The federal government, through several programs, provides a majority of the funding for university research, although industry funded research is another important component.

The breadth and depth of activities at contemporary American universities has substantially transformed their impacts on regional economies and economic activity across the globe. Their economic impacts contribute importantly to the public good.

More recently, as public funding for universities has fallen under increased fiscal pressure from other public spending priorities, research grants have become an increasingly important incremental / supplemental funding source for public universities.

At the same time, pressure continues to increase to develop better measures of the "value" of university research – especially in terms of economic benefits. In *Measuring the Economic Value of Research*, published earlier this year, Kaye Husbands Fealing, Julia I. Lane, John L. King, and Stanley R. Johnson, review the traditional methods of "valuing" university research and present a case study on its impact in food safety to illustrate such value in one instance. However, they conclude that better methods to consistently, accurately, and widely assess the value of university research are needed. The following sections describe some of the currently quantifiable measures of the economic impacts of university research conducted at Arizona's Public University Enterprise as well as other less quantified, but important, impacts of university research on the regional and state economies in Arizona.

Measurable impacts of research expenditures

Obviously, spending at universities on research related activities, most notably funded by the federal government, results in spending in the region. The total research expenditures at Arizona's three public universities – the Arizona Public University Enterprise – exceeded $1.2 billion in fiscal year 2017. The following table illustrates the breakdown of those expenditures by source of funding and by university.

Research Expenditures by Source of Funds
Arizona Public University Enterprise Impact
($ mil)
(Fiscal Year 2017)

Source of Funds	Arizona State University	Northern Arizona University	University of Arizona	**Total**
U.S. Federal Government	$227.6	$26.0	$273.6	**$527.2**
State & local government	$31.9	$6.3	$19.6	**$57.8**
Business	$16.6	$0.5	$12.4	**$29.5**
Non-profit organizations	$30.5	$2.1	$35.6	**$68.2**
Institutional	$160.9	$11.1	$109.6	**$281.6**
Cost sharing	$5.1	$0.0	$11.7	**$16.8**
Unrecovered indirect costs	$43.0	$0.0	$65.9	**$108.9**
Other	$29.3	$0.3	$93.8	**$123.4**
Total	**$545.0**	**$46.3**	**$622.2**	**$1,213.5**

Sources: ASU; NAU; UA

The cumulative research expenditures at the Arizona Pubic University Enterprise represent over one-quarter of their total cumulative spending of all types. The following table illustrates the total expenditures of the Enterprise by type and university.

Research Expenditures by University
Arizona Public University Enterprise Impact
(Fiscal Year 2017)

	Arizona State University	Northern Arizona University	University of Arizona	**Total**
Total research spending ($ mil)	$545.02	$46.25	$622.20	**$1,213.47**
Total university expenditures ($ mil)	$2,188.53	$498.60	$1,954.10	**$4,641.23**
Research spending share of total expenditures	24.9%	9.3%	31.8%	**26.1%**

Sources: ASU; NAU; UA

The Enterprise's research expenditures include spending for personnel salaries and benefits as well as spending on equipment, supplies, contracts, and other spending. This spending impacts the region's and the state's economy. That spending, in turn, drives other economic activity in the state. In total, the statewide economic impact of the research expenditures of the Arizona Public University Enterprise exceed $2.0 billion dollars. The following table illustrates the overall economic output in the state as a result of the Enterprise's research expenditures by category – direct and indirect & induced.

Economic Impact of Research Expenditures
Arizona Public University Enterprise Impact
($ mil)
(Fiscal Year 2017)

Economic Output	Arizona State University	Northern Arizona University	University of Arizona	**Total**
Direct	$545.0	$46.3	$622.2	**$1,213.5**
Indirect & Induced	$341.5	$44.0	$444.5	**$830.1**
Total	**$886.5**	**$90.3**	**$1,066.7**	**$2,043.5**

Sources: ASU; NAU; UA

The economic impacts of the research spending illustrated in the preceding tables are relatively short-term and occur simultaneously with the actual research activity.

The described impacts represent the estimated share generated from research activities of the total impacts listed in Section 3.0 of this report. That is, the estimated impacts from research spending activities are not *in addition to* the total impacts, but instead, the figures represent research spending's *estimated share* of total impacts.

Other Impacts on the Economy

Beyond these consequences of the Enterprise's research expenditures described above, major research universities have other important impacts on their regional and state economies. These include their significant impact on the regional workforce and regional human capital. For large universities, this is likely the most significant impact of the universities on the regional economy and state economies.

Large, sophisticated, research universities also benefit the regional economy through the outcomes and processes of their research. Through their findings and activities, especially when in collaboration with key regional industries, these universities perform an important knowledge transfer to key regional industries.

Finally, some university research activities may produce spinoff start-ups and entrepreneurial ventures as a result of the research findings.

Due to their larger scale and, frequently, greater breadth of research areas, Research 1 universities can have a more significant impact on their regional and state economies.

When discussing the "new building blocks for jobs and economic growth", in 2011, Ben S. Bernanke, then Chairman of the Board of Governors of the Federal Reserve System, noted that "over the past 200 years or so, innovation, technical advances, and investment in capital goods embodying new technologies have transformed economies around the world."

He also commented that "economic growth and the associated improvements in living standards reflect a number of determinants". These include 1) increased workers' skills, 2) savings and capital accumulation; and 3) institutional factors such as flexible markets and a quality regulatory framework.

Chairman Bernanke argues further that policies that promote research and development promote innovation and technological change. While he recognizes that rapid broad dissemination of research findings often produce broad social returns that may be higher than the narrow returns to those directly involved in the actual research and initial innovation, where research development actually occurs can matter. He cites "a cutting-edge scientific or technological center can create a variety of spillovers that promote innovation, quality skills acquisition, and productivity in industries located nearby;…"

Impacts on Regional Workforce and Human Capital

By producing highly skilled graduates for the regional and state economies, research universities contribute to ensuring an adequate supply of qualified employees for the growth and expansion of the existing regional and state employers and for new and relocating businesses.

Dr. Jason Owen-Smith, in his recent book *Research Universities and the Public Good*, suggests that, while often not fully acknowledged, the primary (and arguably most important) "means of 'technology transfer' from universities to the world is graduation" (emphasis added). These graduates enhance the three roles of research universities described above as they move into many different fields of work in the regional economy. By increasing graduates' skills and knowledge, research universities, like all educational institutions, advance the public good.

A properly educated and trained workforce of sufficient size is essential to economic growth regional economic development. In *The Fountain of Knowledge – The Role of Universities in Economic Development*, Shiri Breznitz opens her Introduction to the book with: "Universities, viewed as fountains of knowledge, produce the world's most important resources: young minds and an educated labor force, which in turn produce cutting-edge research and innovative ideas and products that contribute directly to economic development."

An adequately sized, properly skilled workforce is essential to positive economic growth and regional economic development. By helping to ensure such a workforce, research universities

contribute importantly, if indirectly, to the vitality, growth, and development of the economy. That vitality, growth, and development in turn drives household incomes and higher living standards.

Knowledge transfer to key regional industries

The free movement of ideas, innovations, and findings back and forth between regional industries and research universities facilitates the efficient transfer of research findings to those regional industries. The resulting increase in the productivity of those industries stimulates local economic growth and development. These exchanges are far more valuable when the research areas are relevant to economically important regional and state industries and where is strong, joint collaboration.

In *The Fountain of Knowledge – The Role of Universities in Economic Development*, Breznitz also states: "Today, universities around the world find themselves going beyond the traditional roles of research and teaching to drive the development of local economies through collaborations with industry." In the "Conclusion" to the book, Bresnitz notes that the research in the book "emphasizes the impact of location on universities' technology-transfer capability, and hence their economic development contribution. The region in which a university is situated, its history and environment, is critical in the way it influences internal university mechanisms for technology transfer."

At a time when research universities are actively seeking to increase their contributions their regional and state economies, many are looking to identify best practices among their peers. Breznitz argues against the notion that one university's successful technology transfer model can be easily transported to another. Rather, the impact that a university can have on its local economy must be understood in terms of the university's own idiosyncratic internal mechanisms, as well as the state and regional markets within which it operates.

To illustrate her argument, Breznitz undertakes a comparative analysis of two universities, Yale and Cambridge, and the different outcomes of their attempts at technology commercialization in biotech. By contrasting these two universities—their unique policies, organizational structure, institutional culture, and location within distinct national polities—she makes a powerful case for the idea that technology transfer is dependent on highly variable historical and environmental factors. Breznitz highlights key features to weigh and engage in developing future university and economic development policies that are "tailor-made" for their local context.

Writing in *Public Universities and Regional Growth*, Martin Kenney and David C. Mowery argue based on the research of others, "the dependence of technological innovation on advances in science and engineering research has increased in recent decades,…." They further suggest "that universities also play a unique role in both research and training, and their ability to expose graduates to the frontiers of scientific research provides a powerful mechanism for the transfer of knowledge and technology."

Kenney and Mowery suggest that in some of the best examples there is a symbiotic relationship between the research industry and important regional industries. And, that the response of the

research university to regional industry can be foundational to the success of both. They illustrate their point with a case study of the University of California Davis and the wine growing industry in that region of California.

For Kenney and Mowery, the free (unpatented) exchange of information, knowledge, and techniques between UC Davis and industry researchers and operators advanced the overall progress of research in both areas. Furthermore, while the entire winemaking industry across California benefitted from the work at UC Davis, the Napa Valley wineries enjoyed a greater advantage due their close proximity to the university. Much of the work at UC Davis came in response to the needs and challenges faced by the industry.

Importantly, the success of the Napa Valley wineries is ultimately predicated on the soils and growing climate of the region. Even the strongest university-industry collaboration could not replace that those foundational circumstances, but the recognition of the region's comparative advantage by both the industry and the university along with a positive focus on maximizing that advantage fostered the effective collaboration.

It is important to note the broader point regarding the free movement of knowledge within the private economy as well as open regulatory and legal systems and as key factors in economic success, including the transfer to and adoption of university research by private industry. In *Barriers to Riches*, Nobel Prize winning economist Edward Prescott and his co-author Stephen Parente demonstrate that only national economies that are open to the diffusion of knowledge and technology prosper, while those nations that restrict the production enhancing technologies lag. So too it must be with regional and state economies that are open to new productivity enhancing technologies and knowledge that promote increases in total factor production.

Thus, to fully benefit from the potential impetus to economic growth and prosperity from university research, regional and state economies must be properly positioned and free from restrictive regulations that inhibit the full utilization of such research. Said in another way, even the most potentially beneficial research findings will have little positive effect on total factor production and economic growth and vitality in the presence of monopoly practices, or regulatory schemes, that constrain the dispersion and utilization of those findings.

Spinoff start-ups and entrepreneurial ventures

There are many anecdotal examples of ideas or innovation developed at a research university that spun out into startups that eventually grow into large, complex, highly profitable business. These anecdotes drive much of the attention given to university research and economic development.

The more typical examples seem to be small startups that either, a) fail in a short period of time, b) are absorbed or purchased by existing business that can quickly and easily deploy the innovation within a larger operation to enhance productivity – or purchased to eliminate potential competition, or c) are able to survive long enough to either market a product to be used in a larger production system or developing a licensing model to deploy the innovation through other firms.

While exciting, the scale of the economic impact of these venture, on balance, do not compare to the long-run impact of thousands of highly skilled graduates each year on the regional workforce nor the benefits of collaboration among university researchers and existing, important regional industries.

Long-run impacts of university research

All of these impacts – workforce enhancement, knowledge transfer, and spinoff – unlike the impacts resulting from the immediate impacts of the research spending, tend to be long-term impacts.

Luisa Blanco, James Prieger, and Ji Gu, in *The Impact of Research and Development on Economic Growth and Productivity in the US States*, note "the relationship between R & D and economic growth is a long-run relationship". They conclude later, "that R&D does not seem to have significant short-run impacts on productivity, whether the R&D is performed within the state or in other states. This highlights the long run nature of the link between R&D investment and growth in a state's economy."

Blanco, Prieger, and Gu, also note "most importantly, the relationship between R&D and economic growth is a long-run relationship."

Other impacts on the regional economy

Elsewhere in *Research Universities and the Public Good*, Owen-Smith posits that research universities play three distinct roles in advancing the public good. First, they are "sources" of discovery. As such they discover new things and knowledge; they develop new skills in research trained individuals who carry those skills out beyond the university; and they facilitate the combination of those new things/knowledge and those new skill into new purposes. Owens-Smith prefers to refer to those new purposes as "innovations".

Second, universities can and often do serve as "anchors" of economic activity due, in part to their, "stability and fixity". He analogizes the effect large universities on a regional economy to high-quality "anchor tenants" on a retail shopping mall that attract people with certain demands and expectations. In doing so, the universities contribute to "the tone of their regions." Furthermore, the universities can foster interorganizational networks and collaboration.

Third, universities bring together people and ideas from different disciplines and different places and so doing serves as "hubs". As such they are often transit points for ideas and people in the process connecting those people and ideas to the regional economy and civil society. Again, he analogizes universities, but this time to airline hubs that allow travelers to connect to distant places or the center of a wheel that connects it to the larger machine.

Challenges of measuring the (full) economic contribution of research universities

Writing in *Measuring the Economic Value of Research*, published earlier this year, Husbands Fealing, et al. argue "In fact, research ideas – the black box between research funding and results – are transmitted through networks in long, circuitous, and often nonlinear fashion over quite long periods.(emphasis added) So, the right framework [for analysis] begins with identifying the right

unit of analysis – people – and examining how research funding builds public and private networks. The evidence is clear that people and networks are the drives of innovation."(emphasis added)

Finally, Husbands Fealing, et al. argue that "there is no systematic answer to the very specific question of the link between federal R&D and economic growth." They continue "Hitherto, the examination of the results of … expenditures on scientific research has tied to directly link research grants to bibliometric measures like publications." Prior examinations have focused too heavily on the published records of research and insufficiently on the "people". "[S]uch an approach is the wrong framework to use: "Documents do not do science, people do science."

Ongoing Process

The review of relevant research described above was broad and comprehensive, but not exhaustive. There has been and continues to be much work done on attempting to reasonably estimate the overall impact and benefit of university research on economic activity, regional economic growth, and economic development. Continued better understanding the various important ways that universities contribute to their regional and state economies will broaden awareness and support for their role and value.

REFERENCES

Husbands Fealing, Kay, Lane, Julia I., King, John L., and Johnson, Stanley R., *Measuring the Economic Value of Research*, Cambridge, Cambridge University Press, 2018

Kenney, Martin and Mowery, David C., Editors, *Public Universities and Regional Growth*, Stanford, Stanford University Press, 2018

Owens-Smith, Jason, *Research Universities and the Public Good*, Stanford, Stanford University Press, 2018

Parente, Stephen L., Prescott and Edward C., *Barriers to Riches*, Cambridge, Massachusetts Institute of Technology, 2000

Brezenitz, Shiri M., 2014, *The Fountain of Knowledge – The Role of Universities in Economic Development*, Stanford, Stanford University Press, 2014

Bernake, Ben S., *Remarks – Promoting Research & Development: The Government's Role* to The new Building Blocks for Jobs and Economic Growth conference, Georgetown University, Washington, Federal Reserve System, 2011

Economic and Planning Systems for Office of the President The University of California, *The University of California's Economic Contribution to the State of California*, Berkley, Economic and Planning Systems, 2011

Salter. Ammon J. and Martin, Ben R., *The economic benefits of publicly funded basic research: a critical view*, Falmer, University of Sussex, 2000

Blanco, Luisa, Prieger, James, and Gu, Ji, *The Impact of Research and Development on Economic Growth and Productivity in the US States*, Pepperdine University, *School of Public Policy Working Papers*, 2013 Pepperdine, Pepperdine University