

# THE CONTRIBUTION OF ARIZONA STATE UNIVERSITY TO THE ARIZONA ECONOMY, FISCAL YEAR 2016

**A Report from the Office of the University Economist**

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ARIZONA STATE UNIVERSITY

## TABLE OF CONTENTS

Summary	1
Introduction	2
Economic Impact Analysis	3
Human Capital Approach: ASU as a Supplier of Higher Education	9
University Research and Local Economic Development	17
Appendix: ASU Student Spending Survey	19

## LIST OF TABLES

1. Economic Impact of Arizona State University, Fiscal Year 2016	4
2. Fiscal Impact of Arizona State University, Fiscal Year 2016	8
3. Value of a Bachelor's Degree Based on Full-Time, Year-Round Workers in the United States, 2013 Through 2015	12
4. Value Added by Arizona State University Undergraduate Education to Arizona Income, Fiscal Year 2016	14
A-1. Characteristics of Respondents to Arizona State University Student Survey	19
A-2. Mean Responses to Spending Questions in the Arizona State University Student Survey	20

## LIST OF CHARTS

1. Impact of Arizona State University on Arizona Employment, Fiscal Year 2016	5
2. Impact of Arizona State University on Arizona Labor Income, Fiscal Year 2016	6
3. Mean Annual Earnings by Age and Educational Attainment, Full-Time, Year-Round Workers in the United States, 2013 Through 2015	10
4. Ratio of Mean Earnings of University Graduates to High School Graduates, Full-Time, Year-Round Workers in the United States	11

## SUMMARY

One approach to measuring the contribution of a university to the local economy is to identify the economic effects produced by the spending of the university, its students and employees, and university visitors. The spending of the Arizona State University (ASU) community in fiscal year (FY) 2016 was responsible for 47,650 jobs, labor income of \$2.423 billion, and gross product of \$3.579 billion in Arizona. The university community contributed \$207 million in state and local government revenue in Arizona.

In FY 2016, ASU employed 16,800 faculty, staff, and graduate assistants and had a total payroll of \$1,128 million. In addition, the university was responsible for 3,100 jobs and labor income of \$140 million in Arizona because of what it spent on construction, equipment, and other goods and services. Another round of economic impacts arises from the consumer spending of faculty, staff, students, and university visitors. A total of 12,700 jobs and labor income of \$411 million were directly supported by this spending.

The above-noted spending events create multiplier effects when firms supplying goods and services to the university community place upstream demands on other producers, when the employees of these firms make consumer purchases, and when governments spend additional tax revenues. The multiplier effects themselves amount to 15,100 jobs and labor income of \$744 million.

The economic activity that is supported by the spending of the university community also serves to generate tax revenues for Arizona state and local governments. ASU faculty and staff are estimated to have paid \$30 million in Arizona individual income taxes and local residential property taxes. The consumer spending of faculty and staff generated — both directly and indirectly — \$54 million in state and local government taxes. Spending by ASU students, an important channel of economic impact, is estimated to have generated, both directly and indirectly, \$85 million in tax revenues for state and local governments. Other fiscal impacts, including those connected with university construction and purchases of goods and services, totaled \$38 million in Arizona tax revenues in FY 2016.

An alternative approach to assessing the economic value of a university is to compare the value of the education services provided by the university to the costs of producing those services. In a “cost-benefit” analysis, the full costs of a four-year college education are compared to the benefits students realize in the form of higher lifetime earnings. This report demonstrates that higher education is a high-yield investment, generating benefits that are 3-to-4 times as large as the costs. The costs of education include net tuition and fees, state appropriations for instructional support, and lost earnings during the time the student is in school. For a four-year undergraduate education at ASU, total costs are approximately \$150,000. Based on national statistics relating individual earnings to educational attainment, the lifetime benefits to be realized by an ASU undergraduate are estimated to be \$600,000 for men and \$450,000 for women.

## INTRODUCTION

This report provides an assessment for fiscal year (FY) 2016 of the contribution of Arizona State University (ASU) to the Arizona economy. The economic effects of the university are measured using two different approaches. In a traditional “economic impact analysis,” estimates are made of the Arizona jobs and incomes that are supported by the spending of the university, its employees, and students. This approach focuses on the resources or inputs needed to produce both the services of the university and the goods and services purchased by its students and employees. Economic impact analysis gives an indication of how much larger the Arizona economy is because of the presence of ASU.

An alternative approach to assessing the economic value of a university is to measure the value of the services provided by the university and compare that value with the costs of producing the services. In a “cost-benefit” analysis of higher education, the full costs of a four-year college education are compared to the benefits students realize in the form of higher lifetime earnings. This report demonstrates that higher education is a high-yield investment, generating benefits that are 3-to-4 times as large as the costs.

Arizona State University and other research universities also contribute to the local economy by helping businesses solve industrial problems and by producing research findings that spawn or attract new companies. These effects are difficult to measure precisely. However, numerous national and international studies have found that through their research, universities can make a significant contribution to the economy of the city in which they are located. This report provides a brief review of what is known about the factors necessary for university research to significantly affect local economic activity and assesses Arizona State University and its location in light of those factors.

## **ECONOMIC IMPACT ANALYSIS**

The purpose of an economic impact analysis of a university is to measure the contribution the university makes to local area jobs and incomes through its own spending and the spending of students, faculty, and staff. What are referred to as “direct” impacts are the jobs and incomes provided by the university itself and by businesses who supply goods and services purchased by the university, its students, and employees. In economic impact analysis, estimates are also made of so-called “multiplier effects” that arise through backward linkages between industries and from additional rounds of consumer spending generated throughout the economic impact process.

Estimates of the economic impact of ASU were made using an Arizona-specific version of IMPLAN, an input-output model used widely by researchers throughout the United States.<sup>1</sup> The study area for the analysis was the state of Arizona. Impacts refer to jobs and incomes generated somewhere in the state. Impacts are reported for three economic variables: gross product, labor income, and employment. Gross product is a broad measure of income consisting of employee compensation, proprietor income (self-employed income), property income, and indirect business taxes. Labor income is the sum of employee compensation and proprietor income. Employment is a count of both full-time and part-time jobs.

Table 1 provides a summary of the results. Charts 1 and 2 provide further detail on the impacts ASU has on Arizona employment and labor income, with results separated into direct and multiplier effects. All primary data and impacts refer to FY 2016 and are totals across ASU’s metropolitan campuses.

### **University Expenditures: Operations**

ASU directly affects the economy of Arizona by employing approximately 16,800 people, excluding students, on either a full-time or part-time basis. During the 2015-16 academic year, the university employed 5,745 faculty, 7,515 administrative and classified staff, and 3,507 graduate assistants and associates. University payroll for FY 2016 was \$1,128 million, with wages and salaries accounting for \$850 million and the remainder being employee-related expenses.

Another way in which ASU directly affects the economy is by purchasing goods and services that are necessary for university operations. Nonpayroll expenditures in FY 2016 created a demand for \$268 million worth of goods and services supplied by Arizona businesses.<sup>2</sup> These purchases directly accounted for 2,290 jobs, \$85 million in labor income, and \$138 million in Arizona gross product.

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<sup>1</sup> The specific model used was based on IMPLAN’s 2013 database. In building the model, trade flows were calculated using IMPLAN’s regional purchase coefficients. Full SAM (Social Accounting Matrix) multipliers were used. These multipliers allow for a recycling of income through the consumer spending of households, the spending of governments out of tax revenues, and the capital spending of firms out of profits.

<sup>2</sup> Estimates of the demand for Arizona goods and services associated with ASU operations were based on detailed expense data made available by ASU Financial Services by 6-digit object code. Expenses used to estimate local economic impacts were limited to those for which payments were made to an Arizona vendor.

**TABLE 1**  
**ECONOMIC IMPACT OF ARIZONA STATE UNIVERSITY, FISCAL YEAR 2016**

	<b>Gross Product (in millions)</b>	<b>Labor Income (in millions)</b>	<b>Employment</b>
TOTAL	\$3,579	\$2,423	47,650
University Payroll and Employment	1,309	1,128	16,767
Nonpayroll Operating Expenditures	293	181	4,257
University Construction	141	109	1,902
Spending by Faculty and Staff	579	344	7,286
Student Spending	1,171	605	15,930
Visitor Spending	86	56	1,508

Source: Center for Competitiveness and Prosperity Research, L. William Seidman Research Institute, W. P. Carey School of Business, Arizona State University.

University purchases induce secondary or multiplier effects in an economy. These effects occur when immediate suppliers of ASU products purchase intermediate goods and services from upstream suppliers and when all affected suppliers hire additional employees who, in turn, make consumer purchases and pay taxes that support government spending programs. The secondary effects of ASU nonpayroll operating expenditures were estimated to be 1,970 jobs, \$96 million in labor income, and \$155 in gross product. The total impact of university purchases was 4,260 jobs, \$181 million of labor income, and \$293 million in gross product.

#### **University Expenditures: Construction**

ASU's construction outlays in FY 2016 totaled \$165 million. Expenditures associated with these projects directly generated 810 jobs, \$55 million in labor income, and \$55 million in gross product. When multiplier effects are included, the total impact of ASU construction spending in FY 2016 was 1,900 jobs, \$109 million in labor income, and \$141 million in gross product.

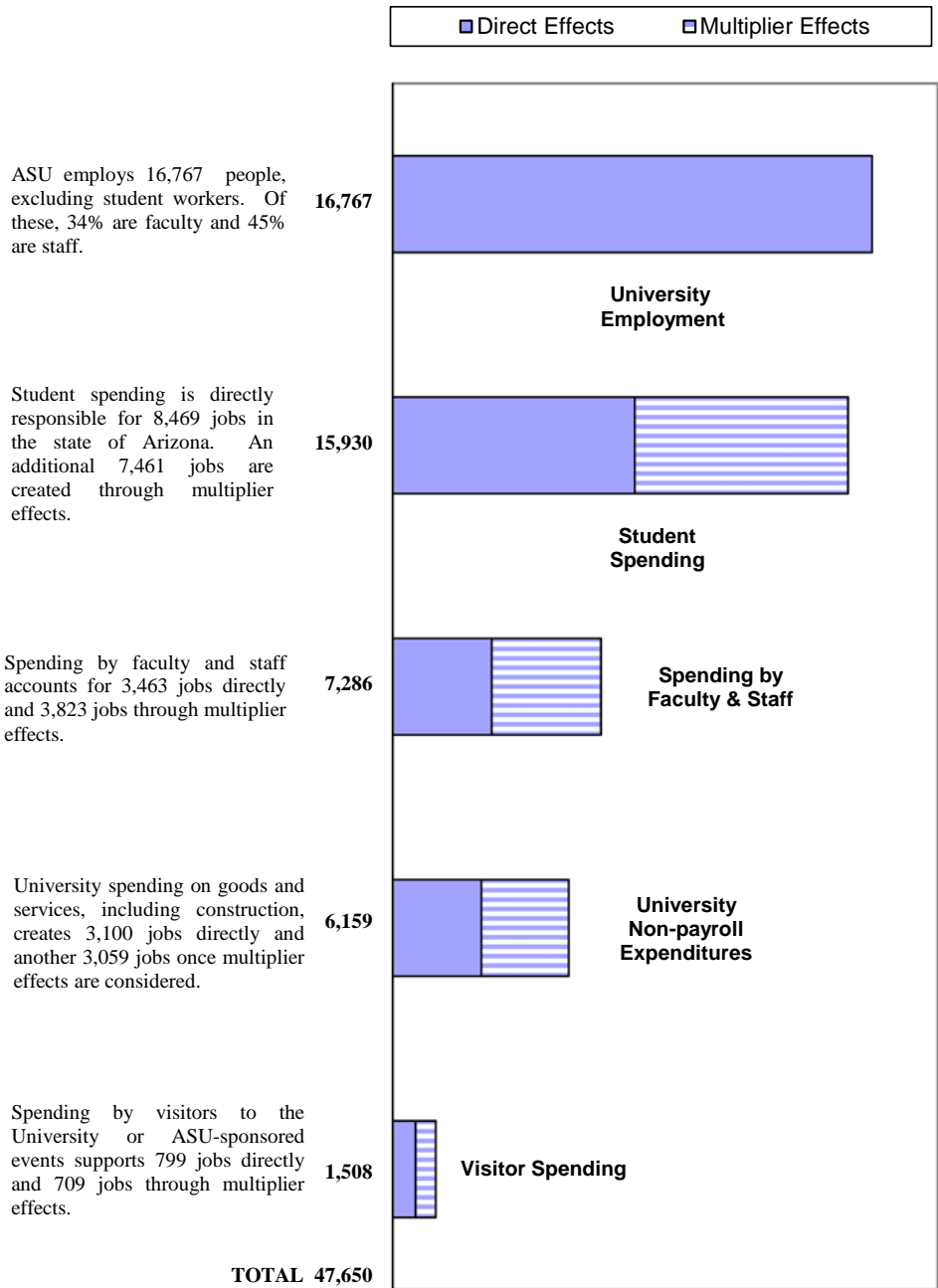
#### **Employee Spending**

In economic impact analysis, university faculty and staff contribute to the size of the state's economy not only through their own employment, but by purchasing goods and services from Arizona businesses. Estimates of spending by faculty and staff were made by combining ASU payroll data with statistics from the U.S. Bureau of Labor Statistics (BLS) on the share of income spent on individual commodity items by U.S. households.<sup>3</sup> Consumer expenditures associated with the earnings of ASU faculty and staff were

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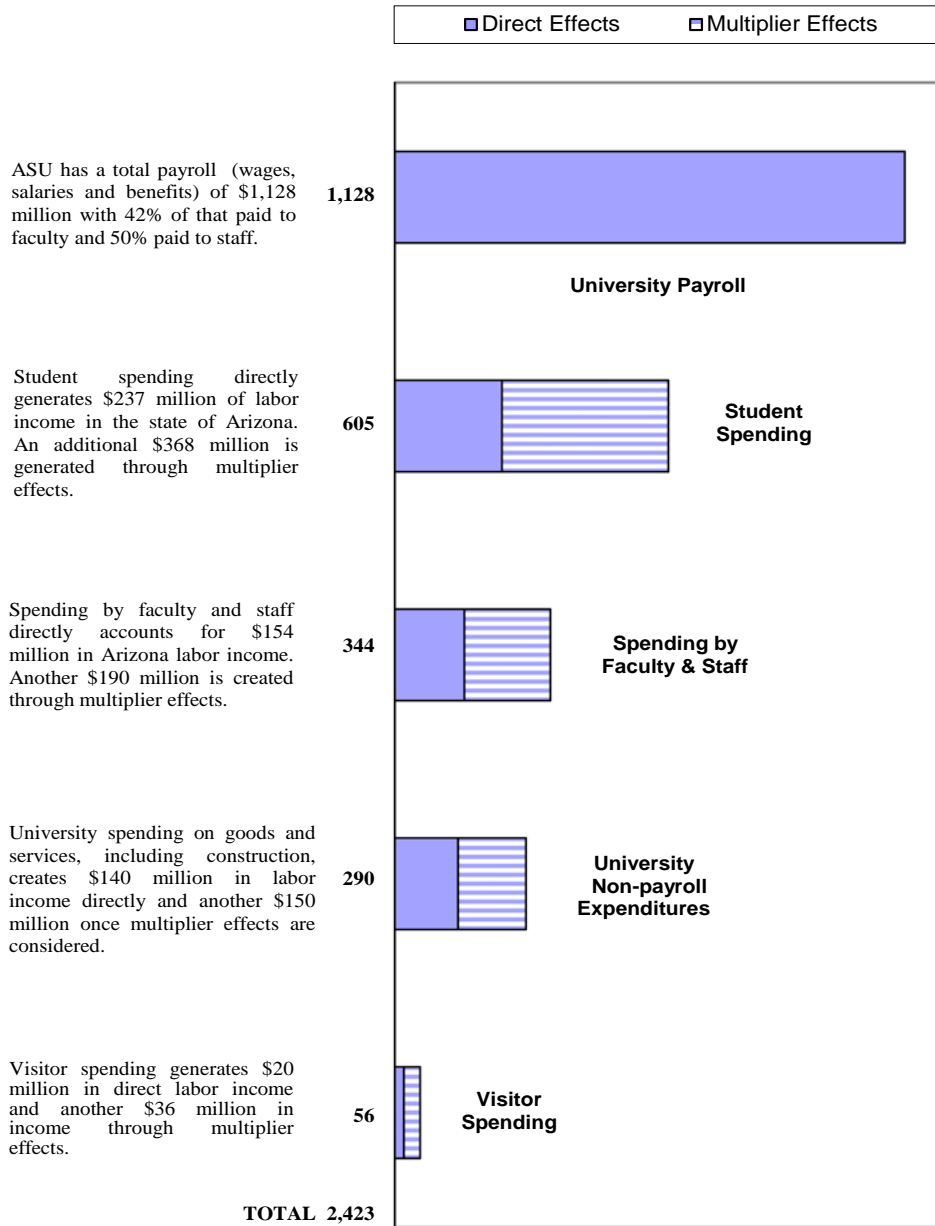
<sup>3</sup> For the nation as whole, personal consumption expenditures are currently about 80 percent of personal income. The aggregate data include retirees and families with low-wage primary earners, groups that have above-average propensities to consume. For ASU faculty and staff, many of whom are highly skilled and who collectively have above-average earnings, personal consumption expenditures were assumed to be 70 percent of employee compensation. The detailed commodity composition of these expenditures was taken from IMPLAN data files. These data, in turn, come from the Consumer Expenditure Survey produced by the BLS.

# CHART 1 IMPACT OF ARIZONA STATE UNIVERSITY ON ARIZONA EMPLOYMENT, FISCAL YEAR 2016



Source: Center for Competitiveness and Prosperity Research, L. William Seidman Research Institute, W. P. Carey School of Business, Arizona State University.

## CHART 2 IMPACT OF ARIZONA STATE UNIVERSITY ON ARIZONA LABOR INCOME, FISCAL YEAR 2016



Note: Figures represent millions of dollars.  
 Source: Center for Competitiveness and Prosperity Research, L. William Seidman Research Institute, W. P. Carey School of Business, Arizona State University.



estimated to be \$721 million in FY 2016. This spending was directly responsible for 3,463 jobs, \$154 million in labor income, and \$278 million in Arizona gross product.

As with institutional spending, consumer spending generates secondary or multiplier effects throughout an economy. Spending by ASU faculty and staff had a secondary impact on the Arizona economy of 3,823 jobs, \$190 million in labor income, and \$301 million in gross product. In total, expenditures by ASU faculty and staff accounted for 7,286 Arizona jobs, \$344 million worth of labor income, and \$579 million in gross product.

### **Student Spending**

An average of 76,900 students were enrolled at ASU during the fall and spring semesters of the 2015-16 academic year.<sup>4</sup> Because of their sheer number, ASU students exert a large influence on the local economy. Estimates of student spending were made by combining enrollment figures with estimates of per capita student spending obtained from an ASU student survey conducted in the fall of 2016. The survey process and results are described in the Appendix. The survey provided estimates of monthly expenditures per student for nine individual commodity groups. Average total monthly expenditures were estimated to be \$1,581 per student.

The ASU student population was directly responsible for \$1,148 million worth of consumer spending in FY 2016, excluding tuition. Of this amount, 35 percent was for housing (including imputed rent on owner-occupied housing), 17 percent went for utilities and telecommunication services, 14 percent was spent on groceries, and 8 percent was spent eating out. Other important expenditure categories were vehicle operation, retail, and entertainment. The direct impact of this spending on Arizona was 8,469 jobs, \$237 million in labor income, and \$584 million in gross product.

The secondary effect of student expenditures was an additional 7,461 jobs, \$368 million in labor income, and \$587 million of gross product. The total economic impact of spending by the ASU student population was 15,930 jobs, \$605 million worth of labor income, and \$1,171 million in Arizona gross product.

A little over one-third of ASU students have nonresident status, being either international or with a home address in another U.S. state. The total economic impact of nonresident student spending, including multiplier effects, is 5,850 jobs, \$222 million in labor income, and \$430 million in gross product.

### **Visitor Spending**

Athletic events, cultural activities, conferences, and other programs draw large numbers of visitors to Arizona State University each year. In addition, parents and friends visit students, and prospective students and their families make evaluation visits to the campus. The total economic impact of visitors is estimated to be 1,508 jobs, \$56 million in labor income, and \$86 million in Arizona gross product.

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<sup>4</sup> This enrollment figure is based on the sum of full-time-equivalent enrollment at metropolitan campuses plus an estimate of Skysong (on-line) enrollment of students with in-state addresses.

### **Total Economic Impact**

The total impact of Arizona State University on Arizona gross product is estimated to have been \$3.6 billion in FY 2016. The total employment impact of ASU, including university employees and all other jobs indirectly induced, was 47,650 jobs. The total labor income associated with these jobs was estimated to be \$2.4 billion.

### **Fiscal Impact**

Arizona jobs and incomes that are supported by the spending of the university community serve to generate tax revenues for state and local governments. These induced tax revenues can be referred to as the “fiscal impact” of the university. Estimates were made of the fiscal impact of ASU community spending on each of three sources of state and local government tax revenues: the Arizona state income tax (individual and corporate), state and local government general sales taxes, and local property taxes. The results are summarized by category of spending in Table 2.

Student spending generates, both directly and indirectly, \$85 million in state and local government tax revenues. These revenues include not only the sales taxes collected directly from student expenditures on taxable items, but also the tax revenues associated with the economic activity that is generated in the local economy by the spending of students. Spending by faculty and staff made from ASU earnings generates, both directly and indirectly, \$54 million in state and local government tax revenues. Revenues associated with the taxation of earnings of ASU faculty and staff under the individual income tax and the taxation of residential property owned by ASU employees are estimated to be \$30 million. Adding in other fiscal impacts, particularly those related to the nonpayroll expenditures of the university, the total fiscal impact of ASU in FY 2016 is estimated to have been \$207 million.

**TABLE 2**  
**FISCAL IMPACT OF ARIZONA STATE UNIVERSITY, FISCAL YEAR 2016**  
**Arizona State and Local Government Tax Revenues (in millions)**

TOTAL	\$207
University Payroll and Employment	30
University Nonpayroll Operating Expenditures	21
University Construction	10
Spending by Faculty and Staff	54
Student Spending	85
Visitor Spending	6

Source: Center for Competitiveness and Prosperity Research, L. William Seidman Research Institute, W. P. Carey School of Business, Arizona State University.

**HUMAN CAPITAL APPROACH:  
ASU AS A SUPPLIER OF HIGHER EDUCATION**

Arizona State University sponsors and supports a diverse set of activities that directly benefit the community, including basic and applied research, cultural events, and other public service activities. However, the primary mission of the university is to provide quality education for its students. The economic value of a university education is reflected in the earnings premium realized by workers with four-year degrees.

**Earnings Premium for University Graduates**

One can gain a sense of magnitude of the financial benefits of higher education by comparing the earnings experiences of people who did and did not complete college.<sup>5</sup> Data on earnings by educational attainment are collected each year by the U.S. Census Bureau in its Current Population Survey. Chart 3 shows results from recent surveys on mean annual earnings of men and women who were fully employed, arranged by age group and for two levels of education: high school graduates (but no further education) and those with a bachelor's degree (but no further education). The data are national in coverage and include people who have been educated at schools throughout the country and are employed across all 50 states. Data from the Current Population Survey are not reliable by state and the American Community Survey does not provide comparable data.

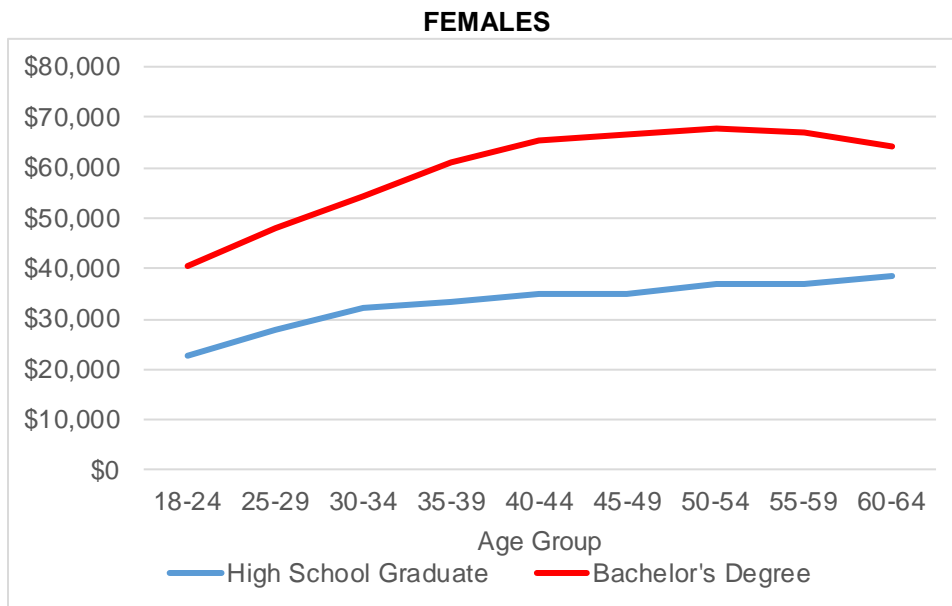
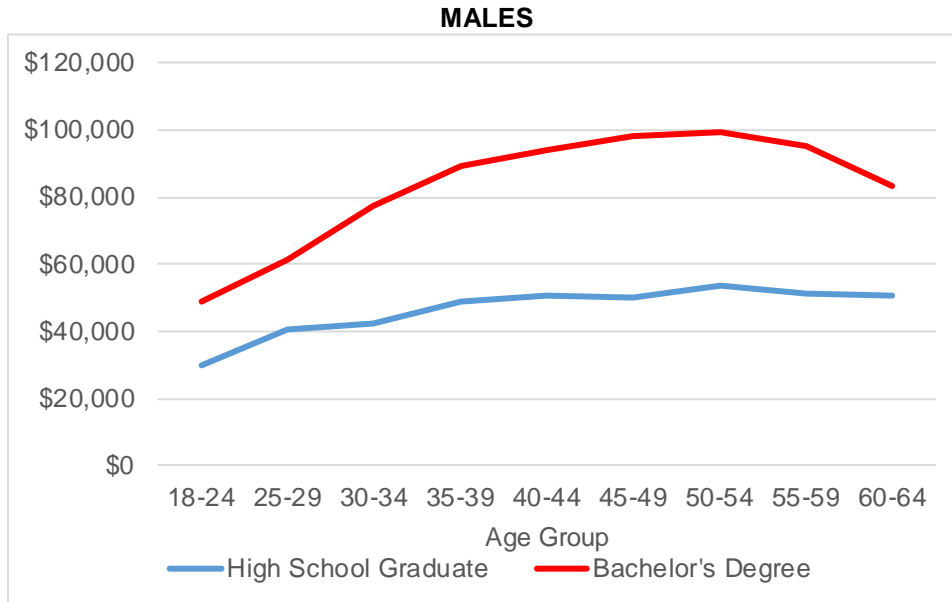
The earnings premium for a university education is substantial. Based on averages for the years 2013 through 2015, male workers between the ages of 35 and 44, for example, earned 84 percent more if they had completed a bachelor's degree than if they had only a high school diploma. Female workers between the ages 35 and 44 earned 85 percent more with a four-year degree.

The earnings premium for higher education rose rapidly during the 1980s and 1990s (see Chart 4). The rise in the premium over that period is thought to have been driven by a broad-based increase in the demand for skilled workers that occurred throughout the industrialized world and was a part of what came to be known as the "knowledge economy." High skill premiums became evident not only in the earnings of educated workers but also in the earnings of those with work experience and skills acquired on the job. Labor market economists attribute the rise in the education/skills premium to several factors: skill-biased technological advances (especially involving computers), increased trade with less-developed countries, and a decline in the importance of unions and wage-setting institutions in some countries, including the United States.

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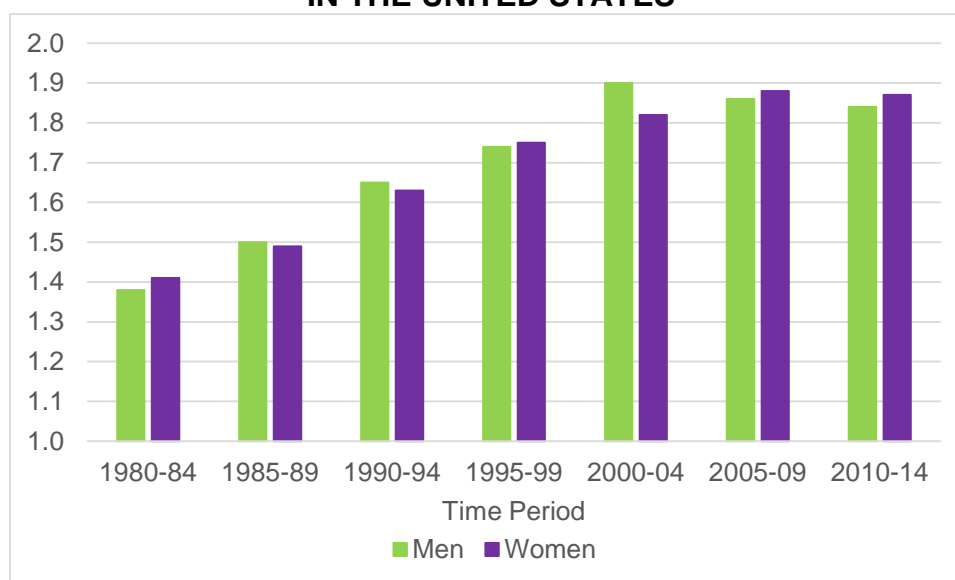
<sup>5</sup> Simple comparisons of earnings between individuals with different educational backgrounds can be misleading if earnings differentials are due to other factors that are correlated with educational attainment. What is known as the issue of "ability bias" is the possibility that the earnings premium observed for college graduates is partly a reflection of the fact that people who are successful in school are those with high innate abilities and that these abilities, both cognitive and noncognitive, also help them to be successful in the job market. The issue of ability bias remains an active area of research among labor economists. The consensus view among scholars is that the true average return to education is probably not much below the estimate suggested by simple cross-tabulations of education and earnings. For a review of studies, see D. Card, "The Causal Effect of Education on Earnings," *Handbook of Labor Economics* 3A (North-Holland-Elsevier, 1999): 1801-63.

**CHART 3  
MEAN ANNUAL EARNINGS BY AGE AND EDUCATIONAL ATTAINMENT,  
FULL-TIME, YEAR-ROUND WORKERS IN THE UNITED STATES,  
2013 THROUGH 2015**



Source: U.S. Department of Commerce, Census Bureau, Current Population Survey.

**CHART 4**  
**RATIO OF MEAN EARNINGS OF UNIVERSITY GRADUATES TO**  
**HIGH SCHOOL GRADUATES, FULL-TIME, YEAR-ROUND WORKERS**  
**IN THE UNITED STATES**



Source: U.S. Department of Commerce, Census Bureau, Current Population Survey.

After rising rapidly during the 1980s and 1990s, the university earnings premium has been relatively flat since the early 2000s. For male workers, there has been a modest decline in the premium. Nevertheless, the earnings premium remains at a historically high level. As demonstrated in the next subsection, the premium is presently at such a high level as to make a university education a very high-yield financial investment.

### **Value of a University Degree**

A cost-benefit analysis of the investment value of a four-year degree is provided in Table 3. The costs of going to college include tuition and fees paid by the student, any state funds used to support higher education, and most importantly foregone earnings during the time the student is attending college. The average direct or out-of-pocket costs of education (tuition net of grants, fees, and books) at ASU are \$9,500 per student per year for in-state students. State funds received by ASU to help defray the costs of education are approximately \$5,000 per student per year. The foregone earnings of ASU male students are estimated to be \$27,500 per year, and the foregone earnings of female students are estimated at \$21,200 per year. For the entire four-year period, the total costs of attending ASU amount to approximately \$168,000 for men and \$143,000 for women.

In the absence of specific information on the earnings performance of ASU graduates, the benefits of having an ASU undergraduate degree are estimated by using national data to calculate the difference between the mean earnings of a U.S. worker of a given age and sex who holds a bachelor's degree (and no more) and the mean earnings of a worker with

**TABLE 3**  
**VALUE OF A BACHELOR’S DEGREE BASED ON FULL-TIME, YEAR-ROUND**  
**WORKERS IN THE UNITED STATES, 2013 THROUGH 2015**

	Males	Females
<b>Costs (Ages 18 through 21):</b>		
Net Tuition, Fees, and Books	\$38,000	\$38,000
State Appropriations	20,000	20,000
Foregone Earnings	109,900	84,900
Total Costs	167,900	142,900
Total Costs Discounted at 4 Percent Real Interest	158,100	134,700
<b>Benefits (Ages 22 Through 65):</b>		
Earnings With a High School Diploma	2,084,200	1,490,400
Earnings With a Four-Year College Degree	3,698,300	2,654,200
Differential in Earnings	1,614,100	1,163,800
Earnings Differential Discounted at 4 Percent Real Interest	609,400	449,700
Net Present Value of Bachelor’s Degree	451,300	315,000
Internal Rate of Return	12.8%	12.3%

Source: Center for Competitiveness and Prosperity Research, L. William Seidman Research Institute, W. P. Carey School of Business, Arizona State University.

the same demographic characteristics who has only completed high school.<sup>6</sup> Using this approach and assuming that a university graduate works continuously from age 22 to 65, the additional earnings provided by a university degree are \$1,614,000 for men and \$1,164,000 for women.

When comparing streams of expenses and incomes that accrue over time, it is necessary to “discount” figures to a common base year. The present value of receiving \$10,000 ten years from now is significantly less than \$10,000 — not just because of inflation, but because of the time value of money.

If future expenses are discounted to the present using an inflation-adjusted interest rate of 4 percent, the costs of attending college amount to \$158,000 for men and \$135,000 for women. Discounting has a more dramatic effect on the present value of future earnings. The present value of the earnings premium afforded by a college education is \$609,000 for a male graduate and \$450,000 for a female graduate.

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<sup>6</sup> Hoffman and Rex (2016) use a dataset assembled by the Arizona Board of Regents to calculate the average wages of ASU graduates who were working in the state of Arizona in 2015. The data are tabulated and presented by year of graduation. The dataset was created by matching the Social Security numbers of ASU graduates to numbers in the unemployment insurance files maintained by the Arizona Department of Economic Security. The sample used to calculate average wages covers only graduates who are now working in Arizona, and it may include workers who have an undergraduate degree from ASU but an advanced degree from another institution. In the latter case, wages partly reflect the value added from graduate-level education. See D. Hoffman and T. Rex, “The Impact of Arizona State University Graduates Employed in Arizona in 2015,” Office of the University Economist, Arizona State University, available on-line at <https://wpcarey.asu.edu/sites/default/files/valueasudegree10-16.pdf>.

As the analysis shows, the benefits of a university education decidedly outweigh the costs. The net present value of a bachelor's degree is \$451,000 for men and \$315,000 for women. A high school graduate who could successfully complete a four-year degree but for whatever reason chooses not to do so is effectively turning down a gift of \$451,000 (\$315,000) to be given to him (her) at age 18.

Another way of expressing the investment value of a university education is to calculate its "internal rate of return." This is the discount rate that would equalize the present value of benefits with the present value of costs. Earning a university degree provides an inflation-adjusted internal rate of return of 12.8 percent for men and 12.3 percent for women. This means that if a student were to borrow money to cover all of the costs of going to college and pay a real interest rate of 12.8 percent (12.3 percent), he (she) would have just enough in additional earnings over the course of a lifetime to pay off the loan with interest. Actual borrowing rates are much lower, of course.

The concept of internal rate of return allows the value of alternative kinds of investments to be compared. It has been estimated that over the past 100 years, the average annual real return on U.S. stocks has been 7 percent. Thus, an investment in a university education beats what is regarded as the best long-term financial investment — the stock market — and does so by a wide margin.<sup>7</sup>

### **Other Benefits of Education**

The benefits of a university education are not limited to the increase in lifetime earnings realized by the degree holder. For example, there are well-documented positive effects of educational attainment on personal health and longevity. There is also evidence of spillover benefits realized by other parties. Within the same family, children of highly educated parents (e.g., highly educated mothers) are more likely to achieve a high level of educational attainment themselves, even after controlling for family income. There is also evidence of productivity spillovers from higher education. Highly educated workers not only become more productive themselves, but they also raise the average level of productivity of those who work around them.<sup>8</sup> Simulations for Arizona using

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<sup>7</sup> Hill (2013) uses an approach similar to the one used here to quantify the effect that rising tuition and falling earnings premiums over the 2000s had on the return on a four-year university investment. Comparing the 2000-to-2002 period with the 2010-to-2012 period, Hill finds that a combination of higher tuition and somewhat smaller earnings premiums served to reduce the return realized by a male graduate by 1.2 percentage points. See K. Hill, "Has the Return to Investing in a College Education Declined?," Office of the University Economist, Arizona State University, available at <https://wpcarey.asu.edu/sites/default/files/collegereturn12-13.pdf>.

<sup>8</sup> The clearest evidence of local productivity spillovers from higher education is provided by the fact that (1) cities with more educated residents have consistently grown faster than comparable cities with less human capital and (2) wages of workers of varying levels of educational attainment are higher the larger the share of the local labor force with a college degree. A review of the evidence from data on urban population growth can be found in E. Glaeser and A. Saiz, "The Rise of the Skilled City," *Brookings-Wharton Papers on Urban Affairs* (2004): 47-105. Evidence of productivity spillovers that comes from examining earnings by level of educational attainment is provided by E. Moretti in "Workers' Education, Spillovers and Productivity: Evidence from Plant-Level Production Functions," *American Economic Review* 94 (June 2004): 656-90 and "Estimating the Social Return to Higher Education: Evidence from Longitudinal and Repeated Cross-Sectional Data," *Journal of Econometrics* 121 (July/August 2004): 175-212.

conservative estimates of productivity spillovers suggest that an investment in a college education provides an additional social return beyond the private return of 4 percent.<sup>9 10</sup>

### **Contribution of ASU Undergraduate Education to Arizona Income**

Because higher education has such a large effect on an individual’s lifetime earnings, total income in the state of Arizona is significantly higher because of the education received by ASU students over the past several decades. This conclusion does not necessarily follow from the earlier demonstration that college is a sound investment for an individual. Many ASU graduates end up leaving the state. Also, because of steady growth in the university’s student population, there are currently more students incurring costs, such as foregone personal income and taxpayer support, than there are former graduates in any four-year cohort. Nevertheless, informed calculations suggest that Arizona’s annual net income is now \$2.1 billion higher because of the flow of undergraduate education services that have been provided by the university since the early 1970s. Table 4 provides a summary of these calculations.

In the absence of more specific information, it is assumed that ASU graduates working in the state receive a college earnings premium equal to the nationwide average for workers of the same age and sex. Based on national data, those who graduated in the early 1980s

**TABLE 4**  
**VALUE ADDED BY ARIZONA STATE UNIVERSITY UNDERGRADUATE**  
**EDUCATION TO ARIZONA INCOME, FISCAL YEAR 2016**  
(in millions)

<b>Total Incremental Earnings of Former ASU Undergraduates*</b> (Cohorts From 1972 Through 2015)	\$4,083
<b>Costs of Current Student Population:</b>	
Foregone Income (49,600 undergraduates at \$24,300)**	-1,205
Net Tuition, Fees, and Books (49,600 undergraduates at \$9,500)**	-471
State Appropriations	-290
 <b>Net Effect on Arizona Income</b>	 2,117

\*The reported incremental earnings figure is an estimate based on national data of the aggregate college earnings premium received by ASU undergraduate degree holders who were working in Arizona in 2015.

\*\* These calculations include only Arizona residents.

Source: Center for Competitiveness and Prosperity Research, L. William Seidman Research Institute, W. P. Carey School of Business, Arizona State University.

<sup>9</sup> The estimates of productivity spillovers for Arizona are provided in K. Hill, D. Hoffman and T. Rex, “The Value of Higher Education: Individual and Societal Benefits,” Office of the University Economist, Arizona State University, October 2005, available on-line at <https://wpcarey.asu.edu/sites/default/files/edvalue10-05.pdf>.

<sup>10</sup> For a general review of the private and social benefits of higher education, see W. McMahon, *Higher Learning, Greater Good: The Private and Social Benefits of Higher Education*, The John Hopkins University Press, 2009.



and are now in their mid-50s, for example, are earning \$30,000 (women) to \$45,000 (men) more than they would have had they only completed high school. Employed graduates who received a four-year degree circa 2000, and are now in their mid-30s, earn between \$27,000 and \$40,000 more because of their undergraduate education.

Estimates of total Arizona incremental income received by former ASU undergraduates are made by combining the per graduate earnings premiums described above with estimates from an Arizona Board of Regents database of the number of ASU undergraduate degree holders who were working in the state of Arizona in 2015. These data are available by annual graduating cohort for each year from 1990 through 2015. The ABOR data indicate that the share of ASU graduates now working in Arizona is 55 percent for those who graduated in 2010. In-state employment rates are progressively lower the more distant the date of graduation. The employment rate for those who graduated in 1990, for example, is 33 percent.<sup>11</sup>

The total incremental earnings of former ASU undergraduates who are now working in Arizona is estimated to be \$4.1 billion. To calculate the net effect of ASU undergraduate education on current state income, allowance must be made for the costs incurred by students now attending ASU. There are 74,000 undergraduates enrolled at the university, and about 50,000 of these are in-state residents. Combining these figures with the average costs per student — costs associated with foregone income, tuition and fees, and state appropriations — the estimate is \$2.0 billion for the total cost to Arizona of ASU's current undergraduate population. Thus, the net effect of ASU undergraduate education on current income in the state of Arizona is approximately \$2.1 billion.

The \$2.1 billion figure cited above is fundamentally different from the \$13.2 billion figure produced and reported by Hoffman and Rex (2016). The \$13.2 billion figure is an estimate of the aggregate gross earnings of ASU graduates who were working in Arizona in 2015. Gross earnings reflect the value of all skills and human capital an individual has acquired throughout his or her life, including not only the education received while attending ASU but the education received in primary and secondary schools as well as any tertiary education received at an institution other than ASU.

The \$2.1 billion figure is an estimate made from national survey data of the value added by ASU undergraduate instruction to degree holders who were working in Arizona in 2015. Value added is measured as the difference between the average earnings of a college graduate and the earnings of someone who only completed high school. Other notable differences between the \$2.1 billion figure and the \$13.2 billion figure are: (1) the

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<sup>11</sup> Figures from the ABOR database on numbers of former ASU graduates who were employed in Arizona in 2015 are from Hoffman and Rex (2016). The ABOR database covers people who received an ASU undergraduate degree from 1990 through 2015. Employment rates for those who graduated from 1972 through 1989 were estimated by extrapolating the ABOR data backward using national data from the U.S. Bureau of Labor Statistics on labor force participation by age and sex. The steady decline in Arizona employment rates with years since graduation that is present in the ABOR data is presumably driven by out-of-state migration. Employment rates continue to decline with years since graduation in the extrapolated series because of increasing retirement.

former covers only those who obtained an ASU undergraduate degree while the latter includes those who received an ASU graduate degree, and (2) the former is net of tuition and other costs of education while the latter does not consider costs.

## **UNIVERSITY RESEARCH AND LOCAL ECONOMIC DEVELOPMENT<sup>12</sup>**

Up to this point, the analysis of the contribution of Arizona State University to the Arizona economy has focused on the impact of the university community as an employer and purchaser of goods and services and as a provider of higher education services. These are not the only contributions ASU makes to the local economy. Many of the university's research programs create technologies and solutions to industrial problems that help to improve the productivity and competitiveness of local businesses. The presence of a faculty respected for its research accomplishments also serves as a catalyst for economic development. These broader economic contributions are not easily measured, but they are no less valuable to the state.

Research is an important activity at ASU. Research and development expenditures across all science and engineering fields were \$458 million in 2015, placing ASU 48th highest among the 905 U.S. colleges and universities reporting positive research expenditures in surveys conducted by the National Science Foundation. ASU is classified by the Carnegie Foundation for the Advancement of Teaching in the group of doctorate-granting institutions with the "highest level of research activity."

In the long run, the economic benefits of university research accrue largely to consumers throughout the world in the form of lower prices and a greater variety of products available. Despite the generally global dispersion of these benefits, research at universities can have important effects on production and employment in the city or region in which the university is located. Local impacts include the attraction of industrial laboratories, the start-up of new high-tech businesses, and competitive advantages enjoyed by local businesses when their technology is advanced by university research.

One reason university research programs generate local economic impacts is that some research findings are difficult to transfer to industry without frequent face-to-face contact between university and industrial scientists. In many cases of scientific discoveries with revolutionary commercial potential, knowledge is tacit and difficult to communicate without personal interaction. If the pioneering scientist has a university appointment that he wishes to maintain, he will serve to determine the location of new firms entering the market to develop the technology.

Research universities also generate local economic impacts through their graduate programs. Availability of scientific labor is an important concern for managers of industrial laboratories, and they may choose to site a lab in an area if local universities can provide a steady supply of highly qualified science and engineering graduates. Because of a variety of local attachments that people develop while in school, young professionals often prefer to remain in the vicinity of their graduate school, especially if that school is located in a large urban area. In its 2014 survey, the NSF found ASU to be 36th highest out of 422 institutions in the number of doctorate degrees awarded.

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<sup>12</sup> For a more complete exposition of the ideas and conclusions in this section, see K. Hill, "University Research and Local Economic Development," *News and Views*, a publication of the Economic Development Division of the American Planning Association, Summer 2008, pp.14-16.

Evidence of local economic impacts from university research comes from a variety of sources: case studies of local industries born from the ideas of university scientists, university records of income earned and new businesses formed from university research findings, and econometric evidence identifying a statistical association between the level of economic activity in an area and the presence of a research university. The evidence shows that university research programs can have significant local economic impacts.

Research universities with the greatest potential for promoting local economic development are those with high quality research and graduate programs that are located in a large urban area with an existing concentration of corporate research activity and high-tech production. The potential for large local impacts from ASU's research and graduate programs is greatly aided by the fact that ASU is located in a major metropolitan area with a climate and other natural amenities that mobile inventors and professional workers find attractive. Phoenix also rates highly in many measures related to engineering, including a large local electronics industry and a number of highly rated engineering departments at ASU.

**APPENDIX: ASU STUDENT SPENDING SURVEY**

In the fall of 2016, an electronic survey was sent to every student enrolled at Arizona State University. The primary purpose of the survey was to collect information on how much students spend each month in the local economy. Students were asked to provide estimates of monthly expenditures for housing (if they rented), utilities, telecommunications, groceries, eating out, entertainment, retail, personal services, and car maintenance and repair. Students also were asked to provide basic demographic and personal information including location of home residence (in-state, other U.S. state, international), student classification (undergraduate or graduate student), and sex. A total of 1,739 usable survey responses were obtained.

The survey results are summarized in Tables A-1 and A-2. As indicated in Table A-1, females, graduate students, and students with home residence in Arizona were overrepresented in the survey, compared to official ASU enrollment totals. Mean monthly expenditures by item are shown in Table A-2. The first column shows the simple means across all survey respondents. The second column is calculated using a weighted average of means for individual groups cross-tabulated by student classification and home residence. The economic impact analysis reported in this document is based on the weighted expenditure means. The weighted average total monthly expenditure per student is \$1,581.

**TABLE A-1  
CHARACTERISTICS OF RESPONDENTS TO ARIZONA STATE UNIVERSITY  
STUDENT SURVEY**

	<b>Number of Responses</b>	<b>Share of Responses</b>	<b>Share of All Students*</b>
Sex:			
Male	771	44.9%	50.3%
Female	945	55.1	49.7
Degree Program:			
Undergraduate	1,224	70.4	81.5
Graduate	514	29.6	18.5
Residency Status:			
In State	1,180	67.9	63.3
Other U.S. State	328	18.9	22.8
International	230	13.2	13.9

\* Based on enrollment at metropolitan campuses in fall 2015.

Source: ASU Student Spending Survey, Fall 2016.

**TABLE A-2**  
**MEAN RESPONSES TO SPENDING QUESTIONS IN THE ARIZONA STATE**  
**UNIVERSITY STUDENT SURVEY**

	<b>Average Monthly Expenditures</b>	
	<b>Unweighted</b>	<b>Weighted</b>
TOTAL	\$1,703	\$1,581
Housing	648	561
Utilities	166	159
Telecommunications	119	114
Groceries	228	221
Eating Out	136	132
Entertainment	88	85
Nonfood Retail	111	107
Vehicle Maintenance & Repair	125	123
Personal Services	82	79

Source: ASU Student Spending Survey, Fall 2016.