

# CHAPTER 4

## The Role of the University in Economic Development

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### INTRODUCTION

**A**ny top-rated research university has two core missions, namely, education and scholarly research. The primary focus of the institution must be on maintaining quality in these two areas, since the external reputation of the university depends upon its ability to serve students well and on the research reputation of its faculty.

But universities are frequently asked to address other societal needs. This is particularly true of state public universities in the U.S., which were often created with the expectation that they would serve the commonwealth. Public universities typically face a host of additional demands such as providing an education that is affordable to all state citizens or translating research into practical applications for agriculture and industry. As a result, many state public universities also pursue outreach and service to the state. For instance, at the University of Wisconsin-Madison (UW), we regularly talk about our three-fold mission of “education, research and outreach”.

This paper focuses on one particular aspect of outreach, namely, the demand that universities contribute to the economic growth and development of their region. In many ways, such an expectation has been present since the founding of public universities; indeed, as the U.S. expanded geographically in the 1800s and created new states, establishing a state university was considered essential to building the educated citizenry needed for the state to grow. With the economic slowdown of the past decade, however, state legislators and local political leaders have increasingly come to expect that universities

should take part in a host of economic development activities that often go beyond the traditional mission of the university. This can include everything from helping to attract new businesses into the region, creating training programs that cater to local industry needs, forming shared research partnerships with local companies, encouraging and supporting new business start-ups, or actively facilitating technology transfer to existing businesses.

Such demands are not limited to states or regions. The U.S., like many other countries, also encourages universities to engage in joint work with industry on immediate technological challenges. For instance, the U.S. government has recently launched several Institutes for Manufacturing Innovation (IMI), as part of its National Networks for Manufacturing Innovation (NNMI) program (2013). Each IMI is focused on a key technology issue in manufacturing, from digital design, to new materials, to 3-D printing. IMIs are selected for federal funding by a competitive bidding process. In order to bid, a combined group of universities, community colleges, businesses and government entities come together to propose how they will work collaboratively to train individuals and advance knowledge in this area. The universities involved are explicitly asked to put teams of their researchers together with industry people to address specific technological questions with high commercial value.

Whether at the national level or through economic development activities at a regional and state level, these efforts all pull the university into more direct involvement with industry and with public sector economic development activities. They also push the University into putting more of its resources into applied research questions, as well as providing more directed training in areas defined as high value to industry.

## THE TRADITIONAL ROLE OF THE UNIVERSITY IN ECONOMIC GROWTH

There is nothing controversial about expecting a university to play a role in economic growth. Indeed, the two central functions of any university — education and research — are also central to economic growth.

Universities provide training to some of the most highly skilled individuals in society. Economists have long discussed the impact of higher education on economic growth. Goldin and Katz (2008) indicate that the founding of state public universities in the U.S., providing broad access to all citizens, helped the U.S. build its economic strength. Post World War II, the U.S. expanded higher education faster than almost any other country; this provided a competitive edge with a higher share of skilled employees in the workforce. In more recent decades, as the share of college-educated workers in the population has grown in other countries (now exceeding the share in the U.S. for

many developed nations), these other countries have seen their economic strength rise as well.

Economists often try to decompose economic growth into different factors. Within the U.S., growing worker skills has been a steady component of growth. Between 1980 and 2014, a little more than one-tenth of economic growth was due to skill increases in the labour force. (These growth calculations are based on data from Fernald [2014].) It is worth noting that in recent U.S. history, growth in the sheer number of workers has mattered more than skill growth. Major growth in women's labour force participation since the 1960s and substantial immigration since the 1980s have increased the size of the U.S. labour force, adding almost 20% to economic growth since 1980.

The role of universities in fostering research is also central to economic growth. Much of the research done by universities is basic research, that is, it is not focused on a specific applied problem, but is designed to expand the boundaries of knowledge in a particular field. Such work is often highly theoretical and motivated by intellectually interesting questions as defined by disciplinary frameworks. Much of this work has no immediate or obvious application. But today's basic research is the basis for tomorrow's innovation in industry. Basic research done in the 1950s and 1960s in engineering, electronics, early computers and material sciences, often with no obvious instrumental value, over time produced an explosion of new technologies that have transformed our world, including such items as personal computers, mobile phones and GPS systems. At the same time, basic biological research from past decades is now leading to a revolution in medical and biological science with individually targeted treatments based on personal genomic information. None of these new technologies would have been possible without the basic and often highly-theoretical work done at universities in the past.

Recent work on the citations to past work included in patent applications suggests that many current patents are based on published ideas from more than a decade ago. Fully 25% of patents cite work that is more than 20 years old. In addition, it is not uncommon for patents to cite work far outside the field in which the patent is registered (Jaffe & Trajtenberg, 2005).

Hence university research is central to economic innovation. Scientific advances can lead to new products that improve well-being and create new markets. Or, often just as important, they can lead to new processes that produce goods more efficiently or at a higher quality level or that deliver services more effectively. For instance, think of the just-in-time inventory systems that allow retail firms to track goods and meet consumer demand more effectively at a lower cost, all based on software systems and silicon.

Innovation is even more important to economic growth than labour quality. Since 1980, innovation (making better products or products that are produced or delivered more efficiently) accounts for 68% of U.S. economic growth. Not

all of this can be ascribed to universities, of course. The actual translation of existing research into new products and new processes often occurs in applied research within industry. But the initial basic research — much of it done in universities — is crucial for businesses that stay competitive by adapting new technologies to transform existing products or to create new products.

Most industrialized countries recognize the value of this basic research by funding it through public dollars. It is not by accident that public funding of research has risen sharply in many of the most globally-competitive nations. Indeed, just as the U.S. has lost its top-ranked position as a country with one of the highest share of college-educated workers, it has also lost its top-ranked position as a country with one of the highest investments of public dollars into research (Atkinson & Stewart, 2011). U.S. funding of basic research (largely going to universities) has declined in the past decade (Association of American Universities, 2015).

In short, by pursuing their core mission, universities are central to economic growth. But that has not prevented a rising demand for universities to participate even more directly in efforts at economic development.

## **ANALYSING MORE DIRECT ROLES FOR THE UNIVERSITY IN ECONOMIC DEVELOPMENT**

There is little disagreement about the importance of universities in making sure that societies have access to educated citizens and to new research developments. But what about the more applied demands for universities to be directly involved in an economic development agenda? This section discusses and evaluates some of those demands.

### **Meeting training needs**

Universities might be asked to develop curriculums that directly meet local employer needs. It is common for community colleges or professional programs to establish partnerships with industry to provide workers with specific skills, to certify skill levels or to retrain individuals in new skills, but it is less common for universities to undertake such specific educational partnerships. In part, the educational program in universities is often more general than applied. It is designed to prepare students for a career, not a specific job, teaching them cognitive and communication skills that can be used in a wide variety of jobs.

That said, many universities already offer courses that cater to specific industry needs. In locations where a substantial number of students are hired by one or two major industries, it's not uncommon to see classes that provide in-depth instruction in issues relevant to those industries. Professional schools

that are affiliated with universities frequently run training or retraining programs for industry.

Ideally, such programs make sense if they can both meet local industry needs and provide broadly useful skills for other students as well. For instance, at UW-Madison, we have initiated a computer science (CS) certificate for undergraduate students who are majoring in other areas. One reason to do this is a very large local employer who is interested in computer science majors but can't find enough to fill all the required jobs. This employer is willing to hire smart undergraduates and train them, but wants to know if an English or Chemistry major has some basic CS knowledge. This certificate will provide useful information to their hiring process. But we were willing to offer this certificate at UW because we thought it would be broadly useful to students far beyond the needs of this specific employer, allowing students to expand important skills and identify themselves as computer-literate regardless of major.

### **Assisting in technology transfer**

Second, universities might be asked to step up their efforts to increase technology transfer from research into commercial applications, as a way to stimulate economic growth and business development in the region. There are two quite different ways of accomplishing this. On the one hand, universities can be pushed to build more and stronger industry collaborations with existing businesses. On the other hand, universities can be pushed to help develop potentially commercializable ideas from within the university community. Let me talk briefly about each of these.

University/industry partnerships have long existed, but regularly raise difficult questions. This is particularly true of partnerships aimed at collaborations between University researchers and industry product developers. As firms have become less vertically integrated in recent decades, they have often shed basic research functions and looked instead for partnerships with research institutions. In many cases, they propose to provide additional funding for certain research areas at a University, in exchange for close access to the results that emerge.

University faculty often worry that such partnerships can contaminate the research process. For instance, it might focus researchers on more limited (and more commercializable) research than they might otherwise undertake. In the worst case, universities worry that the credibility of university-based research results may be tainted by funding from interested parties who desire certain outcomes. For these reasons, there are often clear agreements signed in such partnerships indicating the expectations of both parties and establishing limits to what industry can request in exchange for funding. Among other things,

such agreements almost always make it clear that faculty research is owned first by the faculty member and/or the university, and faculty have the right to publish results, whatever they may show. The ownership of any patents or licences is typically agreed upon ahead of time.

These issues can make university/industry partnerships complex. But such partnerships can also provide great benefits to both parties. They provide a business with early access to research results that can give a competitive edge in developing new products. They provide the university with funding support for researchers and graduate students; they can help university faculty understand better what research questions might have the most value to those outside the university; and they often provide hiring opportunities for students who are involved with the research. Effective collaborations typically exist when both sides have well-defined and congruent expectations about how they will operate together, with the university receiving the independence necessary to pursue and publish research without interference.

An alternative to working with existing businesses to transfer research results into products is to work directly with university researchers, helping them identify and develop potentially commercializable ideas, creating new business start-ups or selling technology to interested parties. For instance, many universities have structures in place to help faculty receive and develop patents or to support other promising ideas.

Helping to support tech transfer directly from the university into new start-ups is attractive for several reasons. If universities support the start-up of new businesses, they may be able to capture some of the revenues through ownership rights as the company grows. If they are able to sell a patent that is used in a successful product, they will capture the patent revenue over time. If successful new businesses emerge from technologies created at a university, this can have multiple favourable effects. It can attract new faculty and students to the university who believe this is a place where they can be entrepreneurial. It can create jobs for graduating students in a company run by people closely connected to the university. It can lead to successful future donors. And it builds community and political support for the university as a contributor to job and business growth in the area.

The biggest problem with these efforts is that there are few models of how to do this in a way that guarantees a high likelihood of success. For instance, UW is one of the universities that has been highly successful in pursuing patents on faculty inventions. We have an independent organization, the Wisconsin Alumni Research Foundation (WARF), founded in 1925, which has built a substantial endowment based on patent income, the returns from which are invested in UW research. Only a few other universities can claim similar levels of financial success in patenting. Yet, even WARF will tell you that patents are a very uncertain thing. There is no guarantee that any patent

will make money... and many reasons why it won't. While WARF has a long history of identifying promising patents, the vast majority of their patents have not produced financial returns. Their financial success is due to a limited number of patents which came out at the right moment and were utilized in the right way. In short, there's a strong element of luck in making money through patenting faculty inventions.

Similarly, lots of universities are experimenting with ways to help faculty start companies based on their ideas and inventions. But there is no clearly-agreed upon model of how to do this successfully. Faculty often have little interest or training in running a business. Hence, the university needs to create a structure of support that identifies ideas with high commercial potential (and faculty are rarely the best judge of this); that links faculty up with the legal and business expertise needed to develop their idea into a potentially saleable product; and that provides the early start-up funding needed to do this. Like many other universities, we're experimenting with this at UW, trying to develop the expertise and the funds to move more ideas from the university into the commercial world. But this is still a work in process, at our university and elsewhere.

### **Developing entrepreneurship**

Universities are increasingly being asked to encourage entrepreneurship, among both their students and their faculty. The technology transfer initiatives discussed above are one way to reward and develop faculty entrepreneurship. Let me focus this discussion on student entrepreneurship.

The success of Silicon Valley has resulted in efforts around the world to recreate such success locally. The importance of entrepreneurs to the explosion of rapidly growing and successful companies in Silicon Valley has meant that everybody wants to create their own group of local entrepreneurs. Communities are creating spaces for people engaged in new business start-ups to gather and work together and are working to attract the venture capital and angel investors necessary for new start-ups to launch. These communities expect universities to turn out graduates who want to be involved in this work, full of ideas and ready to launch a dozen companies.

There remains a lively debate about whether entrepreneurs are born or made. Research suggests that there are clear differences in people's risk-taking behaviour, and that entrepreneurs have a higher tolerance for taking risks. But entrepreneurship also requires encouragement and knowledge about how to nurture an idea into a successful product.

Many universities have increased their efforts to provide entrepreneurship training... and not just in business schools, where courses on entrepreneurship have long been common. For instance, at UW, we now have an undergraduate

entrepreneurship certificate, available as an add-on to any major on campus. Over 220 students are currently in this certificate program, from majors that range from psychology to arts to retailing to economics. We also have a certificate program for Ph.D. students in entrepreneurship, so those who think that they may put their disciplinary training to use by developing new ideas can gain insight into the business and legal issues in which they will also need expertise.

It's hard to evaluate the impact of entrepreneurship training programs. Since the students who enter such programs are already interested in business development, it's not surprising that a higher share of students in these programs try to start their own business at some point in the future. Student interest in entrepreneurship training is strong right now. Just as universities add courses in other areas of student demand, so adding courses in entrepreneurship is a reasonable response to shifting student interests.

### **Regional marketing**

Those who run economic development organizations are actively involved in courting new businesses to persuade them to settle locally or in working with existing businesses to persuade them to expand locally rather than elsewhere. Public universities are particularly likely to be asked to participate in such efforts at local marketing.

For instance, at UW we are regularly asked to host site selection groups who come to the region, to tell them something about UW, our students and our research activities. Upon occasion, I and others have been asked to talk with senior officials in companies that are considering locating their next facility in the south Wisconsin region. I consider taking part in these requests part of the responsibility we have to the state as a public university.

### **UNIVERSITIES AS DRIVERS OF ECONOMIC GROWTH: SHOULD THIS BE A RECOGNIZED MISSION?**

Through their core missions of education and research, universities are centrally involved in the economic development agenda. But the demand for them to do more is not likely to go away soon. Should universities respond to these demands to make curricular and programmatic choices in order to directly benefit the local economy?

Major involvement in economic development efforts can affect the scope of university activities. Such programs tend to emphasize the training that has immediate job rewards and the research that has obvious industrial applications. While doing some of this is important and probably necessary at any

university, it does not recognize the full sweep of a university's responsibility. Such efforts de-emphasize the importance of fields of study without immediately apparent economic benefits, such as philosophy, astronomy or the arts. A university thrives because of its scope across the fields of knowledge; in the long run, a weaker arts or philosophy program can also make for a weaker university and a less effective set of science programs. For instance, the opportunity for scientists to interact those who study the philosophy of science or the ability of social scientists to understand the role of arts in society is important.

Similarly troubling, economic development efforts often emphasize the value of applied versus basic work. Basic research is absolutely essential to the long-term development of new commercial products. Taking too many resources from basic research directly weakens one of the core missions of the university. Few other institutions see basic research as a core function, and its long-term value to the economy is immense. Ironically, too much of an immediate emphasis on economic development can lead to long-term economic weakness.

But these drawbacks simply indicate that such efforts need to be wisely selected and pursued. When done well, programs that facilitate economic development can reinforce and create synergies with the educational and basic research missions of the university. Effective technology transfer programs can help faculty think about how their ideas can be applied. Industry partnerships can open up new areas of inquiry. Entrepreneurship programs can enrich the college curriculum.

This suggests that programs which involve the university in direct economic development will be useful efforts when they mesh with the central goals of the university. For instance, creating an entrepreneurship certificate expands the curriculum, and can serve students from across the university. It meets the demands of students, who are clients of the university much more directly than any local economic development agency. But providing a narrowly-defined training program for a local business is less clearly advantageous. If one of the programs within the university has expertise on this, and/or if the local business is willing to pay a price that makes this a net money-maker, then there may be reasons to set up such a program. But providing narrowly-focused training may be better done by another educational institution than the research university.

Similarly, industry partnerships can be highly beneficial to certain research groups on campus, but they also have the potential for controversy and arguments over appropriate roles and ownership of results. A university that says "yes" to every collaborative proposal with industry is probably not being discriminating enough; a university that says "no" to every industry proposal is probably not being creative enough in thinking about the gains from such partnerships. The appropriate balance will vary across universities.

The easy decisions are those where it's clear up front that a new partnership or new program will benefit the university. But in many cases, it's just not possible to evaluate new programs without some experimentation and learning over time. This is particularly true of many of the tech transfer efforts, as well as some industry partnerships. Universities need to be nimble enough to regularly reevaluate what they are doing and decide if the design of their current programs is working or needs to be tweaked in some way.

Demands that universities be actively engaged in activities that promote current economic development efforts will continue. And universities will continue to find benefits to participating in some of these efforts. But this is not a core mission. Faced with these demands, universities should first communicate all the ways in which they already make key contributions to economic growth through education and research. If there is a willingness and the resources to do even more, then these additional efforts should reinforce and build upon the things a university is already doing. In the end, direct involvement in economic development should be in the portfolio of a university's activities (particularly a public university), but should be done in a way that adds to its other activities rather than diverting resources. And, like all things that universities undertake, the effectiveness of these programs should be evaluated regularly. Universities can do more for long-term economic growth through excellent education and top-quality research than through many other activities.

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