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The Expanding Business of the Entrepreneurial University: Job Creation

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The Expanding Business of the Entrepreneurial University: Job Creation ¹

Mike Murphy and Michael Dyrenfurth

Abstract: This chapter explores the role of universities in job creation. It does this by taking two approaches. The first is to look at how the university sees its role as expanding from traditional first and second mission activities to encompass third mission activities including industry engagement and how this supports job creation and economic development. The second approach is to examine how new jobs are created in a geographic region or country, and the role that the university can play in support of this. Typical third mission activities such as incubators, technology transfer, and science parks are also examined; including the role of government support and incentives.

Keywords: Job creation, Role of the university, Third mission, Policy, FDI, SME, Innovation, STEM, Economic development

You can guarantee lifetime employability by training people, making them adaptable, making them mobile to go other places to do other things. But you can't guarantee lifetime employment – Jack Welch (2001).

Introduction

There is little argument about the value of higher education and its contributions to society. For example, James Duderstadt has written that the contemporary research university reaches into every aspect of modern society:

It educates the graduates that sustain commerce, government, and professional practice; it performs the research and scholarship so essential to a knowledge-driven global economy; and it applies this knowledge to meet a diverse array of social needs including health care, economic development, and national security (Duderstadt 2004).

Typically universities view their mission in terms of three streams of activity: teaching and learning; research, often termed discovery; and service, now more recently termed engagement. Depending on the kind of university an institution is, and on the tenor of the time and the economic environment and context in which it is operating, the relative importance of each of these three missions can vary. For many institutions on both sides of the Atlantic, the importance of the third mission, i.e. engage-

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ment, has increased in importance relative to the first and second mission. We also observe that the relative emphasis is not a ‘zero sum’ game, but rather that the role of the university continues to expand to encompass more responsibilities than ever before.

The authors, coming from Ireland and the United States, focus this chapter on the dimensions of the university that contribute directly or indirectly to job creation as the outputs of the three missions of the modern, entrepreneurial university. We do this for two reasons. First, in both the United States and Ireland, even though both seem to have put the economic recession of 2008 behind them, job creation and economic development remain critically important to ensuring and maintaining societal living standards into the future. Therefore it is appropriate to ask the question of organisations receiving public monies as to what role they can and should play in advancing the economies of the societies housing and supporting them. Second, universities today generally accept their role as being wider than teaching and research, and so engage in a range of engagement activities—the latter is particularly true of US land grant universities and other institutions with similar missions.

Much has been written of the necessity and benefits of university third mission activities with respect to economic development, but less has been written with respect to a key output of university activity, namely job creation. Therefore, this chapter looks for evidence of sustainable job creation resulting from the activities of universities. Given the rhetoric focused on jobs, and its link to a nation’s sense of its well-being, it is more than prudent for university leaders to consider their institution’s role in job creation. In particular, university faculty and administrators dealing with science, technology, engineering, and mathematics (STEM) programs must consider how they and their activities make and can make contributions to this critical imperative. By doing so, they perhaps can develop “a better understanding of the conditions under which technological innovation can be made to function more effectively in the generation of economic growth” (Landau and Rosenberg 1986, p. v-vi).

Thus we examine the role of the university in job creation, including through its first and second missions of learning and discovery, analyse the literature addressing university job creation, present findings and draw conclusions.

The (expanding) Role of the (entrepreneurial) University

Today it is generally accepted that the core functions of the entrepreneurial university are knowledge distribution (via learning), knowledge generation (via research), and knowledge transfer (via engagement with stakeholders outside of the university). These are described respectively as first, second and third mission activities of the university. University involvement in each of these core functions developed historically. André Oosterlinck described this development as follows:

The oldest function of a university, dating back to the Middle Ages, is knowledge distribution. This is what universities have done for many centuries, without bothering too much about knowledge creation. Only towards the end of the 18th and the beginning of the 19th centuries, did universities feel the need to contribute to knowledge progress, and to actively create new knowledge. ... The third essential activity, apart from knowledge distribution and knowledge creation, is still younger. We have to wait till the second half of the 20th century to witness the birth of what is called knowledge transfer to society at large. This meant that universities started to realize that they are not located in an isolated ivory tower, but that they have responsibilities to fulfil which go beyond knowledge creation and knowledge distribution, not only among our stu-

dents, but in society at large, which should benefit from the very existence of universities (Oosterlinck 2004, p. 121).

Figure 10.1 graphically shows the historical development of these missions, with societal triggers and prototype or frontrunner institutions (adapted from Trencher *et al.*, 2014).

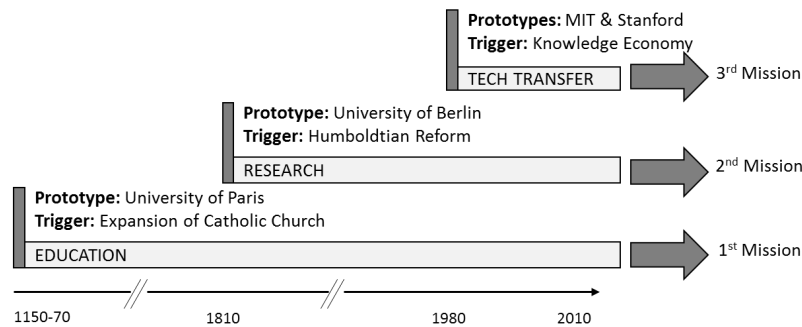


Figure 10.1 Emergence of university missions with triggers and prototypes

Universities can be viewed passively as facilitators or actively as engines of economic development. In either case, there is generally no confusion regarding their first and second mission activities. Perhaps the Kellogg Commission (1999) report entitled *Returning to our roots: The engaged institution* broached this topic most cogently during the early days of its ascendancy. However, the emergent description of a third mission can be ambiguous, and at its simplest refers to the range of university activities not covered by the first or second mission. Third mission activities can be diverse and span a wide spectrum, and can be grouped into three distinct sets of activities: (a) Technology Transfer & Innovation activities; (b) Continuing Education activities, and (c) Social Engagement activities (E3M 2011). The activities within the grouping of Technology Transfer & Innovation are those most directly associated with economic development and include such elements as intellectual property licensing, technology parks, support for spin-out companies, external consultancy, technology problem solving, etc.

Generally, third mission technology transfer and innovation activities are driven by economic objectives. Economic value and value for money are becoming more important for universities as performance indicators. We will return to aspects of third mission activities later in the chapter to examine the evidence in the literature of their effectiveness. Individual universities with distinct mission statements will balance all three core activities (learning, discovery, and engagement) in pursuit of their specific mission, but modern universities generally pursue all three functions in order to justify the name “university”. These core functions contribute individually and collectively to the well-being of society, but to differing degrees. Each of these missions will be explored with regard to its role and effectiveness in creating jobs.

Jobs-oriented Perspective of Universities

Specifically with respect to creating jobs, we first take a different perspective – i.e., one that might be considered retrospective - on the role of the university in creating jobs. We look at job creation simply from the perspective of mechanisms to create the largest number of jobs, rather than accept that the third mission activities of universities, in and of themselves, are the best or indeed the only mechanisms by which universities create jobs. We argue that if the regional or national goal is job growth, then the focus must be on how and where the greatest job growth occurs.

Attracting Large Companies into the Region

Considering a country like Ireland, or a region such as the State of Indiana, in the United States, what is the best mechanism to create jobs, and hence economic stability or indeed prosperity, within that geographic area? We argue that the single most effective way to quickly grow jobs within these areas is to attract large companies into the regional or national geographic footprint. “In today’s knowledge economy, universities are recognized increasingly not only as centers of learning but also as focal points of regional growth and employment” (Wessner 2011). So, for example, within Ireland consistent government strategy since the 1960s has been to attract foreign direct investment (FDI) into Ireland and the FDI sector has been an important contributor to Ireland’s economic performance over this period. Successfully convincing one large company to re-locate into the region or country, to build a new plant or facility there, will likely add thousands of new jobs that are directly employed by the new company, and in addition thousands of additional secondary jobs that emerge to support the company because it happens to now be located in that region.

In Ireland, the government agency tasked with increasing FDI is IDA Ireland, and according to IDA Ireland (2015), the impact that FDI has made to the Irish economy is highly significant, being responsible for employing 174,448 directly, and supporting an estimated 122,000 indirect jobs. With a workforce in Ireland of almost 2 million people, this means that approximately 15% of the total workforce is either employed directly by FDI companies or employed in support companies. Similarly, an example from the State of Indiana documents that the Subaru automobile assembly plant in Lafayette Indiana, which began producing cars in 1989, now directly employs over 4,600 people (Wikipedia 2017).

Companies, often multinationals, choose to relocate into one region rather than another for a range of reasons, such as access to new markets, suitable employment law, and a favourable tax environment. One additional and often very important reason is the size, quality and educational preparedness of the workforce in that region. Government agencies can leverage the quality of the educational system as they work to entice companies to relocate into their geographic footprint. According to the Irish National Strategy for Higher Education to 2030, the “expansion of higher education opportunities has been critical in generating the supply of skilled graduates that underpinned the significant increases in productivity, employment and export oriented roles achieved from the mid-1990s to the early years of the current century” (Higher Education Authority 2011, p. 31). When prospective companies visit a country or region in which they are considering establishing a new plant or facility, the relevant government agency will invariably bring the executives on a “roadshow” to visit local universities and technical institutes to demonstrate the quality of the talent pool available. The quality of third level education is particularly relevant for advanced manufacturing, information, and services jobs. Figure 10.2

below is a snapshot example of the type of extensive information by which IDA Ireland promotes Ireland as a destination country based on the quality of its education system (IDA Ireland 2016).

Talent & Education

Ireland has one of the most educated workforces in the World, according to the OECD 52% of 25-34 year olds have a third level qualification; 10% higher than the OECD average.

Source: OECD - Education at a Glance 2015

Ireland's education system is amongst the best in the World. It ranks in the top 10 globally for:

- Higher Education achievement¹
- Quality of education²
- Meeting the needs of a competitive economy¹

Source: ¹IMD Competitiveness Yearbook 2016
²WEF Global Competitiveness Report 2015-2016

Figure 10.2 Talent & Education in Ireland

It is also worth noting that when a country or region pursues FDI as a strategic objective, then this in turn can impact on the focus and support of its third level education system. So, for example, IDA Ireland in referring to government support states that the Irish “Government’s technology skills action plan aims to make Ireland a global leader for technology talent and skills. The target is to meet 74% of forecast industry demand for high-level technology skills from the education system by 2018, up from the current level, estimated at over 60%” (IDA 2015). The result is greater support for STEM education and training, including re-skilling programs. In fact, in Ireland, the third level non-university sector significantly expanded between 1970 and 2000 directly in response to, and in support of, the government’s initiative to attract multinational companies into Ireland as a manufacturing base.

Attracting a large company to relocate into region is a major achievement. However products and services have a normal life cycle and it is not unusual to see multinational companies consider relocating their plants and facilities again near the end of that life cycle. Therefore maintaining the company in a region often requires additional support and other forms of engagement, including expertise, within that region. One such mechanism is the support that universities can provide through research, often targeted use-inspired research, which companies can access in order to extend the life cycles of products and services, or indeed to create new products and services. For example in Ireland consider the Tyndall National Institute, which is closely aligned with University College Cork, and is a “national and global leader in impact from ICT research excellence”. According to its chairman Eoin O’Driscoll, during 2015 “Tyndall continued to work closely with industry in these areas to enhance product and service offerings by delivering on its mission of creating impact through scientific excellence. Tyndall’s contribution to Ireland’s long-term competitiveness lies in its focus on market-ready research and its relationship with industry” (Tyndall 2015).

Taking a US example of FDI, one of the prime university tools for job creation has been the Technology/Research/Science Park. In reporting on a US National Research Council symposium on research parks, Wessner (2011) added the concept of regional innovation clusters to the mix of such entities:

Responding to the challenges of fostering regional growth and employment in an increasingly competitive global economy, many U.S. states and regions have developed programs to attract and grow companies as well as attract the talent and resources necessary to develop innovation clusters. These state and regionally based initiatives have a broad range of goals and increasingly include significant resources, often with a sectoral focus and often in partnership with foundations and universities. These are being joined by recent initiatives to coordinate and concentrate investments from a variety of federal agencies that provide significant resources to develop regional centers of innovation, business incubators, and other strategies to encourage entrepreneurship and high-tech development. This has led to renewed interest in understanding the nature of innovation clusters and public policies associated with successful cluster development (p. xiii).

Therefore to have the largest impact on the creation of new jobs, we argue that the quality of the third level educational system is essential, and therefore the university, through discharging its traditional first mission role of learning is fundamentally important to job creation. To quote Gerhard Casper in speaking about the origins and success of Stanford, he said that “the story of Stanford (and therefore ultimately that of the relationship between Stanford and the Silicon Valley) is not a story of a university that set out to become a locomotive of economic change in its region and country. Rather it is the story of a university that, especially in the period following World War II, built on and increased its commitment to the highest-quality teaching and research, and the pursuit of innovation” (Casper 1998).

Job Creation in Small and Medium Companies

Moving beyond use of foreign direct investment as the primary mechanism to create large numbers of jobs, the next area to focus on should be support for the small and medium enterprise (SME) sector of the economy. According to industry experts, fast-growing small businesses are the engine of jobs growth in the global economy (Dell 2011). “Small firms account for a disproportionately large fraction of job creation and destruction relative to their share of employment. Jobs created by small firms are no less likely to persist than those created by large firms” (Hijzen 2010, p. 621).

Typical definitions of small companies are those which employ fewer than 50 employees, with annual turnover of less than €10 million. A medium-sized company employs between 50 and 249 employees, with an annual turnover of less than €50 million (Enterprise Ireland 2017). Regarding the location of most job creation, in 2011 the OECD reported:

SMEs (small and medium-sized enterprises) account for 60 to 70 per cent of jobs in most OECD countries, with a particularly large share in Italy and Japan, and a relatively smaller share in the United States. Throughout they also account for a disproportionately large share of new jobs, especially in those countries which have displayed a strong employment record, including the United States and the Netherlands. (OECD 2011, p.3)

From a job creation perspective, the role of the university should be to help the small or medium sized company to scale up. This can be achieved through consultancy, process improvement and support for new product or service ideation and development. Research collaboration between companies and universities will often be

supported in one manner or another by the state, for example through research tax credits or intellectual property (IP) policy support. An existing company, be it small or medium, has the infrastructure to support its expansion, which is generally not the case with a start-up company. The development or extension of a new product or service, for example through new functionality or adjacent markets, will likely result in the growth of new jobs. Also, it is easier for a smaller company to grow by 10 to 20 percent in this manner; thereby a multitude of new jobs can be created through at least some support from the local university. For example, in Ireland, the government agency Enterprise Ireland provides a number of supports for established companies. These supports include: a graduate program that matches graduates with companies to develop and execute plans to grow in key markets; an Innovation Vouchers program, each voucher worth €5,000, which are available to assist a company to work with a university or knowledge provider to explore a business opportunity or technical problem; support for collaborative research projects with research partners across Europe; SME-customised management education, to enable senior managers to learn and apply best management practice to support their global growth; and a job expansion fund to support new employment (Enterprise Ireland 2017). In the USA, taking Purdue University's TAP (Technical Assistance Program) as just one example, we noted that the *2014-2015 Annual Report (2015)* listed their program's Indiana impact as: "456 Jobs created/saved...Economic impact of increased sales \$24.8 million...Retained sales \$116.8 million...Cost savings \$9.3 million...Capital investment \$24.2 million...Reaching 625 employers in 71 counties" (p.2).

Examining the supports that small and medium sized companies would benefit from in order to expand, it is clear that the role of the university is to (1) be sufficiently close to industry as to have expertise that can support companies in their near term goals, and (2) produce the type of graduates who will perform well in companies seeking to expand. In both cases this requires the university to focus on the quality of its educational programs and also to maintain close connections with its key industry sector sectors, perhaps through collaborative research. Therefore, as we argued above with regard to FDI, the traditional university first mission role of learning combined with the third mission role of industry engagement are important to job creation in the SME sector.

Another key role of the university, which again works at the intersection of first and third mission activities, is workforce development. In analysing knowledge-based industries and the successful North Carolina model, Nichola Lowe has documented the critically important combination of university educational roles with targeted and customized workforce development. She has observed that universities can act as workforce intermediaries that expand local employment opportunities. "Vocational training supports play a crucial role in the upgrading process by enabling firms to enhance and expand worker skill" (Lowe 2007).

We note that many universities see training as outside of their mission, and not encompassed within their first mission of teaching and learning. However, in a German study, the underlying value of workforce development was found to be considerable. "According to recent research, the reform of an education system providing adequate skills for all citizens could increase GDP by much as 10% in the long term" (Bertelsmann Foundation, 2009).

Start-Up Companies

In continuing our jobs-oriented perspective of the university, let us now turn our attention to start-up companies. In this regard, universities generally adopt a range of reasonably well-understood mechanisms, under the umbrella title of university third mission, or industry engagement. These include incubator support, licensing support, technology transfer, and research / science / technology parks on or adjacent to the university campus. Incubator support is typically oriented around a program to help people to take a concept or an idea and to successfully launch their business. “Job creation is a main underlying purpose of incubator support for new business formation, especially of technology-based firms. Incubators can also play an important role in ... regional economic development” (OECD 1997). These supports include mentoring, workshops, and ecosystem of like-minded entrepreneurs, access to investors and funding, etcetera.

In a more recent paper Tamásy (2007), described the prevalence of parks and incubators, but felt compelled to conclude that in general they were less successful than their aspirations would suggest:

Today, technology-oriented business incubators are a worldwide phenomenon, although empirical research evidence clearly suggests that they tend to fail in supporting entrepreneurship, innovation, and regional development and, therefore, do not fulfil their expected role as policy instrument. ... Finally, the business incubator idea in practice is actually a very modest contributor to regional economic development. Using the logic of the NBIA [National Business Incubator Association], creating on average 20,000 jobs per year in a nation with a [US] labour force of 147.4 million and an unemployed rate of 5.5 percent (in 2004) is not really a big push. (p. 460)

An example perhaps of where universities can have too great an expectation of their ability to create jobs from their third mission activity came from the announcement of a university research alliance established in Ireland between University College Dublin (UCD) and Trinity College Dublin (TCD). In 2009, as Ireland inexorably slid into a terrible financial depression, the Irish Prime Minister announced that the two universities were to establish a research alliance with the goal of creating 30,000 jobs in the 4-mile corridor between the two campus locations. The alliance was to be supported by €650 million drawn from state, and industry funding. It planned to bring together PhD education, research and enterprise for job creation, and was to be modelled on Silicon Valley and Boston, which were anchored on the research-intensive universities of Stanford and MIT, respectively. It also looked at the success of Nokia in Finland as a goal to develop a leading home-grown technology company in Ireland. The alliance would build on the two universities’ existing technology transfer operations and enterprise facilities. A task force was established to develop the policy, legal and infrastructural elements that would be required to facilitate such world-class innovation. From the perspective of the universities, they saw it as a visionary job creation plan, which was part of the national recovery initiative as Ireland headed deeper into financial crisis (Flynn 2009). While the alliance was well-intentioned and politically supported, it was ultimately not successful, and certainly not from the perspective of its goal to create 30,000 jobs. However, individually both universities continue to successfully pursue their research agendas as two of Ireland’s leading research universities.

A University-oriented Perspective on Jobs

In this section we take a university-oriented perspective to examine how the university sees itself creating jobs both directly and indirectly. This should be contrasted with the previous section which looked at activities the authors believe create the most jobs. Whereas here we will examine (i) the value of higher education to the graduate; (ii) the university as a direct employer of large numbers of people; and the economic value of the university to the region in which it is located; (iii) the economic/jobs argument for research in universities; and finally (iv) we will describe in some detail the third mission activities adopted by innovative and entrepreneurial universities, particularly those that result, or are intended to result, in job creation.

Job creation by universities occurs by means of at least three streams as depicted in Figure 10.3 and as described below:

1. The actual employment of people by universities as they increase their size, service reach, and intensity of effort in each of their three missions
2. The job creation that comes from university sparked entrepreneurship activity, start-ups, incubators, technology and research parks (third mission)
3. The additional recruitment undertaken by business, industry, social service agencies, and government as they expand their functions to better meet needs, and to take advantage of new capabilities that research and development due to university second mission outcomes engenders.

These three streams are conceptually illustrated in Figure 10.3. The dashed lines indicate that while the exact shape or proportions of two of the three contributors to job creation by universities is unknown, while the data for university staff employment is relatively well known as indicated by the solid line.

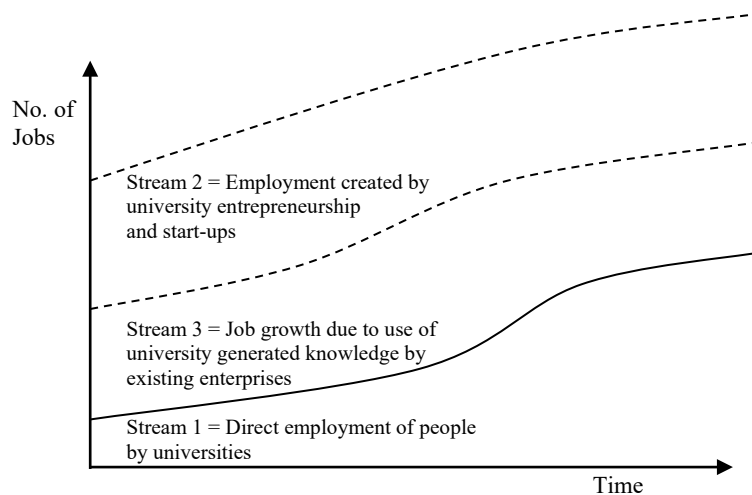


Figure 10.3 Conceptual view of University involvement in Job Creation

The Value of Higher Education to the Graduate

Let us first of all establish the fact that higher education is of direct financial value to the individual who pursues a third level qualification. Because the individual has acquired that third level qualification he or she is more likely to have a job which pays better than someone without qualification. Therefore there is a win-win situa-

tion for the individual in terms of their job and career prospects, and the company in terms of acquiring necessary advanced skills to support the company’s goals. As a consequence, Claudia Goldin and Lawrence Katz have written that “higher education in the United States expanded at extraordinary rates during most of the twentieth century. Whereas 10 percent of all Americans born in 1900 attended some college 50 percent of those born in 1950 did” (2008 p. 283). Goldin and Katz present data that show education as still a very good investment. “In fact, the marginal individual today who does not graduate high school, who does not continue to college, and who does not complete college, is leaving large amounts of money lying on the street” (*ibid.* p. 325). Figure 10.4 below (adapted from Figure 8.1 of Goldin and Katz, p. 290), shows that there is a wage premium for both high school graduates and college graduates, but that the college wage premium has increased significantly from 1950 (with the exception of the 1970s), and that this wage premium continues to widen for college graduates.

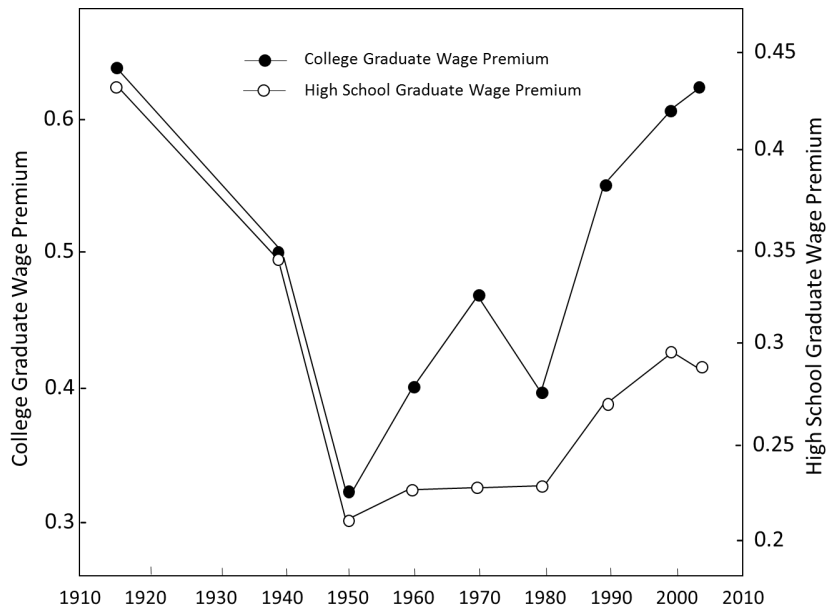


Figure 10.4 College Graduate and High School Graduate Wage Premiums

While Figure 10.4 shows a wage premium for both college and high school graduates in the United States, Steven Rattner (2017) presents US Bureau of Labor Statistics evidence that further underscores the value of a college education. Figure 10.5 below shows the percentage change in inflation-adjusted weekly pay from 1979 to 2016 for US workers.

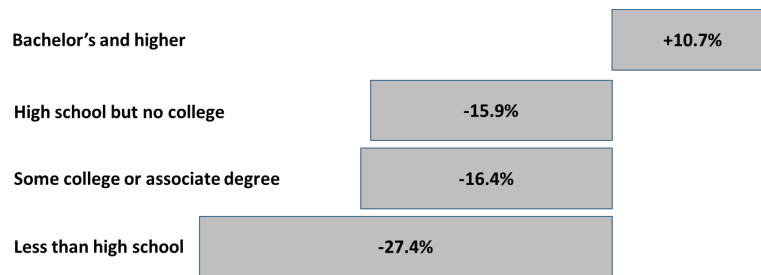


Fig. 10.5 Percentage change in inflation-adjusted weekly pay - 1979 to 2016

Goldin and Katz sound a warning when they write that “college is no longer the automatic ticket to success. Rather, degrees in particular fields and advanced training in certain areas are now exceedingly important. ... No longer does having a high school or college degree make you indispensable, especially if your skills can be imported or emulated by a computer program”. (*ibid.* p. 353)

According to Thomas Piketty, “in the long run, the best way to reduce inequalities with respect to labor as well as to increase the average productivity of the labor force and the overall growth of the economy is surely to invest in education” (Piketty 2014, pp. 306-307). He argues that over the long run education and technology are the decisive determinants of wage levels. Interestingly, Piketty also examines whether educational institutions foster social mobility. He makes the point that qualification levels have shifted upwards: “a high school diploma now represents what a grade school certificate used to mean, a college degree what a high school diploma used to stand for, and so on. As technologies and workplace needs changed, all wage levels increased at similar rates, so that inequality did not change”(*ibid.* p. 484).

Universities as Employers

Third level education is big business. In the United States approximately 2.6% of the gross domestic product (GDP) of \$18 trillion is expended on third level education, with 1.6% on private institutions and 1% on public institutions. In Ireland, €2.3 billion representing approximately 1.25% of GDP is spent on third level education with the majority of that amount spent on public education. The percentage of students attending higher education has increased significantly. Table 10.1 shows the increases in the percentage of population holding a tertiary qualification (adapted from Table A1.3 in OECD 2016).

Table 10.1 Percentage of Population holding a Tertiary Qualification

	25 – 64 year-olds	
	2005	2015
Ireland	29%	43%
USA	39%	45%
OECD Average	27%	35%
EU22 Average	24%	32%

With the strong growth in student numbers, there has also been growth in staff employed in higher education. Over roughly the past twenty years the total number of people employed in US degree-granting institutions has effectively doubled, from

just over 2 million people to just under 4 million people (see Table 10.2). At the same time, the number of faculty or academic staff has more than doubled, from more than 677 thousand to over 1.5 million academics in the United States (adapted from Table 314.10 in NCES 2016).

Table 10.2 Full-Time-Equivalent Staff in Degree-granting Institutions

	1995	2005	2015
Faculty/Academic (FTE)	677,783	1,290,426	1,551,015
Total (FTE)	2,088,272	3,379,087	3,915,918

In Ireland, the number of people currently employed in higher education is approximately 24 thousand, or just over 1% of the labour force. In the United States, approximately 2.4% of the labour force is employed in higher education. The conclusion is simple: universities are large employers. As higher education has expanded, universities have been significant contributors to directly creating jobs, even though this is not typically mentioned in any of their mission documents. A self-study commissioned by University College Dublin (UCD) reports that “the university directly employs just over 4,000 people (3,340 full-time equivalents (FTE's)), which ranks the university as one of the largest employers in Dublin and would place it among the top 50 private employers overall in Ireland. UCD therefore plays a pivotal role as an employer in the immediate Dublin economy” (UCD 2015). In this study UCD also estimated that it generated a further 3,340 full-time equivalent secondary jobs outside of the university, and that student expenditure in the economy resulted in a further 2,234 jobs in Ireland. Thus UCD states that the total employment resulting from the existence of UCD is put at 8,914 total FTE jobs, with an estimated total annual economic output of €1.3 billion (UCD 2015).

In an example at a different scale, Reuters notes in describing its 2016 rankings for the world’s most innovative universities, “Companies founded by Stanford alumni - including Hewlett Packard and Google ... have upended existing industries and been the cornerstone of entirely new economies”. It cites a 2012 study by Stanford in which it estimated that “all the companies formed by Stanford entrepreneurs generate \$2.7 trillion in annual revenue, which would be equivalent to the 10th largest economy in the world” (Reuters 2016).

University Second Mission in support of Job Creation

Universities have other mechanisms for job creation than technology parks and incubators. The entire university, including its research and development activity is in itself a job creation mechanism. André Oosterlinck framed this issue by observing that

the times during which academic science and technology were largely exogenous to the economic system are over. Academic research now has become much more endogenised and integrated into the economic cycle of innovation and growth. On the one hand, business looks upon academia as a source of scientific novelty and technological breakthroughs to fuel its innovation process. On the other hand, an ever increasing number of academic institutions is becoming fully aware of the economic potential of their research efforts (Oosterlinck 2004, p. ?).

The USA’s National Academy Committee on Measuring Economic and Other Returns on Federal Research Investments, Board on Science, Technology, and Economic Policy, Committee on Science, Engineering, and Public Policy, Policy and

Global Affairs conducted a workshop focussing on measuring the impacts of federal investments in research. In the 2011 report of this workshop, rapporteurs Olson & Merrill stated that:

Based on preliminary results for U.S. metropolitan areas, a positive correlation exists between wages, employment, and academic R and D ... The results indicate that a 1 percent increase in academic R and D is associated with roughly 120,000 more people employed and \$3 billion more earnings in a metropolitan area. (Olson & Merrill, p. 22)

Third Mission – the Entrepreneurial University

In this section we present findings that point to the economic benefits of an engaged university. The outcomes resulting from a culture of innovation “are the creation and transfer of technology, job and wealth creation, and enhanced recognition and prestige, all of which feed back to, and reinforce, the role of the university” (Smilor *et al* 2007, p. 206). It might be argued that a university can be innovative without necessarily being engaged, in the sense of having a vibrant third mission. However, the evidence appears to be strong that the links between industry, especially science-based industry, and the university continue to develop, and the results are good for both. Industry draws increasingly on university research for ideas, while university researchers in turn draw ideas from commercial trends. “Such partnering between university and industry contributes to innovation and growth in the United States and is expected to remain an indispensable element for future economic growth” (Wessner 2011).

Evidence has been developed to show the benefits associated with engaged research universities, and that the nucleus in the development of a dynamic technology center is a research university. If one is not in place, then a technology centre is not likely to develop. Around the nucleus is an organization of talent, money and networks, such as the one that exists around Stanford University. The university’s research engine can then generate a vibrant regional economy. These findings have been extended to other research universities outside of the United States, including Cambridge, England. (Smilor *et al* 2007, p. 204). Research universities are becoming more innovative and entrepreneurial by taking on new roles in a knowledge economy. The research university has become more engaged by more actively promoting technology transfer and commercialization. “As a result, the paradigm of the university has been changing” (Smilor & Matthews 2004).

Silicon Valley is used repeatedly as an example of innovation and job creation success and many regions and countries seek to emulate this success. According to one former president of Stanford University (Gerhard Casper 1998), it was important for Stanford to focus and to stick to the fundamental purpose of a research-intensive university, and this has contributed to its success and the benefit of society. Silicon Valley is recognised the world over for having a productive relationship between a university and the surrounding region. The ingredients that created the productive relationship between Stanford and Silicon Valley have been described by Casper as:

A commitment to building ‘steeple of excellence’ in research, learning and teaching; viewing the combination of teaching and research is what we are about, despite innumerable temptations; having the freedom to set agendas; seeking industry partnerships as enrichments to, not distractions from, the research process; maintaining porous boundaries; and being open to chance and serendipity in research (Casper 1998).

Role of Government and Policy ²

There is an ongoing imperative to provide people with rewarding (both economically and personally) work and the converse of avoiding the numerous negative effects of unemployment. “Job creation and destruction are both effects of economic policy, the degree of out- and in-sourcing, and the ability to create new ideas that can be transformed into jobs” (Ibsen & Westergaard-Nielsen 2005).

In the period between the Great War and the Second World War, John Maynard Keynes developed the argument that the level of employment is determined by the spending of money. Keynes (1936) argued that it is wrong to assume that competitive markets will, in the long run, deliver full employment or that full employment is the natural equilibrium state of a market economy. On the contrary, underemployment and under-investment are likely to be the natural state unless active measures are taken. This suggests that it is not just appropriate but necessary for a Government to play an active role in trying to ensure full employment. For example, the US has been steadily losing manufacturing jobs to other economies, such as China and Mexico. These countries have improved the quality of their manufacturing, as well as their abilities in advanced manufacturing and assembly, while maintaining labor costs below that of the United States (Rattner, 2017). During the height of the recent economic crisis, former Intel CEO Andy Grove declared that “job creation must be the No. 1 objective of state economic policy. The government plays a strategic role in setting the priorities and arraying the forces and organization necessary to achieve this goal” (Grove 2010).

If it is accepted that a government should take a more interventionist role in job creation, then what policies, supports and actions should it consider with regard to our universities? This is a question with no one right answer and perhaps no right answer at all. For example, the Irish Government in a 2010 strategy document focussed on economic recovery titled *Jobs & Growth*, states that “the role of Government is to help create the right conditions for enterprise to grow and prosper”. This is less of an interventionist role than Grove argues for within the United States. Indeed, the Irish Government summarises its approach as one of providing the *right environment*. “The tax system is purposefully pro-business and fine-tuned to ensure it is internationally competitive. Our regulatory environment is smart and fair and we aim to further improve administrative cost savings for business in our “better regulation” program” (Government 2010). Perhaps a more passionate and direct way to make a similar positive statement was in former US President Barack Obama’s speech to a joint session of Congress, on 8 September, 2011, in which he highlighted the importance of jobs in the economy:

Now, the *American Jobs Act* answers the urgent need to create jobs right away. But we can’t stop there. ...we have to ... start building an economy that lasts into the future -- an economy that creates good, middle-class jobs that pay well and offer security. We now live in a world where technology has made it possible for companies to take their business anywhere. If we want them

² This section was originally drafted in 2011 at the height of the worldwide economic crisis. In re-visiting it six years later in 2017, the authors note that while the urgency and immediacy of the crisis has ameliorated, the importance of sustainable job creation remains.

to start here and stay here and hire here, we have to be able to out-build and out-educate and out-innovate every other country on Earth.

The point can be made here that the United States had been successfully out-educating every other country for decades, and that as a consequence it had the best higher education system in the world. Students continue to flock to US colleges and universities, and one estimate has put the number of foreign third level students studying in the United States at almost one million (NPR 2015). What has made US higher education so good? “Competition and a *laissez faire* system, decentralised authority, public funding, gender neutrality, openness, and forgiveness were important in the past for secondary education and continue, in some fashion, to be important for secondary and higher education today” (Goldin & Katz 2008. pp. 259 – 260).

Countries can take a more interventionist approach to job creation, and seek to create a positive environment to enable job growth. Countries recognise the advantages of a high quality education system, and more and more are investing in their university system. There is evidence that at a macro level, these steps are beneficial. An example of this can be seen in measures to codify the economic competitiveness of individual countries. The World Economic Forum (www3.weforum.org) publishes a *Global Competitiveness Report*, which provides a snapshot of the competitiveness of the majority of the world’s national economies based on a global competitiveness index (GCI). The GCI is structured around the three themes, one of which is *Innovation and Sophistication*. Innovation and Sophistication factors comprise capacity for innovation, quality of scientific research institutions, company spending on R&D, university-industry collaboration in R&D, government procurement of advanced technology products, availability of scientists and engineers, utility patents and intellectual property protection. The countries that rank highly in the *Global Competitiveness Report 2016-2017* all have excellent higher education systems with a strong focus on technology and innovation. In 2016, the top ten ranked countries, in order, were Switzerland, Singapore, United States, Netherlands, Germany, Sweden, United Kingdom, Japan, Hong Kong, and Finland. Other notables include Ireland (23rd), and China (28th).

Notwithstanding a proactive government creating a favourable business environment, and a high quality third level educational system, there are still other (larger) difficulties associated with sustainable job creation. These difficulties result from a shift in corporate power towards shareholder value at the expense of labour within growth oriented corporations. “A new orthodoxy, that corporations existed to create shareholder value, coincided with the rise of information and communication technologies (ICT), in particular the World Wide Web” (Davis 2015). Consequently policy efforts to create good jobs are no longer aligned with shareholder capitalism. The maximization of shareholder value results in a de-valuation of sustainable jobs within the corporation, thereby making any government goal, and indeed university goal, of job creation extremely difficult.

Perhaps as a final comment on the role and effectiveness of policy makers, Steven Rattner makes observations and recommendations regarding the loss of manufacturing jobs in the United States in which he argues that “better training and education are among our best hopes.” He recommends a number of policy actions including “better education (particularly in science and maths) and training; higher federal investment spending on infrastructure and research and development; increasing mobility to encourage workers to move to where the jobs are” (Rattner

2017). At the end of the day, if the jobs move, the workers must be prepared to move too. In speaking to a graduating class of MBA students at Harvard Business School in 2001, Jack Welch said that “you can guarantee lifetime employability by training people, making them adaptable, making them mobile to go other places to do other things. But you can’t guarantee lifetime employment” (Welch 2001).

Findings

This chapter has examined the different roles that the university plays in job creation, and wittingly or unwittingly, it has a significant role to play. Figure 10.6 below describes the approach taken to examine these different university roles in creating jobs. Modern universities that embrace, and are capable of successfully blending, their many strengths across all three university missions appear best placed to become such innovative universities. On the right hand side of Figure 10.6 are the traditional university missions, and it is to these that the university typically devotes its attention. If successful, then we have argued that it can best lead to the successes on the left side of Figure 10.6 via the attraction of large companies, support for growth of small and medium sized companies, and the nurturing of start-up companies.

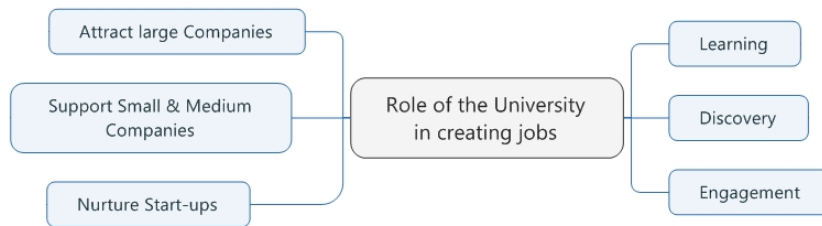


Figure 10.6 The many roles of the University in creating jobs

The means by which the university can positively contribute to job creation are depicted in Figure 10.7 as extensions of Learning (first mission), Discovery (second mission), and Engagement (third mission).

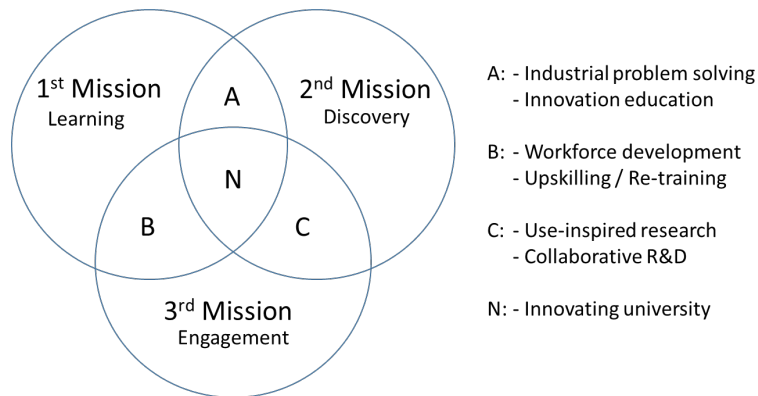


Figure 10.7 The expanding role of the Entrepreneurial University

In the above figure we have listed just two examples for each of the cross-activities that connect the primary missions of the modern entrepreneurial university. So, for example, workforce development and upskilling / re-training are activities that link 1st and 3rd missions. We argue that the intersection of the three missions is at the heart of the modern university – and where successful innovative universities such as Stanford, Purdue, KU Leuven, TU Delft, and Dublin Institute of Technology (to name but a few) find themselves. Such universities have assumed a more proactive role in shaping the economies of their regions. For such successful universities:

The result is the emergence of a culture of innovation that revolves around role models worthy of emulation; personal and organizational networks; enhanced capital resources; and a mindset that encourages tolerance of, and diversity in, the population. The outcomes of this process are the creation and transfer of technology, job and wealth creation, and enhanced recognition and prestige, all of which feedback to, and reinforce, the role of the university (Smilor 2007, p. 206).

Table 10.3 elaborates on the above figure by indicating estimates of the extent to which each mission contributes to job creation and economic development. It should be noted that each mission has important functions and contributions to make to the desired goal – none is omittable if we seek the maximum impact and effectiveness.

Type / Outcome	1 st Mission Learning	2 nd Mission Discovery	3 rd Mission Engagement
Attracting large companies	Significant Role	Some Role	Minor Role
Supporting SME	Significant Role	Significant Role	Significant Role
Nurturing start-ups	Minor Role	Some Role	Significant Role

Table 10.3 University mission impacts on job creation

To summarize, the main findings are as follows:

- The quality of the third level education system is critical, in order to create a readily-available high-end workforce. This means the quality of the traditional teaching role of the university must not be overlooked when examining means of job creation, as it generates high-quality graduates. The university

must likewise focus on the quality of its educational programs and also maintain close connections with key industry sectors. This can be achieved through a range of collaborative initiatives, including collaborative research and curriculum advisement.

- Countries, or regions, should have an effective continuum of technologically capable people, i.e., a workforce sufficiently diverse and educated to staff their economies. This continuum should range across the spectrum from operatives who can function effectively, through skilled craft workers, technicians, and across to technology-focused engineers and research-focused engineers. Universities clearly generate many technologically capable people. But they are not the sole providers. Community colleges, other non-university colleges and industry-based training programs also generate workforce capability.
- Coordinated and concentrated support from government agencies and universities contributes to effectiveness of job creation.
- While technology parks favour STEM opportunities, incubators need not be STEM-based. As above, coordinated efforts integrating university and government economic development activity with incubator and technology park support offer most promise.
- Job creation is a main underlying purpose of incubator support for new business formation, especially of technology-based firms. However, the evidence is that incubators are not strong job creators, and certainly not as impactful as FDI.
- The combination of strong university first mission role of learning linked with third mission role of industry engagement are significantly important to job creation in the SME sector, the engine of economic growth and job creation.
- With respect to job creation, universities should emphasize use-inspired and market-driven research in addition to curiosity-driven basic research. This also helps keep the university connected to the companies within its region.
- The university should maintain focus on quality with respect to its primary roles, and ensure that mission dilution, or mission creep does not occur. “It is important that the fundamental values of research and teaching are complemented rather than hampered by the university’s active engagement and involvement in the emerging processes of industrial and entrepreneurial innovation and knowledge transfer” (Oosterlinck 2004).

Conclusion

A review and analysis of the literature and institutional experience leads to the conclusion that the first (teaching/learning) and second (discovery) missions of the university are critically important for economic development and job creation to occur. However, in and of themselves they are not optimal. A focus on third mission (industry engagement) that is aligned with and supports the overall mission of the university appears to be optimal. Systematic and concerted policy and planning support for economic development and job creation appears to be vital. Furthermore it is not sufficient that such planning be done by the university alone. Coordinated planning and actions by the university, in concert with government and the private

sector is necessary. However, there is an important cautionary note required in that the university must always be capable of independent thinking and action in order to avoid becoming a directly-controlled instrument of government. A creative tension must be maintained, while acknowledging that some higher education institutions should be more directly aligned with government policy than others.

Strategic planning for the future would benefit from having a reasoned view of alternative futures and their probabilities, such as through scenario planning. Universities are probably better positioned and equipped to generate such scenarios although they will need to involve government, the private sector and society if their findings are to be reliable yet avoid ‘group-think’. Technological change has always influenced jobs, with some developments reducing, or indeed eliminating, jobs while other technological developments have created entirely new types of jobs. As observed by Nathan Rosenberg:

It seems to be much easier to anticipate the employment-displacing effects of technological change than the employment-expanding ones. Partly this is because we do not have a good technique for dealing with the impact of product innovation. The anticipation of the employment-expanding consequences of innovations seems to require a much greater exercise of the social imagination, an ability to foresee uses in entirely new social contexts (Rosenberg 1986, p. 30).

In addition to the above, university value systems, as manifested by both administration and faculty on both sides of the Atlantic, need to appreciate and reward both excellent learning and use-inspired research and development, equally with the rewards for basic research. On a related but separate point, because of the absolute necessity that regions and nations be able to draw on an array of highly capable people to initiate, advance and operate their economic engines, the concept of an array of institutions supplying a spectrum of such capable people is also necessary. This capability needs to be adopted and resourced effectively by policymakers. This also implies that there is no single category of institution that is dispensable, and while their relative importance may vary based on local/regional needs, a viable presence of a range of skills and higher education-based institutions is absolutely necessary.

In closing, we return to Claudia Goldin and Lawrence Katz, who declared:

As technological change races forward, demands for skills - some new and some old - are altered. If the workforce can rapidly make the adjustment, then economic growth is enhanced without greatly exacerbating inequality of economic outcomes. If, on the other hand, the skills that are currently demanded are produced slowly and if the workforce is less flexible in its skill set, then growth is slowed and inequality widens. Those who can make the adjustments as well as those who gain the new skills are rewarded. Others are left behind. (Goldin & Katz 2008, p. 352)

This is the ongoing and relentless race between technology and education, in which the ordinary citizen bears direct witness to this through the quantity and quality of jobs available. The outcomes of the race are either economic growth, or increasing inequality. In this race between technology and education, universities are critical intermediaries.

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