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Universities and regional economic development: The entrepreneurial University of Waterloo

Allison Bramwell, David A. Wolfe*

Program on Globalization and Regional Innovation Systems, Centre for International Studies, University of Toronto, 1 Devonshire Place, Toronto, Ontario, Canada M5S 3K7

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ABSTRACT

This paper argues that the contribution of some universities to local and regional economic dynamism is much richer than overly mechanistic depictions suggest. Beyond generating commercializable knowledge and qualified research scientists, universities produce other mechanisms of knowledge transfer, such as generating and attracting talent to the local economy, and collaborating with local industry by providing formal and informal technical support. A detailed case study of the University of Waterloo, in Waterloo, Ontario, Canada, with its progressive Coop and Entrepreneurial education programs, and innovative Intellectual Property policy, illustrates the way in which the university has contributed to growth and innovation in the local and regional economy.

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1. Introduction

Universities have emerged as central actors in the knowledge-based economy, expected to play an active role in promoting technological change and innovation. However, the nature of their role in regional economic development is less well understood than is often presumed. While the presence of a leading research university is a critical asset for urban and regional economies, it is not sufficient in itself to stimulate strong regional economic growth because universities tend to be 'catalysts' of technological innovation rather than 'drivers' (Doutriaux, 2003; Wolfe, 2005a). Yet many policymakers still view research universities as potential 'knowledge factories' for the new economy (David, 1997), with untapped reservoirs of commercializable knowledge waiting to be taken up by firms and applied. This mechanistic view of the way in which basic scientific research is transformed into commercial products demonstrates a misconception of the commercialization process itself, as well as the role that universities can and should be expected to play in that process. The flow of knowledge does drive innovation, but knowledge transfer from universities to industry is a fluid, complex and iterative process involving many different actors. As a consequence, the role of universities in technology transfer and commercialization is much more nuanced than traditional linear conceptions of the innovation process assume (Stokes, 1997; Branscomb, 1997).

From a theoretical perspective, the linear approach to technology transfer is being replaced by approaches that emphasize the interactive and social nature of the knowledge transfer process and the importance of tacit dimensions of knowledge. The goal of this paper is to suggest a more robust conception of the ways in which university-generated knowledge is transferred into the local economy. We argue that universities are not just generators of commercializable knowledge or even highly qualified research scientists; they provide other equally critical mechanisms of knowledge transfer. First, they generate *and* attract talent, which contributes both to the stock of tacit knowledge in the local economy, as well as to the 'thickness' of the local labour market

* Corresponding author. Tel.: +1 416 946 8922; fax: +1 416 946 8915.
E-mail address: dwolfe@chass.utoronto.ca (D.A. Wolfe).
URL: http://www.utoronto.ca/progris (D.A. Wolfe).

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(Florida, 2002; Betts and Lee, 2005). Second, in addition to the conduct of basic research, universities provide both formal and informal technical support, as well as specialized expertise and facilities for on-going, firm-based R&D activities (Grossman et al., 2001; National Academy of Engineering, 2003; Mowery et al., 2004). Third, universities act as a conduit enabling firms to access knowledge from the 'global pipelines' of international academic research networks (Bathelt et al., 2004; Lawton Smith, 2003a; OECD, 1999). Finally, rather than acting as 'ivory towers' insulated from their community, they can function as 'good community players' that support firm formation and growth by facilitating tacit knowledge exchange among networks of innovative firms and acting as 'anchors of creativity' that sustain the virtuous cycle of talent attraction and retention (Wolfe, 2005a; Henton et al., 1997; Gertler and Vinodrai, 2005; Betts and Lee, 2005).

This paper presents a theoretical discussion of the recent literature on universities, innovation and regional economic development, with a particular emphasis on the process of learning and mechanisms of tacit knowledge exchange between universities and local actors. It draws upon a detailed case study, based on 96 in-depth interviews with firms, associations, and knowledge institutions, of the dynamic cluster of information and communications technology firms in the Waterloo region of Ontario, Canada (Bramwell et al., 2008). The University of Waterloo, the leading post-secondary educational institution in the region, emerges as a strong example of an 'entrepreneurial research university' that is actively engaged with the process of economic development in the local community (Tornatzky et al., 2002). While commercialization activities and the spin-off of startup firms have clearly contributed to the region's economic success, other equally important forms of knowledge transfer are occurring and the university's role in economic development transcends the success of its commercialization efforts. In relation to the framework outlined above, the University of Waterloo has been a critical catalyst for local economic development through its ability to generate and attract the talent that underpins academic and applied excellence in science, math and engineering, support for local firm-based R&D, and its explicit institutional support for entrepreneurial activity at the local level. A research finding of particular importance is the intermediary function of the Co-operative Education Program in facilitating the transfer of tacit knowledge between students and local and non-local ICT firms.

2. Universities and 'Learning' in knowledge-based economies: the role of tacit knowledge and interactive learning

> People are preoccupied with spin-offs, with the idea of starting something new. There is a lot of naivety around this especially with people in government and economists who think [that with] one good piece of research and a patent and you can build a company. It does not work like that. If you do not have at least 40 innovations and a lot other things, you are not going to go very far.[1]

The transformation of the post-war research system in the leading industrial countries followed from the demonstrated success of wartime R&D efforts that produced significant research breakthroughs in radar, atomic weapons and other critical technologies. In this new system, universities were privileged as a principal site for the conduct of scientific research and their autonomy in this endeavour was left intact. Underlying the post-war 'social contract for science' (Martin, 2003) was the 'linear model' of innovation based on the assumption that "a rather straightforward conversion takes place from investments in basic science to economic growth, passing through applied science, technological development, and marketing" (Lundvall, 2002, p. 3).[2] In recent years, however, universities have come under increasing pressure to move farther along the innovation continuum and supplement their traditional role in the conduct of basic research with more applied research activities, reflecting a shift in government expectations that public investments in basic research should produce a measurable economic return (Etkowitz and Webster, 1998; Geiger, 2004; Wolfe, 2005b). As a result, universities have shifted their emphasis to include more applied research of greater relevance to industry, and to diffuse technical knowledge and provide technical support to industry.

This shift in the balance between primary and more applied research in the universities has not always been matched by a corresponding shift in understanding of the nature of the innovation process. This shift depends on the recognition that the adoption and diffusion of new knowledge by firms involves the transfer of both codified and tacit knowledge through a process of *interactive* and *social* learning (Lundvall, 1992, 2004; Maskell, 2001; Gertler, 2004). The capacity for firm-based learning in a region depends on their ability to exploit both external, codified and reproducible knowledge, which is often university-generated, as well as the ability to develop and assess person-embodied, tacit knowledge. The density of a firm's interaction with suppliers, customers, and knowledge institutions is critical to the constant learning and adaptation that underpins the innovation process. Successful learning through interaction involves a capacity for *localized* learning within firms, and between firms and supporting institutions. The regional level is conducive to this form of learning because firms within a region share common networks that facilitate learning among them, and are supported by a common set of regional institutions, including universities (Wolfe, 2005a).

[1] Confidential interview.

[2] In a stylized linear model, the innovation process begins with basic research that leads to new discoveries without consideration of potential future applications, but which can launch potential applications that are pursued and taken-up by firms through further applied research, development, design, production, and marketing. The later stages of this process lead to the successful commercialization of new products and processes (Brooks, 1996; Stokes, 1997).

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