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Does Spending on Higher Education Drive Economic Growth? 20 Years of Evidence Reviewed

by Jon Sanders, Higher Education Policy Analyst, John Locke Foundation

EXECUTIVE SUMMARY

At a time when every dollar counts, appropriation decisions must be based on fact, not fiction – no matter how noble the fiction. Arizona's taxpayers subsidize the estimated 6.8 percent of residents enrolled in the state's two-year and four-year colleges and universities. Taxpayers also subsidize the one-third of enrollees who are nonresidents. What is the return on this investment?

Research has long shown that college graduates earn significantly more than nongraduates. Conventional wisdom holds, likewise, that public spending on higher education drives economic growth. Using data from all 50 states and spanning two decades, this study puts that conventional wisdom to the test and attempts to determine whether taxpayers are getting a good return on their money.

Three distinct regressions find no consistent, statistically significant impact of higher-education appropriations on states' economic growth. Indeed, a stronger relationship is found when the models are reversed, suggesting that a better case can be made that growth drives spending, rather than spending driving growth.

Comparing states' higher-education appropriations and gross state products also yields no solid evidence that spending drives economic growth. For example, 2 of the 10 fastest-growing states from 1981 to 2000 experienced real decreases in per capita higher-education appropriations, while 3 of the 10 slowest-growing states were among the top 10 in growth of real higher-education appropriations. From 1991 to 2000, none of the top 10 states in greatest higher-education appropriations were among the top 10 in economic growth. During the same time, Arizona was 46th among the 50 states in real higher-education appropriations per capita – actually appropriating less in 2000 than in 1991 – yet it was the 16th fastest-growing state. Finally, analysis suggests no connection between the presence of prestigious universities in a state and its economic growth.

This study is the first in a series examining the impact of higher-education spending and investment on Arizona's economy.

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Epicenters of Economic Development?

According to the U.S. Department of Education, national enrollment at degree-granting institutions is projected to increase between 2000 and 2012, most significantly among the traditional college population 18 to 24 years old.[1] Total college enrollment is projected to be 18 million in 2012, 15 percent more than in 2000. Among public, degree-granting institutions, enrollment is likewise expected to increase 15 percent, from 12 million in 2000 to 13.5 million in 2012.[2]

The assumption that state support of the university system drives the state's economy has become entrenched among Arizona policy-makers.

Research has long shown that college graduates have significantly greater lifetime earnings than nongraduates. By some estimates, the average college graduate with a bachelor's degree earns 54 percent more than the average high school graduate and 104 percent more than the average person without a high school diploma (the differences for advanced degrees are even greater).[3] Individual earning power, then, can be expected to increase substantially, based on U.S. Department of Education college enrollment projections.

As personal investment in higher education significantly increases an individual's earning power, real public appropriations for higher education per capita would seem likely to translate into increased gross state product per capita. That is, state funding of higher education would appear to be good for the economy, and what's good for the economy is generally considered good for everyone.

In fact, the assumption that state support of the university system drives the state's economy has become entrenched among Arizona policy-makers. Consider the following statements:

- "It is imperative that the state recognize the crucial role of higher education as a driver for Arizona's New Economy and increase the financial support required for higher education to effectively fulfill this role. The result will be an enhanced contribution by higher education to quality of life and the economy of the state." – *Arizona at Risk: An Urgent Call for Action*, Report of the Governor's Task Force on Higher Education[4]
- "The State of Arizona has been consistently spending less and less on higher education as a fraction of personal income (43% less since 1979!) and of the total state budget. This trend obviously has to be reversed, or the decline of the universities will eventually erode the state's economy and quality of life." – Paul Sypherd, senior vice president for academic affairs and provost, and Elizabeth Ervin, vice provost for

academic personnel, University of Arizona[5]

- "It is time to stop viewing universities...as easy marks to balance the budget. Instead, we must recognize them as epicenters of economic development. They educate the workforces of tomorrow, and their research expands our horizons." – Governor Janet Napolitano[6]

Using data from all 50 states and spanning more than twenty years, this study tests policymakers' assumption that there is a direct correlation between increased public spending on higher education and economic growth. This study is the first in a series designed to examine the impact of higher-education spending and investment on Arizona's economy.

The Many Pay for the Few

The vast majority of people in any state are not enrolled in college, yet they help pay the way for the small minority who are enrolled. Nationally, an average of 5.4 percent of a state's resident population is enrolled in higher education annually.[7] Thus, the federal and state tax dollars of the many pay for the few to attend public institutions of higher education.

During fiscal year 2000, public, degree-granting institutions[8] nationwide received these amounts:

- Federal appropriations totaled nearly $42 billion (32 percent of revenues) for four-year institutions and more than $16 billion (57 percent of revenues) for two-year institutions.
- Tuition and fees totaled $23 billion (18 percent of revenues) for four-year institutions and nearly $6 billion (20 percent of revenues) for two-year institutions. These amounts include government Pell grants paid to students at those institutions.
- Government grants and contracts accounted for the third-highest portion of total revenues: $18 billion (14 percent of revenues) for four-year institutions and more than $3 billion (12 percent of revenues) for two-year institutions.[9]

The vast majority of people in any state are not enrolled in college, yet they help pay the way for the small minority who are enrolled.

Federal tax dollars, allocated directly to institutions or indirectly to the students who attend them, accounted for 46 percent of all revenues (not including Pell grants) at four-year, public, degree-granting institutions and 69 percent (not including Pell grants) of all revenues at two-year, public, degree-granting institutions.

Though federal investment in public higher education was $79 billion in 2000 (not including Pell grants), only a fraction of any state's resident population enrolls in higher education. Arizona ranks fifth among states in highest percentage of residents enrolled in higher education,[10] at 6.8 percent, including both full-time and part-time students.[11]

In the fall of 2000, 105,000 Arizona students were enrolled full-time in four-year, degree-granting institutions, while nearly 175,000 were enrolled full-time at two-year institutions.[12] Therefore, 5 million Arizonans (fewer than 4 million of whom are 18 years old and above) paid the lion's share through their federal tax dollars[13] for only 2.7 percent of Arizona's adult population to attend the four-year Arizona university system full-time, and for only 4.5 percent of its adult population to attend the two-year Arizona community college system full-time.[14]

In fiscal year 2001, total appropriated funds for the Arizona university system were $993 million. What is the return on this investment for Arizona's taxpayers?

Arizonans also pay a significant amount through their state taxes. In fiscal year 2001, total appropriated funds for the Arizona university system were $993 million. For community colleges, combined appropriations from the general fund and from other appropriated funds totaled nearly $135 million.[15]

As a result of Proposition 301, which voters approved in November 2000, Arizona taxpayers also fund public education through a 0.6 percent increase in the state sales tax. All funds raised through the Proposition 301 tax increase are dedicated to education, which includes K-12 as well as universities and community colleges. The Arizona Board of Regents, which administers the funds through the Technology and Research Initiative Fund, estimates that additional annual revenues for fiscal years 2002-2006 will range from $45 million to $55 million.[16] Over 20 years, the universities' share (12 percent) is projected to be $1.1 billion.[17]

The sales tax increase has not generated controversy, but university students have protested a recently approved tuition increase of $1,000 per undergraduate. The University of Arizona, however, reassures those who share the students' concern: "It's important to realize that education for all Arizona residents is already highly subsidized, and will remain so. An Arizona resident undergraduate pays a mere $2,500 toward an education that in fact costs more than $12,000 to provide. That's a significant subsidy."[18]

Return on Investment

What is the return on this investment for Arizona's taxpayers?

In 2000, the Board of Regents reported: "Arizona's universities receive funding from the state, and the universities give back technology, trained workers, payroll, local purchases, and a broader tax base to the economy of the state. The overall annual economic impact of the universities is estimated to be more than $5.3 billion."[19]

Basing their 2002 report on fiscal year 1998 and 1999 university data, the Board of Regents found that the state's three public universities had a combined estimated economic impact on their local communities of more than $4.4 billion, in addition to creating more than 89,000 jobs. Roughly one-quarter of those jobs are held by people who live in Arizona.[20] While the reported

economic impact of Arizona's universities dropped by nearly $1 billion from 2000 to 2002, employment in Arizona during that period grew by an estimated 125,000 jobs, from 2,325,000 to nearly 2,500,000.[21]

Beginning in 1993 at less than 1.7 million jobs, employment in Arizona grew steadily for nearly a decade before leveling off in 2002 at more than 2.5 million.[22] Meanwhile, from 1991 to 1998, per capita state funding for higher education decreased by more than 35 percent, from $210 to $133.[23] Further, in fiscal years 2002 and 2003, budget cuts of $48 million and $19 million were enacted,[24] with further cuts proposed for fiscal year 2004.[25]

Although Arizona's economic growth during the 1990s occurred amid diminished per capita higher-education spending, actual and proposed cuts have been criticized as being a threat to the state's economy. In its 2002 report titled *Arizona's Economic Future*, the Arizona Department of Commerce concludes that college education is critical to competitiveness because it provides a talented pool of skilled workers and entrepreneurs. The report also notes that college-educated residents have significantly higher earnings than those with only a high school diploma.[26]

Yet a fundamental flaw of the department's argument is revealed on the next page of the report. For resident spending on public education to be a sound investment, it must be current or future *residents* who attend in-state universities, earn degrees, and remain in-state, infusing the state's economy with their higher individual earnings and productivity after they graduate.

At best, the economic boosts described by the Board of Regents are short-term and fluctuate annually. The regents' economic impact estimates are based on direct and indirect economic activity, which includes faculty, staff, and student employment; university purchases of services, supplies, and equipment; as well as consumer spending by faculty, staff, students, and visitors.[27]

Contributions to longer-term economic growth would appear only *after* university students graduate, and only *if* those graduates remain in-state. The Department of Commerce notes that Arizona's university system does attract the "best and brightest" students, many of whom are from outside the state. During 2000, for example, 31 percent of in-state college enrollments came from outside Arizona.[28]

According to the Department of Commerce, a crucial element to economic growth is encouraging out-of-state businesses to open in Arizona. This means that their workers and their families must be willing to relocate and enroll their primary and secondary school-age children in Arizona schools. The department concludes that attracting out-of-state college students is essential because Arizona universities must be relied on to "partially offset the detrimental effects of a weak K-12

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school system,"[29] one whose high school completion rate ranks last nationally. Among students who graduate from high school, only 45 percent enroll in college, which puts Arizona 47th nationally[30] in share of high school students who enroll in college.[31] Moreover, 8 percent of Arizona high school graduates enroll in out-of-state institutions.[32]

Thus, the majority of residents pay for the Arizona university system through their state and federal tax dollars, while nearly a third of the students enrolled are from out-of-state. In addition, there is no guarantee that graduates from the Arizona university system will remain in the state.[33]

According to the regents' own estimates, the Arizona university system's contribution accounted for 89,000 jobs, or only four percent of all Arizona jobs in 1999.

In response to budget cuts already enacted, the Board of Regents concluded: "Our universities are facing a critical problem that threatens their quality and vitality and erodes the contribution they make to the economic well-being of Arizona."[34] According to the regents' own estimates, however, the Arizona university system's contribution accounted for 89,000 jobs, or only four percent of all Arizona jobs in 1999.

The Impact of Education Spending on Economic Growth

What is the relationship between public support of higher education and a state's economic growth?[35]

To test for correlation between increased state spending on higher education and state growth, this study presents the results of regression analyses that compare real growth of gross state product (GSP) per capita in the 50 states during the study period with their real increases in higher-education appropriations per capita, allowing for up to 5 years' worth of lagged effects.

Regression Tables 1, 2, and 3 (see Appendix) use three approaches to test the relationship between a state's per capita higher-education appropriations and its per capita economic output, or GSP:

- Table 1 tests the correlation directly.
- Table 2 tests the correlation according to the *annual* change in a state's higher-education appropriations per capita (the difference between one year's amount and the previous year's) and its economic output per capita.
- Table 3 tests the correlation according to the annual *percentage* change in a state's higher-education appropriations per capita (the percentage increase or decrease of one year's amount over the previous year's amount) and its economic output per capita.

Where Table 1 tests just the annual amounts, Tables 2 and 3 test whether growth (or lack thereof) in a state's per capita higher-education appropriations explains growth (or lack thereof) in a state's per capita economic output. A detailed explanation for interpreting key

statistics precedes the regression tables in the appendix.

Each regression model reveals a correlation between a state's per capita higher-education appropriations and its per capita economic output, but in each model the correlation is slight:

- Designed to measure how well higher-education spending explains economic growth, Table 1 finds it has weak explanatory power. On a scale of 0 to 1, the explanatory value is only 0.14.
- Table 2 tests the more specific correlation between the annual change in higher-education appropriations and economic growth. The strength of the correlation is only 0.15.
- Table 3 tests the specific correlation between the annual percentage change in spending and the annual percentage change in economic growth. This is the weakest correlation of all, rating only 0.06 on a scale of 0 to 1.

Each statistic indicates very little correlation between GSP and higher-education appropriations or the annual change in them.

Nevertheless, Table 1 demonstrates a direct correlation between a state's per capita higher-education appropriations and its per capita economic output, but only in the case of current-year appropriations. However, the correlation is *negative* (-36.75), suggesting that increased current-year appropriations have, if anything, an adverse impact on GSP.[36]

Table 2 suggests that the current-year annual change in real per capita appropriations is significant, as are the 2-year and 3-year lags in annual change in real per capita appropriations. The current-year and 3-year lag changes show positive correlations between spending and economic growth, but the correlation is negative (-6.84) for the 2-year lag.

In Table 3, the current-year, 3-year, 4-year, and 5-year lags in per capita annual percentage change in real appropriations appear significant. While the current-year and 3-year lag variables indicate a positive effect on annual percentage change in real GSP per capita, the 4-year and 5-year lag variables indicate a negative relationship.

At best, the results demonstrate a weak positive correlation between spending on higher education and GSP. Where a correlation exists, it is positive in some years and negative in others.

At best, the results demonstrate a weak positive correlation between spending on higher education and GSP. Where a correlation exists, it is positive in some years and negative in others. The only consistent finding among the models is a significant correlation between current-year GSP and current-year state appropriations for higher education, but the correlation does not consistently hold for subsequent years. This suggests that current-year appropriations for higher education do not translate into long-term economic growth.

Contrary to expectations, the strongest demonstrable correlation

between higher-education spending and economic growth is negative (see Table 1). Thus, according to these regression analyses, increasing higher-education spending may actually *decrease* GSP.

Does Economic Growth Drive Higher-Education Spending?

Tables 1, 2, and 3 show only a weak correlation between a state's higher-education appropriations per capita and its economic output per capita. The strongest correlation suggests that a state's per capita higher-education appropriations may actually have a *negative* effect on its per capita economic output.

The case for the growth-drives-spending models is stronger than for the spending-drives-growth models.

The results suggest that the model may be backward. Rather than state spending on higher education driving a state's economy, perhaps a state's economic growth drives its spending on higher education. Tables 4, 5, and 6 (see Appendix) show the results of regression analyses testing the proposition that growth drives spending.[37]

Each regression model reveals a slightly more robust relationship once the model is reversed:

- Table 4 finds a stronger direct correlation for growth-drives-spending. On a scale of 0 to 1, the strength of the correlation is 0.16 (compared to a correlation of 0.14 for spending-drives-growth).
- Table 5 tests the correlation between the *annual* change in economic growth and higher-education appropriations. The strength of the correlation is 0.31, which is more than twice as strong as in the reverse model tested in Table 2 (0.15).
- For the correlation between the annual *percentage* change in economic growth and the annual change in higher-education appropriations tested in Table 6, the strength of the correlation is 0.15, on a scale of 0 to 1. Again, this correlation is more than twice as strong as in the reverse model tested in Table 3 (0.06).

The case for the growth-drives-spending models is stronger than for the spending-drives-growth models. Not only are the fits better, but the independent variables (GSP, or the annual change in GSP) are highly significant. These models also tested for lagged effects up to 5 years, and they found highly significant lags going back 2 years in the annual change models (Tables 5 and 6) and 1 year in the simple model (Table 4).

In short, if economic growth and education spending are related, economic growth appears to drive education spending, rather than education spending driving economic growth.

Comparing State Growth to State Support for Higher Education

Regression analyses suggest that the proposition that higher-education spending drives the economy is false. We can, however, look at that assumption from another perspective. If growth drives education spending, states with the greatest economic activity should have the greatest support of higher education. Conversely, states with the least economic activity per capita should have the least support of higher education per capita. We can examine these premises using 2000 per capita GSP[38] as the measure of state economic activity and using 1999-2000 per capita state appropriations for higher education[39] as the measure of state support for higher education.

To provide one-year, 20-year, and 10-year perspectives, Tables 7, 8, and 9 (see Appendix) rank the 50 states as follows:

- For a one-year perspective, Table 7 ranks the states according to real GSP and real appropriations for higher-education per capita for 2000.
- For a 20-year perspective, Table 8 ranks the states according to the change in real appropriations for higher-education per capita for 1981 to 2000 and the change in real GSP for 1981 to 2001.
- For a 10-year perspective, Table 9 ranks the states according to the change in real appropriations for higher education per capita for 1991 to 2000 and the change in real GSP for 1991 to 2001.

A One-Year View of Real GSP vs. Appropriations

As Table 7 shows, some states with the greatest per capita economic activity have the least per capita state support for higher education. Among the top 10 states in greatest per capita economic activity, corresponding rankings in real higher-education appropriations vary considerably.

Mississippi ranks 49th in economic activity per capita yet is 1st in per capita higher-education appropriations. Similarly, North Dakota ranks 41st in per capita economic activity yet is 3rd in per capita higher-education appropriations.

For example, Connecticut ranks 1st nationally in greatest economic activity per capita, but ranks 25th among the states in per capita higher-education appropriations. New Hampshire ranks dead last in real per capita higher-education appropriations, though it ranks 10th nationally in per capita economic activity. Other top 10 states in greatest per capita economic activity (and their higher-education appropriations rankings) include Wyoming (4th), Alaska (7th), and Colorado (41st).

Among the 10 states with the least economic activity per capita, rankings in real higher-education appropriations also vary considerably. Mississippi ranks 49th in economic activity per capita yet is 1st in per capita higher-education appropriations. Similarly, North Dakota ranks 41st in per capita economic activity yet is 3rd in per capita higher-education appropriations. The 10 states with the least per capita economic activity include Alabama (11th in per capita higher-education appropriations),

Kentucky (14th), Maine (40th), and Montana (45th). Arizona ranks 39th in real per capita higher-education appropriations and 36th in real per capita GSP in 2000.

While this snapshot suggests that state economic activity during 2000 is unrelated to state appropriations for higher education, what about multiyear trends in economic growth? According to the assumption, states with the greatest increase in support of higher education should experience the greatest growth in their economies. Table 8 examines that proposition in terms of real growth per capita (in 1981 dollars) over the 20-year period from 1981 to 2000.[40]

Arizona ranked 46th among the 50 states in growth in real per capita higher-education appropriations, appropriating less in 2000 than in 1991. Despite this downward trend in higher-education appropriations, Arizona was the 16th fastest-growing state in the nation during that time.

A 20-Year View of Real GSP vs. Appropriations

Table 8 likewise illustrates that a state's economic growth (the difference in real GSP between 1981 and 2000) appears unrelated to growth in the state's support of higher education (the difference in real state appropriations per capita from 1980-81 to 1999-2000). The two states with the largest increases in per capita higher-education appropriations over the 20-year period, Mississippi and New Mexico, were 41st and 44th in GSP growth. North Dakota had the 7th-largest increase in per capita higher-education appropriations in the nation during that time, but it ranked only 45th in GSP growth.

Again, among the top 10 states with the greatest increases in higher-education appropriations over 20 years, corresponding GSP rankings varied substantially. Connecticut, North Carolina, and New Jersey, which ranked 3rd, 6th, and 8th in real appropriations, ranked 2nd, 8th, and 4th in 20-year economic growth. Yet Nebraska and North Dakota, which ranked 4th and 7th in education spending, ranked only 40th and 45th in economic growth.

Further, three of the top 10 fastest-growing states – Rhode Island (9th), New York (6th), and New Hampshire (5th) – had among the nation's lowest increases in per capita higher-education appropriations. Rhode Island was 47th, New York was 45th, and New Hampshire was 39th. In fact, New York and Rhode Island experienced real *decreases* in per capita higher-education appropriations during that time.

Among the 50 states, Arizona ranked 49th in growth in real per capita higher-education appropriations from 1981 to 2000, appropriating less in 2000 than in 1981. Arizona ranked 34th in real per capita GSP growth from 1981 to 2000.

A 10-Year View of Real GSP vs. Appropriations

Table 9 is similar to Table 8 but examines just the last 10 years in the study, 1991 to 2000. Once more, it

finds that a state's real economic growth appears unrelated to growth in the state's support of higher education.

For example, from 1991 to 2000, Arizona ranked 46th among the 50 states in growth in real per capita higher-education appropriations, appropriating less in 2000 than in 1991. Despite this downward trend in higher-education appropriations, Arizona was the 16th fastest-growing state in the nation during that time. The data do not support the claim that Arizona's decline in state support of higher education has damaged the state's economy or eroded its quality of life.

On the contrary, Table 9 shows that states with the greatest per capita economic activity from 1991 to 2000 were frequently those with the least per capita support of higher education. Among the 10 lowest-ranked states in terms of higher-education support, Colorado and Minnesota ranked among the top 10 in economic growth, at 3rd and 6th, respectively.

Conversely, from 1991 to 2000, none of the top 10 states in greatest higher-education appropriations were among the top 10 in economic growth. Though Michigan and Texas were among the top supporters of higher education, they ranked 12th and 17th, respectively, in economic growth. Other top 10 supporters of higher education included North Dakota and Louisiana, which ranked 24th and 46th in terms of GSP growth.

The Impact of Prestigious Universities

If spending on public universities does not drive economic growth, perhaps public spending on prestigious universities does. In fact, in states with prestigious public universities (those that rate highly in published rankings of institutions), the correlation between spending and growth is widely believed to be even greater, with universities that provide high-quality research driving the state's economy.

From 1991 to 2000, none of the top 10 states in greatest higher-education appropriations were among the top 10 in economic growth.

This assumption is closely related to the first assumption: If state spending on higher education results in greater growth for the state economy, then state spending on prestigious institutions of higher education should result in even greater growth for the state economy.[41]

Here, the remarks of North Carolina State University economist David Ball are instructive: "When outputs' value and benefits are not easily observable and measured, the more readily observed inputs surely will be observed, measured, and compared."[42] In the case of prestigious universities, which offer students almost innumerable curriculum choices and vocational possibilities, the value and benefit to individual students

are not easily observable or measurable. Further, students are diverse in their motivation and willingness to pursue an education at any given university, and they also differ greatly in cognitive abilities.[43]

Because the value of a university education to an individual student is so hard to quantify, prestige is commonly the proxy for a university's ability to educate. The ability to educate, in turn, is often measured by how much money comes into a university or a university system. Money spent, then, becomes the chief measure of the effectiveness of those institutions in providing education.

The 15 fastest-growing states are home to 4 prestigious public universities but 20 private ones. Whatever the effect of prestigious institutions on a state's economic growth, it appears to be largely a phenomenon of private institutions.

The practical result of using money as a proxy for prestige, and using prestige as a proxy for institutional effectiveness, is to assume the state needs to spend more money on higher education. According to this thinking, more spending leads to higher prestige, which is supposed to mean greater effectiveness in providing education, which then helps the state's economy. Even if support of higher education generally does not correlate with state growth, could a state's growth correlate with the presence of prestigious universities within that state?

This analysis uses the latest *U.S. News & World Report* rankings of colleges and universities, plus the magazine's four-tier system of delineating among them, to define the number of prestigious institutions within a state,[44] assuming that institutions with top-tier ratings can reasonably be considered "prestigious." In this case, state support is not an important factor, because prestigious universities may also be private. Still, the effect of prestigious universities on state economies should be evident regardless of funding, if prestigious universities do yield greater influence than other universities on a state's economic growth.

Table 10 (see Appendix) ranks the 50 states according to percentage real growth in GSP per capita, from 1981 to 2000. Table 10 includes the numbers of top-tier higher-education institutions in each state that are listed in the *U.S. News & World Report* College Guide.

As Table 10 shows, states with prestigious universities do appear among the fastest-growing states, and most states with prestigious universities rank in the upper half in per capita real GSP growth. However, not all the fastest-growing states have prestigious universities, including Delaware (5th), Oregon (10th), Maine (12th), South Carolina (14th), and Vermont (15th). Moreover, a few of the slowest-growing states, such as Texas (44th), North Dakota (45th), and Louisiana (48th), have prestigious universities.

Because correlation does not equal causation, and given the results of the previous regression analyses, it is probable that faster-growing states are more likely to become home to prestigious universities, rather than that prestigious universities "build" faster-growing states.

Also important to note is that most *U.S. News & World Report* top-tier universities are private institutions. The 15 fastest-growing states are home to 4 prestigious public universities but 20 private ones. The 15 slowest-growing states are home to three times more prestigious private universities than public ones. Whatever the effect of prestigious institutions on a state's economic growth, it appears to be largely a phenomenon of private institutions. In fact, in its findings on the weakness of Arizona's workforce quality, the Arizona Department of Commerce cites the paucity of private colleges and universities in the state.[45]

Corroboration by Other Studies

Other research corroborates the findings of this study. For instance, in a study for the *Review of Economics and Statistics*, Patricia Beeson and Edward Montgomery find that a university has little economic impact on its local community, let alone its state: "Despite the common belief of the importance of universities as an engine of growth, we find only mixed evidence that [universities] have a measurable impact on local labor markets." Although universities affect the mix of labor drawn to an area, Beeson and Montgomery find "at best only weak evidence that universities affect income, the employment rate, or the mix of high-tech and other industries in the area."[46]

University boosters often cite links between scientific breakthroughs from university research and subsequent product development by high-tech firms. Economists Neil Bania, Randall Eberts, and Michael Fogarty, writing in the *Review of Economics and Statistics*, find such benefits fleeting, because products are usually developed elsewhere. "[E]ven though investments in biotechnology research at a number of institutions may increase the inventive activity of R&D laboratories located within the same metropolitan region," they write, "any resulting new products or processes will frequently be developed in other locations."[47]

Regarding the necessity of a state university system, economics professor and higher-education expert George C. Leef recalls that the last of the contiguous 48 states to establish a state university system was New York, the very state "that was pre-eminent in economic growth throughout the nineteenth century and the first half of the twentieth century."[48] Leef writes:

> There was no State University of New York (SUNY) system until 1948, and afterwards there still were minimal funding and student enrollment until the 1960s, when Governor Nelson Rockefeller began a rapid expansion of SUNY. New York did not lack for competent professionals, businesspeople and ordinary workers for the more than 150 years that the state went without a state university system. Instead of assuming that higher education had to be a function of

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the state, New York left it to the marketplace, knowing that just as with other goods and services, there is a demand for education and training, and there are numerous suppliers of those services.[49]

Indeed, some higher-education spending may actually be counter-productive. After all, when a state taxes citizens to fund public institutions of higher education, it forgoes the economic benefits of allowing those citizens to choose for themselves how to spend and invest that money. At the very least, citizens should be skeptical of promises that increased government spending on higher education will lead to greater economic growth.

Citizens should be skeptical of promises that increased government spending on higher education will lead to greater economic growth.

Conclusion

Education experts, policymakers, and political leaders increasingly embrace the notion that higher-education spending drives economic growth.[50] But as states struggle with crushing budget deficits, appropriation decisions must be based on fact, not fiction – no matter how noble the fiction.

The Arizona university system includes some of the nation's up-and-coming research universities, and the state ranks fifth nationally in highest percentage of residents enrolled in higher education. Nevertheless, in any state, the many pay the lion's share of higher-education costs through their federal and state tax dollars, subsidizing the few who are enrolled in public institutions of higher learning. Arizona's taxpayers subsidize the estimated 6.8 percent of residents enrolled in the state's two-year and four-year colleges and universities. The many also subsidize the one-third of enrollees who are nonresidents.

As for return on taxpayers' investment in higher education, this study finds little evidence that state support of higher education drives economic growth.

Regression analyses fail to find significant relationships between states' spending on higher education and state economic growth, even accounting for time lags up to five years. In some instances, spending actually has a *negative* impact on economic growth. The little correlation that can be found is better explained by *reversing* the models. That is, a stronger case can be made that real per capita state economic growth leads to increases in real per capita state spending on higher education.

Comparing states' higher-education appropriations and gross state product also finds no indication that education spending drives economic growth. In fact, 2 of the 10 fastest-growing states from 1981 to 2000 (New York and Rhode Island) experienced real decreases in per capita higher-education appropriations, while 3 of the 10 slowest-growing states (Mississippi, New Mexico, and North Dakota) were

among the top 10 in growth of real higher-education appropriations. From 1991 to 2000, none of the top 10 states in greatest higher-education appropriations were among the top 10 in economic growth. From 1991 to 2000, Arizona was 46th among the 50 states in real higher-education appropriations per capita – actually appropriating less in 2000 than in 1991 – yet it was the 16th fastest-growing state.

Finally, analysis suggests no connection between the presence of prestigious universities in a state and economic growth in that state. Over a 20-year period, some of the fastest-growing states lacked prestigious universities, while some of the slowest-growing states had them. To the extent that the presence of prestigious institutions affects a state's economic growth, the presence of *private* institutions of higher learning may be a more important factor.

APPENDIX

Key Statistics in Regression Tables 1 through 6

Put simply, the R^2 value is a measure of how dependent the dependent variable is on the independent variable. The R^2 statistic ranges in value from 0 to 1, or from no correlation to direct correlation. The adjusted R^2 statistic, which does not range from 0 to 1, is considered a slightly better index. It is the R^2 statistic weighted by the number of independent variables and observations. The R^2 value, then, is a measure of how well the independent variable (in Tables 1 through 3, real change in higher-education appropriations per capita; in Tables 4 through 6, real GSP growth) explains the dependent variable (in Tables 1 through 3, real GSP growth; in Tables 4 through 6, real change in per capita higher-education appropriations).

The adjusted R^2 statistics for most of these models are closer to 0 than to 1. For the simple models (Tables 1 and 4), the adjusted R^2 statistics are 0.14 and 0.16; for the annual change model (Tables 2 and 5), they are 0.15 and 0.31; and for the percentage annual change model (Tables 3 and 6), they are 0.06 and 0.15. The closer the R^2 statistics are to 1, the better "fits" they are to the data, or the better they explain the data. The R^2 statistics suggest whether there is a strong (closer to 1) or weak (closer to 0) correlation between the models' dependent variables (in Tables 1 through 3, real GSP growth; in Tables 4 through 6, real change in higher-education appropriations per capita) and the independent variables (in Tables 1 through 3, real change in higher-education appropriations per capita; in Tables 4 through 6, real GSP growth). Because no R^2 statistic is 0, all the models detect at least a slight relationship.

The parameter estimates in Tables 1 through 6 give the estimated effects of each independent variable on the dependent variable, and the tables list what are known as the "t ratios" for those estimates and probabilities for those t-statistics. The t-statistic for the parameter of an independent variable tests whether that parameter is statistically different from 0. A parameter of 0 means the variable has no explanatory effect of the dependent variable. The "P value" describes the chance that the t-statistic would appear under a normal distribution of values one might find when the parameter of the variable is essentially 0. The higher the t-statistic, the lower its likelihood of being within the normal distribution of values when the variable's parameter is essentially 0 – and the higher its likelihood of being part of the normal distribution of another (not 0) parameter value.

A general standard is to reject the t-test when the parameter value is 0 for P values of 0.05 or smaller. In other words, if the P value were 0.05 (or smaller), one would accept with a 95 percent level of confidence (or greater) the regression's computed estimate of the parameter value for the independent variable. That means one would conclude that the independent variable has some measure of correlation with the dependent variable. For P values higher than 0.05, it is generally standard not to reject the test hypothesis that the independent variable's parameter is 0. That is, one accepts that the independent variable's effect on the dependent variable is insignificant.

Table 1: Effects of Real State Appropriations for Higher Education Per Capita (testing up to a 5-year lag) on Real GSP Per Capita, 1986-2000 (with lag effects from as early as 1981)

Summary of Fit

R^2	0.149568
Adjusted R^2	0.142701
Root Mean Square Error	2957.089000
Mean of Response	16105.85000
Observations (or Sum Wgts)	750.000000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	6	1142663410	190443902.0	21.7790
Error	743	6497069966	8744374.1	Prob > F
C. Total	749	7639733377		<0.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	P Value
Intercept	12980.0060000	404.83110	32.06	<0.0001
Approps, Current	-36.7475900	15.82270	-2.32	0.0205
Approps, 1-yr Lag	8.4971418	22.67957	0.37	0.7080
Approps, 2-yr Lag	21.8743760	21.01540	1.04	0.2983
Approps, 3-yr Lag	6.6385098	19.42215	0.34	0.7326
Approps, 4-yr Lag	-3.6993170	19.31419	-0.19	0.8482
Approps, 5-yr Lag	33.0897210	12.70632	2.60	0.0094

Table 2: Effects of Annual Change in Real State Appropriations for Higher Education Per Capita (testing up to a 5-year lag) on Annual Change in Real GSP Per Capita, 1987-2000 (with lag effects from as early as 1982's change over 1981)

Summary of Fit

R^2	0.155928
Adjusted R^2	0.148620
Root Mean Square Error	455.675900
Mean of Response	233.436700
Observations (or Sum Wgts)	700.000000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	6	26582140	4430357	21.3367
Error	693	143894909	207641	Prob > F
C. Total	699	170477049		<0.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	P Value
Intercept	227.6127300	17.39235	13.09	<0.0001
Approps Change, Current	13.8441410	2.463664	5.62	<0.0001
Approps Change, 1-yr Lag	.4428138	2.405514	1.43	0.1528
Approps Change, 2-yr Lag	-6.8422100	2.308741	-2.96	0.0031
Approps Change, 3-yr Lag	20.3594500	2.061553	9.88	<0.0001
Approps Change, 4-yr Lag	-0.7483650	2.075599	-0.36	0.7185
Approps Change, 5-yr Lag	0.6913194	1.970617	0.35	0.7258

Table 3: Effects of Annual Percentage Change in Real State Appropriations for Higher Education Per Capita (testing up to a 5-year lag) on Annual Percentage Change in Real GSP Per Capita, 1987-2000 (with lag effects from as early as 1982's percentage change over 1981)

Summary of Fit

R^2	0.072473
Adjusted R^2	0.064442
Root Mean Square Error	2.524635
Mean of Response	1.509696
Observations (or Sum Wgts)	700.000000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	6	345.1256	57.5209	9.0246
Error	693	4417.0314	6.3738	Prob > F
C. Total	699	4762.1570		<0.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	P Value
Intercept	1.5352907	0.099283	15.46	<0.0001
Approps % Change	0.090949	0.017054	5.33	<0.0001
Approps % Change, 1-yr Lag	0.0025444	0.016308	0.16	0.8761
Approps % Change, 2-yr Lag	-0.019067	0.015645	-1.22	0.2233
Approps % Change, 3-yr Lag	0.053347	0.015247	3.50	0.0005
Approps % Change, 4-yr Lag	-0.039414	0.015024	-2.62	0.0089
Approps % Change, 5-yr Lag	-0.030587	0.014204	-2.15	0.0316

Table 4: Effects of Real GSP Per Capita (testing up to a 5-year lag) on Real Appropriations for Higher Education Per Capita, 1986-2000 (with lag effects from as early as 1981)

Summary of Fit

R^2	0.165703
Adjusted R^2	0.163470
Root Mean Square Error	28.016500
Mean of Response	109.128300
Observations (or Sum Wgts)	750.000000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	116455.38	58227.7	74.1825
Error	747	586338.53	784.9	Prob > F
C. Total	749	702793.91		<0.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	P Value
Intercept	69.6081120	5.279546	13.18	<0.0001
GSP, Current	-0.0102220	0.001494	-6.84	<0.0001
GSP, 1-yr Lag	0.0128498	0.001453	8.85	<0.0001

Table 5: Effects of Annual Change in Real GSP Per Capita (testing up to a 5-year lag) on Annual Change in Real Appropriations for Higher Education Per Capita, 1987-2000 (with lag effects from as early as 1982's percentage change over 1981)

Summary of Fit

R^2	0.311999
Adjusted R^2	0.309033
Root Mean Square Error	6.056071
Mean of Response	-0.134480
Observations (or Sum Wgts)	700.000000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	3	11575.908	3858.64	105.2088
Error	696	25526.493	36.68	Prob > F
C. Total	699	37102.401		<0.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	P Value
Intercept	-2.16198	0.271422	-7.97	<0.0001
GSP Change, Current	0.0012738	0.000474	2.68	0.0074
GSP Change, 1-yr Lag	0.0026129	0.000319	8.18	<0.0001
GSP Change, 2-yr Lag	0.0048792	0.000325	15.01	<0.0001

Table 6: Effects of Annual Percentage Change in Real GSP Per Capita (testing up to a 5-year lag) on Annual Percentage Change in Real Appropriations for Higher Education Per Capita, 1987-2000 (with lag effects from as early as 1982's percentage change over 1981)

Summary of Fit

R^2	0.155961
Adjusted R^2	0.152323
Root Mean Square Error	5.207521
Mean of Response	0.186427
Observations (or Sum Wgts)	700.000000

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	3	3487.577	1162.53	42.8687
Error	696	18874.321	27.12	Prob > F
C. Total	699	22361.898		<0.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	P Value
Intercept	-1.5660510	0.254311	-6.16	<0.0001
GSP % Change, current	0.3188405	0.076678	4.16	<0.0001
GSP % Change, 1-yr Lag	0.2954397	0.065554	4.51	<0.0001
GSP % Change, 2-yr Lag	0.4904608	0.064345	7.62	<0.0001

Table 7: States Ranked by Real GSP Per Capita and Real Appropriations for Higher Education Per Capita, Fiscal Year 2000

Rank, real GSP	State	Real GSP per capita, 2000, in dollars	Real appropriations per capita, 2000, in dollars	Rank, real appropriations
1	Connecticut	$24,924	$109	25
2	Delaware	24,664	119	17
3	Massachusetts	23,912	87	43
4	Alaska	23,600	150	7
5	New Jersey	22,986	98	34
6	New York	22,457	90	38
7	California	21,107	121	15
8	Wyoming	20,848	151	4
9	Colorado	20,719	89	41
10	New Hampshire	20,533	41	50
11	Illinois	20,053	110	24
12	Minnesota	19,991	139	10
13	Washington	19,862	112	22
14	Nevada	19,766	81	47
15	Virginia	19,636	111	23
16	Georgia	19,200	101	33
17	Texas	18,911	114	20
18	Maryland	18,703	105	31
19	Hawaii	18,651	151	5
20	North Carolina	18,610	150	8
21	Rhode Island	18,522	77	48
22	Oregon	18,460	102	32
23	Pennsylvania	17,555	82	46
24	Ohio	17,507	97	35
25	Nebraska	17,472	146	9
26	Michigan	17,448	112	21
27	Wisconsin	17,233	107	29
28	Missouri	17,035	87	44
29	Kansas	16,866	129	12
30	Indiana	16,843	108	27

Table 7 (continued): States Ranked by Real GSP Per Capita and Real Appropriations for Higher Education Per Capita, Fiscal Year 2000

Rank, real GSP	State	Real GSP per capita, 2000, in dollars	Real appropriations per capita, 2000, in dollars	Rank, real appropriations
31	Tennessee	16,696	92	36
32	Louisiana	16,447	105	30
33	South Dakota	16,382	92	37
34	Iowa	16,333	150	6
35	Utah	16,313	122	13
36	Arizona	16,149	89	39
37	Vermont	16,115	55	49
38	New Mexico	15,932	159	2
39	Florida	15,702	88	42
40	Kentucky	15,626	122	14
41	North Dakota	15,224	154	3
42	Idaho	15,211	115	18
43	South Carolina	15,043	108	26
44	Maine	15,039	89	40
45	Alabama	14,381	132	11
46	Oklahoma	14,183	114	19
47	Arkansas	13,498	121	16
48	Montana	12,869	82	45
49	Mississippi	12,615	164	1
50	West Virginia	12,487	107	28

Table 8: States Ranked by Change in Real Appropriations for Higher Education Per Capita, 1981 to 2000, and Change in Real GSP Per Capita, 1981 to 2001

Rank, real appropia-tions	State	20-year change in real appropria-tions per capita, in dollars	20-year change in real GSP per capita, in dollars	Rank, real GSP
1	Mississippi	$61	$3,083	41
2	New Mexico	52	1,623	44
3	Connecticut	42	10,524	2
4	Nebraska	41	4,565	30
5	Iowa	41	3,380	40
6	North Carolina	39	7,407	8
7	North Dakota	39	149	45
8	New Jersey	39	9,404	4
9	Arkansas	39	3,639	38
10	Kentucky	38	4,557	31
11	Maine	34	5,158	23
12	Alabama	34	4,159	35
13	Massachusetts	31	10,742	1
14	Ohio	30	5,000	28
15	Michigan	30	5,150	24
16	Oklahoma	27	-527	47
17	Illinois	24	6,075	15
18	Indiana	24	5,193	22
19	Georgia	23	7,648	7
20	Minnesota	23	6,706	11
21	West Virginia	20	2,009	42
22	Kansas	20	3,598	39
23	Tennessee	19	5,780	18
24	Maryland	19	6,303	13
25	Virginia	18	7,137	10
26	Florida	17	4,322	32
27	Idaho	17	4,270	33
28	Utah	16	4,730	29
29	Pennsylvania	16	5,580	19
30	Missouri	15	5,114	25

Table 8 (continued): States Ranked by Change in Real Appropriations for Higher Education Per Capita, 1981 to 2000, and Change in Real GSP Per Capita, 1981 to 2001

Rank, real appropriations	State	20-year change in real appropriations per capita, in dollars	20-year change in real GSP per capita, in dollars	Rank, real GSP
31	Texas	15	1,915	43
32	South Dakota	14	5,289	21
33	Louisiana	12	-1,692	48
34	Hawaii	12	3,803	36
35	Delaware	12	10,048	3
36	Oregon	8	6,423	12
37	Nevada	8	3,689	37
38	Wyoming	8	-6,111	49
39	New Hampshire	6	9,222	5
40	Washington	1	6,234	14
41	Colorado	0	5,915	17
42	South Carolina	-1	5,094	26
43	Wisconsin	-1	5,024	27
44	Montana	-3	-70	46
45	New York	-3	7,691	6
46	Vermont	-4	5,442	20
47	Rhode Island	-5	7,199	9
48	California	-9	5,933	16
49	Arizona	-10	4,253	34
50	Alaska	-46	-27,711	50

Table 9: States Ranked by Change in Real Appropriations for Higher Education Per Capita, 1991 to 2000, and Change in Real GSP Per Capita, 1991 to 2001

Rank, real appropriations	State	10-year change in real appropriations per capita, in dollars	10-year change in real GSP per capita, in dollars	Rank, real GSP
1	Mississippi	$60	$1,854	41
2	Arkansas	27	1,746	43
3	Michigan	14	3,494	12
4	Texas	14	3,213	17
5	New Mexico	13	2,467	31
6	Louisiana	12	1,181	46
7	Kentucky	11	2,756	28
8	North Dakota	11	2,843	24
9	Iowa	10	2,381	33
10	Florida	9	1,997	40
11	Illinois	9	3,335	15
12	Massachusetts	9	5,738	1
13	Oklahoma	8	1,458	45
14	Missouri	8	2,588	30
15	Kansas	7	2,374	34
16	Nebraska	6	2,417	32
17	Utah	6	3,492	13
18	Ohio	6	2,946	22
19	Oregon	5	4,445	4
20	South Dakota	5	2,822	26
21	New Jersey	5	3,536	11
22	West Virginia	4	1,477	44
23	Georgia	3	4,040	7
24	Delaware	3	2,676	29
25	Pennsylvania	3	2,827	25
26	Indiana	2	3,085	20
27	Connecticut	2	4,319	5
28	North Carolina	2	3,860	9
29	Rhode Island	-1	3,895	8
30	California	-1	3,026	21

Table 9 (continued): States Ranked by Change in Real Appropriations for Higher Education Per Capita, 1991 to 2000, and Change in Real GSP Per Capita, 1991 to 2001

Rank, real appropriations	State	10-year change in real appropriations per capita, in dollars	10-year change in real GSP per capita, in dollars	Rank, real GSP
31	Alabama	-3	1,846	42
32	New Hampshire	-3	5,322	2
33	Virginia	-3	3,098	18
34	Idaho	-5	3,091	19
35	Nevada	-5	2,084	38
36	Tennessee	-5	2,772	27
37	Maine	-5	2,127	36
38	Maryland	-8	2,353	35
39	Wisconsin	-8	2,934	23
40	Washington	-11	3,376	14
41	Vermont	-12	2,106	37
42	South Carolina	-13	2,001	39
43	Colorado	-13	4,795	3
44	Minnesota	-14	4,148	6
45	Montana	-16	1,109	47
46	Arizona	-18	3,255	16
47	Hawaii	-23	-1,634	49
48	New York	-29	3,564	10
49	Wyoming	-33	867	48
50	Alaska	-73	-2,510	50

Table 10: States Ranked by Percentage Real Growth in GSP Per Capita, 1981 to 2000 and Each State's Number of Top-Tier Higher-Education Institutions listed in *U.S. News & World Report* College Guide

Rank	State	Percentage GSP growth, 1981-2000	Public top-tier institutions	Private top-tier institutions
1	Massachusetts	81.6		5
2	New Hampshire	81.5		1
3	Connecticut	73.1		1
4	New Jersey	69.2		1
5	Delaware	68.7		
6	Georgia	66.2	1	2
7	North Carolina	66.1	1	2
8	Rhode Island	63.6		1
9	Virginia	57.1	2	
10	Oregon	53.4		
11	Tennessee	52.9		1
12	Maine	52.2		
13	New York	52.1		6
14	South Carolina	51.2		
15	Vermont	51.0		
16	Maryland	50.8		1
17	Minnesota	50.5		
18	South Dakota	47.7		
19	Pennsylvania	46.6	1	3
20	Washington	45.7	1	
21	Indiana	44.6		1
22	Illinois	43.5	1	2
23	Missouri	42.9		1
24	Michigan	41.9	1	
25	Kentucky	41.2		
26	Wisconsin	41.2	1	
27	Utah	40.8		
28	Alabama	40.7		
29	Ohio	40.0		1
30	Colorado	40.0		

Table 10 (continued): States Ranked by Percentage Real Growth in GSP Per Capita, 1981 to 2000 and Each State's Number of Top-Tier Higher-Education Institutions listed in *U.S. News & World Report* College Guide

Rank	State	Percentage GSP growth, 1981-2000	Public top-tier institutions	Private top-tier institutions
31	California	39.1	6	4
32	Idaho	39.0		
33	Florida	38.0		
34	Arkansas	36.9		
35	Arizona	35.8		
36	Nebraska	35.4		
37	Mississippi	32.3		
38	Kansas	27.1		
39	Iowa	26.1		
40	Hawaii	25.6		
41	Nevada	22.9		
42	West Virginia	19.2		
43	New Mexico	11.3		
44	Texas	11.3	1	1
45	North Dakota	1.0		1
46	Montana	-0.5		
47	Oklahoma	-3.6		
48	Louisiana	-9.3		1
49	Wyoming	-22.7		
50	Alaska	-54.0		

NOTES

[1] U.S. Department of Education, National Center for Education Statistics, *Projections of Educational Statistics to 2012*, 31st ed., August 2002, p. 25, http://nces.ed.gov/pubs2002/2002030.pdf. "Degree-granting institution" is defined as an institution that provides study beyond the secondary level and that offers programs terminating in an associate, baccalaureate, or higher degree.

[2] Ibid, pp. 25 and 26. For both total college enrollment and public institutions, the "middle alternative" figures are cited. For total college enrollment, the "high alternative" expects an increase of 19 percent, from 15.3 million in 2000 to 18.2 million in 2012. The "low alternative" expects an increase of 12 percent over the same period, to 17.1 million. Neither the "high" nor the "low" alternative is given for public institution enrollment for the period.

[3] U.S. Department of Labor, Bureau of Labor Statistics, *Annual Earnings by Educational Level - Education Does Pay Off!*, 1998, www.stlcc.cc.mo.us/ccdocs/instres/item5.htm. However, as Frederic L. Pryor and David L. Shaffer find in *Who's Not Working and Why* (New York: Cambridge University Press, 1999), the difference is not as large as it appears, owing in great amount to those college graduates who have the cognitive skills that the marketplace demands and whose large earnings raise the averages that include the meager earnings of other, less-skilled college graduates.

[4] *Arizona at Risk: An Urgent Call for Action*, Report of the Governor's Task Force on Higher Education, p. 4, www.sheeo.org/VU/lit/AZ%20at%20Risk.pdf.

[5] Paul Sypherd and Elizabeth Ervin, "Higher Education Issues," February 1999, http://w3.arizona.edu/~provost/issues/issues-4.html.

[6] Janet Napolitano, State of the State Address, January 13, 2003.

[7] U.S. Department of Education, National Center for Education Statistics, *State Comparisons of Education Statistics:* 1969-70 to 1996-97, October 15, 1998, http://nces.ed.gov/pubs98/98018.pdf. Calculations are based on Table 43, 1980 to 1996, excluding the District of Columbia. From 1980 to 1996, an average of 13.4 percent of the District of Columbia resident population was enrolled in higher-education institutions. Downloadable tables from the compendium are available at http://nces.ed.gov/pubs98/98018/#chap3a.

[8] The statistics in this section refer to Title IV public institutions, those eligible to receive federal funds.

[9] U.S. Department of Education, National Center for Education Statistics, *Enrollment in Postsecondary Institutions, Fall 2000, and Financial Statistics, Fiscal Year 2000*, September 2002, Table D, p. 8, http://nces.ed.gov/pubs2002/2002212.pdf. A shorter version of this report by Laura G. Knapp et al. is found in Education Statistics Quarterly, Winter 2002, http://nces.ed.gov/pubs2003/

quarterly/winter/q4_6.asp.

[10] National Center for Education Statistics, *State Comparisons of Education Statistics*, Table 13. During the same time period, Rhode Island had 7.4 percent; Utah 7.1 percent; Massachusetts 7.0 percent; followed by Arizona and Nebraska, which tied at an average of 6.8 percent. Note that this figure differs from the 7.2% total derived from Census projections for 2001.

[11] Ibid. Again, calculations exclude the District of Columbia. Percentages of resident students enrolled in postsecondary institutions are based on figures gathered in 1980, 1985, 1990, 1995, and 1996. Arizona's average percentage of 6.8 remains consistent with fall 2000 enrollment figures; compare National Center for Education Statistics, *Enrollment in Postsecondary Institutions*, Tables 17 and 18, pp. 35 and 36. Includes full-time and part-time students.

[12] Arizona Department of Commerce, *Statewide Economic Study 2002: Arizona's Education & Workforce Infrastructure*, July 2002, p. 5, www.azcommerce.com/pdf/prop/sesreports/Education.pdf. See also National Center for Education Statistics, *Enrollment in Postsecondary Institutions*, Tables 17 and 18, pp. 35 and 36, where figures are higher because full-time and part-time students are included; and Arizona Board of Regents, "University System Quick Facts: Economic Impact," in *The State of Arizona's Public Universities, Spring/Summer 2002* (slide show), www.abor.asu.edu/. Again, the number of students attending the four-year Arizona university system is slightly higher.

[13] Arizona Joint Legislative Budget Committee, "Fiscal Year 2001 Total Appropriated Funds," under *University Funding since 1994*, updated August 19, 2002, www.azleg.state.az.us/jlbc/Uni9403.pdf.

[14] U.S. Census Bureau, "State and County *QuickFacts*," http://quickfacts.census.gov/qfd/states/04000.html. The 2001 projected total population for Arizona is 5,307,331. Calculations are based on adult population only (18 and older). Adjusted adult projected population is 3,895,581. See also "U.S. Census 2000 Redistricting Data," Table 1, www.census.gov/population/cen2000/phc-t6/tab01.xls. Arizona's average 6.8 percent of residents enrolled includes both full-time and part-time enrollments. Using only full-time enrollment figures provided by the Arizona Department of Commerce accounts for the reduction in resident enrollment rates to 3 and 4 percent for four-year and two-year institutions. Interestingly, for many states nationwide, combined full-time and part-time enrollment rates fall in the 3 to 4 percent range. See National Center for Education Statistics, *State Comparisons of Education Statistics*, Table 13.

[15] For Arizona university total appropriated funds, see Joint Legislative Budget Committee, *University Funding*

since 1994. For community college general fund appropriations, see *Community Colleges Funding since 1994*, www.azleg.state.az.us/jlbc/ACC9403.pdf. For community college other fund spending, see *Annual Expenditures for Each Agency since FY 1989-November 2002*, www.azleg.state.az.us/jlbc/OF10year-Web.xls.

[16] Arizona Department of Commerce, *Statewide Economic Study 2002*, p. 6.

[17] Arizona Department of Commerce, *Statewide Economic Study 2002*. See also Arizona State University Morrison Institute for Public Policy, "Five Shoes Waiting to Drop on Arizona's Future," Arizona Policy Choices series, October 2001, p. 32, www.asu.edu/copp/morrison/APC01New.pdf.

[18] Quotation found in University of Arizona information for high school counselors, http://admissions.arizona.edu/Counselors/FAQs.htm. On March 6, 2003, the Arizona Board of Regents approved a $1,000 tuition increase for resident students and a $1,250 increase for nonresident students. For an example of student reaction, see "Tuition Raised by Record $1,000," *Arizona Daily Wildcat*, March 7, 2003, http://wildcat.arizona.edu/papers/96/111/01_1.html.

[19] Arizona Board of Regents, *Arizona University System 2000 Report Card*, p. 8, www.abor.asu.edu/1_the_regents/reports_factbook/rptcrd/2000univ_rpt.html.

[20] Arizona Board of Regents, "University System Quick Facts: Economic Impact," in *The State of Arizona's Public Universities*. The Arizona university system "employs more than 22,000 who live and work in communities throughout the state," according to a previous Report Card based on fall 1997 data, www.abor.asu.edu/1_the_regents/reports_factbook/rptcrd/scope.pdf.

[21] U.S. Department of Labor, Bureau of Labor Statistics, http://data.bls.gov/servlet/SurveyOutputServlet?series_id=LASST04000006&data_tool="EaG".

[22] Ibid.

[23] Joint Legislative Budget Committee figures, referred to in Arizona Department of Commerce, *Arizona's Economic Future*, August 2002, p. 37, www.azcommerce.com/pdf/prop/sesreports/AZEconFuture.pdf.

[24] Arizona Board of Regents, "Mitigating Budget Cuts," in *The State of Arizona's Public Universities*.

[25] See "Executive Budget Compared to the Chairmen's Proposal for Fiscal Year 2004," www.state.az.us/ospb/pdf/FY04-Exec-Leg-Comparison.pdf.

[26] Arizona Department of Commerce, *Arizona's Economic Future*, p. 36.

[27] See, for example, Center for Business Research, College of Business, Arizona State University, *The Economic Impact of Arizona State University*, December 1999, http://wpcarey.asu.edu/seid/cbr/impact/; and Alberta H. Charney and

Vera K. Pavlakovich, *The University of Arizona, an Investment in the Future: Economic & Revenue Impact Analysis, 1997-98*, http://ebr.bpa.arizona.edu/ImpactStudies/UAImpact98/Economic report3.pdf.

[28] National Center for Education Statistics, *Enrollment in Postsecondary Institutions*, Table C, p.5.

[29] Arizona Department of Commerce, *Arizona's Economic Future*, p. 37.

[30] Ibid, p. 34.

[31] Ibid.

[32] National Center for Education Statistics, *Enrollment in Postsecondary Institutions*, Table C, p.5.

[33] The Arizona State University Morrison Institute report, "Five Shoes Waiting to Drop on Arizona's Future," suggests that prospects for retaining and attracting recent college graduates are bleak.

[34] Arizona Board of Regents, "Retaining the Best and the Brightest," in *The State of Arizona's Public Universities*.

[35] The author understands that the factors contributing to economic growth are legion. However, this study focuses on testing the correlation between public spending on higher education and economic growth, because that is the model implied by those advocating increased higher-education spending.

[36] The statistical significance of the five-year lag variable is accidental. It represents a regression phenomenon observed in this study; that is, no matter how many lag variables were tested, only the last one tested significant. For example, if two lag variables were tested, only the two-year lag variable would appear significant; if four lag variables were tested, only the four-year lag variable would appear significant.

[37] The three-year, four-year, and five-year lags were omitted from Tables 4, 5, and 6, and the two-year lag was omitted from Table 4, because the correlations between growth and spending over those periods were insignificant, and their inclusion would have inflated the R^2 values unnecessarily.

[38] U.S. Bureau of Economic Analysis, www.bea.doc.gov/bea/regional/gsp/, and U.S. Census, www.census.gov/.

[39] Edward R. Hines et al., *State Higher Education Appropriations*, various years, http://coe.ilstu.edu/grapevine/.

[40] Inflation is gauged by change in the Consumer Price Index, obtained from the U.S. Bureau of Labor Statistics, http://data.bls.gov, using data for the first half of each year, 1981 to 2000, reflecting the academic calendar.

[41] See, for example, *Arizona at Risk*, p. 23, which quotes Craig Barrett, chief executive officer of Intel Corporation: "If I were to give one bit of advice to the Regents or to the citizens of Arizona for

the future of the economic growth of this state, it would be to have quality research universities.…"

[42] David Ball, quoted in Jon Sanders, "Measuring Up: How North Carolina's Faculty Salaries Compare," Policy Report no. 19, John Locke Foundation, December 1997, p. 1.

[43] Pryor and Shaffer, *Who's Not Working and Why*, p. 73. Among other findings, Pryor and Schaffer find that "there appears to be a shortage of university graduates with a functional literacy corresponding to what employers seek" and that the "low functional literacy of many university graduates represents a serious indictment against the standards of the U.S. higher educational system" (pp. 67-68).

[44] *U.S. News & World Report* online, www.usnews.com/usnews/edu/college/rankings/brief/natudoc/tier1/t1natudoc_brief.php.

[45] Arizona Department of Commerce, Section 3.3, "Education and Workforce Quality," in *Arizona's Economic Future*, p. 37 (pp. 34-39).

[46] Patricia Beeson and Edward Montgomery, "The Effects of Colleges and Universities on Local Labor Markets," *Review of Economics and Statistics*, 1993, p. 759.

[47] Neil Bania, Randall Eberts, and Michael Fogarty, "Universities and the Startup of New Companies: Can We Generalize from Route 128 and Silicon Valley?" Review of Economics and Statistics, 1993, p. 765.

[48] George C. Leef and Jon Sanders, "Public Universities and Economic Growth," Pope Center for Higher Education Policy Inquiry no. 10, October 14, 2000, p. 5.

[49] Ibid.

[50] See Robbie Sherwood and Bill Hart, "University Research Funding Deal Near," *Arizona Republic*, April 16, 2003, p. A1.

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