

**THE CONTRIBUTION OF ARIZONA STATE  
UNIVERSITY TO THE ARIZONA ECONOMY,  
FISCAL YEAR 2009**

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

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## SUMMARY

One approach to measuring the contribution of a university to a local economy is to identify the jobs and incomes that are supported by the spending of the university, and its students, and its employees. In fiscal year (FY) 2009, Arizona State University (ASU) employed almost 20,000 faculty, staff and students full time and part time and had a total payroll of \$846 million. The university was responsible for another 3,350 Arizona jobs and labor income of \$144 million because of what it spent on construction, equipment, and other goods and services. Additional economic impacts arise from the consumer spending of faculty, staff, students and university visitors. A total of 11,680 jobs and income of \$374 million were directly supported by this spending. The total direct impact of the university was 35,000 jobs and labor income of \$1.36 billion.

The spending by the university and by those associated with the university 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 amount to an additional 19,780 jobs and labor income of \$899 million. When all economic interdependencies are accounted for, the spending of the ASU community in FY 2009 was responsible for 54,800 Arizona jobs and labor income of nearly \$2.3 billion.

These totals overstate the net economic impact of the university to the extent that some of the underlying spending would remain in the state even if ASU did not exist. Funds that most certainly would not be lost to the state are those provided by Arizona taxpayers to help support the university, but this represents just 29 percent of the university's total funding. Categories of institutional funding that the state is most at risk of losing without ASU are federal funds for research grants and student scholarships (18 percent of all funds), and revenues from nonresident students (17 percent of the total). More difficult to know is the extent to which resident students might leave the state if ASU, or a comparable institution, did not exist. Resident students account for almost one-quarter of ASU institutional funding and for three-quarters of total student spending. Depending upon what assumptions are made about spending that would be lost to the state without ASU, the net economic impact of ASU ranges anywhere from one-third to 80 percent of the gross impact.

An alternative approach to assessing the economic value of a university is to measure and compare the value of the services provided by the university with the costs of producing those services. In a "cost-benefit analysis" of higher education, the full costs of a four- year college education are compared with 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 three-to-four times as large as the costs. The costs of education include 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 \$125,000. Based on national statistics relating individual earnings to educational attainment, the lifetime benefits to be realized by an ASU undergraduate are estimated to be \$500,000 for men and \$360,000 for women.

Because higher education has such a dramatic effect on an individual's lifetime earnings, total income in the state of Arizona is now \$2.0 billion higher because of the undergraduate education services ASU has provided over the past four decades.

Though difficult to quantify, the university also benefits the state's economic development. The university's research programs not only import money into the state, but create technologies and solutions to industrial problems. Researchers serve as a catalyst for economic development.

## **INTRODUCTION**

This report provides an assessment for fiscal year (FY) 2009 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 its 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 with 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 three-to-four 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. But numerous national and international studies have found that 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 its 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 domestic product by state, labor income, and employment. Gross product is a broad measure of income consisting of employee compensation, proprietors’ income (self-employed income), property income, and indirect business taxes. Labor income is the sum of employee compensation and proprietors’ income. Employment is a count of both full and part-time jobs.

Table 1 provides a summary of results. Charts 1 and 2 detail the effects ASU has on employment and labor income in the state of Arizona. Unless otherwise indicated, all primary data and impacts refer to FY 2009 and are totals across all four campuses— Tempe, West, Polytechnic, and Downtown Phoenix.<sup>2</sup>

### **University Expenditures: Operations**

ASU directly affects the economy of Arizona by employing almost 20,000 people on either a full-time or part-time basis. During the 2008-09 academic year, the university employed approximately 5,000 faculty, 6,800 administrative and classified staff, and 8,200 graduate and undergraduate students. University payroll for FY 2009 was \$846 million, with wages and salaries accounting for \$648 million and the remainder being employee-related expenses.<sup>3</sup>

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 2009 created a demand for \$283 million worth of goods and services supplied by Arizona businesses.<sup>4</sup> These purchases directly accounted for 2,710 jobs, \$110 million in labor income, and \$153 million in Arizona gross state product.

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 3,440 jobs, \$154 million in labor income, and \$238 in gross state product. The total impact of university purchases was 6,150 jobs, \$264 million of labor income, and \$391 million in gross state product.

### **University Expenditures: Construction**

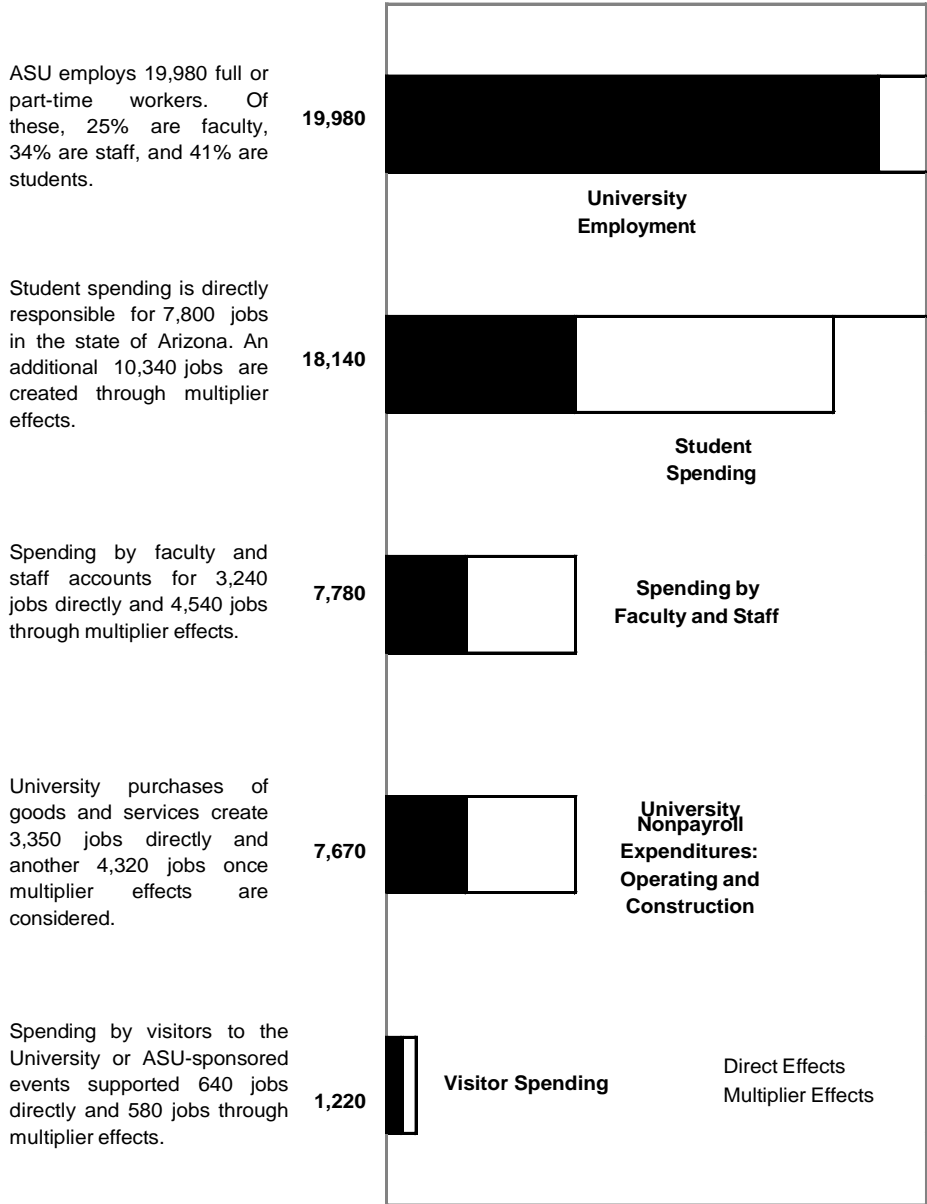
Construction outlays in FY 2009 were \$79 million. Major projects which were ongoing during the year were the repair and refurbishment of the Memorial Union, academic buildings on the Polytechnic campus, the Indoor Training Facility, and the Interdisciplinary Science and Technology Building (IV).<sup>5</sup> Expenditures associated with these projects directly generated 640

**TABLE 1  
ECONOMIC IMPACT OF ARIZONA STATE UNIVERSITY, FISCAL YEAR 2009**

	In Millions		
	Gross Product	Labor Income	Employment
TOTAL ECONOMIC IMPACT	\$3,234	\$2,263	54,790
University Payroll and Employment	901	846	19,980
University Nonpayroll Operating Expenditures	391	264	6,150
University Construction	98	75	1,520
Spending by Faculty and Staff	528	326	7,780
Student Spending	1,250	709	18,140
Visitor Spending	66	43	1,220

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

## CHART 1 IMPACT OF ARIZONA STATE UNIVERSITY ON ARIZONA EMPLOYMENT, FISCAL YEAR 2009



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 2009**  
**(In Millions of Dollars)**

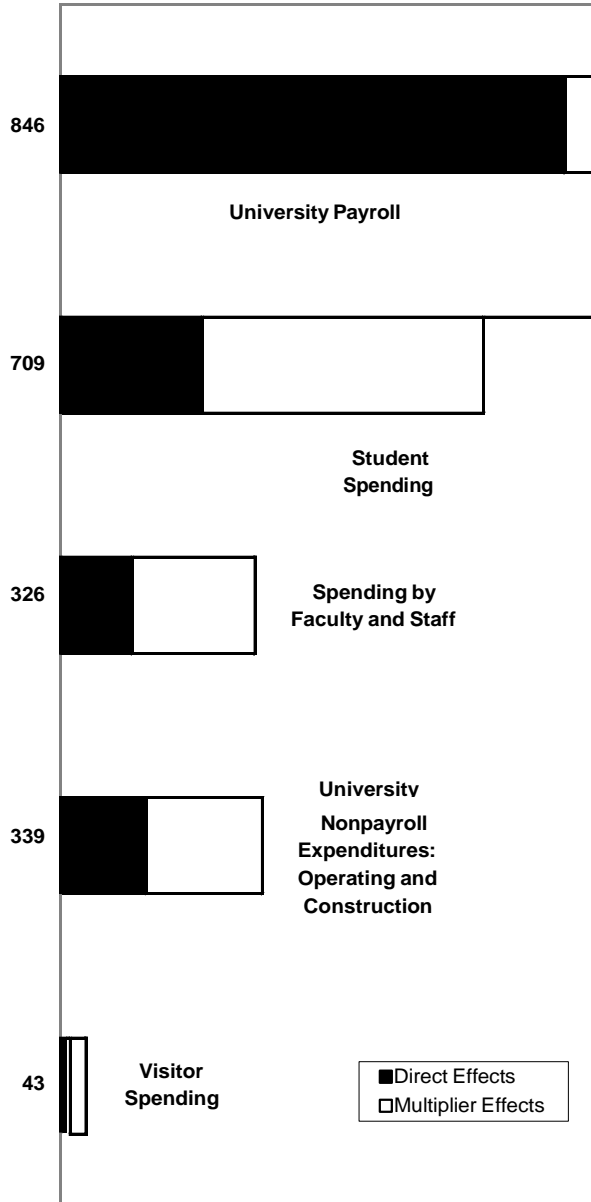
ASU has a total payroll (wages, salaries and benefits) of \$846 million with 42% of that paid to faculty, 49% paid to staff, and 9% paid to students.

Student spending directly generates \$238 million of labor income in the state of Arizona. An additional \$471 million is generated through multiplier effects.

Spending by faculty and staff directly accounts for \$120 million in Arizona labor income. Another \$206 million is created through multiplier effects.

University purchases of goods and services create \$144 million in labor income directly and another \$195 million once multiplier effects are considered.

Visitor spending generates \$16 million in direct labor income and another \$27 million in income through multiplier effects.



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



jobs, \$34 million in labor income, and \$37 million in gross state product. When multiplier effects are included, the total impact of ASU construction spending in FY 2009 was 1,520 jobs, \$75 million in labor income, and \$98 million in gross state product.

### **Employee Spending**

In economic impact analysis, university faculty and staff contribute to 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 Bureau of Labor Statistics on the share of income spent on individual commodity items by U.S. households.<sup>6</sup> The approach used attributes to the university only that household spending financed by wage income earned at ASU. Consumer expenditures associated with the payroll of ASU faculty and staff were estimated to be \$540 million in FY 2009. Of this total, \$363 million was spent on goods and services produced by Arizona businesses. This spending was directly responsible for 3,240 jobs, \$120 million in labor income, and \$213 million in Arizona gross state 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 4,540 jobs, \$206 million in labor income, and \$315 million in gross state product. In total, expenditures by ASU faculty and staff accounted for 7,780 Arizona jobs, \$326 million worth of labor income, and \$528 million in gross product.

### **Student Spending**

An average of 62,400 students was enrolled at ASU during the fall and spring semesters of the 2008-09 academic year. Because of their sheer number, ASU students exert an enormous influence on the local economy. Estimates of student spending were made by combining current enrollment figures with estimates of per capita student spending obtained in a survey conducted in 2004 at the University of Arizona.<sup>7</sup> The survey numbers were adjusted for inflation. Average monthly expenditures per student in FY 2009 were estimated to be approximately \$1,700.

The ASU student population was directly responsible for \$1.0 billion worth of spending, excluding tuition. Of this amount, 27 percent went for nonuniversity housing, 10 percent was spent on groceries, and 9 percent was spent eating out. Other important expenditure categories were utilities and communications, retail, and entertainment. The direct impact of this spending on Arizona was 7,800 jobs, \$238 million in labor income, and \$534 million in gross state product.

The secondary effect of student expenditures was an additional 10,340 jobs, \$471 million in labor income, and \$716 million of gross state product. The total economic impact of spending by the ASU student population was 18,140 jobs, \$709 million worth of labor income, and \$1,250 million in Arizona gross state 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. Many of those who

attend ASU activities are local residents. But it is estimated that out-of-town visitors spent 230,000 visitor-days in the Phoenix area because of University-related activities. These visitors spent \$48 million on lodging, food, entertainment and other goods and services. The total economic impact of this spending is 1,220 jobs, \$43 million in labor income and \$66 million in Arizona gross state product.

### **Total Economic Impact**

The total impact of Arizona State University on Arizona gross product is estimated to have been \$3.2 billion in FY 2009. The total employment impact of ASU, including university employees and all other jobs indirectly induced, was 54,790 jobs. The total labor income associated with these jobs was estimated to be \$2.3 billion.

### **Gross Versus Net Impacts**

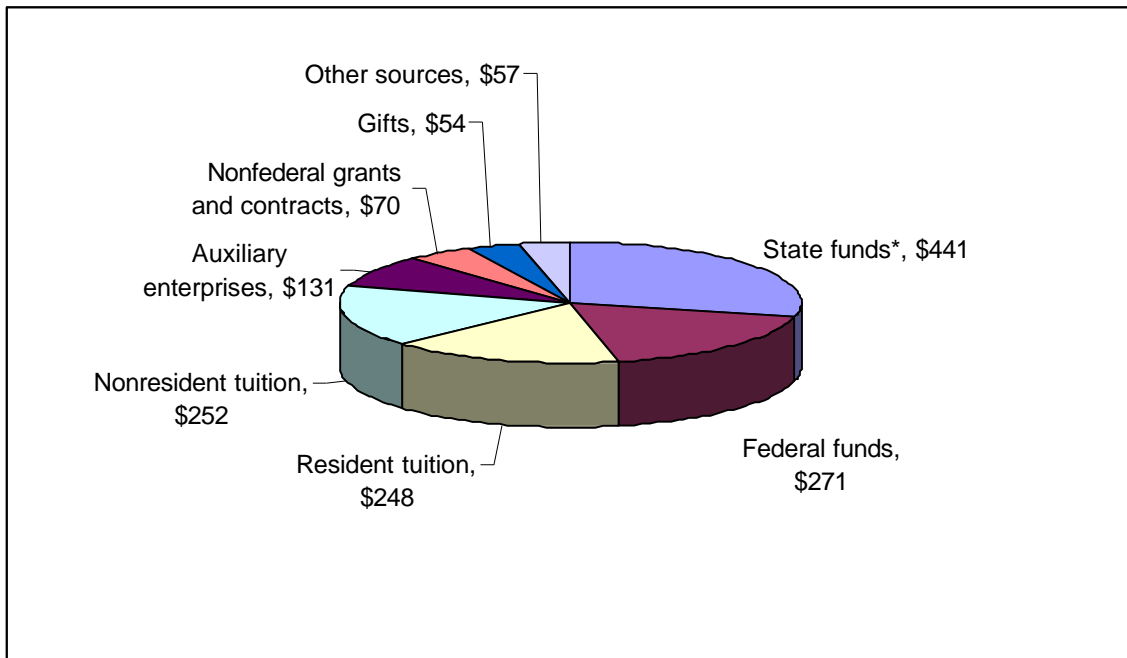
The economic impacts reported in this section represent the “gross” impacts of ASU on the Arizona economy. The figures provide a fair estimate of the jobs and incomes that are supported by the spending of the university, its employees and students. But these figures overstate the “net” impact of the university to the extent that some of the underlying spending would remain in the state even if ASU, or a comparable institution, did not exist. To get a sense of how much lower total employment and income in Arizona might be without ASU, it is useful to review the sources of funds which ASU uses to finance its payroll and nonpayroll expenditures, with an eye toward determining what percentage of those funds would leave the state without the university. It is also important to consider the role students play in the economic impact process, both as a source of funding for ASU operations and as a consumer of goods and services. Many students might choose not to reside in Arizona if ASU did not exist.

Chart 3 provides pertinent detail on the sources of funds for ASU in FY 2009. These funds finance the payroll of the university (and indirectly the spending of its employees), as well as the nonpayroll expenditures of ASU. The categories of funding the state is most at risk of losing without ASU are federal funds for research grants and student scholarships (18 percent of total funds), tuition and fees paid by nonresident students (17 percent), and a portion of revenues from auxiliary enterprises that are connected to the nonresident student population (about 2 percent).<sup>8</sup> The funds that most certainly would not be lost to the state if ASU did not exist are funds provided by Arizona taxpayers (29 percent). These monies could be spent by state government in other ways or returned to taxpayers for their disposition. More difficult to evaluate is the local commitment of other funding sources such as gifts and research contracts from private or nonfederal government sources.

In trying to assess the net economic impact of the university, it is also important to consider the decisions of resident students. Without ASU or a comparable institution, how many resident students now attending ASU would leave the state to pursue opportunities for higher education elsewhere? Resident students account for approximately three-quarters of total student spending, and through their contributions to tuition, fees and the revenues of auxiliary operations, they account for about 23 percent of total ASU funding.

In a **low net impact** scenario, the assumption is that the only spending the state would lose if ASU did not exist was the consumer spending of nonresident students and the institutional

**CHART 3**  
**ARIZONA STATE UNIVERSITY SOURCES OF FUNDS, FISCAL YEAR 2009**



Source: Department of Financial Services, Arizona State University.

spending that is supported by funds the university receives from the federal government and nonresident students. In this case, the net impacts ASU has on the Arizona economy are only one-third the size of the gross impacts. Specifically, ASU would have a net impact of 17,770 jobs, \$740 million in labor income, and \$1,029 million in Arizona gross state product.

Alternatively, ASU would have a **high net impact** on the Arizona economy if all ASU students—resident and nonresident—would be lost to the state without the higher education capacity the university provides and if all sources of institutional funding except for state of Arizona tax dollars also would leave the state without ASU. In this case, the net impacts of ASU are approximately 80 percent the size of the estimated gross impacts. ASU has a net impact on the Arizona economy equal to 44,520 jobs, \$1,825 million in labor income, and \$2,678 million in gross state product.

#### **HUMAN CAPITAL APPROACH: ASU AS A PROVIDER 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. But the primary mission of the university is to provide quality education for its students. The economic value of a college education is reflected in the earnings premium realized by workers with college degrees.

#### **Earnings Premium for College Graduates**

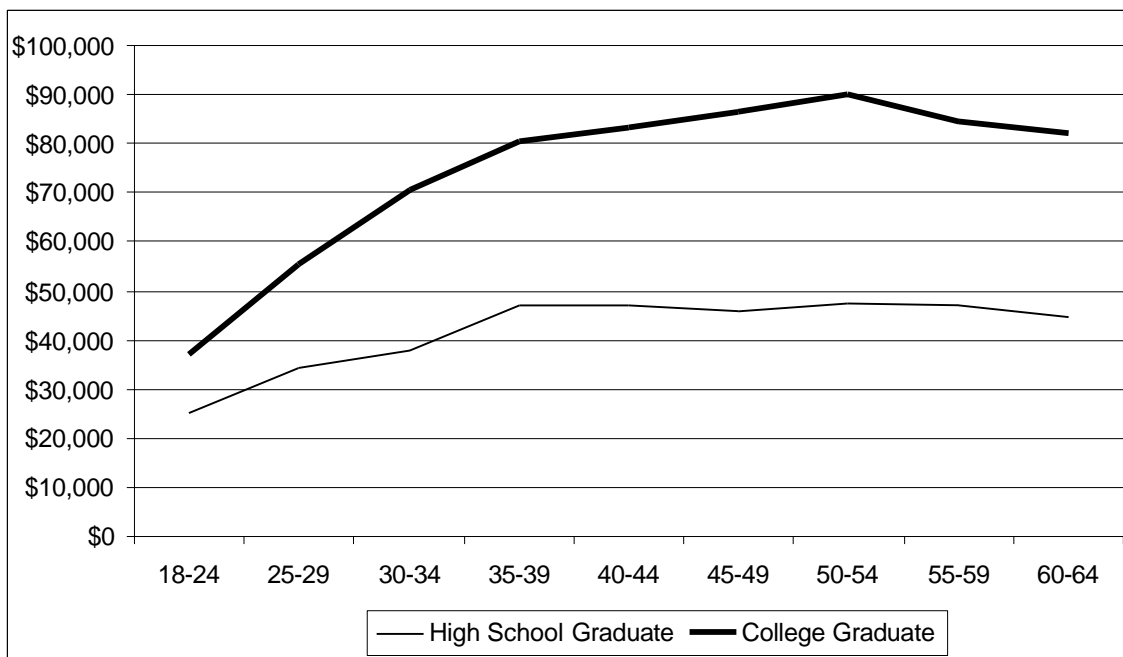
One can gain a sense of magnitude of the financial benefits of higher education by comparing the earnings experiences of people who did and did not complete college.<sup>9</sup> Data on earnings by

educational attainment are collected each year by the U.S. Census Bureau in its Current Population Survey. Chart 4 shows results from the most recent survey on mean annual earnings of men who were fully employed in 2007, arranged by age group and for two levels of education: high school graduates 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 fifty states. More specific information on earnings by education for the state of Arizona is too limited to be reliable.

The earnings premium for a college education is substantial. Based on averages for the years 2005 through 2007, male workers between ages 35 and 44, for example, earn 82 percent more if they have completed college than if they have only a high school degree. A college education also enhances the earnings power of women. Female workers between ages 35 and 44 earn 86 percent more with a college degree.

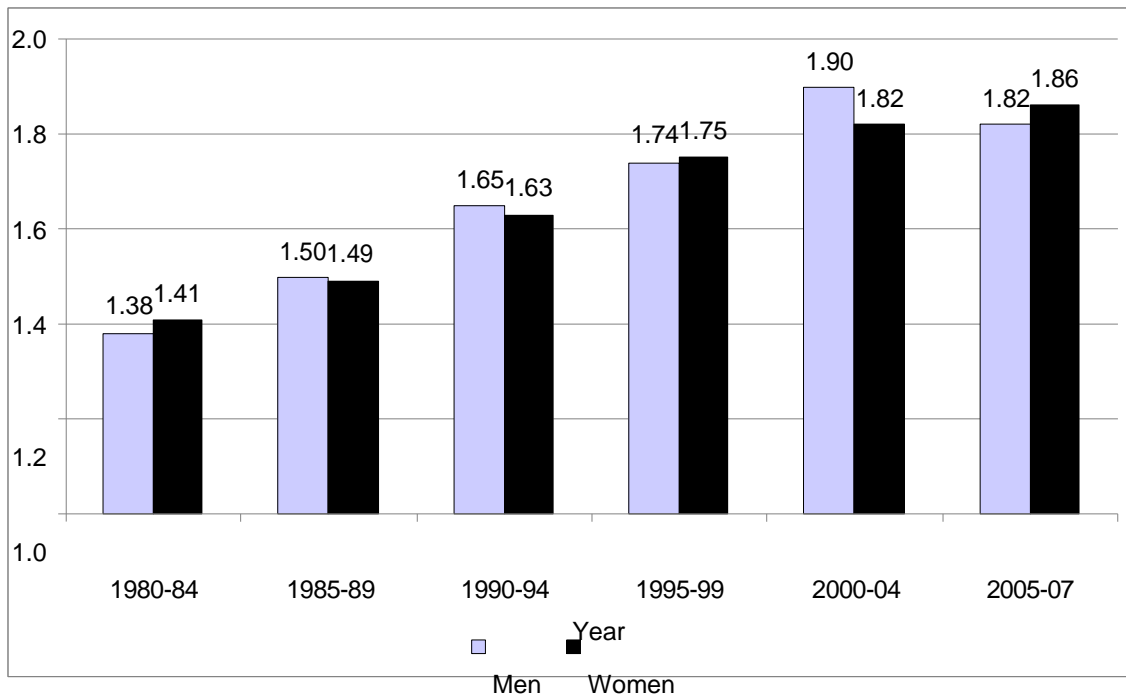
The earnings premium for higher education has been increasing since the early 1980s when the premium was approximately 40 percent for both men and women aged 35-44 (see Chart 5). This trend seems to reflect a broad-based increase in the demand for skilled workers that is occurring throughout the industrialized world. A rising skill premium is 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-using technological advances (especially involving the computer), increased trade

**CHART 4**  
**MEAN ANNUAL EARNINGS BY AGE AND EDUCATIONAL ATTAINMENT**



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

**CHART 5**  
**RATIO OF MEAN EARNINGS OF UNIVERSITY GRADUATES TO HIGH SCHOOL GRADUATES, AGES 35 THROUGH 44**



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

with less-developed countries, and a decline in the importance of unions and wage-setting institutions in some countries.

Although the high return to schooling could eventually lead to a greater supply of educated workers, the consensus opinion of experts is that the demand for skilled workers will continue to grow and the return to education will remain high into the foreseeable future.

#### **Value of a College Degree**

A cost-benefit analysis of the investment value of a four-year college education is provided in Table 2. 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, lost earnings during the time the student is attending college. The average direct costs of education (tuition, fees, and books) at ASU are \$9,800 per student per year. State funds received by ASU to help defray the costs of education are \$7,500 per student per year. The foregone earnings of ASU male students are estimated to be \$16,600 per year, and the foregone earnings of female students are estimated at \$13,900 per year.<sup>10</sup> For the entire four-year period, the total costs of attending college amount to \$135,000 for men and \$125,000 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 calculating the difference

**TABLE 2**  
**VALUE OF A BACHELOR'S DEGREE**

	Men	Women
<b>Costs (Ages 18 to 21):</b>		
Direct Cost of Education	\$39,200	\$39,200
State Appropriations	30,000	30,000
Foregone Earnings	66,200	55,500
Total Costs	135,400	124,700
Total Costs Discounted at 4 Percent Interest	127,500	117,500
<b>Benefits (Ages 22 to 65):</b>		
Earnings With a High School Diploma	1,782,400	1,237,600
Earnings With a Four-Year Degree	3,116,000	2,171,200
Differential in Earnings	1,333,600	933,600
Earnings Differential Discounted at 4 Percent Interest	497,500	355,000
Net Present Value of a Bachelor's Degree	370,000	237,500
Internal Rate of Return	12.5%	11.0%

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

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 the same demographic characteristics who has only completed high school. The estimated earnings differential is then reduced by 5 percent to reflect the general earnings experience of workers in Arizona. Using this approach and assuming that a college graduate works continuously from age 22 to 65, the additional earnings provided by a college education are \$1,334,000 for men and \$934,000 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 \$128,000 for men and \$118,000 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 \$498,000 for a male graduate and \$355,000 for a female graduate.

As the analysis shows, the benefits of a college education decidedly outweigh the costs. The net present value of a college education is \$370,000 for men and \$238,000 for women. A student who could successfully complete college but for whatever reason chooses not to do so is effectively turning down a gift of \$370,000 (\$238,000) to be given to him (her) at age 18.

Another way of expressing the investment value of a college 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 college degree provides an inflation- adjusted

internal rate of return of 12.5 percent for men and 11.0 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 12.5 percent (11.0 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. So the student makes out on the deal.

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. So an investment in a college education beats what is regarded as the best long-term financial investment—the stock market—and does so by a wide margin.

### **Other Benefits of Education**

The benefits of a college education are not limited to the increase in lifetime earnings realized by the degree holder. For example, there are well-documented effects of educational attainment on health. There is also emerging evidence of spillover benefits realized by other workers. 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>11</sup> Simulations for Arizona using 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>12</sup>

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

Because higher education has such a dramatic 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, simple calculations demonstrate that counting only the private benefits of a college education, Arizona's annual net income is now \$2.0 billion higher because of the education services provided by the University. Table 3 provides a summary of these calculations.

In the absence of more specific information, it has been assumed that ASU graduates working in the state receive a college earnings premium equal to the nationwide average premium for workers of the same age and sex (less 5 percent in recognition of the fact that Arizona workers generally earn less than U.S. workers). Those who graduated in the 1970s and are now in their fifties are on average earning \$22,000 (women) to \$34,000 (men) more annually than they would have had they only completed high school. Those graduating around the turn of the century, who are in their late twenties or early thirties, are earning between \$17,000 and \$26,000 more annually because of their undergraduate education. Recent alumni records indicate that 57 percent of ASU graduates now reside in the state of Arizona. Combining this figure with the total number of undergraduate degrees awarded to men and women from 1970 through 2008, one can estimate the gross impact of ASU undergraduate education on current Arizona income. The estimates indicate that income in the state is now \$3.2 billion higher because of the education services provided by the university over the past 38 years.

**TABLE 3**  
**CONTRIBUTION OF ARIZONA STATE UNIVERSITY UNDERGRADUATE**  
**EDUCATION TO ARIZONA INCOME, FISCAL YEAR 2009**

	Value Per Student	Number of Students	In Millions	
			Subtotal	Total
Incremental Earnings*				\$3,206
Costs				1,193
Lost Income	\$15,000	37,500**	\$563	
Tuition, Fees, and Books	6,800	37,500**	255	
State Appropriations	7,500	50,000	375	
Net Effect on Arizona Income				2,013

\* Of former ASU undergraduates from 1970 through 2008, assuming that 57 percent remain in Arizona

\*\* Only resident students are included

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

To estimate the net effect of ASU education on current state income, some allowance must be made for the costs incurred by students now attending ASU. There are approximately 50,000 undergraduates enrolled at the university, and roughly three-quarters of these are considered state residents. Combining these figures with the average costs per student—costs associated with foregone income, tuition and fees, and state appropriations—results in an estimate of \$1.2 billion for the total cost to Arizona of ASU’s present undergraduate population. Thus, the net effect of ASU undergraduate education on current income in the state of Arizona is approximately \$2.0 billion.

### **UNIVERSITY RESEARCH AND LOCAL ECONOMIC DEVELOPMENT<sup>13</sup>**

Up to this point, the analysis of the contribution of Arizona State University to the state’s 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. These are not the only contributions that 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 firms. The presence of a faculty respected for its research accomplishments also serves as a catalyst for economic development activities. These broader economic contributions are not easily measured but they are no less valuable to the state of Arizona.

Research is an important activity at ASU. R&D expenditures across all science and engineering fields were \$202 million in FY 2006, placing ASU 81st highest among the 630 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. But 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 is to be maintained, the scientist 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 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 FY 2006 survey, the NSF found ASU to be 32nd highest out of 630 institutions in the number of doctorate degrees awarded.

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 high in many measures related to engineering, including a large local electronics industry and a number of highly rated engineering departments at ASU.

## ENDNOTES

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<sup>1</sup> The specific model used was based on IMPLAN's 2007 database. In building the model, trade flows were calculated using IMPLAN's "regional purchase coefficients," which are econometrically derived estimates of the percentage of demand for a commodity that is satisfied by local producers. 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> Included in the analysis are impacts related to ASU-affiliated units such as the ASU Foundation, the Arizona Capital Facilities Finance Corporation, and ASU Research Park. These are legally separate entities with payroll and operational expenditures that are not tracked in the ASU accounting system. Estimates of their impacts were made and included in the category "university nonpayroll expenditures."

<sup>3</sup> The payroll figures reported above are adjusted for the university-wide furlough in the second half of FY 2009. Total payroll savings from the furlough was \$22 million, or 2.6 percent of actual payroll.

<sup>4</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 were immediately excluded from consideration if they did not involve a payment to an outside vendor or if the expenditure was for a good or service that was clearly produced out-of-state. Having compiled a list of expenditures with a potential local economic impact, IMPLAN internal estimates of regional purchase coefficients were used to determine the likely percentage of expenditures on items produced in Arizona.

<sup>5</sup> Not included among the projects is construction related to the Barrett Honors College. This was not an ASU project. The Barrett Honors College was built by American Capital Communities on land leased to them by ASU.

<sup>6</sup> For the nation as whole, personal consumption expenditures have averaged 83 percent of personal income over the past five years. The aggregate data include retired people and families with unemployed primary earners which have above-average propensities to consume relative to their incomes. For ASU faculty and staff, many of whom are highly skilled and have above-average earnings, personal consumption expenditures were assumed to be only 70 percent of their total employee compensation (wages, salaries, and benefits). The detailed commodity composition of these expenditures was taken from IMPLAN data files. These data, in turn, come from the BLS Consumer Expenditure Survey.

<sup>7</sup> The essential findings from the U of A student survey were published in "The University of Arizona Economic and Tax Revenue Impacts, FY 2004."

<sup>8</sup> Auxiliary enterprises include the ASU bookstore, student housing, and athletic events.

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<sup>9</sup> Simple comparisons of earnings between individuals with different education backgrounds can be misleading if earnings differentials are due to other factors which 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 current consensus 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.

<sup>10</sup> These figures reflect an assumption that while attending college, students work only during the summer. To the extent that students are able to work part-time during the semester, and remain effective in their studies, this analysis overstates costs and understates the net benefits of a college education.

<sup>11</sup> For example, see E. Moretti, “Workers’ Education, Spillovers and Productivity: Evidence from Plant-Level Production Functions,” *American Economic Review* 94 (June 2004): 656-90; and E. Moretti, “Estimating the Social Return to Higher Education: Evidence from Longitudinal and Repeated Cross-Sectional Data,” *Journal of Econometrics* 121 (July/August 2004): 175-212.

<sup>12</sup> See K. Hill, D. Hoffman and T. Rex, “The Value of Higher Education: Individual and Societal Benefits,” Report prepared for the Productivity and Prosperity Project at Arizona State University, October 2005, available on-line at <http://economist.asu.edu/p3/education>.

<sup>13</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.