



Academic engagement and commercialisation: A review of the literature on university–industry relations

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ABSTRACT

A considerable body of work highlights the relevance of collaborative research, contract research, consulting and informal relationships for university–industry knowledge transfer. We present a systematic review of research on academic scientists' involvement in these activities to which we refer as 'academic engagement'. Apart from extracting findings that are generalisable across studies, we ask how academic engagement differs from commercialisation, defined as intellectual property creation and academic entrepreneurship. We identify the individual, organisational and institutional antecedents and consequences of academic engagement, and then compare these findings with the antecedents and consequences of commercialisation. Apart from being more widely practiced, academic engagement is distinct from commercialisation in that it is closely aligned with traditional academic research activities, and pursued by academics to access resources supporting their research agendas. We conclude by identifying future research needs, opportunities for methodological improvement and policy interventions.

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1. Introduction

Universities are organisations that perform a key role within contemporary societies by educating large proportions of the population and generating knowledge. Recently, often on the initiative of policy-makers, many universities have taken action to develop a 'third mission' by fostering links with knowledge users and

facilitating technology transfer (Etzkowitz et al., 2000b; Florida and Cohen, 1999; Gulbrandsen and Slipersæter, 2007).

Amongst the various channels available for establishing these links, the commercialisation of academic knowledge, involving the patenting and licensing of inventions as well as academic entrepreneurship, has attracted major attention both within the academic literature and the policy community (O'Shea et al., 2008; Phan and Siegel, 2006; Rothaermel et al., 2007). Commercialisation is considered a prime example for generating academic impact because it constitutes immediate, measurable market acceptance for outputs of academic research (Markman et al., 2008). To support commercialisation, many universities have established specialised structures, such as technology transfer offices (TTOs), science parks and incubators (Clarysse et al., 2005; Siegel et al., 2003), and created supportive internal rules and procedures (Thursby et al., 2001).

Whilst commercialisation clearly represents an important way for academic research to contribute to economy and society,

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there are multiple other ways in which university research is transferred (Salter and Martin, 2001). In this paper, we focus on 'academic engagement' which we define as knowledge-related collaboration by academic researchers with non-academic organisations. These interactions include formal activities such as collaborative research, contract research, and consulting, as well as informal activities like providing ad hoc advice and networking with practitioners (Abreu et al., 2009; Bonaccorsi and Piccaluga, 1994; D'Este and Patel, 2007; Meyer-Krahmer and Schmoch, 1998; Perkmann and Walsh, 2008). Academic engagement is also sometimes referred to as informal technology transfer (Link et al., 2007), even though most of these interactions tend to be formalised using contracts.

Academic engagement represents an important way in which academic knowledge is transferred into the industrial domain; many companies consider it significantly more valuable than licensing university patents (Cohen et al., 2002). Universities' income from academic engagement is usually a high multiple of the income derived from intellectual property (Perkmann et al., 2011). It should be added that academic engagement is not a new phenomenon but has a long tradition, particularly at universities that emphasise practical and technical relevance as part of their mission, such as the US land grant universities who seek to provide practical education whilst assisting local firms and agricultural contexts (Mowery and Nelson, 2004). Perhaps mirroring the recent policy and research interest in commercialisation, however, there has been a surge in research published on this topic, yet the state of knowledge remains relatively fragmented and tentative. In addition, there have been few efforts to underpin academic engagement conceptually, which stands in contrast to commercialisation where entrepreneurship theory has been applied.

We address these gaps by presenting a systematic review of the literature on academic engagement. The research question guiding our review is: What are the antecedents and consequences of academic engagement? We will consolidate results from all existing studies and extract generally applicable results. In a further step, we compare our findings with what is known about the antecedents and consequences of commercialisation, i.e. intellectual property creation and academic entrepreneurship (Rothaermel et al., 2007). This analysis allows us to address whether academic engagement is driven by the same mechanisms as commercialisation, or whether it represents a conceptually different type of phenomenon that needs to be treated separately by researchers and policy-makers.

Our work adds to existing research in four important ways. We provide the first systematic review of academic engagement and compare the latter with commercialisation. We paint a comprehensive picture of the antecedents and consequences of academic engagement across various contexts. Our approach allows us to separate factors and boundary conditions that may be idiosyncratic and the patterns that apply to the phenomenon more generally. We also identify aspects that are either less well researched or contested, providing direction for future research.

Second, we synthesise our empirical results into a novel theoretical framework on academic engagement. We outline both the differences and overlaps between academic engagement and academics' involvement in commercialisation and thereby hope to facilitate a convergence between these two streams of the literature.

Third, we make a methodological contribution, by discussing why studying academic engagement requires methodological approaches that differ from those for studying commercialisation. We also identify the challenges posed by these approaches and suggest how they may be overcome.

Fourth, our results are policy-relevant. In the last 30 years, universities have experienced major changes that have affected their objectives, sources of funding and modes of operation (Geuna,

2001; McKelvey and Holmén, 2009). There have been important modifications in universities' policy environments due to initiatives such as the Bayh–Dole Act of 1980 in the US, and the abandonment of the 'professor's privilege' in most European countries (Baldini et al., 2006; Grimaldi et al., 2011; Lissoni et al., 2008; Mowery et al., 2001). For policy-makers, it is important to know whether academic engagement is driven by similar mechanisms to commercialisation, or affected by factors that may not be activated by entrepreneurial incentives.

2. Conceptual background

Here we clarify the concept of academic engagement, and its relationship to the concept of commercialisation. Academic engagement is characterised by the following aspects which refer to organisation and objectives, respectively. First, academic engagement represents inter-organisational collaboration instances, usually involving 'person-to-person interactions' (Cohen et al., 2002), that link universities and other organisations, notably firms (Bonaccorsi and Piccaluga, 1994; Meyer-Krahmer and Schmoch, 1998; Schartinger et al., 2002). The quid-pro-quo agreed amongst the partners may be purely financial, i.e. the academic may work for a fee, or may consist of non-financial benefits such as access to materials or data for academic research projects or ideational input (Mansfield, 1995; Perkmann and Walsh, 2009; Senker, 1995). Second, generally the partners pursue goals that are broader than the narrow confines of conducting research for the sake of academic publishing, and seek to generate some kind of utility for the non-academic partners. For instance, the academic may offer his/her expertise to provide new ideas on application-oriented issues, solve problems and suggest solutions to collaborating organisations.

How does academic engagement relate to commercialisation? First, in terms of organisation, while academic engagement represents collaboration, commercialisation – or 'technology transfer' – may occur via academic entrepreneurship, that is the founding of a firm with the objective to commercially exploit a patented invention, or in some cases, a body of unpatented expertise (Shane, 2004). Alternatively, a patented or otherwise protected invention may be licensed out against the contracted receipt of royalties (Jensen and Thursby, 2001). For both processes, patenting represents a preliminary step, indicating a disposition on the part of the academic towards some kind of exploitation. Second, commercialisation means an academic invention is exploited with the objective to reap financial rewards; by contrast, academic engagement is broader and is pursued for varying objectives.

Despite these differences, there are important links and overlaps between both types of activity. In fact, commercialisation is often an outcome or follow-on activity, whether intended or unintended, of academic engagement. Working on common projects with industry may provide academics with insights into what ideas may be commercially valuable, and hence the opportunity to develop or co-develop inventions that can be patented, licensed or enable an academic spin-off. In other words, academic engagement often precedes commercialisation in time and can hence be regarded as an input factor to the latter. In some cases, it may also accompany commercialisation, for instance when spin-off companies work collaboratively with the university labs they originated from (Meyer, 2003).

Both academic engagement and commercialisation tend to be individually driven and pursued on a discretionary basis. Universities are 'professional bureaucracies' (Mintzberg, 1979) that rely on the independent initiative of autonomous, highly skilled professionals to reach their organisational goals. While academic entrepreneurship – as well as patenting as an often used proxy for entrepreneurial behaviour – are also primarily individual

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