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Intermediating knowledge exchange between universities and businesses

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ABSTRACT

The forging of links between universities and businesses is viewed increasingly as an important means of stimulating knowledge development that can lead to commercial innovation. Achieving effective knowledge exchange, however, requires the midwifery of different kinds of intermediaries often working in concert. Active and many faceted intermediation for the purposes of knowledge sharing and commercialization is essential when the knowledge is tacit or uncodified. The papers in this special section describe and discuss various intermediary mechanisms that assist universities in transferring knowledge and aiding the process of innovation. No single recipe is clearly superior but examining a variety of experiences helps to highlight the strengths of specific intermediary processes and to identify some of their shortcomings.

1. Making a knowledge economy

There can be no denying that the skill and knowledge intensity of a wide range of productive activities in manufacturing and in the services industries is on the rise. A closely related and parallel development is the quickening of technological change most notably but by no means exclusively in areas directly affected by the IT revolution.[1] This began gathering momentum in the 1980s. Because IT, being a general purpose technology (GPT),[2] permeates so many activities and its reach continues to expand, the trends it has unleashed – a tighter integration of global markets, a greater demand for skills, a stronger focus on R&D to achieve more technological mileage, and a faster pace of innovation to sustain firm level competitiveness – will not soon abate. The economic ripple effects of electricity and the internal combustion engine were spread over four to five decades and there is every reason to believe that the consequences of IT will be as far reaching. Other technologies with their roots in basic research conducted mainly since the 1970s are beginning to reinforce the impetus provided by IT. These are advances in the fields of biotechnology, nanotechnology, the material sciences, and most recently, in alternative energy sources. To varying degrees, these intersect with one another and also with IT, opening up new inter-disciplinary subfields for research and promising fruitful synergies already apparent for example in bioinformatics and the crafting of exotic new materials using nanotechnology (see Silberglitt et al., 2006). The potential cornucopia of technologies appears limitless, and around the world governments and businesses are pinning their hopes with respect to economic growth, improving living standards, and environmental sustainability for example, on technological progress. Science is also expected to provide a part, perhaps the essential part, of the solution to the challenges posed by climate change, the demand for cost-effective and practical sources of renewable energy to supplement fossil fuels, and the health problems associated with ageing,

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[1] See, for instance the discussion of accelerating technological innovation and some of its implication in Rycroft (2006).

[2] The characteristics of GPTs are examined in Helpman (1998).

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sedentariness and recalcitrant infectious diseases old and new.

If technology is and remains the key, and in particular, technology that derives from advances in a number of relatively new scientific fields, then we can expect three trends to intensify:

- The ratio of jobs requiring higher order skills will increase and workers will need to periodically refresh and/or diversify their skills over the course of longer working lives.
- Accelerating technological progress will entail increasing investment in basic and applied science, the development of innovative technologies, and effective channels for diffusing this knowledge to potential users.
- The importance of entrepreneurship and intermediating entities responsible for identifying and marketing promising technologies, adapting and commercializing them and shouldering some of the financial, developmental and market related risks will become greater.

These trends have a number of major implications from among which we will focus on the two that are at the heart of this special section. First is the role of universities and their associated local and increasingly global knowledge networks in generating the scientific know-how and in conducting some of the early-stage development that underpins commercial technologies.

Second is the process by which more of the scientific knowledge and embryonic technologies being discovered can be transformed into viable technologies with a shorter lag than is currently the case so that the payoff from investment in skills and in R&D is quicker and larger. The purpose of the papers in this special section is not only to examine the evolving links between universities and businesses but also to delve into the less well-understood process of knowledge exchange between universities and different types of users which can take many different forms, and the function of intermediaries which encourage and facilitate the process.

2. Universities and firms: the ties that bind

There is growing literature on the many faceted contribution of universities to development, a contribution which relies more and more on the accretion of knowledge in its many forms and the educating of the labor force. By socializing workers and equipping them with skills, universities and other training institutions play a vital role the world over. They are a crucial part of the foundation of any modern industrial economy and their salience is becoming greater in ones where economic growth and better living standards are entwined with continuous advances in useable knowledge.

Starting in the 19th century, a small number of universities in industrialized and industrial countries have engaged in basic and some applied research.[3] There is also a lengthening tradition of collaboration with businesses, farming communities, and government agencies on practical aspects of technology development by, for example, the land grant universities in the U.S. and the technical universities in Germany.[4] These universities have engaged in basic and applied research, have contracted with firms to perfect technologies, provided consulting and extension services, and licensed their research findings. In recent years, universities have leveraged their intellectual property (IP) to spin-off firms by encouraging students and faculty to be entrepreneurial, by establishing incubators and in some cases creating science parks and providing small amounts of seed funding for start-ups.

While universities have a large hand in producing the human capital so vital for the functioning and growth of a knowledge-intensive economy, the evidence on their direct contribution to commercially viable technologies is much patchier. A few of the leading research universities, almost all in the United States, derive a handsome income from licensing fees and royalties, although a handful of patents contribute the bulk of this revenue and in no case does it account for more than a small fraction of the university's annual budget (Lester, 2005). These very same universities are also linked to start-up companies and provide a hub for clusters of firms, most notably in the fields of biotechnology, pharmaceuticals, and IT. Many other universities in the United States, Europe and Asia are the source of consulting services and of spin-offs and generate a trickle of patents. But for these universities the links to business are sparse and not particularly lucrative, and few institutions offer incentives to faculty members to pursue such opportunities. That businesses also do not currently perceive of universities as the leading sources of technology of commercial significance emerges from surveys conducted in the United States and the U.K. Universities are ranked behind competitors, customers, exhibitions, own research, suppliers, trade associations and other sources (see Cosh et al., 2006). This is surprising, but there are grounds for believing that the role of universities in the knowledge economy will acquire greater importance, and linkages with firms will start to multiply in industrialized and industrializing countries.[5] There are several reasons for anticipating such a trend.

First and foremost is the emphasis firms are assigning to product and process innovation to sustain competitiveness, enhance returns and to diversify into promising market niches.[6] A competitive strategy, which gives primacy to innovation, requires investment in R&D, whether in-house, through alliances and partnerships with other firms, or

[3] On the early beginnings of research universities and an account of their subsequent evolution (see Clark, 2006; Yusuf, 2007; Mazzoleni, 2005; Mowery, 2005). Atkinson and Blanpied (2008) describe how the research university emerged in the U.S., the contribution of a few universities to technology development during WWII, and the subsequent support provided by the government.

[4] Questions remain as to whether technical universities, which have been favored by Germany, give rise to more knowledge spillovers as compared with general universities. Audretsch and Lehmann (2005) find little difference between the two.

[5] See Geiger (2006).

[6] The shortening lifecycle of products is inducing firms to emphasize innovation as is the shortening lag time in bringing products to market.