

## SELECTED BARRIERS MANAGEMENT OF COMMERCIALIZATION IN THE INTERNATIONAL UNIVERSITY RESEARCH

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**Abstract:** Commercialisation of the university researches and innovations is an integral part of a knowledge based institution. Thereby, due to the importance of commercialisation, certain institutions are working to speed up the diffusion process and technology transfer of new technology or new products or new services. In the world of globalization, universities are required to get involved in activities to commercialize university research and innovations to industries. It's important that all activities and organizational structures related to commercialisation of academic research should be managed in a way which should increase commercialisation with minimum negative effect on education and research. It's also desirable that it should also improve university's overall capacity to perform different functions. The above mentioned facts make commercialisation of academic research a big challenge for university. The most 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 'university research'.

**Key words:** management of commercialization, entrepreneurship, innovation, R&D

### Introduction

Research commercialization is a process in which, using all possible opportunities all circumstances to get profit from investment in technological innovation be prepared (Dilcher, 2002). Recently, commercialisation is also often perceived as a bridge between entrepreneurship and technology transfer within the university environment. Lackéus and Middleton (2015) explored university-based entrepreneurship and they identified the bridging capabilities of venture creation. Another trend of commercialisation is to analyze micro and macro levels that attempts to provide a broader conceptualization of academic entrepreneurship and an appreciation of the contextual heterogeneity of academic entrepreneurship and the implications for how it occurs (Wright, 2014). Many authors claim that universities have new role to commercialize research results.

Despite rapid increases in industrial R&D involvement and resource commitment over the following 25 years, academic tradition paid little attention to the organization and management of large-scale technology-based programs. Indeed it was for the purpose of bringing academic research-based insights to bear

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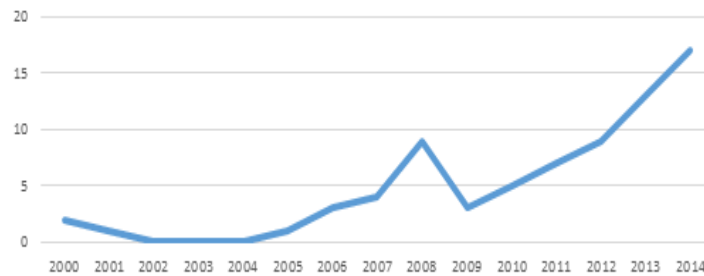
on technological enterprises. Academics had concentrated largely on two themes: historical entrepreneurship about the lives and activities of great "creative inventors", like Edison and Bell, and psychological research into the "creativity process". The whole transfer of technology and related commercialization is a number of consecutive complicated processes requiring knowledge, not only technical knowledge which concerns innovations directly, but also knowledge in scope of economy, marketing and intellectual property law. The whole undertaking to introduce an innovative idea can be divided into stages.

The university relationship is also an informal technology transfer (Link et al., 2007), going to be formalized using contracts. Our gaps by presenting by the first like a systematic review of the literature on university research. The research question of our review is: What are the consequences and possibilities of university research? Our results from studies should be applicable structures. Moreover, we compare many findings with antecedents and consequences of commercialization for enterprises (Tabor, 2005; Rothaermel, 2007; Walicka and Czemiel-Grzybowska, 2013). Our conclusions allow university research is driven by the same mechanisms as commercialisation.

### Research Methodology

We prepare systematic review of evidence of commercialisation and academic engagement. Literature review was established like state of current knowledge in a field. We applied following procedure. The first, we identified all relevant articles with commercialisation subject with were published from 2000 to 2014. We conducted a search in the title and abstracts of published, also using keywords. We performed our search of the journals with the highest article counts from *Research Policy*, *Journal of Technology Transfer*, and *Technovation*. We also excluded surveys articles dealing solely with commercialisation rather than engagement.

The purpose of this research is to identify and analyze the roles of academic research for commercialisation and selected barriers of commercialisation research.



**Figure 1. Total numbers of year publications of commercialisation at selected journals from 2000 to 2014**

The procedure yielded 223 results. In the first step, we filtered this list according to fit. As we were particularly interested in studies using data on individual researchers, then we removed all articles which did not fulfil our criterion. Our procedure eliminated 152 articles. In the second step, it were screened the remaining every articles, applying basic quality criteria to ascertain whether data had been collected in a research way and some papers had intelligible results. At this step it was also eliminated those articles that had a research focus. Our procedure left it with a total of 71 articles.

**Table 1. Synthesis of journal's articles from 2000 to 2014**

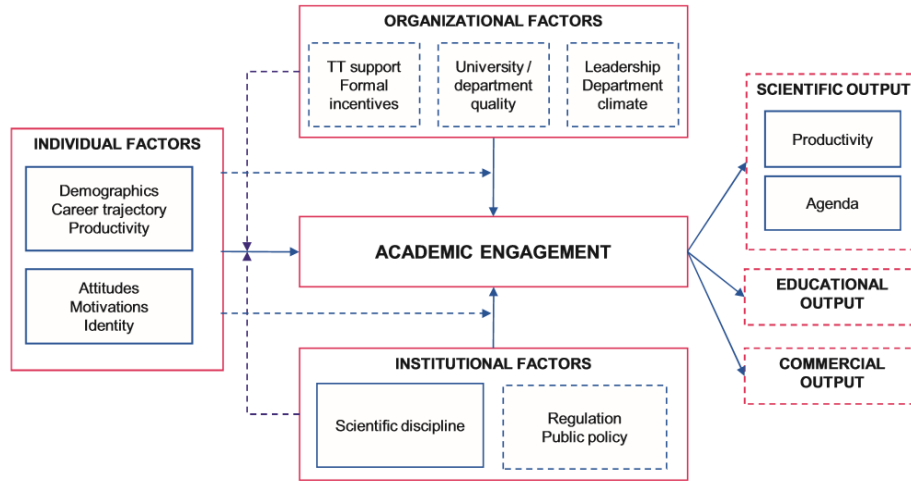
Subject	Number and % articles
<i>Research Policy</i>	31 (43%)
<i>Journal of Technology Transfer</i>	24 (34%)
<i>Technovation</i>	16 (23%)
US	36 (51%)
Europe	20 (28%)
Asia	5 (8%)
Other	8 (13%)
Total	69 (100%)

The articles which we chosen are published we observe a skewed distribution (Table 1): two journals (*Research Policy* and *Journal of Technology Transfer*) account for 56% of all output. As a final step in our analysis, it was obviously compared the results obtained on relation between universities and entrepreneurs and universities involvement in commercialisation. Although, University research, research on commercialisation has previously been qualified and published by reviews (Geuna and Muscio, 2001; Larsen, 2011; Phan and Siegel, 2006).

Analytically, academic engagement means collaboration; focus on studies of how individuals within organizations initiate maintain collaborations with other businesses are relevant for analyzing it (Brzeziński and Czemieli-Grzybowska, 2015). The organisational and individual levels, outcomes both at motivation for individuals to engage in collaboration and formal characteristic. Commercialisation implies a more narrowly focused interest in the exploitation of specific methodology. Researchers used the analytical framework of entrepreneurship to explore commercialisation, involving aspects of opportunity recognition and individual economic incentives (Lach and Schankerman, 2008; Shane, 2004). Empirically, information on patents is accessible from public patent directories and various studies have successfully attempted to identify university patents without universities signature (Tursby et al., 2007; Lissoni et al., 2008). Figure 2 presents insights from literature review in stylized model, outlining the various antecedents of academic engagement at organizational, individual and institutional levels.

**Research Results and Implication**

The results of details depend on a specific aspect of academic engagement. We systematic reported how this compares with commercialization. Academically, we reported the proportion of academics engaged in different types of activities in the studies reviewed. The university research is varied and includes grants awarded, contracts awarded, commercialization experience and other forms of knowledge exchange (D’Este and Perkam, 2011; Nilsson et al., 2010).



**Figure 2. Framework of external engagement by academic researchers (Perkman et al, 2013)**

Plewa (2005) used a different approach to identify the barriers of commercializing research which is discovering conflicts of interests between universities and organizations. Besides these barriers and constraints, many university professors and staff believe that being an entrepreneur practically prevents them from their main mission as researchers, which is to continue learning and teaching (Zahra and Garvis, 2000).

**Table 2. Selected international barriers from international researches about commercialization compare external engagement by academic researchers**

Barriers	Lack of businesses strategies of development	Researchers
<b>Management (organizational factors)</b>	Lack of long-term strategies and a practical vision of commercialisation	<i>Bureaucracy and the inflexibility of administrative systems in universities</i> (Siegel et al., 2003; Sooreh et al., 2011).
	Lack of support for commercialization from the senior management	

	No effective management of intellectual properties	<i>The inefficient management of intellectual properties</i> (Siegel et al., 2003)
	Bureaucracy and inflexibility of the university administrative system toward	<i>The lack of long-term strategies</i> (Elmuti et al., 2005; Czemieli-Grzybowski, 2015).
<b>Industrial (institutional factors)</b>	Lack of awareness of industry actors of technologies produced in the universities	<i>Cultural differences of industrial actors and academics</i> (Grondys et al., 2014; Jurczyk-Bunkowska and Pawełszek, 2015; Siegel et al., 2003; Elmuti et al., 2005)
	Divided vision of the university and industry	
	The public sector's aversion	
	Failure of the Industry to ensure full protection of intellectual property rights	
	Administrative bureaucracy	
	Failure to identify companies that are willing to acquire technologies	<i>Not being familiar with companies willing to acquire technology</i> (Czemieli-Grzybowski, 2014, Phan et al., 2006).
	Different aims and priorities	
	University project take a long time	
	Inconsistency between university projects and industry needs	
	Different cultures, interests, motivations of industry participants and academics	
Motivation for publishing research		
<b>Human resources (Individual factors, scientific output, educational output)</b>	The unrealistic expectations of the universities' administrators and professors about the value of their technology	<i>Lack of motivation and procedures</i> (Brzeziński, 2015; Shane, 2004; Haeussler and Colyvas, 2011; Siegel et al., 2003).
	Researchers' lack of awareness of intellectual property rights in universities	<i>Inaccessibility to proper human resources</i> (Boardman and Ponomariov, 2009; Lackéus and Middleton, 2015).
	Professors' lack of freedom to participate in business activities	<i>Not having enough information about personal property rights</i> (Czemieli-Grzybowski, 2014).
	Lack of access to appropriate human resources	<i>The ambiguous relationship between researchers and money</i> (Larsen, 2011; Siegel et al., 2003).
	Researchers' vague and uncertain relationship with money	<i>The motivation for publishing</i> (Larsen, 2011).
	Scientists' characteristics	<i>The characteristics of scientists</i> (Rothaermel et al., 2007; Sooreh et

		al., 2011).
	Lack of role models	<i>Lack of knowledge and skills in fields of commercial activities and launching businesses</i> (Czemiel-Grzybowska, 2015; Perkman et al., 2013; Siegel et al., 2003; Czemiel-Grzybowska, 2014)
<b>Environmental (institutional factors)</b>	Slow speed of negotiations on knowledge transfer	<i>Cooperating with experts outside the organization</i> (e.g. accountants, venture capitalists and lawyers) (Link et al., 2007).
	Political constraints and sanctions	<i>Clarification and sharing market demands</i> (Rothaermel and Thursby, 2005; Lissoni, 2008).
	Managerial instability and constant chan	<i>The lack of communication and networks among investors, industry actors and academics</i> (Lissoni, 2008; Czemiel-Grzybowska, 2014a).
	Identification and location of favorite technologies	<i>Slow speed of knowledge transfer negotiations, detecting and locating the technologies</i> (Boardman and Ponomariov, 2009; D'Este and Perkmann, 2011).
	Political constraints and sanctions	<i>Public environment</i> (Zahra and Garvis, 2000; Sooreh et al., 2011). <i>Incapability of products in competition</i> (Czemiel-Grzybowska, 2014b). <i>Demand conceptualization</i> (Lissoni, 2008).
<b>Structural (commercialisation output)</b>	Lack of incentive structures (cash prizes) such as the promotion of the staff and faculty members	The lack of a practical perspective (Lissoni, 2008).
	Have the faculty share the profits	<i>The inadequate resources allocated to technology transfer in universities</i> (D'Este and Perkmann, 2011).
		<i>The need for technical supports</i> (Dilcher, 2002; Azagra-Caro, 2007). <i>Incentive structure (cash and non-cash rewards) including credits to improve employees and the payment and incentive systems of technology transfer offices</i> (Siegel et al., 2003).
	Lack of motivation and inclination	<i>Inefficiency of the processes of patent transferring agreements</i> (Lach and Schankerman, 2008; Brzeziński, 2015). The monotonous nature of academic

		researches (Plewa, 2005; Phan, 2006).
	Lack of incentive structures (non-cash prizes), reward systems and bonuses for the faculty members and the staff	<i>Inefficiency of processes and procedures used</i> (Siegel et al., 2003).
		<i>Different research questions and the current difficulties in the revelation trends of "General knowledge," unawareness of graduates to the recent industrial advancements</i> (D'Este and Perkmann, 2011; Perkmann et al., 2013).

The institutional barriers as important barriers are because according to the interviews, institutional barriers such as laws, regulations and legislations are recognized as significant barriers in commercialization. The, cognitive and normative barriers are less investigated in earlier works. While in earlier works, just cultural barriers were identified as one of the type of barriers and impediments, such that they were viewed in a general manner or from the perspective of cultural differences of the industry and the university. The cultural-cognitive barriers are recognized as institutional barriers.

*Individual characteristics* are a main players and an important role in predicting academic engagement. Also male academics are more likely to engage with industry (Azagra-Caro, 2007). Then, age has an ambiguous effect, even when controlling for seniority. Some from studies find a positive relationship (Boardman and Ponomariov, 2009; Haeussler and Colyvas, 2011). Remember that engagement is often seeded by individual contacts and more experienced researchers are likely to have larger networks, and hence more social capital or enabling. Have chance to find newly partners in the private sector. *Organisational factors* are likely to moderate the impact of individual characteristics on external engagement.

The impact of academics' engagement with industry on teaching is not clear and the question has not been addressed in the literature. The only exception is Lin and Bozeman (2006), who observe that academics with industry exposure support more students. There is some evidence that academic researchers involved in commercialisation activities practice higher degrees of secrecy than their non-commercializing colleagues and that academic entrepreneurship may hamper the accumulation of knowledge in the public domain.

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## WYBRANE BARIERY ZARZĄDZANIA KOMERCJALIZACJĄ W BADANIACH UCZELNI MIĘDZYNARODOWEJ

**Streszczenie:** Komercjalizacja innowacji powstałych w ramach badań jest integralną częścią rozwijających się przedsiębiorstw. Ze względu na znaczenie komercjalizacji, niektóre instytucje działają w celu przyspieszenia procesu dyfuzji i transferu technologii nowych technologii i nowych produktów lub nowych usług. W dobie globalizacji, uczelnie są zobowiązane do zaangażowania się w działania na rzecz komercjalizacji badań naukowych i innowacji na rzecz przemysłu. Ważne jest, że wszystkie działania i struktury organizacyjne związane z komercjalizacją badań naukowych powinny być zarządzane w sposób, który powinien zdynamizować procesy komercjalizacji przy minimalnym negatywnym wpływie na edukację i badania. Wskazana jest poprawa funkcjonalności uczelni i jej użyteczności do wytwarzania innowacji w ramach badań naukowych na rzecz przemysłu. Powyższe fakty sprawiają, komercjalizacja badań naukowych jest dużym wyzwaniem dla uczelni. W artykule podkreślamy znaczenie współpracy w dziedzinie badań, doradztwa i nieformalnych powiązań do transferu wiedzy między uczelniami a przedsiębiorstwami. Prezentujemy popularność tematyki dotyczącej komercjalizacji w badaniach międzynarodowych oraz wskazujemy na wybrane bariery ograniczające rozwój współpracy między uczelnią a przemysłem w kierunku komercjalizacji.

**Słowa kluczowe:** zarządzanie komercjalizacją, przedsiębiorczość, innowacje, badania i rozwój

### 選定壁壘在國際高校科研管理的商業化

**摘要：**商業化大學研究和創新是一個以知識為基礎的機構的一個組成部分。因此，由於商業化的重要性，某些機構正在努力加快新技術，新產品或新服務的擴散過程和技術轉讓。在全球化的世界裡，大學都需要得到參與活動的商業化大學研究和創新行業。重要的是，凡是涉及到學術研究的商業化活動和組織結構應在其中應該增加商業化對教育和科研的最小負面影響的方式進行管理。這也是可取的，它也應提高學校的執行不同的功能整體能力。上述事實使學術研究的商業化對大學的一大挑戰。最工作突出了合作研究，委託研究，諮詢和大學非正式關係的相關性-行業知識轉移。我們目前對學術科學家參與這些活動，我們稱其為“大學研究的研究系統的審查。

**關鍵詞：**商業，創業，創新，研發管理