

# State Investment in Universities:

Rethinking the Impact on  
Economic Growth

Jay Schalin




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FOR HIGHER EDUCATION POLICY

A low-angle photograph of a construction site under a clear blue sky with scattered white clouds. A large yellow tower crane is positioned on the left, its lattice structure extending diagonally across the frame. In the center, a yellow and black striped lifting hook is suspended by several thick cables, holding a large, rectangular concrete slab. To the left of the slab, a worker in a red hard hat and dark clothing is perched on a metal scaffolding structure, working on a concrete wall. The concrete wall and other structural elements are visible in the lower-left portion of the image.

But caution must be practiced  
first and foremost by those  
who espouse the prevailing philosophy,  
that universities are the “engine”  
of economic growth and therefore  
constantly need higher funding.

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## About the Author

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Jay Schalin joined the John William Pope Center for Higher Education Policy in August 2007. As a senior writer, he researches and writes about higher education issues, primarily in North Carolina, and oversees the center's website.

A Philadelphia native, Schalin began working as a freelance journalist for the *Asbury Park Press* in New Jersey in 1994 and has also written for several other papers in New Jersey and Delaware. In 1998, he returned to school to complete his education, graduating from Richard Stockton College in New Jersey with a B.S. in computer science in 2001. After graduation, he was employed as a software engineer for Computer Sciences Corporation. He received his master's degree in economics from the University of Delaware in 2008.



## To the Reader

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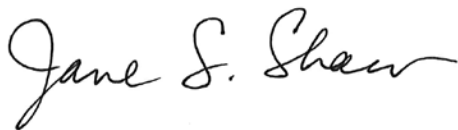
Policymakers today commonly assume that investing taxpayers' funds into higher education leads to major payoffs in economic growth. Governors, state legislators, and others in positions of power routinely endorse massive appropriations for university education and research, even in poor economic times, on the grounds that taxpayers will be rewarded many times over.

Economic development committees pull out endless studies purporting to show that investment in education will earn two, three, or even 26 times its cost over a finite number of years.

Federal funding is justified on the same grounds—spurring economic growth.

But are these rosy projections true? To what extent do taxpayer expenditures for universities actually contribute to economic growth? Those questions do not have easy answers. In this paper, Jay Schalin, senior writer for the John W. Pope Center for Higher Education Policy, ventures beyond the superficial claims to look at broader economic studies that attempt to correlate expenditures with results. He finds that the results are not as favorable as they are often said to be, and he offers some explanations for why.

“State Investment in Universities: Rethinking the Impact on Economic Growth” reflects the Pope Center’s concern for quality, efficiency, and meaningful purpose in higher education, and we look forward to the discussion it will elicit.



Jane S. Shaw  
President  
John W. Pope Center for Higher Education Policy



# State Investment in Universities: Rethinking the Impact on Economic Growth

Jay Schalin

## Humanity has long sought a

philosopher's stone—a magic mechanism that creates riches out of simple materials. From ancient mythical kings with the “golden touch” through medieval alchemists attempting to turn base metals into gold and silver and Goethe's Faust and Mephisto producing unlimited wealth through confidence-backed credit money, the search continues.

In recent years, many influential people believe they have at last found the key to guaranteed wealth creation: investment in higher education. Two governors illustrate confidence in that discovery:

Our colleges and universities are powerful engines of economic development. They have spawned industries of the future in advanced computing, biotechnology, advanced materials, and environmental technology. Industries that have created thousands of jobs already. And will provide thousands more in the future. The investments we make in these technology areas through targeted tax incentives will fuel this growth.

*Washington Governor Gary Locke,  
2004 State of the State Address*

We need to invest more ... to spur innovation and creativity. If we endow chairs and recruit great faculty to our universities, the brightest and best minds can be attracted to Iowa. If we expand lab space and incubator space, those bright minds can transfer into new products and new opportunities for Iowa.

*Iowa Governor Tom Vilsack,  
2006 State of the State Address*

These governors and other advocates justify public investment in higher education by citing close correlations between wealth and education levels, and by pointing to successful high-tech clusters near major research universities. Economic studies abound showing that each public dollar invested in higher education is multiplied two or more times as it wends its way through the local or regional economy. Politicians, in particular, perceive universities as some sort of “field of economic dreams”—fund them, and prosperity will come.

But the fundamental relationship between education and economic growth requires much more scrutiny. In that light, the central question of this essay asks: “Does increased state support for higher education lead to economic growth?” A review of academic economic studies and other commentaries focusing on the relationship between economic development and universities suggests that the answer is complex. Much of the literature is conflicting; slight differences in assumptions can lead to major differences in results.

Yet, despite the complexity, some things stand out clearly.

To begin on solid ground, we can be fairly certain that gains in knowledge—improvements in job skills, education levels, technology levels, innovation and so on—contribute to rising living standards. On this there is a general consensus. The relationship between education and economic growth has been acknowledged at least since 1890, when the neo-classical economist Alfred Marshall wrote that “knowledge is our most powerful engine of production” (Cooke and Leydesdorff 2006, 30).

Models explaining economic growth (“growth theory models”) have consistently demonstrated that increases in measurable components of the economy, primarily labor supply (population) and capital, account for less than half of per capita economic growth. The rest comes from hard-to-quantify factors such as knowledge and increased specialization. Higher education creates new knowledge and improves the general level of skill (that is, improves the quality of labor)—although certainly other forces contribute as much or more to the production of new knowledge and to the increase in human capital.

Additional empirical evidence supports education’s connection to growth. People with college educations generally earn more money, and university researchers innovate, creating new ideas and applications. Furthermore, innovation is increasingly tied to higher education because innovation requires more highly specialized learning and training than it did in the past. The backyard mechanic and shop floor tinkerer have been replaced by university-trained scientists as the primary sources of technical breakthroughs.

Yet to say that a link exists between growth and higher education is not the same as saying that higher education always produces economic development. It is even more tenuous to suggest that increased public support of higher education necessarily translates to a healthier economy.

Indeed, if the returns to investment in education were as high as many studies claim—returning many dollars for each dollar invested—then why would anything but exponential growth occur anywhere on the globe? Governments could throw every possible dollar into their university systems, then sit back and watch their societies flourish. Yet this is not happening.

This essay assumes that some public investment in higher education is good. Yet the optimal level and sources of that investment are debatable: First, how much total investment is appropriate? Then, how much investment should be private and how much should be public? And which elements of higher education are likely to produce economic growth?

Precisely quantified answers to these questions are not readily produced, as shall be shown. Accordingly, the converse of those questions should also be asked: Does government spending on higher education have negative effects? Which

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situations will likely prove infertile territory for creating economic growth through spending on higher education?

This paper raises new questions that have not previously been in the spotlight and pinpoints old questions that need further exploration. The discussion also introduces a simple model that helps to illustrate the complex dynamics of the relationship between economic development and state subsidies to higher education.

### Overview of This Paper

The paper begins with a discussion of popular or prevalent theoretical justifications for government subsidies in general and specifically for subsidizing higher education. It also describes how these justifications are sometimes in conflict with one another.

The next major section describes the prevailing model of academia as an “engine of economic growth.” It raises objections to the model and introduces the key concept of “agglomeration.” Another important concept known as the “triple helix,” a combination of universities, business, and government, is also examined.

The paper then discusses the available empirical research on the relationship between higher education and economic development and subsidies. This research is divided into two



types. One uses detailed data to describe specific elements and objects of the relationship between higher education and economic growth; the other focuses on the overall performance of the economy and the overall public support for higher education.

Since this delineation resembles the division of economics into microeconomics, which is concerned with individual entities, and macroeconomics, which is concerned with the economy in aggregate, those terms will be used to describe the two types of studies. While most research on the paper's central question has been "microeconomic," especially the attempts to quantify the impact of individual universities on a region, the "macroeconomic" analysis addresses this paper's central question much more directly. Macroeconomic analysis leads to the introduction of a new model for understanding the central question. This model applies the principles of the Laffer curve, which describes how higher taxes result in diminishing marginal revenues, to the relationship between state appropriations to higher education and economic growth.

An appendix discusses the three major high-tech industrial regions frequently cited as proof that higher education is paramount in economic development in the modern economy.

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## “Educated individuals drive the economy.”

*Norman Mueller  
University of Tuebingen, 2007*

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### Theoretical Justifications for Subsidies

Before turning to the reasons why increasing state subsidies to higher education are assumed to produce economic growth, the broad theoretical reasons for government subsidies to higher education should be explored.

German economic historian Norman Mueller begins his 2007 article "(Mis-) Understanding Education Externalities" with the late economist Richard Musgrave's classic three reasons for government intervention in an activity: stabilization, distribution, and allocation. Mueller dismisses stabilization—

that is, mitigating fluctuations in income—because that is a fiscal function determined by the overall budget, not a targeted component like education.

Nor is education spending an ideal method for wealth redistribution, according to Mueller. Indeed, in many cases, higher education subsidies probably have "regressive redistributive effects" (Mueller 2007, 11). That is, they reduce the costs of the middle class and wealthy as much as or more than they reduce the costs of the poor. For instance, in North Carolina, middle-class and wealthy students flock to the state's top universities; the state's elite often educates its next generation at UNC-Chapel Hill.

With stabilization and redistribution out of the picture, only the allocation function remains. To Mueller, the poor or inadequate allocation of higher education by the private sector—which he deems a "market failure"—is the chief justification for governmental intervention (Mueller 2007, 11). The failure he describes is the tendency of individuals to purchase less than the socially optimal level of higher education.

Two theoretical reasons are also frequently offered to justify subsidies to higher education.

First, when education is unsubsidized, individuals only choose enough to meet their own needs, not the needs of society. Therefore, according to John Siegfried, Allen Sanderson, and Peter McHenry (2006), a society must subsidize higher education to ensure that individuals educate themselves enough to meet society's needs as well as their own. In other words, society must "socially optimize" the amount of education.

The other important justification, mentioned by both Siegfried et al. and Michael Rizzo (2004), is to promote social mobility and equality of opportunity. Our society has long considered these to be fundamental values, and providing people from different backgrounds access to higher education has been a primary mechanism for achieving these goals.

But equalization of opportunity and economic development are somewhat in conflict.

If the sole objective of subsidies were economic development, states would do best to reserve financial aid for the students most likely to innovate or to enter in-demand professions.

This is best accomplished through merit scholarships for gifted students—especially those interested in careers in the types of applied research that tend to produce rewards in the immediate future.

But merit scholarships often do little to promote the other goal, equality of opportunity. Admissions criteria such as SAT scores are often closely correlated with income—thus, giving merit scholarships on the basis of SAT scores may exclude students whose test scores do not reflect their true ability but who need, and deserve, help. On the other hand, when only need is considered, the result is wholesale subsidization of students who are either not ready for college or who lack the aptitude to complete a four-year degree program. Neither the students nor society is likely to be served—students forgo income while in school and do not markedly improve their skills, while society must pay for them to attend school and receives neither the income they would produce if they were in the full-time workforce nor the future external benefits of their improved skill level.

### **Socially Optimizing Higher Education**

Enthusiasm for public investment in higher education is based on the supposed returns to such investments—the social benefits of higher education. Measuring the social benefits can be extremely difficult, but essentially, as Rizzo (2004) suggests, it involves adding the private returns to education (the personal benefits) and the public benefits (such as the improved livability of a community of educated people) and then subtracting the private and public costs. Specifically:

- Private returns in higher education are the ones captured by the principal investor—the student. The most common private return is the increased income resulting from going to college. Others are non-quantifiable entities such as a greater appreciation for culture, social connections, etc.
- Private costs are the amount of the investment made by the individual (such as tuition), the income forfeited by going to school instead of working, and so on.
- Public returns are those returns not captured by the individual. These include the higher taxes paid by educated individuals or the improved livability of a community since educated individuals commit fewer crimes and need fewer social services.

- Many public costs, such as subsidies to public universities and grants, are easily quantified. Other public costs, such as increased traffic or private development opportunity costs, are much more difficult to ascertain.

Private returns and costs are the concerns of individuals. People will choose to acquire education as long as they believe that the private benefits (particularly, income) exceed the private costs.

Conversely, public costs and benefits are not paid or received by individuals. They are considered “externalities,” the effects of a decision or action on parties (sometimes the public) not directly involved in that decision. (And since they often have little effect on an individual, they usually do not carry much weight in that individual’s decisionmaking.)

For example, a firm’s decision to move a factory to a community creates positive externalities there: the profits of small businesses in that locale rise because the new factory workers purchase goods and services, and the factory also increases local taxes and enhances the general prosperity of the region.

But a new factory can pose negative externalities as well. Increased pollution and highway traffic from the plant can detract from the livability of the region.

Society benefits from education primarily because of its positive externalities, according to Mueller. “If there is any reason for government to get involved with the financing of teaching institutions ... it can only be potentially existing externalities,” he wrote (2007, 12). Perhaps the most important externality produced by higher education is educated individuals on the cutting edge of innovation—which benefits everyone.

### **Human Capital**

The basic economic purpose of higher education is to enhance human capital (variously defined as skill, knowledge, or technology). Human capital raises a person’s future productive capacity, which in turn increases one’s future income and ability to engage in economic activities.

Furthermore, an important dynamic occurs between research and human capital—each is necessary to increase the other.

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# While enhancing individuals' abilities to innovate is paramount to growth, the general level of human capital in a community or region is important as well.

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According to Michael Rizzo, investments in scientific research generally exhibit increasing returns. That is, increases in research continually raise productivity and therefore higher outputs. This interactive element explains the endogenous dynamic in growth theory: As an economy grows, it can devote more of its resources to research and education, increasing human capital and productivity further, so that the economy grows even more and has even more resources to devote to research, and so on in a continual cycle.

While enhancing individuals' abilities to innovate is paramount to growth, the general level of human capital in a community or region is important as well. There is a direct, positive correlation between years of schooling and income; the more educated a community's workforce, the higher the average income is likely to be. A university both attracts talented individuals from elsewhere and educates the local workforce; without it, talented local residents would go elsewhere for their education, and a proportion of those who leave would not return. And it goes without saying that no outsiders would move to the community for non-existent educational opportunities (or employment at the university).

Others cite additional benefits from increasing the general level of human capital. Rizzo argues that the higher incomes of educated people lead to a bigger tax base. Siegfried et al. suggest that educated workers also improve the skills of co-workers through the exchange of knowledge. (Knowledge of how co-workers' skills are improved can be elusive, however.)

What can be quantified is that low-skill workers in an area benefit from the presence of high-skill workers. Enrico Moretti, cited by Rizzo (2004, 22), indicates that for each 1 percent increase in college graduates in the population, high school dropouts' wages rise 1.9 percent, high school graduates' wages rise 1.6 percent, and college graduates' rise 0.4 percent.

The problem of quantifying human capital was initially considered overwhelming and therefore university economic impact studies ignored it, according to Melanie Blackwell, Steven Cobb, and David Weinberg (2002). However, Blackwell et al. report that starting in 1993 several papers attempted to estimate "discounted lifetime earnings differentials" (2002, 89). These studies compared the earnings of college graduates with those of high school graduates.

The problem with these attempts, according to Blackwell et al. is "a fatal flaw arising from data limitations" (2002, 89). Specifically, a college education is not responsible for all of the difference in lifetime earnings between the two groups (this problem pervades labor economics). College graduates very often have natural abilities that would enable them to earn more than others without any difference in education. It might even be impossible to quantify the value added by colleges because of this.

## **Location and Migration**

As advanced technology and innovation become more important to the U.S. economy, it is natural to expect growth to occur in areas with an educated population. Indeed, Rizzo cites Glaeser and Saez (2003), who "show that the percentage of workers with college degrees strongly predicts future income growth rates in urban areas" (2004, 22). (The relationship is positive.)

Universities raise the level of human capital in an area by attracting many talented students, some of whom work in research capacities while attending school (primarily as graduate students) and others who stay in the area after graduation (Siegfried et al. 2006, 21). The presence of an educated workforce also can help to attract or retain employers (Luger et al. 2001, 5).

Therefore, the presence of a university would seem to naturally lend itself to economic growth. But sometimes the details tell a different story.

According to Rizzo (2004, 22-23), a 2004 study by John Bound and his colleagues Jeffrey Groen, Gabor Kedzi, and Sarah Turner found only a loose connection between the number of college graduates produced in a state and the number of graduates living in a state. Appropriate jobs must exist to hold highly skilled workers in a community, and factors other than the existence of colleges determine the location of industry. For example, Siegfried et al. write that it is highly unlikely that even 10 percent of Dartmouth graduates remain in the area “because there are not enough jobs in Hanover, New Hampshire” to absorb that 10 percent (2006, 23).

Andrew Gillen and Richard Vedder also comment on the frequent disparity between the number of people educated in a state and the percentage of educated people who live there. Compared to Georgia and Virginia, North Carolina devotes tremendous public resources to educating its population. In 2005, North Carolina appropriated \$7,153 for each full-time higher education student, while Georgia spent \$5,760 and Virginia only \$4,576. North Carolina also had a higher percentage of people aged 18 to 24 in school that year: 39.9 percent compared to Georgia’s 32.7 percent and Virginia’s 38.4 percent (Gillen and Vedder 2008, 10-13).

Yet, despite a long tradition of strong support for higher education, only 25.6 percent of North Carolina adults had a bachelor’s degree in 2006, as opposed to 28.1 percent in Georgia and 32.1 percent in Virginia. The discrepancy between North Carolina and Virginia illustrates the difference that jobs make. Virginia’s proximity to the national capital attracts educated people from all over the country to work in the government (or in government-related areas). In contrast, much of North Carolina remains rural, and the sophisticated economies of the Research Triangle and Charlotte do not offset the state’s blue-collar majority.

Still, a college does attract people to its location, and some students remain after graduation. The eventual long-term impact may be less than expected, however. According to Jeffrey Groen, cited by Siegfried (2006, 22), only 10 percent of out-of-state students remain in the state for 10 to 15 years after graduation.

Siegfried et al. suggest that local graduates tend to crowd out whatever in-migration occurs; local graduates of other schools eventually return home and replace out-of-state graduates. The net effect of out-of-state graduates remaining eventually approaches zero, unless the college produces or attracts new jobs that keep them there. (If many jobs existed without any association with the school, then this would not be an impact caused by the school—the school’s impact would still be zero.)

And most of the human capital externalities that can be captured from investments in higher education are at the graduate and professional level, according to Rizzo. New Ph.D.s, according to Albert Sumell, Paula Stephan, and James Adams (2004), generally leave the local area shortly after completing their degree. This suggests that investment in higher education to spur economic development might be more difficult than anticipated by many proponents of government investment. Retention is greatest in areas where universities have long-established traditions of producing lots of scientists and engineers—this is also likely to be where industry has already developed.

The question of whether universities draw talent permanently to an area leads to the “spontaneous development” problem, a key concept. For, while a university might attract industry and might promote growth through innovation, unless the surrounding region has the right mix of jobs, educated people will leave. Therefore, without the right infrastructure, a campaign to promote economic growth with higher education subsidies will be fruitless, at least in the short and intermediate terms.

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**“We have broadened our traditional agriculture economy and become a Mecca for biotech, pharmaceuticals, and life sciences by uniquely bringing together government, higher education and private business. This allows ideas to springboard from the lab to the market place. Just look around. There’s Quintiles, Merck, Bayer, Biogen, PPD and more.”**

*North Carolina Governor Beverly Perdue  
2009 State of the State Address*

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## **Research and the Triple-Helix Model**

According to a majority of mainstream academics, forecasters, and public officials, a new economy based on knowledge will dominate the twenty-first century. Technical and scientific innovation is the driving force of this new “knowledge economy.” These officials suggest that universities, as the source of much new knowledge and almost all new scientists and engineers, should play a greater role in the economy. Much of academia has adopted this redefinition of its purpose with relish and has eagerly engaged its two partners in the endeavor—the business community and government.

Thus, in addition to the contribution made to human capital through higher education, many policymakers and business leaders seek universities as active partners in guiding and encouraging economic growth.

The term “triple helix” was adopted by Henry Etzkowitz, Phil Cooke and Loet Leydesdorff, among others, to describe this new phenomenon of cooperation. As the name implies, it refers to three independent structures joined together to create one structure.

Cooperation among these three sectors of society—private industry, academia, and government—seems natural, since they have many mutual interests. This cooperation is also

not new. The idea behind the land-grant university, which many of the best-known state universities are, was to facilitate commerce. As Gordon Rausser, a former dean at the University of California who has served on the Council of Economic Advisors, said, his school was founded primarily to “marry scientific insight with technical knowledge to improve agricultural production” (Washburn 2005, 26).

By 1912, many universities had patenting and licensing offices to facilitate the transfer of technology from school laboratories to the production line via third parties. Yet World War II, with its urgent demands for sophisticated weaponry and rapid communications, really brought all three institutions into full cooperation.

According to Jennifer Washburn (2005), whose book *University Inc.* outlines the history of the growing relationship between universities and business, during World War I, U.S. military researchers were inducted directly into the military. But Vannevar Bush, the founder of Raytheon who served as the chairman of the National Defense Research Committee at the start of World War II, decided to allow professors to keep their civilian status. The government issued research contracts to them instead.

After the war, at the urging of Bush, the government decided to continue issuing such contracts for the good of science. Bush suggested that federal funding would keep research “free of market dictates” (Washburn 2005, 41). Bush’s characterization of federally funded scientific research as the “seed corn” for “future technological advancement” (Washburn 2005, 41) has become almost universally accepted in policy circles.

Federal funding of research continued at high levels through the 1950s, fueled first by Cold War defense spending, then by the “space race.” The Department of Defense was joined by the National Institutes of Health, the National Science Foundation, and later, in the 1970s, the Department of Energy as major funding sources for universities and industry.

Hence, a new model of the university emerged. It was dubbed the “multiversity” by former University of California President Clark Kerr in his seminal 1963 article in *Harper’s*, “The Multiversity: Are Its Several Souls Worth Saving?” (and a subsequent book). Departing from the longstanding conception of academia as an isolated, unified community

of scholars, Kerr's vision recognized the varied interests on campus, embraced the rest of society, and accepted new roles of involvement with government, the local communities, and the business world.

A new business model emerged in the post-war era, too. Unlike the dominant manufacturing industries of previous eras, which were largely dependent on natural resources, the new model was based on knowledge, communications, and the ability to make rapid adjustments. Innovation, entrepreneurship and venture capitalism were its primary elements.

And government's participation in the economy exploded as well. According to the Bureau of Economic Analysis, in 1930, government activity was 13 percent of the U.S. GDP, in 1947 it was 24 percent, and in 2009 it was 46 percent (Chantrill 2010).

With their visions and methods aligned, academia, government, and private industry heightened their cooperation, resulting in the triple-helix model. The basic mechanisms and ethos are:

- Universities can use their endowments plus government and private industry funding for research, often in shared endeavors, and everybody benefits.
- Government provides funding and contracts to private industry and academia to meet its heavy demand for research. Government-funded basic research also becomes part of the public domain, available to private industry and academia.
- Private industry keeps in close contact with university researchers to stay at the frontiers of knowledge and is able to fund applied research of its own, often with the university as a subcontractor. It maintains an equally close relationship with the government.

According to the model, businesses not only receive a new source of ideas from university research but also get a steady source of skilled employees from the school's graduates—some of whom might have already worked on the firm's projects.

And schools not only receive funding from external sources and access to government and private research, but they often gain extra income through licenses and patents for original

discoveries. Their own research with profit potential can also be "spun off" by professors into private companies. These companies can be funded privately, by endowments, or publicly through economic development grants. Most major research universities have their own licensing and patent offices on campus to help researchers through the maze of regulations and funding options they face. From the growth produced by promoting economic development, the government receives benefits such as increased tax revenues and lower transfers to needy citizens. It can also use the power of funding money to direct the activities of academia and industry.

The theory promotes the triple helix as a win-win-win situation.

Although the components of this model existed during the post-World War II period, the triple helix was kicked into high gear in 1980 by the University and Small Business Patent Procedures Act, commonly called Bayh-Dole. This law gave universities much more ability to get exclusive patents and licenses from federally funded research, in the hope that this would give the sluggish economy of the 1970s a jolt.

There had always been some interaction among the three institutions, but according to Etzkowitz (2002, 2) it was previously "bilateral." That is, government would interact with both industry and academia individually, but there was little attempt to coordinate the activities of all three. Each institution also tended to stay within its own sphere of activity. Today, however, all three intertwine: Universities have become more entrepreneurial, industry has become an educator, and the government serves as a venture capitalist at times.

The triple-helix model is commonly accepted, and many state governments conduct their economic affairs accordingly. They fund university research and foster relationships between research and industry. University professors serve as consultants to industry, while industry professionals serve as adjunct professors. State economic development officials are promoting cooperation by restructuring tax systems and funding infrastructure projects to further the goals of industry. In time, the relationships are likely to grow stronger, with universities providing on-site education at businesses and firms funding scholarships and fellowships.

Whether the nation has benefited from this taxpayer-supported development is difficult to know. Considerable evidence supports the triple-helix concept as an engine of growth. Many

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# Universities have become more entrepreneurial, industry has become an educator, and the government serves as a venture capitalist at times.

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universities have spawned nearby centers of high-tech business. Two research groups, Dan Berglund and Marianne Clarke (1999) and Louis Tornatzky, Paul Waugaman, and Denis Gray (2002), note that all centers of high-tech business are located near research universities. And most major research university administrators can cite a long list of successful companies that have “spun off” from their laboratories.

Yet proponents of the theory suggest that not enough is being done to enable the triple-helix to work its development magic. Berglund and Clarke (2000) see a major barrier in the state laws and university policies that restrict the use of university equipment for the benefit of private companies. They suggest changing the requirements for faculty use of time, particularly recommending granting tenure to faculty researchers, even though they never see the inside of a classroom. Berglund and Clarke also urge greater interaction with industry and recommend more funding for technology transfer offices, which attempt to market university technology to the business community, help professors who wish to start their own firms to acquire capital, and guide those professors through regulatory mazes.

Still, ethical concerns abound in these relationships, and neither government nor academia is known for efficient use of resources or ability to discern profitable endeavors. Berglund and Clarke (2000, 15) caution that such policies can require trade-offs, such as less time in the classroom for professors. And it may not be possible to create high-tech centers at will—if an existing knowledge industry infrastructure is missing, the odds of successful development greatly diminish. After all, not all research universities are near high-tech centers, indicating that the mere presence of a nearby research university is not sufficient to start a high-tech cluster. (The University of Indiana and Pennsylvania State are examples of top-level research institutions with little industrial development nearby.)

Another suspect element surrounding the triple helix is whether public investment will distort economic development

by favoring research that creates companies that can’t make it on their own. Enthusiasts for public investment, such as Berglund and Clarke, recommend that states should compensate for any venture capital “shortfalls.” Etzkowitz goes even further, suggesting that government can—and does—reduce risk in the development of new technology. Methods include government supply of “bridging funds, grants and matching funds to support R&D and access to participation in joint projects with government laboratories” (2000, 8). He also says that government performs a valuable service by using public money to fund projects deemed too risky by private venture investors.

This confidence in the role of government funding ignores an obvious problem: If projects are deemed too risky by private venture capitalists, whose livelihoods are based upon making wise decisions about risk, then there is a strong possibility that government will support ventures that are very likely to fail. Risk is substantial in high-tech and especially bio-tech ventures, and if a start-up cannot attract private money, it would seem to have little chance of commercial success.

Berglund and Clarke also indicate that “to build an R & D base requires a long-term, sustained, and significant investment” (2000, 8). While such a sustained effort might produce the necessary agglomeration effects (the creation of a supporting infrastructure through the founding of similar enterprises) to create a knowledge industry cluster, such extended investment also raises the stakes. It might mean that the government is funding projects likely to fail, year after year. Alternatives—including tax relief—might grow the economy better.

So, although knowledge has clearly been advanced through the collaborative arrangement espoused by Berglund and Clarke and Etzkowitz, it is impossible to tell whether the triple-helix mechanism has been as efficient as purely private research would be. At one time, considerable basic research was conducted by private industry. AT&T’s Bell Laboratories were once focused on such basic (or primary) research and

employed many Nobel Prize winners. Today, however, primary research is more in the realm of universities; 54 percent of primary research is conducted in universities, according to the Association of American Universities (2009). Industry concentrates on applied research, which can be taken to market more quickly. In 2006, only 3.8 percent of industrial research was considered basic, according to the National Science Board (2008).

This raises a “counterfactual problem”—what would have occurred in the absence of the triple-helix model? This question poses a high hurdle for anybody wishing to fully comprehend the economic value of government investment in higher education. It is often impossible to construct an accurate counterfactual so this problem is often ignored. In the case of Bell Labs, for example, there is no way of knowing whether that private firm, and industry in general, would have continued to pursue basic research in the absence of government grants to universities.

Yet there are many examples of high-tech clusters where the model appears to have worked. The three best known—Boston’s Route 128 area, California’s Silicon Valley, and North Carolina’s Research Triangle Park—are discussed in the appendix.

### **The Spontaneous Development Question**

Can governments, universities, and businesses simply create a knowledge economy out of thin air? Or is successful economic development dependent on a great many pre-existing conditions? In spite of his great enthusiasm for the successful cooperation of universities, businesses, and governments, even Etzkowitz does not say that development can occur in a void (2002, 11). Instead, he contends that “a local region must have some scientific and technological institutions and (must have) produced or obtained other kinds of necessary innovation-supporting instruments such as investment mechanisms and institutions to promote concerted action.”

Etzkowitz’s observation has much supporting evidence. High-tech clusters are difficult if not impossible to create by government policies alone, tending to occur somewhat naturally because of favorable conditions in a particular area.

Washburn (2005, 176) describes how, after Carnegie-Mellon successfully spun off the search engine Lycos in the early

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# Can governments, universities, and businesses simply create a knowledge economy out of thin air?

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years of the Internet, the owners of Lycos eventually took the company to Boston, where a high-tech infrastructure already existed. (Pittsburgh has since developed some infrastructure, largely due to Carnegie-Mellon’s presence.)

Phil Cooke and Loet Leydesdorff suggest that a knowledge economy is not static geographically. Certain regions that incubate new knowledge do not necessarily benefit from their discoveries later. As technical and production processes improve, firms can relocate to less expensive areas, “generating a threat of de-industrialization” in the areas that first launched the new industries. They cite Gerhard Krauss and Hans-Georg Wolff and others for noting that “the four regions indicated by the EU [European Union] as ‘engines of innovation’ in the early 1990s were no longer the most innovative regions in the late 1990s” (2005, 11).

### **Further Objections to the Triple-Helix Model**

The triple-helix perspective makes intuitive sense in describing academia’s relationship to industry and economic development, and the relationship may make net contributions to economic growth. But there are many potential objections.

For one thing, the final results may not justify all the effort. A 2003 Brookings Institution report, “Signs of Life,” cast doubt on the impact of new biotech companies, according to Washburn (2005, 188-9). She said that the report stated that “most biotech companies are small, so new job creation tends to be limited. ... most biotech start-ups, even the successful ones, do not grow into large pharmaceutical firms. Instead, they tend to license their technologies to larger, established drug companies, to form joint ventures, or to sell off their entire companies, so that whatever commercial activity they generate locally may actually be short-lived.”



The new relationships also create concern about the basic mission of a university. There is a potential trade-off between the university's two major basic functions—education (the transfer of existing knowledge to a new generation) and research (the creation of new knowledge). The increasing emphasis on research amplifies this trade-off. For, as priorities shift away from education, so do resources. For instance, the tuition revenues derived from enormous undergraduate class sections, filled with hundreds of students, often subsidize activities that support research.

Universities giving greater priority to research will often seek top research professors at top salaries and cut costs in undergraduate education by relying on graduate students and contingent faculty to teach. They can also shift endowment spending from students to funding research facilities, equipment, and the like.

There is also a key trade-off between a focus on basic research, in which underlying scientific principles are sought, and applied research, which seeks to solve more immediate problems. According to Washburn, universities now hope to gain much more financially from applied research and therefore tend to put basic research on the back burner. Researchers tend to take fewer risks, preferring topics that promise immediate rewards instead of more speculative subjects that might eventually be of greater benefit.

And, as colleges tend to focus on advancing their own store of proprietary knowledge, they are likely to produce less knowledge for the common domain, to be used freely by all. Washburn cautions about the danger of corporate research “squeezing out public interest research and weakening the nation’s capacity for innovation” (2005, 9).

The focus on immediate rewards from research raises one of the strongest critiques of the triple-helix assumptions. Innovation has a powerful random quality that can foil the best-laid plans of states and universities. No matter how much talent a university assembles, and no matter how well the state, school, and industry provide that talent with the means for discovery, there is no certainty of a financially rewarding knowledge breakthrough.

In fact, most universities have failed to garner large profits from their research. For every Florida State University, which has profited greatly from the cancer-fighting drug Taxol, there are

## **A CLASSIC START-UP COMPANY: SAS**

**Despite objections to the triple-helix theory, there is no shortage of successful companies spawned from government-supported university research in the manner the theory suggests. The North Carolina company SAS is one; it began as a federal government research grant to the statistics department at NC State (*Intelligence Quarterly* 2009).**

**Speaking in an interview in *Intelligence Quarterly* (2009), founder Jim Goodnight described how a technical advance by computer giant IBM spurred further innovations, one of which became his Statistical Analysis System, the centerpiece of SAS. Before IBM’s System 360 model computer, instruction sets—the early versions of software—were machine-specific. This meant that programmers had to rewrite the instructions for every different computer they wanted to run the program on. With the System/360 series, the programs became portable, so that one program could be used in many computers. To take advantage of this innovation, said Goodnight, “N.C. State’s statistics department received funding from the National Institutes of Health to find a way to use the IBM System/360 to analyze the growing volumes of research data in the country” (*Intelligence Quarterly* 2009, 19).**

**Goodnight worked on the program at NC State under the aegis of the National Institutes of Health from 1966 to 1972, when the federal agency shifted funds to cancer research. To keep the program going, the U.S. Department of Agriculture, NC State, and eight other land-grant universities each contributed \$5,000 annually to cover costs. By 1976, Goodnight’s program was paying its own way with outside contracts.**

**At that time, with space limitations at the university providing a gentle nudge out the door, Goodnight took his operation private. Start-up costs were minimized since he had already developed his customer base at NC State, and he was also able to rent time on an IBM System/360 at the Triangle Universities Computing Center (located on the NC State campus) instead of investing in an expensive maxi-computer.**

**SAS currently has approximately 11,000 employees, mostly at its Cary, North Carolina, campus, not far from Research Triangle Park. Its 2008 revenues were approximately \$2.15 billion.**

several schools whose tech-transfer offices operate at a loss. A 2003 study, “Who Bears the Growing Cost of Science at Universities?” by Cornell University economists Ronald Ehrenberg, Michael Rizzo, and George Jakubson, found that, for 138 major research institutions in 2000, the median of net revenues from patents and licenses was only \$343,952 (discussed in Washburn 2005, 169-79).

Washburn cites Arthur Rolnick, a senior vice-president at the Federal Reserve Bank of Minneapolis, who “strongly questioned the wisdom of asking the state’s university system to drive economic development and productivity in the state (2005, 175). States weren’t very good at picking ‘winners and losers,’ he said, and neither were universities.”

She also quotes Michael Crow, president of Arizona State University who previously headed Columbia University’s successful tech-transfer program. He suggested that many universities would fail when seeking profit from proprietary research. Such universities “have to start thinking like companies, and they’re bad at that” (Washburn 2005, 187).

According to Crow, the best thing to do is let “faculty members do what their noses tell them to do.” “‘The university can be a driving force,’ said Crow, ‘if it’s a great center for science—not if it’s a great center for technology transfer. Technology transfer is ... a secondary objective at best.’” He added that attempts to put tech transfer at the forefront of a university’s operations “will corrupt the university for sure” (Washburn 2005, 187-8).

## Empirical Studies

The academic and political establishment tends to assume that investment in higher education is a sure-fire means to economic development. Yet proving this assertion is challenging at best, and perhaps impossible.

Some of the quantification hurdles are insurmountable. Even so, academic researchers churn out studies on a regular basis showing that, for each dollar invested in a university or in a state higher education system, the region is rewarded with some desirable return.

There are two general approaches to quantifying the effect of higher education on a region. One is perhaps best described as macroeconomic. In this empirical method, a region’s economy is studied only in the aggregate. Researchers employ

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# The academic and political establishment tends to assume that investment in higher education is a sure-fire means to economic development.

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statistical regressions in an econometric growth model to determine the role that a variety of factors (such as education spending or educational attainment) have in spurring economic growth.

Macroeconomic studies provide understanding of relationships without the need for extensive gathering of very specific data or fully describing each complex process. And they directly address this paper’s central question. Unfortunately, such studies are rare.

A more prevalent approach can be termed microeconomic (or multiplier-analysis). It often examines data at the line-item level, such as faculty salaries or university equipment purchases, to comprehend the dynamics between higher education and the economy. These studies use techniques such as cost-benefit analysis and economic impact studies to compute private and public costs and benefits.

The following two sections present the pros and cons of these two kinds of regional development/university investment studies, beginning with the microeconomic approach.

## Microeconomic Analysis

Microeconomic methods are very good at looking at the individual dynamics of a university-related economy. For instance, a researcher might want to investigate whether the presence of a large percentage of college-educated people in a community has any effect on the wages of less-educated workers, or whether there is any relationship between an increase in research spending and undergraduate class sizes.

On the other hand, cost-benefit analysis and economic impact studies are a questionable means of determining the overall impact a university or university system can have (or the impact of higher education in general). They suffer due to the tremendous complexity of an economy—and even of a university’s activities. It is perhaps too much to ask that any researcher identify and quantify every change in the economy that is initiated by a change in state higher education spending. Indeed, some of the likely externalities produced by a university, such as the amount of economic growth that can be attributed to the university’s role in the advancement of knowledge, defy quantification.

Yet microeconomic investigation can still be illuminating. It provides insight into the flow of higher education spending: Does it go where it will do the most good, or does it merely produce higher salaries and superfluous staffing?

And there is ample evidence that indicates universities do attract new money to an area. Several microeconomic methods are used to quantify the effects of a university on a region or location. The two most common are cost-benefit analysis and economic impact studies. According to Rizzo (2004) the cost-benefit analysis has been used most often, although economic impact studies are gaining in popularity.

Measuring the returns to research—including losses on research—is an area where microeconomic methods perform very poorly. While one may estimate the effects that the salaries of researchers will have on a local economy, it is difficult to derive the effects of discovery and innovation, which have large random components.

Siegfried et al. (2006, 4) expose the shortcomings of microanalysis with one glaring example. They cite impact studies of two similar private universities just a few miles apart: Loyola of Chicago and Northwestern. Of the two, one would expect that Northwestern would have a slightly higher impact. It is more prestigious, had higher tuition (\$37,125 vs. \$29,486), and has a slightly smaller undergraduate enrollment (8,176 vs. 9,365) but a much larger graduate program (8,249 vs. 4,145). Northwestern is also classified as a Research I (very high research activity) while Loyola only has a Research II (high research activity) Carnegie classification. Yet Loyola was credited with having a \$1.42 billion impact in one study, while Northwestern’s impact was counted as a mere \$145 million (both studies used 2006 dollars).

Only two conclusions can be drawn from such a wild discrepancy: Either one of the studies is nonsense, or both are.

Siegfried et al. describe some other incongruities. They are particularly wary of the many studies that claim, for each dollar of government spending, that a school returns \$X (an estimated value) to the local or state economy. “In 67 studies reporting this estimate, its value spans from \$1.84 to \$26, a range simply beyond belief .... Although colleges are heterogeneous, the variety is not enough to justify such a large range of estimates” (Siegfried et al. 2006, 4-5).

When such a claim is made, Siegfried et al. wrote, it usually falsely attributes “all of the return from the university’s myriad activities to the small portion of the budget contributed by the state.” The authors note that even the bottom of the range, 84 percent, is absurd when 15 percent returns on a stock portfolio are considered outstanding. “If returns to higher education were as high as these statements imply,” the authors wrote, “states and the private sector would be building universities frantically” (Siegfried et al. 2006, 19).

Data gathering is also a problem in the conduct of such studies. For instance, while most university spending is in the form of salaries, and is easily known, many universities do not provide vendor information for all purchases. Some purchases, such as computer equipment, are from outside the area and should not be counted in the measurement of local impact (Siegfried et al. 2006, 12). Without complete knowledge of all procurement, the impact study becomes an estimate rather than a firm figure. Additionally, much information in these studies, such as the national data available for estimates of student spending, is based on surveys and is therefore suspect.

An even bigger problem occurs when studies are forced to consider data other than known quantities. Such assumed benefits as the creation of “an educated workforce” and “a desirable environment” can defy data gathering and make getting an accurate estimate of the impact very unlikely.

Counterfactuals, which attempt to quantify what would have existed in place of the university had the university never existed, make the determination of a school’s impact even more difficult. They will be discussed below.

Perhaps the biggest disadvantage of impact studies is that they are not good instruments for dealing with marginal terms.

Siegfried et al. (2006, 8-9) say that impact studies tend to be “all or nothing ... confounding the impact of the first 10,000 students with the effect of the last 100 students to enroll. Diminishing marginal returns can create mischief.”

With so many intangibles to be discovered through surveys, multipliers (discussed in the next section), or simply ignored, the veracity of microeconomic techniques for determining impacts must be questioned. Too often, studies based on these methods are presented as fact by policymakers and university administrators intent on demonstrating how much money schools attract to an area in order to justify greater public spending on higher education.

### ***The Indirect Spending Problem***

Both economic impact studies and cost-benefit analyses often focus on the effects of university spending in the local community. This spending, whether in the form of professors' salaries or students' off-campus expenditures, brings up another important concept—indirect spending. Unfortunately, indirect spending raises a host of measurement difficulties.

Initially, the money spent by universities, students, and visitors is considered to be “direct spending.” That is, it is a direct payment from the university, students, or visitors to businesses in the community. But direct spending generates additional income, which is considered “indirect” (Blackwell et al. 2002, 90). In other words, some of the money spent by students at a local tavern is then spent locally by the tavern owner and employees—the original direct spending is repeated, or “multiplied.”

Indirect spending cannot be gathered by ordinary methods—it must be estimated through the application of multipliers to direct spending. Some researchers use elementary multipliers based on empirical studies. These might simply multiply the economy times one number, such as 1.5, to approximate the flow of indirect spending.

Other multipliers are actually sophisticated models of the local economy. Usually variables describing local conditions and university spending are plugged into a regional input-output model, such as the Department of Commerce's RIMS-II model (Blackwell et al. 2002, 91). For a study to even approach accuracy, each type of direct spending requires a different multiplier. For instance, much more of the money spent on

salaries is spent locally than is money spent on equipment, unless the equipment is manufactured locally.

Regional models, such as the REMI (Regional Economic Models, Inc.) used by Luger et al. (2001, 13-15), have an advantage over simple multiplier models. They can determine an estimate of the needed multipliers dynamically, according to local conditions and to changes in supply and demand effected by the changes in inputs.

Still, many multipliers used are off the shelf, Siegfried et al. claim, rather than specific to the university under study, and therefore are at best vague estimates of the actual behavior of money. Among their other objections (2006, 17-18) to estimating the local impact of a school with regional economic models are these:

- Local expenditures by universities can differ from expenditures by other businesses or agencies.
- If the pattern of incremental expenditures differs from average expenditures, it will distort the estimate because the models use average expenditures.
- Purchases by town residents often differ from the model's assumptions.

Indeed, modeling an economy is so complex that using even the most sophisticated multipliers must be questioned.

Another problem Siegfried et al. mention is the identification of geographic area. Frequently, impact studies identify a small area, but then use a pre-packaged multiplier that was intended for a much larger area, exaggerating the impact.

### ***The Counterfactual Problem***

Another procedure impact studies commonly employ is to compare how the community fares with the college's existence versus how it would fare without it—to present a “counterfactual.”

It is no simple task to create a realistic counterfactual, however. For instance, very different impacts are likely to be derived depending on whether one attempts to describe the community as if the university disappeared today, or as if it never existed (Rizzo 2004, 25).

Siegfried et al. caution that comparing “all economic activity generated by the institution” to an alternative of “doing nothing” is unlikely to provide an accurate estimate of a university’s impact. “Few decisions are of such an ‘all or nothing’ nature,” they write (2006, 8). They suggest that few studies employ the counterfactual accurately. Instead, there is a tendency to disregard “that portion of an institution’s economic activity that would remain in the local area if that institution were not there is not a contribution to the local economy.”

It is, after all, impossible to truly know the nature of development that would have occurred without the college. To illustrate, imagine if Drexel University never existed. This would leave a huge question mark just west of Philadelphia’s downtown, bordering on the commercial and financial district, the University of Pennsylvania, and residential neighborhoods. Such prime real estate would assuredly be used for some purpose, but without knowing what that purpose is, fully assessing the economic impact as a result of the university is impossible.

It might very well be that, if commercial and financial interests had made use of the property instead of Drexel, the area would have thrived economically, and the university’s effect on the city’s finances could be measured as negative. Alternatively, if the property’s usage had been confined to low-income residential purposes, the school’s impact would be measured as significantly positive.

Another question about counterfactuals concerns in-migration. Siegfried et al. ask who should be considered the local population: the residents who existed before the college or the residents who exist after the college? For instance, if the study claims that average incomes in the area rise, it might be due to the large number of highly paid researchers and instructors who move into the area, with existing residents benefiting little. After

all, few local residents are likely to possess the skills required by universities or by the ancillary businesses attracted by the university. So even if the economic impact of a university on a community is significant, the benefits may bypass the initial taxpayers who helped to bring the newcomers in.

Therefore, economists differ on whom to include in the affected population. Siegfried et al. quoted Barry Bluestone, who favored including as a direct local impact the incremental future incomes of all graduates who stay in the area, but Siegfried et al. caution (2006, 21) that only graduates from the original, non-migratory population should be included.

Because of these difficulties, many studies ignore the counterfactual. Others simply try to wrestle with it as best they can. Yet no matter how carefully a counterfactual is constructed, unless a campus is extremely new or is located in an otherwise undeveloped rural area or small town (and the “alternative” use of the land is knowable), it will always depend somewhat on conjecture.

### **Macroeconomic Analysis**

Macroeconomic studies using statistical regression analysis provide a way to directly examine the central question of this paper—whether increased state support for higher education leads to economic growth. They offer the most useful perspective for observing the effect on the economy of state spending on higher education.

While microeconomic analysis struggles with such hard-to-estimate concepts as indirect spending, counterfactuals, and the randomness of innovation, the macro approach is concerned only with the overall performance of the economy and therefore renders these difficulties irrelevant.

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**While microeconomic analysis struggles with such hard-to-estimate concepts as indirect spending, counterfactuals, and the randomness of innovation, the macro approach is concerned only with the overall performance of the economy and therefore renders these difficulties irrelevant.**

Yet the macroeconomic approach is not without several problems of its own. First, the proper construction of the econometric model can be a trying obstacle. Also, these studies are few in number. At least two exist, however, and their results support each other, indicating some validity. And they both claim a remarkable discovery—there is a negative relationship between state subsidies to higher education and economic growth!

The central model in the unpublished paper “North Carolina Higher Education: Facts and Fiction” by University of Ohio economists Richard Vedder and Matthew Denhart (2007) is representative of both models. Bornali Bhandari, an economics professor at Fitchburg State College, and Bradley Curs, an economist at the University of Missouri-Columbia, created several different versions that yield further insight in another unpublished paper (Bhandari and Curs 2008), but their basic model is similar to Vedder and Denhart’s.

The models consist of variables representing factors likely to influence economic growth. Variables in the Vedder-Denhart model that have positive relationships with economic growth include the percentage of college graduates among the state’s population, the age of the state (this is a proxy, or quantifiable substitute, for capitalization, since older states tend to be more heavily developed), and population growth (as expected, states with growing economies attract in-migration).

Also as expected, taxes have a strong negative correlation with growth, as does “current state personal income” (in other words, states that already had high incomes saw less growth). The Bhandari-Curs basic model yielded similar results. (More on other Bhandari-Curs models below).

But the central independent variable of both Vedder-Denhart’s and Bhandari-Curs’s equations—per capita public spending on higher education—had a significantly negative relationship with economic growth.

This finding conflicts with almost all expectations. Intuitively, one would assume a positive relationship for all the reasons previously stated: people with college educations earn more, research provides the innovation that attracts investment and new businesses, and so on.

In fact, as stated in the introduction, there is a consensus in growth theory that part of the dramatic rise in living standards in the last two centuries can be attributed to increases in human capital. And because there appears to be no limit to

the increase in knowledge, the eventual returns to increased education are assumed to be infinite.

Of course, growth theory is primarily concerned with very long periods of time. But even in the short term, the assumption of a positive relationship between investment in higher education and economic growth is nearly universal. Apparent evidence confirming this assumption is everywhere: high-tech clusters near universities, successful spin-off companies that started as academic research grants, and the steady march of public university graduates into well-paying jobs in private industry.

So what accounts for this contradiction? How can there be this obvious positive relationship between higher education subsidies and economic growth and a concurrent negative relationship, as posited by the studies using regression analysis?

To rectify this seeming contradiction, marginal thinking must be employed. One of the flaws of economic impact studies is their tendency to describe things in terms of “for each dollar of subsidy, X dollars are returned.” X is a constant positive number, suggesting that the return for the last dollar of subsidy is the same as the first dollar. Even the two macroeconomic regression models commit this same error, though yielding different results.

Modern economics, however, rightfully focuses on marginal returns. The return for the last dollar invested is very likely to be different than for the previous dollars (typically much less). The solution to the contradiction suggests that both alternatives, positive or negative, are correct depending on the level, timing, or mix of subsidies.

The next section will illustrate this concept graphically.

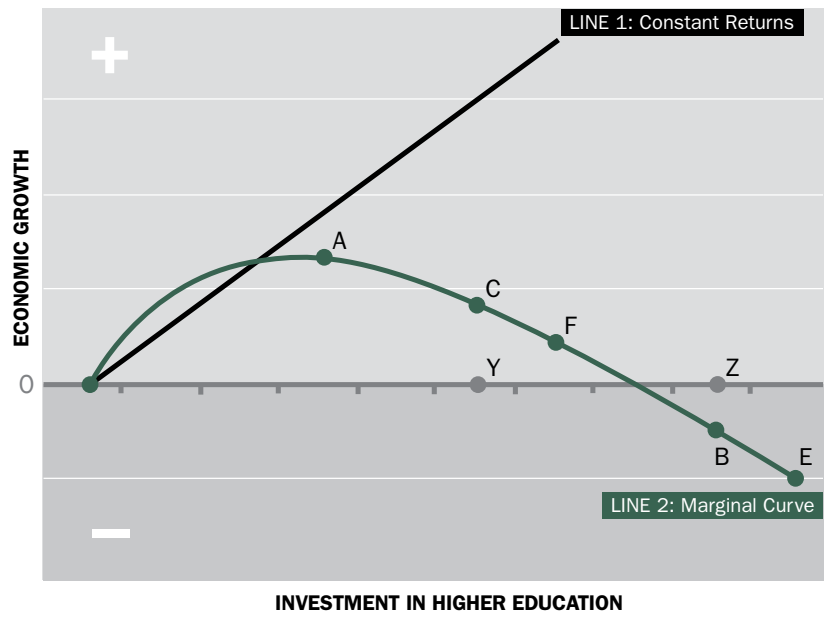
### **The Model (with apologies to Art Laffer)**

The figures on the following page illustrate how investment in state higher education is subject to diminishing marginal returns—eventually the investment become less and less effective in contributing to economic growth. The curve for these diminishing returns to higher education spending is similar to Art Laffer’s graphical description of the impact of higher marginal tax rates on tax yield (Laffer 2004).

In Figure 1, line 1 describes a constant “return to scale”—the benefits from the first dollar invested by the state give the

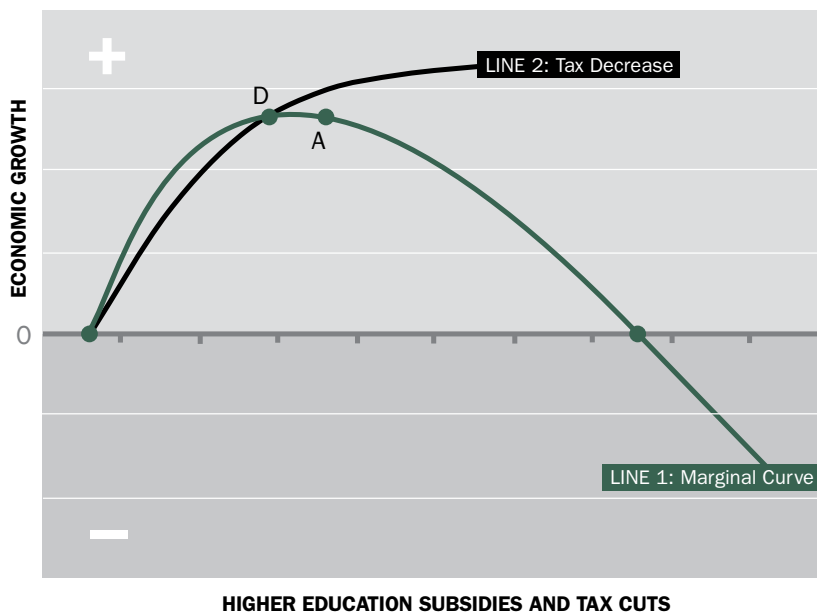
**Figure 1**

How Investment in State Higher Education Is Subject to Diminishing Marginal Returns



**Figure 2**

The Relationship Between Higher Education Investment Growth and Tax Cuts



same benefits as the last dollar. This curve represents the growth suggested by a standard impact study. Line 2, however, represents a diminishing marginal return, which is a more accurate reflection of increased spending. The first dollar yields a very high return, but as the level of the subsidy increases along the X axis, the rate of economic growth (on the Y axis) gradually slows, reaching its apex at Point A.

Beyond Point A, any additional subsidies decrease the rate of growth. Many elements in public higher education work against growth: the cost of subsidies and the higher taxes needed to pay for them, the income forgone by students while they are in school, and so on. Also, the benefits tend to shrink as spending rises—consider the possibility that the universities can produce many more graduates than the state’s economy can absorb in a year.

At Point A, these negative factors begin to outweigh the benefits. When funding moves further along the curve to the right (such as at Point C) the state continues to grow because of investment in its public university system, although its rate of return is diminishing. But as the state blindly pumps in money hoping to improve the economy, few additional benefits are produced, and the burden to the state is so high that the relationship between state spending and economic growth becomes negative. This is represented by Point B, below the X axis, where spending is at Point Z. That is where we appear to be now—according to the two empirical studies.

Vedder and Denhart suggested that the high college attrition rate is one important reason for this negative relationship. Because nearly 50 percent of incoming students don’t graduate in six years, states are spending lots of money that does not significantly increase the state’s human capital. Andrew Gillen and Vedder, in “North Carolina’s Higher Education Sector: Success or Failure” (2008), include another explanation of why increased spending by universities does not translate to better results: The money is often shifted to higher salaries and increased staffing rather than to a higher quality education.

The charts on page 21 are merely intended to represent a general concept. Each individual curve only represents a specific mix of expenditures—in reality there are an infinite number of such curves. If a university system changed its mix of expenditures by emphasizing elements likely to spur growth, such as engineering education and applied research, the curve

would be shaped differently to reflect that change. Likewise, a shift by the state in the mix to include more social amenities for students and more degree programs in the social sciences would also create a much-altered curve.

But the curves shown depict the basic dynamics of how higher education subsidies interact with economic development. Assume that the subsidies are at Point Z, and the economy is contracting at Point B. If the general level of subsidies to higher education decreases to Point Y, the growth rate will slide up to Point C on the curve. (Specific changes in the mix of subsidies, such as a decrease only in need-based scholarships, would require movement to another curve using income and substitution effects, which are beyond the scope of this paper.)

Another constraint on the effectiveness of subsidizing higher education as a tool of economic development is the alternative uses of state funding. According to Rizzo (2004, 21), subsidization should occur only when the marginal expenditure of taxpayer money on higher education produces a net “social return” that is at least as high as the marginal expenditure on any other budget item. In other words, if health care or highways have a higher return at the margin, it would make sense to invest in them rather than in higher education.

To see this, look at Figure 2 on page 21. As in Figure 1, growth is pitted against state higher education subsidies (line 1). But line 2 shows the relationship between growth and the size of one possible alternative use of state funds, a tax cut. While initially growth is best promoted by spending on higher education, beyond the intersection of the two lines (Point D), economic growth becomes greater by cutting taxes instead. This suggests that D is the optimal level of subsidies to higher education.

Modifications to the basic model of Bhandari and Curs (2008, 10) indicate a major reason why subsidies fail to produce the expected results. They added variables to capture the effect of the percentages of students who attend private colleges. (States range from Massachusetts, where 43 percent of college students attend state schools, and Wyoming, where 95 percent of college students are in state schools.)

They discovered that states with many students at private colleges do indeed have a negative relationship between state spending and economic growth, even more so than models like Vedder’s and their own first model indicate (Point E in



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# Students who would likely purchase more costly private education are induced by low tuitions to attend the highly subsidized public schools instead.

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Figure 1). But states where higher education is predominantly public have a slightly positive relationship between higher education subsidies and economic growth (Point F).

Furthermore, Bhandari and Curs's findings suggest that public schools may be "crowding out" private schools due to a moral hazard. Students who would likely purchase more costly private education are induced by low tuitions to attend the highly subsidized public schools instead. Therefore, the subsidies do not produce positive externalities resulting from a more educated population as intended—they are merely replacing the social benefits that would occur if the students attended private schools. And the social costs are raised considerably by the taxation of the state's residents and businesses to subsidize public education.

Thus, growth from state spending is not enhanced but inhibited in states where there are many private higher education opportunities. Conversely, the positive relationship between growth and higher education subsidies in states with few such private opportunities suggests that these subsidies are indeed helping to produce such benefits, albeit very slightly. This difference between the effect of subsidies in states with many private colleges and states with few can be seen by the shift along line 2 in Figure 1 from Point E to Point F. Still, even for the states where public education is dominant, the amount of economic growth produced is minimal for the amount of subsidies, and thus likely to be far less than the alternate uses.

This crowding-out theory is supported by empirical evidence. At the end of World War II, approximately 51 percent of college students went to private schools, while today only 26 percent do so (Department of Education 2008).

The crowding-out hypothesis also matches the Gillen-Vedder observation (2008, 6) that few students at the University of North Carolina's top public campuses need financial aid. According to Gillen and Vedder, only 14 percent of the

students at UNC-Chapel Hill and 16 percent at NC State (the two most prestigious schools in the UNC system) receive federal Pell grants. This is exceedingly low for public universities and supports other evidence that students at these schools have primarily middle-class and even wealthy backgrounds. It is very likely that many of them would seek a more expensive private education if these attractive subsidized options were unavailable.

And such public schools are not only available, they cost roughly one-third as much. Private Wake Forest University is considered roughly equivalent to UNC-Chapel Hill in prestige. For the 2008-9 school year, the College Board website states that all expenses needed to attend Wake Forest totaled \$52,082 annually, while UNC costs an in-state student a mere \$15,587. (State appropriations per full-time student at UNC-Chapel Hill were \$21,444 that year [Borders 2009, 7].) This also implies that, given the absence of public education, there will be at least some private higher education that contributes to economic growth without government involvement.

## Conclusion

So we have arrived back at the paper's central question: Does increased state spending on higher education promote economic growth? And there appears to be a definitive answer:

Sometimes it does, and sometimes it doesn't.

While that statement might seem to be anticlimactic, or even a bit facetious, it suggests that the key to understanding lies in the paper's secondary questions: How much investment is appropriate? How much investment should be private and how much should be public?

Some conclusions can be drawn from the evidence presented. The real effect of state spending on higher education almost assuredly depends on the pre-existing level of spending and on

the specific mix of spending. There are indications that it also depends on the state's existing economic environment. Is there enough of an infrastructure to take advantage of increased research? Is the state in need of educated professionals to help residents conduct their daily business?

The models by Vedder and his colleagues and by Bhandari-Curs have provided further insight. They indicate that our current levels of state spending on higher education are too high. Bhandari-Curs also provides a glimpse into the public vs. private question and suggests that public investment may be simply replacing private money in some circumstances, rendering the subsidies ineffective.

However, there still needs to be much more research in this area. The Vedder-Denhart and Bhandari-Curs articles are unpublished; it would be enlightening to see more macro models similar to theirs to verify that the Laffer-style curve hypothesis proposed in the preceding section accurately describes higher education spending.

Furthermore, the other secondary questions have important policy implications: What components of higher education are likely to contribute to growth? Which situations are likely to prove fertile or infertile territory for creating economic growth through spending on higher education? Does spending on higher education have possible negative effects?

Additionally, more research should be conducted to better understand whether spending on "marginal students," who have low admissions qualifications, detracts from economic growth. Policymakers should also be informed about how to set admissions standards optimally for aiding growth. It would also be best to know for certain whether university extension services for the state's farmers actually help the economy or merely replace businesses that would provide the same services more efficiently. Any number of such questions need further exploration. For example, should incentives for effective research funding be provided beforehand, based on the problems to be solved, or afterward, based on results?

But even without 100 percent certainty, we can be fairly confident that some things on campus are unproductive economically in the long run: high non-faculty staffing levels, climbing walls in the gymnasium and other frills, homecoming performances with big-name music stars, and diversity mandates. And if expensive scholarships and subsidies

are being used to produce more graduates with degrees in "soft" majors that have little "real-world" application, such as sociology, the expenditure probably detracts from the economy.

On the other hand, scholarship money used to produce more engineers, nurses, scientists, and financiers might promote development (unless there are known labor supply gluts in these professions).

The effects of research spending are especially resistant to understanding. First of all, success from research is highly random. A state can invest many millions on university research without any return, or—in contrast—a lone professor with little or no grant money can make a discovery that leads to many millions in future tax revenues for the state.

And the evidence is not necessarily always what it seems to be. A university community can appear to be buzzing with all kinds of economic activity, but it might be merely an illusion created by government funding. And the involvement of universities in private research can also appear to be more beneficial than it is to the overall economy: Is there really more research going on, or are low-paid graduate assistants doing work that was formerly done by well-paid employees of a private company? And is the "triple helix" merely a mechanism that shifts costs from private research companies to the government, with universities in the middle as an intellectual "bagman?"

And should government and academia be making investment decisions based on the potential monetary returns from research, or is that a function for which they are ill-equipped?

Too often, policymakers hoping to create the next Research Triangle Park (see appendix) assume that the world is static—that the same conditions that existed in the North Carolina of the 1950s exist perpetually in every state in the union. But the Triangle is the creation of a particularly promising place at a particular point in time. Today, the landscape seems to be less ripe for Triangle-style development, partly due to the intense competition—every state is attempting to do the same thing.

And since Research Triangle Park opened, the world has seen an explosion of commercial activity involving research, particularly in computers and pharmaceuticals. The question must be asked whether there is some new "next big thing" coming down the pike that will redeem all the investment in further research by creating millions of jobs. Topics on the

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## But caution must be practiced first and foremost by those who espouse the prevailing philosophy, that universities are the “engine” of economic growth and therefore constantly need higher funding.

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frontiers of knowledge today that are often mentioned in that capacity, such as nanotechnology, seem unlikely to do so in the foreseeable future. Without the scale of activity that creates well-paying employment for a great many people, the economic benefits from such advances are likely to be illusory.

Another concern is that involving the state university system in economic development has more than a hint of central planning about it, an idea that has never worked in the long run. Economics is a field where the most advanced thinkers of a particular age sometimes can conceive of no more specific explanation for key mechanisms than “the invisible hand” or “animal spirits.” And a philosophical consideration that should be a larger part of the decision-making process is whether the taxation of citizens to pay for the non-

essential education of other citizens (and non-essential research, too) conflicts with basic American values.

But just as we should not expect that throwing money at higher education will produce vast economic benefits, we should be just as wary of dismantling our public university systems before we know more. We can be fairly sure of some things: Having large numbers of smart young people study difficult and important subjects is good for the world and the economy. And having extremely smart people study the wonders of the universe leads to greater knowledge, which in turn leads to greater material comfort.

Certainly, economic growth is not the only criterion for spending on higher education. Public higher education exists in a very large part to guarantee equality of opportunity and social mobility, and it might be best to keep this path to success open, at least for a while longer.

So one key word must be “caution,” in all things, until more is known. But caution must be practiced first and foremost by those who espouse the prevailing philosophy, that universities are the “engine” of economic growth and therefore constantly need higher funding. Higher education is much more likely to be one small component in a vast engine that is difficult to comprehend. The subject must be examined more from a dynamic than a static approach and with a focus on the marginal returns rather than from a perspective based on the average return. In the final analysis, the current general levels of public spending on higher education are very likely too much of a good thing, limiting economic growth rather than promoting it.

## Appendix: The Emergence of High-Tech Clusters

Despite many doubts raised about triple-helix economies, there are still abundant examples of successful ones. In some areas of this country, cooperation between government, industry, and academia has resulted in a thriving “knowledge economy.”

Three locations are frequently cited as examples by politicians, industry leaders, and academics looking to promote “triple helix” or “multiversity” economic development in their own regions. They are the Route 128 corridor near Boston, Silicon Valley in California, and Research Triangle Park in North Carolina. These regions followed different paths to achieve spectacular economic growth, but they share at least one common denominator—all three are located near one, or several, major research universities.

### Massachusetts’ Route 128 Corridor

The emergence and resurgence of Boston’s Route 128 high-tech corridor occurred “indigenously” and “spontaneously,” according to MIT economist Nancy S. Dorfman (1983, 301), whose research focuses on innovation and high-tech industry. Her 1983 article in *Research Policy*, “Route 128: The Development of a Regional High Technology Economy,” discusses the forces that created a thriving high-tech center from a stagnating post-Vietnam War industrial economy in the late 1970s.

By “indigenously,” Dorfman means that the expansion depended on “the growth of existing firms and the start-up of new ones by entrepreneurs with roots in the state,” instead of from companies moving operations into the area. “Spontaneously” refers to the way this growth occurred naturally within the business community (with an assist from the large number of universities in the area)—“unabetted by efforts on the part of local interest groups or government” (1983, 301).

The lack of involvement includes the universities’ administrations. While Harvard and MIT were crucial to the establishment of Boston as a high-tech center, and Dorfman (1983, 301) cites MIT’s staff and graduates as the “single most important source of entrepreneurs to the region”), neither school explicitly sought involvement in local economic development, she writes.

Instead, Dorfman credits Boston’s boom in the late 1970s to what she called “agglomeration” effects, or “external economies of scale.” This means that local growth in the size and number of firms in a specific industry (and its related industries) makes an area attractive for a firm in that industry to conduct business. As Dorfman suggests, there are “important advantages in locating near to complementary and competitive enterprises” (1983, 307).

Natural resources play almost no part in determining whether an area is suited to development of a high-tech cluster (Dorfman 1983, 304). The two most important factors are a labor force with the appropriate skills and an existing “technological infrastructure,” according to Dorfman (1983, 304-6).

The Boston area satisfies both requirements. Boston has perhaps the country’s highest concentration of institutes of higher learning, producing large numbers of potential knowledge workers. Harvard and MIT are among the world’s preeminent research universities—their faculty and graduate students are at the forefront of scientific knowledge.

The city has also been a center of the electronics industry since the turn of the twentieth century, and there were many high-tech firms established in the Route 128 area before the late-1970s boom. Dorfman cites Edward Roberts, the founder of the MIT Entrepreneurship Center, who “located more than 175 new Massachusetts firms that had been founded by former full-time employees” of MIT “during the 1960s alone” (309-10). Roberts also felt he had not discovered every such firm. And

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80 percent of the firms had survived at least five years. Roberts also “found 39 firms that had spun off from one large employer alone in Massachusetts” (Dorfman 1983, 309-10).

The 1970s were a difficult time for manufacturers in the United States. Overseas competition was ending U.S. domination of the international markets, and the end of the Vietnam War meant a severe downturn in military contracts. Boston’s manufacturers faced the same problems as the rest of the country.

But because of its educational facilities and industrial past, the city was fully poised to take advantage of high tech’s rise in the 1970s and 80s. It already had what Dorfman identifies as the essential elements of a high-tech infrastructure: a network of “job-shoppers” who could custom-make circuit boards, precision machine shops, electronics components manufacturers, and a university faculty able to perform cutting-edge research and consulting (Dorfman 1983, 306-7).

Starting a high-tech enterprise is much more difficult in an area where these elements are not present, according to Dorfman: “While parts and sub-assemblies can, in principle, be ordered from out-of-state, in the design stage, close contact with suppliers is more than a convenience” (1983, 307).

Other valuable resources Dorfman mentioned are a good transportation system, venture capital, the availability of buildings or building sites, and a good quality of life to attract and keep professional workers.

But at the heart of an economic cluster is entrepreneurship. And entrepreneurs tend to come from two sources: academia and existing industries. The Boston area had both.

### **California’s Silicon Valley**

A similar sort of random agglomeration characterized the initial growth of Silicon Valley.

There are many public misconceptions about how the huge northern California electronics industry began. Silicon Valley exploded into the national consciousness with the high-tech boom of the 1980s, and many younger people associate its beginnings with the founding of Apple Computer in 1977. Others believe that it began with semiconductor inventor Robert Shockley’s move to the West Coast in the 1950s and the subsequent founding of Fairchild Semiconductor by his former employees in 1957.

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People with even deeper knowledge of the area and the industry suggest that the Valley owes its existence largely to the efforts of Stanford University’s Frederick Terman, who, as head of the Electrical Engineering Department in the 1930s, ‘40s and ‘50s, was instrumental in attracting top-flight technical talent to the Palo Alto area and urged his top graduate students to turn their research into entrepreneurial concerns. (The best-known and most successful of his pupils were William Hewlett and David Packard, who started their vacuum-tube business in 1939.)

But the real seeds of the San Francisco Bay’s electronics industry were planted well before Terman ascended to the department chair. By that time, there already was a cluster of important private firms manufacturing the vacuum tubes that were as important to the electronics industry of the mid-twentieth century as semiconductors are today. And while some of these companies were founded by Stanford alumni, the university was perhaps more passenger than driver in the early years.

According to Christophe Lecuyer (2005) the key factor in the start of the Valley was San Francisco’s maritime tradition. The city was the most important commercial seaport on the West Coast, and the surrounding area had several military bases. From May 13, 1897, when Marconi sent the first wireless message over open seas, one of the most important applications for radio waves was ocean-going communications. With many mariners in the area, both civilian and military, an intrinsic interest in radios followed, and the San Francisco Bay rapidly became home to a large community of hobbyists. Lecuyer said (2005, 16-17) that by the mid-1920s, the area had

10 percent of all the amateur radio operators in the country, and one of two national publications for radio hobbyists was published there.

Local hobbyists started many of the first important electronics firms in the area, including Cyrill Elwell of Federal Telegraph (1909), Fred Eitel and Jack McCullough of Eitel and McCullough (1934), Charles Litton of Litton Engineering Laboratories (1932), and Ralph Heintz of Heintz and Kaufman (1921). Other major radio manufacturing firms were nearby: the San Francisco-based companies Kolster Radio Corporation and Remler, and Napa-based Magnavox. Television pioneer Philo Farnsworth also conducted his most important research in a San Francisco laboratory during the 1920s.

Still, Stanford, as the main college in the southern Bay area, educated many of the promising local electronics enthusiasts, including Elwell, Litton, and Heintz. Once Terman—also a radio hobbyist who grew up near the Stanford campus as the son of a professor and a close friend of many of the industrialists—gained influence in the school’s engineering department, the symbiotic relationship between Stanford and the electronics industry grew. Throughout his Stanford career, he sought to bring the most gifted students to the Palo Alto campus, and once they were there, he encouraged them to develop their talents to the fullest by remaining in graduate school and taking their discoveries into the private sector as entrepreneurs.

Perhaps the most notable shared endeavor between Stanford and industry in the first half of the twentieth century was the discovery of the “klystron,” says C. Stewart Gillmor, the author of *Fred Terman at Stanford: Building a Discipline, a University, and Silicon Valley* (Gillmor 2004, 159). A klystron is a complex form of vacuum tube developed by the Varian brothers, Russell and Sigurd, and physics professor William Hansen.

The Varians had a rudimentary laboratory in the socialist utopian community of Halcyon near San Luis Obispo, where they were studying the use of microwaves to detect airplanes in flight. Russell Varian had roomed with William Hansen (another close friend of Terman) when they studied physics together at Stanford. Hansen went on to join the faculty as a physics professor and specialist in electromagnetic waves—his research was crucial to the Varians’ own. To further the cooperation, Stanford named the Varians as salaried “research associates” in the physics department and provided them with lab space

and materials. “In exchange, the Varian brothers signed over to Stanford any patent rights and one-half of the royalties from devices that might emerge from their work on aircraft warning systems,” writes Gillmor (2004, 162).

The company formed to put the klystrons into production, Varian Associates, blossomed with the coming world war, as did most of the Bay area tube manufacturers. Military purchases of electronic equipment and research funding were government’s main involvement with the early growth of Silicon Valley.

The event that put the “silicon” in Silicon Valley was also random. It began with a bitter quarrel between the primary inventors of the semi-conductor at Bell Laboratories in New Jersey, John Bardeen and Walter Brattton, and their supervisor William Shockley. When Shockley left Bell Labs in 1954, he looked to California. He grew up not far from Palo Alto and was strongly attached to his mother, who still resided there (Berlin 2005, 53-54).

After a year teaching at the California Institute of Technology (his alma mater) and a year working at the Pentagon in Washington, D.C., Shockley knew that Bell Labs and its manufacturing wing, Western Electric, would not aggressively push the development of semiconductors, and struck out on his own (Berlin 2005, 54). He quickly found a financial backer in another Cal Tech alumnus, Arnold Beckman, the wealthy founder of Beckman Instruments in Fullerton, California. Although Beckman wanted the new Shockley Semiconductor Laboratories division of Beckman Instruments located in the Los Angeles area, Shockley insisted on the Bay area, not only for personal reasons, but because the area was alive and humming with the activity of existing electronics firms, mostly due to the military buildup during the Cold War (Berlin 2005, 56).

Shockley recruited top talent from across the country for his enterprise, located in a Quonset hut five miles south of Stanford’s campus on the Palo Alto-Mountainside border. One of his first decisions was to produce the semiconductors out of silicon instead of germanium (the original material), largely because of the former’s abundance and therefore low cost (Berlin 2005, 63).

It didn’t take long for Shockley’s prickly personality to grate on his workers, however. In 1957, eight top researchers broke away, with backing from IBM heir and inventor Sherman

Fairchild. The new company, Fairchild Semiconductors, rapidly gained industry leadership in the production of silicon transistors under the leadership of Robert Noyce. Internal management problems at Fairchild's home office in New York led many of the founders to spin off other companies, most notably Intel, formed by Noyce and Gordon Moore (Berlin 2005).

Soon the area surrounding Palo Alto became known as Silicon Valley for its dominance by the semiconductor-based computer industry. And it was only natural that, when Steven Jobs and Stephen Wozniak turned their hobby building computers into a Fortune 500 company called Apple Computers, it would happen there.

### **North Carolina's Research Triangle**

The main difference in development between Route 128 and the Silicon Valley was Fred Terman's deliberate attempt to encourage the synergy between academy and industry in Silicon Valley. But both areas began without overall leadership, and neither had government involvement beyond military contracts. They were, for the most part, both spontaneous and indigenous.

The Research Triangle Park of North Carolina is the only one of the three celebrated high-tech clusters that was conceived of before it existed, and the only one where government and academia were equal partners with private industry during the initial development stage. It also relied on outside firms relocating in the area—it was neither indigenous nor spontaneous.

The Triangle metropolitan area of North Carolina is named for the configuration of its three main towns: Raleigh, Durham, and Chapel Hill. Each city has a large, prestigious research university: North Carolina State in Raleigh, Duke in Durham, and the University of North Carolina at Chapel Hill. The idea of using the universities to draw industry was bandied about for a long time before it came into existence. Albert Link, a University of North Carolina-Greensboro economics professor who wrote the definitive history of the Triangle, cited a 1945 speech by former governor R. Gregg Cherry as the source of the original suggestion (Link 1995, 10-11).

The idea was a direct response to North Carolina's historically weak economy—according to Link, in 1952 it was ranked dead last in per capita income among the 48 states. Its traditional

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economy was based on agriculture (particularly tobacco), textiles, and furniture manufacturing. All three industries would soon face severe competition from other parts of the country and world. The state had a traditional commitment to higher education, but graduates left the state. And the idea of using the universities for economic development was not new, according to Link (Link 1995, 10).

The principals involved in the project were well aware of the developments in Massachusetts and the Silicon Valley, and the post-World War II era was ripe for an expansion of research. And they were also aware that their particular region of North Carolina had special qualities. While it lacked the historical economic development and technological infrastructure of the other two clusters, it had its own advantages. Few areas in the country had large tracts of inexpensive farms and woodlands and a large airport in the middle of a triangle formed by three major research universities, all within a short distance of each other.

The Triangle was a project driven, for the most part, by civic-minded men who donated their time and money to making it work. This was why Albert Link titled his book *A Generosity of Spirit* (Link 1995, 7).

But the profit motive played its part as well. While politicians and academics made speeches and had discussions, a private construction company owner from Greensboro named Romeo Guest led the initial charge (Link 1995, 12). He was given credit for suggesting the name “Research Triangle,” although Link said that the name might not have been completely original, given the configuration of the three universities (Link 1995, 21). In the early 1950s, before the idea of a research park was introduced, Guest traveled the East Coast with Brandon Hodges, the state treasurer, and Walter Harper, who headed the Commerce and Industry Division in the state’s Department of Conservation and Development, looking for companies to relocate in North Carolina.

William Newell, the director of the Textile Research Center at NC State, came up with the idea of an actual research park (Link 1995, 18).

Link wrote that the idea really took off in 1955, after Guest and the others were able to convince then-Governor Luther Hodges to give his support. Shortly after, Governor Hodges formed the Research Triangle Development Council to oversee the process of creating a research park with university involvement.

All three heads of the three universities climbed aboard as well. While the existence of the universities was the key selling point for the park, their actual role was rather limited. This was noted in the minutes of a Council subcommittee meeting:

It is not anticipated that the three universities in the Triangle shall engage directly in the conduct of industrial research, except under carefully designed and administered policies. Rather, the principal functions of the Universities are to stimulate industrial research by the research atmosphere their existence creates, and to supplement industrial-research talents and facilities by providing a wellspring of knowledge and talents for the stimulation and guidance of research by industrial firms (Link 1995, 28-9).

In other words, the presence of universities provided some of the agglomeration externalities that were absent due to the lack of a technological infrastructure—they put the relocating companies at the center of new ideas and provided them with a trained workforce.

In November 1955, the decision was made that the park should be developed as a private, profit-seeking endeavor (while the Council was incorporated as a “non-stock, non-profit” entity financed by private contributions) (Link 1995, 30). In 1957, Guest, William Saunders, who ran the Department of Conservation and Development, and Governor Hodges entered into negotiations with Karl Robbins, a former North Carolina textile mill owner who had moved to New York City. Robbins pledged \$1 million dollars to purchase land for the park.

By the end of 1957, nearly 4,000 acres had been bought or optioned for purchase by the newly formed Pinelands Corporation. Robbins was the sole owner of stock, while Guest was appointed president of the board of directors.

Eventually Robbins soured on investing, since the Council was unable to attract other investors. In 1958, Archie Davis, the chairman of Wachovia Bank, realized that he could raise money more quickly by asking for charitable contributions than by selling Pinelands stock. By early 1959, he had raised \$1.425 million, primarily to retire the stock through outright purchase of the land and to fund the Research Triangle Institute’s start-up costs. Davis became president of the Research Triangle Foundation, which was created to oversee the park’s operations (Link 1995, 68).

The first company to purchase land to build a research facility was Chemstrand Corporation, a joint subsidiary of Monsanto and American Viscose, in 1959. The second purchaser was the United States Forest Service in 1960. It was not until 1965, however, that the Research Triangle Park reached “the turning point,” according to Davis (Link, 1995, 90). In that year, IBM, which had been courted by the Council for seven years, bought land for a huge research facility. This not only brought the venture out of debt, Davis said, but IBM’s “presence also validated the mission of the park” (Link 1995, 91).

Although Research Triangle Park started slowly, it is now the nation’s largest research park. It contains approximately 7,000 acres, with roughly 40,000 employees working at over 130 facilities owned by some of the biggest names in industry. The agglomeration has spread beyond the park’s boundaries, particularly to the nearby communities of Raleigh and Cary (Research Triangle Park 2010).



## References

- Association of American Universities. 2009. University Research and Graduate Education. Online: <http://www.aau.edu/research/article.aspx?id=4656>.
- Bercovitz, Janet, and Maryann Feldmann. 2006. Entrepreneurial Universities and Technology Transfer: A Conceptual Framework for Understanding Knowledge-Based Economic Development. *The Journal of Technology Transfer* 31 (1): 175-188.
- Berglund, Dan, and Marianne Clarke. 2000. *Using Research and Development to Grow State Economies*. Washington, DC: NGA Center for Best Practices, September. Online: <http://www.nga.org/Files/pdf/2000RESEARCH.pdf>.
- Berlin, Leslie. 2005. *The Man Behind the Microchip: Robert Noyce and the Invention of Silicon Valley*. New York: Oxford University Press.
- Bhandari, Bornali, and Bradley R. Curs. 2008. *The Roles of Higher Education Expenditure and the Privatization of the Higher Education on U.S. States Economic Growth*. Preliminary draft in possession of the author.
- Blackwell, Melanie, Steven Cobb, and David Weinberg. 2002. The Economic Impact of Education Institutions: Issues and Methodology. *Economic Development Quarterly* 16(1): 88-95.
- Borders, Max. 2009. *The UNC School of the Arts: Should It Be Self-Supporting?* Raleigh, NC. John W. Pope Center For Higher Education Policy. Online: [http://popecenter.org/inquiry\\_papers/article.html?id=2266](http://popecenter.org/inquiry_papers/article.html?id=2266).
- Chantrill, Christopher. 2009. US Government Spending as Percent of GDP (chart using data from the Bureau of Economic Analysis, U.S. Government Budget, and U.S. Census Bureau). Online: [www.usgovernmentspending.com/us\\_20th\\_century\\_chart.html#usgs303](http://www.usgovernmentspending.com/us_20th_century_chart.html#usgs303).
- Cooke, Philip, and Loet Leydesdorff. 2005. Regional Development in the Knowledge-based Economy: The Construction of Advantage. *The Journal of Technology Transfer* 31(1): 5-16.
- Department of Education. 2008. Total Fall Enrollment in Degree-granting Institutions, by Attendance Status, Sex of Student, and Control of Institution: Selected Years, 1947 through 2007. National Center for Education Statistics, Digest of Education Statistics, Table 188. Online: [http://nces.ed.gov/programs/digest/d08/tables/dt08\\_188.asp](http://nces.ed.gov/programs/digest/d08/tables/dt08_188.asp).
- Dorfman, Nancy S. 1983. Route 128: The Development of a Regional High Technology Economy. *Research Policy*, 12(6): 299-316.
- Etzkowitz, Henry. 2002. The Triple-Helix of University-Industry-Government: Implications for Policy and Evaluation. Stockholm: Swedish Institute for Studies in Education and Research – SISTER ([www.sister.nu](http://www.sister.nu)).
- Feller, Irwin. 2004. Virtuous and Vicious Cycles in the Contributions of Public Research Universities to State Economic Development Objectives. *Economic Development Quarterly*, 18 (2): 138-150.
- Gillen, Andrew, and Richard Vedder. 2008. *North Carolina's Higher Education System: Success or Failure?* Washington, DC: Center for College Affordability and Productivity. Online: [http://www.collegeaffordability.net/NC%20Report\\_Final.pdf](http://www.collegeaffordability.net/NC%20Report_Final.pdf). (Accessed 29 September 2008).
- Gillmor, C. Stewart. 2004. *Fred Terman at Stanford: Building a Discipline, a University, and Silicon Valley*. Palo Alto, CA: Stanford University Press.
- Intelligence Quarterly*. 2009. The Perpetual Business: An Interview with SAS Co-founder and CEO Jim Goodnight, Part One. (Q1):18-23.
- Kerr, Clark. 1963. The Multiversity: Are Its Several Souls Worth Saving? *Harper's*, November: 37-42.
- Laffer, Arthur B. 2004. The Laffer Curve: Past, Present, and Future. *Backgrounder #1765*. Washington, DC: Heritage Foundation. Online: <http://www.heritage.org/Research/Taxes/bg1765.cfm>.
- Lecuyer, Christophe. 2005. *Making Silicon Valley: Innovation and the Growth of High Tech, 1930-1970*. Cambridge, MA: MIT Press.
- Leydesdorff, Loet, and Henry Etzkowitz. 1996. Emergence of a Triple Helix of University-Industry-Government Relations. Online: <http://users.fmg.uva.nl/lleydesdorff/th1a/> (Accessed 28 September, 2008).

- \_\_\_\_\_. 1998. The Triple Helix as a Model for Innovation Studies. *Science and Public Policy*, 25(3): 195-203.
- Link, Albert N. 1995. *A Generosity of Spirit: The Early History of the Research Triangle Park*. Research Triangle Park: Research Triangle Foundation of North Carolina.
- Luger, Michael, Jun Koo, Jonathan Perry, and Stephen Billings. 2001. *The Economic Impact of the UNC System on the State of North Carolina*. Chapel Hill, NC: Kenan Institute, University of North Carolina.
- Mueller, Norman. 2007. (Mis-) Understanding Education Externalities. Munich, Germany: Munich Personal RePec Archive, Paper No. 6307. Online: <http://mpra.ub.uni-muenchen.de/6307>.
- National Science Board. 2008. Research and Development: Essential Foundation for U.S. Competitiveness in a Global Economy: A Companion to Science and Engineering Indicators 2008. Online: <http://www.nsf.gov/statistics/nsb0803/start.htm#declining>.
- Research Triangle Park, The. 2010. Research Triangle Park Foundation. Online: <http://www.rtp.org/main/index.php?pid=178&sec=1>.
- Rizzo, Michael. 2004. The Public Interest in Higher Education. In *Education + Economic Development*, Proceedings of the Federal Reserve Bank of Cleveland Research Conference, November. Cleveland, OH: 19-45.
- SAS Company History. Online: [http://www.sas.com/presscenter/bgndr\\_history.html](http://www.sas.com/presscenter/bgndr_history.html).
- Siegfried, John J., Allen R. Sanderson, and Peter McHenry. 2006. *The Economic Impact of Colleges and Universities*. Nashville, TN: Department of Economics, Vanderbilt University.
- Sumell, Albert, Paula Stephan, and James Adams. 2005. *Capturing Knowledge: The Location Decision of New PhDs Working in Industry*. Cambridge, MA: National Bureau of Economic Research.
- Tornatzky, Louis G., Paul G. Waugaman, and Denis O. Gray. 2002. *Innovation U.: New University Roles in a Knowledge Economy*. Research Triangle Park, NC: Southern Growth Policies Board.
- Vedder, Richard, and Matthew Denhart. 2007. North Carolina Higher Education: Facts and Fiction. Unpublished draft in possession of the author.
- Washburn, Jennifer. 2005. *University Inc.* New York: Basic Books.

## **ABOUT THE POPE CENTER**

The John William Pope Center for Higher Education Policy is a nonprofit institute dedicated to improving higher education in North Carolina and the nation. Located in Raleigh, North Carolina, it is named for the late John William Pope, who served on the Board of Trustees of the University of North Carolina at Chapel Hill.

The center aims to increase the diversity of ideas taught, debated, and discussed on campus, including respect for the institutions that underlie economic prosperity and freedom of action and conscience. A key goal is increasing the quality of teaching, so that students will graduate with strong literacy, good knowledge of the nation's history and institutions, and the fundamentals of mathematics and science. We also want to increase students' commitment to learning and to encourage cost-effective administration and governance.

To accomplish these goals, we inform parents, students, trustees, alumni, and administrators about actual learning on campus and how it can be improved. We inform taxpayers and policymakers about the use and impact of government funds, and we seek ways to help students become acquainted with ideas that are dismissed or marginalized on campuses today.

Jane S. Shaw is the president of the Pope Center. She can be reached at [shaw@popecenter.org](mailto:shaw@popecenter.org). More information about the Pope Center, as well as most of our studies and articles, can be found on our Web site at [popecenter.org](http://popecenter.org). Donations to the center, a 501(c)(3) organization, are tax-deductible.

# State Investment in Universities:

## Rethinking the Impact on Economic Growth

Jay Schalin

Does investing taxpayer money in higher education lead to major payoffs in economic growth? State legislators and policymakers say yes. They routinely advocate massive appropriations for university education and research, even in poor economic times, on the grounds that taxpayers will be rewarded many times over.

The investment of federal funds is assumed to achieve similar returns.

But are these rosy projections true? To what extent do taxpayer expenditures for universities actually contribute to economic growth? Those questions do not have easy answers.

In this paper, Jay Schalin, senior writer for the John W. Pope Center for Higher Education Policy, goes beyond the superficial claims to look at broader economic studies that attempt to correlate expenditures with results. He finds that the results are not as favorable as they are often said to be, and he offers some explanations for why.

The report is published by the John W. Pope Center for Higher Education Policy, a nonprofit institute dedicated to excellence in higher education. For more information, see [popecenter.org](http://popecenter.org).