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Shedding Light on Early Stage Academic Entrepreneurship: Finnish University Researchers' Views on Key Stakeholder Relations and Their Influence on the Research Commercialization Process

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Abstract

Since the mid-1980s, along with the opening up of the Finnish economy, the pressure to commercialize university research has steadily increased in Finland. This is in line with the growing importance of innovations in an ever-globalizing world in which purely production- cost-based strategies are about to become obsolete. However, in comparison to other Nordic countries and Western European industrial countries, Finnish investments in research have fallen short in their ability to increase high-technology export levels (Kotiranta and Tahvanainen 2018). Moreover, Finnish academia faces challenges in creating university-based economic activity (Nikulainen and Tahvanainen 2013). In order to help to understand these challenges, this article examines the phenomenon within the context of an entrepreneurial ecosystem according to which various stakeholders are involved in the birth and development of university-based economic activity. As prior research has mainly taken a macrolevel view of the stakeholders involved, we aim at extending the extant research by adopting a qualitative, microlevel approach.

More specifically, we provide a qualitative analysis of interviews with Finnish scientists, focusing on their experiences in stakeholder relations at the early stages of academic commercialization. Our article provides an overview of the different stakeholders and their involvement and exposes the opportunities and possible pitfalls taking place within these different stakeholder relations. We offer a critical examination of the current support mechanisms and propose ideas for how academic entrepreneurship

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in Finnish universities could be enhanced through closer stakeholder collaboration.

Keywords: Commercialization of research, academic entrepreneurship, entrepreneurial ecosystem, support mechanisms, stakeholders

Introduction

In an ever-globalizing world, in which production-cost-based strategies are about to become obsolete, there is a wide consensus about the notion that science, technology, and innovation (STI) are among the key drivers of economic competitiveness (see, e.g., Nieminen, Loikkanen, and Pelkonen 2016). As a result of this, developed economies worldwide are pressured to facilitate the discovery and development of innovations that would enhance industrial renewal (Nikulainen and Tahvanainen 2013). Universities are recognized as central actors in industrial innovation because they cater for the production of knowledge, which is a key component of innovation (Etzkowitz et al., 2000).

Universities have traditionally had two important roles in societies: research and teaching. Based on these roles, universities have been seen as support structures for innovation, as they have supplied industry with trained individuals, research results, and knowledge. However, the so-called second academic revolution allocated a third role to universities, according to which universities are expected to have a direct economic as well as societal impact (Farrell et al. 2006). The former refers to the notion that, with the help of university graduates who possess new knowledge and research skills, companies are able to increase their productivity as well as enhance their innovation capabilities. This, in turn, translates into a measurable growth in employment and growth in gross domestic product (GDP). The societal impact of universities refers to, among others, increased tax revenues, decreased demand for welfare support, and a lower demand for health services. (Farrell et al. 2006, 2). The aspirations to economic growth and social welfare are widely acknowledged to require the creation of a strong knowledge base and its commercial exploitation (Dosi and Nelson 2010). The latter challenges universities to recreate their identity as universities are currently expected to engage vigorously in research commercialization activities. In this article, we refer to this as academic entrepreneurship. (Etzkowitz 2003, 2013; Balven et al. 2018).

Academic entrepreneurship (AE) falls generally into two categories: formal and informal. In its formal manifestation, AE is managed by the university's technology transfer office, and the end results are either patents, licenses, royalty agreements, or start-ups (Thursby and Thursby 2002; Lockett et al. 2005). The informal manifestations of AE refer to those forms of commercialization that are not managed by the university's technology transfer office. In this case, AE could actualize as consulting activities, collaborative research, student placements, and joint PhD

programs with industry (Agrawal and Henderson 2002; Cohen, Nelson, and Walsh 2002; Siegel, Waldman, and Link 2003; D'Este and Patel 2007; Link, Siegel, and Bozeman 2007; Stephan 2009; Perkmann et al. 2013).

According to Ejerimo and Toivanen, the pressure to commercialize university research has steadily increased in Finland since the mid-1980s. An important driver of this trend has been the increased role of external research funding for Finnish universities (2018). In 1985 external research funding accounted for about eight percent of university budgets, while nearly three decades later, in 2013, it accounted for almost sixty percent (Statistics Finland 2014). In Finland, innovation and new venture development rely on strong governmental stewardship (Kao 2009), and since the late 1990s several policy instruments have explicitly focused on facilitating research commercialization in Finnish universities. The Finnish funding agency responsible for technology and innovation under the auspices of the Finnish government launched a series of targeted programs in order to support universities and public research institutes in turning research into business (Ejerimo and Toivanen 2018). In 2007, Finland adopted a legislation that emulated the Bayh-Dole Act that was passed in the United States in 1980. The passage of the University Inventions Act aimed at promoting the recognition of inventions as well as their commercial utilization in Finnish universities by renewing and clarifying the allocation of rights and obligations between different academic parties (Kauppinen 2014).

According to international evaluation of the Finnish national innovation system, there are apparent weaknesses in technology and knowledge transfer. For example, Finnish investments in research have fallen short in their ability to increase high-technology export levels in comparison to other Nordic countries and Western European industrial countries (Kotiranta and Tahvanainen 2018). In other words, Finland does not seem to make full use of its skills and human-capital-based growth potential (Aiginger, Okko, and Ylä-Anttila 2009). The same goes also for the Finnish academia, which faces challenges in creating university-based economic activity (Nikulainen and Tahvanainen 2013).

According to recent comparison between researchers in Finland and in the United States, Finnish researchers do seem to face nearly twice as many challenges as their American counterparts regarding research commercialization. Key inhibiting factors include, among others, lack of time, financial risk, and difficulties in financing (Nikulainen and Tahvanainen 2013). Moreover, Finnish researchers typically experience trouble coping with the conflicting academic and entrepreneurial interests and roles (Tuunainen and Knuutila 2009; Ranga, Perälampi, and Kansikas 2016), which may be in part a result of the universities' failure to provide a supportive atmosphere for academic entrepreneurship (Ambos et al. 2008). These challenges reflect the "European paradox" in university technology commercialization (see, e.g., European Commission 1995, 2007) that is characterized by disappointingly low levels of inventions and related

commercialization activity despite high investments in university research (Nikulainen and Tahvanainen 2013).

Given the above, it is important to examine AE to further understand the various factors that inhibit and foster the process. Even though the university is often considered as one of the key actors in supporting commercialization (e.g., Galan-Muros et al. 2017), the literature on AE has emphasized the role of the whole entrepreneurial ecosystem for the birth and development of academic spin-offs (Mason and Brown 2014). In this view, the support from various other stakeholders, such as the university departments (Rasmussen, Mosey, and Wright 2014) and intermediary organizations (e.g., Konttinen, Suvinen, Nieminen 2009; Suvinen, Konttinen, Nieminen 2010) is also essential. Nevertheless, prior research has typically addressed the stakeholders' roles from a macrolevel perspective, with limited focus on the scientists' individual views on commercialization (Grimaldi et al. 2011; Guerrero et al. 2014). Also research on universities and their commercial activities, in general, has mainly been conducted at the national, regional, or organizational level (e.g., Mansfield and Lee 1996; Arundel and Geuna 2004; Segarra-Blasco and Arauzo-Carod 2008). The emphasis on institutional actors has left the role of individual researchers as an area that requires further attention (see, e.g., Nikulainen and Tahvanainen 2013). We therefore join Holloway (2015) in his view that it is central that the challenges, contradictions, and tensions that the scientists explore when thinking about commercialization should come to the fore. This is in line with recent calls for the microlevel analyses of the mechanisms underlying AE (Balven et al. 2018).

In order to further our understanding of research commercialization activity from the point of view of individual researchers, we adopt a microlevel perspective to examine the Finnish scientists' perceptions of their relations with diverse stakeholders in AE, with a focus on the early stages of commercialization. By focusing on the early phases of the potential establishment of a university spin-off, we aim to shed light on the preparatory phases leading to the creation of a new venture, the study of which has been a neglected issue in the spin-off literature (Druilhe and Garnsey 2001) as well as in entrepreneurship theory (Phan 2004). Existing studies confirm that the initial development stages of university spin-offs have a critical role in their further development (Vohora, Wright, and Lockett 2004), and thus our research is able to propose ideas for enhancing academic entrepreneurship at its most critical phases. Our research is focused on the formal forms aspectsmanifestations of AE and especially on those commercialization projects in which the end result is expected to be an academic spin-off. For our purposes, we define an academic spin-off as a new firm created to commercially exploit some knowledge, technology, or research results developed within a university (Pirnay, Surlemont, and Nlemvo 2003).

Following Balven et al. (2018), we conceive that the individual faculty members and their perceptions lie at the center of the micro-processes

determining the entrepreneurial act. Drawing on a qualitative methodology, our study examines how Finnish scientists perceive the involvement of various stakeholders at the early phases of commercialization, that is, when exploring the commercial potential of their research and preparing for the potential establishment of an academic spin-off. In particular, we address the following research questions:

- (1) From the point of view of Finnish university scientists, which stakeholder relations seem to be the central ones affecting the research commercialization process before the potential establishment of an academic spin-off?
- (2) From the point of view of Finnish university scientists, what kind of an influence do the central stakeholder relations have on the research commercialization process before the potential establishment of an academic spin-off?

In addition to answering recent calls for adopting a microlevel perspective on AE, we also address the contextual nature of AE by examining it in the Finnish university setting, in particular. Existing research on AE is fairly concentrated on research that is focused on either a US or a UK context. Therefore, the current conclusions may be culturally specific (Hayter et al. 2018). Thus, at this stage of knowledge accumulation, it is important to conduct studies by using data that are gathered outside the US and UK contexts.

Our research draws particular attention to the tensioned nature of stakeholder support and expectations in regards to AE. This article provides an overview of the different stakeholders and their support. The benefits and challenges arising from stakeholder relations are discussed in detail, and we also propose practical solutions for commercialization policies and practices with respect to Finland. Specifically, we propose an integrated view of stakeholders and suggest that a closer collaboration between the different stakeholders in the entrepreneurial ecosystem could help foster academic entrepreneurship.

Finnish Entrepreneurial Ecosystem for Academic Entrepreneurship

The Entrepreneurial Ecosystem

While universities hold a focal role in supporting academic commercialization (Galan-Muros et al. 2017), the support from various other stakeholders is also essential (Perkmann et al. 2013). Academic entrepreneurship evolves at the interface between the university and business, and a consideration of the whole entrepreneurial ecosystem (Mason and Brown, 2014) is hence required to understand the support structures that either foster or inhibit academic spin-offs. The key stakeholders in academic commercialization include, among others, the university, the

national regulatory authorities that develop the academic commercialization-related policies (Perkmann et al. 2013), the commercialization-supporting university departments (Rasmussen, Mosey, and Wright 2014) as well as intermediary organizations (Konttinen, Suvinen, and Nieminen 2009; Suvinen, Konttinen, Nieminen 2010). Before investigating in detail the key stakeholders in AE, it is important to set the scene by discussing the national regulatory environment and its changes.

The passage of the Bayh–Dole Act in the United States in 1980 contributed to significant changes in academic commercialization, as since that time in history, there has been a substantial increase in start-up creation activities, as well as patenting and licensing (Grimaldi et al. 2011). The passage of the Act has been seen as both an outcome of and response to the changing climate, as it enhanced the incentives for both universities and firms to commercialize the knowledge created by their faculty and staff. The legislation instituted a uniform patent policy across federal agencies, while at the same time removing many restrictions on licensing. It also allowed universities to own those patents that arise from federal research grants. (Grimaldi et al. 2011). Additionally, the act also stipulated that researchers working on a federal research grant are required to disclose their inventions to the university (Berman 2008; Mowery et al. 2001).

In the following years, several European (Wright et al. 2008) and Asian (Kodama 2008) countries adopted similar legislation. Finland was one of the late-stage adopters, as in 2007 it underwent a change regarding the ownership rights of inventions created by university researchers. Until that year, the default ownership of inventions by university researchers rested with the individual, commonly referred to as the “professor’s privilege” (Tahvanainen 2009) or the “researcher exception.” However, in 2007, the passage of the University Inventions Act gave universities institutional ownership of inventions made in commissioned research. Moreover, the act sought also to renew and clarify the allocation of rights and obligations between parties, such as faculty, department, and university, in order to promote the recognition of inventions as well as their commercial utilization (Kauppinen 2014).

According to the University Inventions Act, research is divided into two categories, open and commissioned research. The former is performed during employment and as stipulated by the university without the involvement of any external parties. In addition, open research is funded from the university’s own budget or the researcher’s personal grants. In the case of open research, inventors retain the rights to their inventions. However, even in this case, the inventors are obligated to disclose their inventions to the university (Kauppinen 2014). The other category of research, namely, commissioned research, involves at least one party external to the university, for example, an external financier, as well as liabilities that relate either to the research results or how the research is implemented. This means in practice that the university is entitled to acquire the rights to the

invention, while the inventor is entitled to a compensation, for example, in the form of royalties (Kauppinen 2014).

The Reform of the Universities Act in 2010 changed the legal status of universities into private entities, thus giving them more independence with the designing and organizing of their commercialization activities. Consequently, some of the universities have positioned themselves more toward commercialization, making advances in this area with the help of well-functioning processes, while others are slowly catching up. Thus, there are regional variations regarding the strategic choices of Finnish universities in relation to research commercialization (Valtakari et al. 2018).

In the wake of the passage of the Bayh-Dole Act in the United States and the adoption of similar legislation in European and Asian countries, research universities worldwide have established technology transfer offices (TTOs) to manage the commercialization of intellectual property that is owned by universities (Link, Siegel, and Wright 2015). In Finland, the Ministry of Education allocated 10.8 million euros for universities for the period 1999–2003 to be used for the development of both innovation services and research results (Bill on the University Inventions Act 2004). In Finland, the technology transfer offices are usually labeled as offices of “innovation services” or “research and innovation services.” The first TTO was established in 1999 at the University of Oulu, and its primary administrative responsibility was to support services that relate to issues of intellectual property rights (Kauppinen 2014). In Finland, the number of yearly invention disclosures were slightly increased right after the passage of the act, which according to Tahvanainen (2009) might result from the stronger promotional efforts of TTOs and the consequent increase in confidence among researchers. In their promotional efforts, the TTOs emphasized to the researchers that it is not in their home university’s interest to exploit them and make profits based on inventions. However, one of the major challenges regarding the Act was the notion that it still left room for interpretation in the allocation of inventions into invention categories determining the assignment of intellectual property rights (IPRs). Thus, it left the university personnel with difficulties in assigning IPR ownership (Tahvanainen 2009). Moreover, some research has also addressed the possibly negative effects on patenting; Ejerimo and Toivanen (2018) show a drop of 29 percent in patenting by academic researchers in Finland between 2007 and 2010. One of the most pressing challenges of the TTOs is to ensure that their personnel have the required commercial expertise to provide services that are related to the commercialization of inventions in the interface of the university and industry. This challenge is aggravated by problems in recruiting commercial experts because of the high opportunity costs that the appropriate professionals face (Tahvanainen 2009). These costs refer to the notion that the remuneration of commercial experts for assisting research groups in research commercialization efforts is not competitive compared to the salary/remuneration that they might be able to obtain from elsewhere.

In addition to TTOs, universities also comprise other support structures for academic entrepreneurship, including the central university management, departments, research groups, individual researchers, and students (Rasmussen and Wright 2015). Universities can also enhance opportunities for commercialization through the provision of financial support, offering flexibility in licensing terms, and reducing teaching and research loads for scientists involved with commercialization (Galán-Muros et al. 2017). As described by Baglieri, Baldi, and Tucci (2018), universities may also adopt different types of business models to support academic entrepreneurship. The university can also offer researchers incentives, such as allowing them to participate in the transfer activities, to receive monetary gains from the exploitation of their findings (Debackere and Veugelers 2005), or even offering them the possibility of having patents and commercialization incorporated into merit, tenure, and career advancement criteria (Sanberg et al. 2014).

The passage of the University Inventions Act has been seen as encouraging and legitimizing potential academic entrepreneurs who have previously been inhibited by the anti-commercial university culture, to act against conventional academic norms and actively participate in start-up and other economic activities (Tahvanainen 2009). Prior literature has, however, addressed the universities' failures to provide sufficient support. In Finland, for example, the lack of incentives for commercialization within the basic funding of Finnish universities remains a challenge, and many Finnish universities still lack commercialization experts (Valtakari et al. 2018). Moreover, it has been shown that researchers engaging in commercialization can seldom drop out of any of their previous tasks (Ambos et al. 2008). A recent survey from Finland reported the lack of time as the main reason for scientists not becoming involved with commercialization, with difficulties in financing and financial risk as other major inhibiting factors (Nikulainen and Tahvanainen 2013).

In addition to the focal role of universities in academic entrepreneurship, the role of intermediary organizations is particularly important and much used by research-based spin-offs in the early phases of the process. Intermediary organizations include national, regional, and local actors (Ståhle et al. 2004), and they assist science-based entrepreneurs to overcome information and resource asymmetries by providing specialized services. They also play an essential coordinating role, as they forge networks and partnerships among the science-based business community, while at the same time introducing nascent science-based entrepreneurs to more established and influential business mentors, partners, or leaders (Clayton, Feldman, and Lowe 2018). The international ecosystem literature commonly recognizes the following intermediaries: physical space providers (incubators, accelerators, and coworking space providers); providers of professional services; networking, connecting, and assisting organizations; and finance providers (including venture capital, angel investment, public financing, and crowdfunding sources). Physical space

providers help science-based entrepreneurs by giving them access to physical facilities at below-market rates and with preferential terms. The close proximity of nascent entrepreneurs allows for the circulation of ideas. Lately, these intermediary organizations have also started to offer services that aid commercialization, in addition to providing physical space (Phan et al. 2005). The professional service organizations are either public, quasi-public, or nonprofit programs that serve networking support roles for science-based entrepreneurs by coordinating local organizations and programs and serving in agenda-setting roles for policy and practice (Clayton, Feldman, and Lowe 2018). The service firms' role in the development of AE is in vetting proposals for new spin-offs and connecting the spin-off companies' founders to a wider pool of networks, resources, and entrepreneurial support. Such firms have access to specialized knowledge, and they are usually embedded in an existing entrepreneurial community, thus enabling them to serve as a network bridge for new science-based entrepreneurs (Zhang and Li 2010). In the Finnish context, intermediary organizations are predominantly understood to be either publicly owned or semipublic regional companies, nonprofit organizations (Koskenlinna et al. 2005), or privately owned firms (Suvinen, Konttinen, and Nieminen 2010). Approximately a decade ago, it was estimated that there were approximately 80 regional development companies, 22 technology centers (science parks), 70 incubator organizations, and 40 other innovation-supporting organizations in Finland (Koskenlinna et al. 2005). Finnish intermediaries seem to be fulfilling their role in various ways, for example, by specifying the business idea, making necessary contracts, acquiring physical infrastructure, and defining intellectual property protection related issues. These services are also generally available regionally (Konttinen, Suvinen, and Nieminen 2009); however, there are regional and even local variations in operational models and the quality of services (Valtakari et al. 2018). From the point of view of researcher-entrepreneurs, the whole network of many actors can appear slightly fuzzy (Konttinen, Suvinen, and Nieminen 2009).

Finance providers can be categorized into public, nonprofit, and private funding sources, and they can be either local- or national-level operators (Clayton, Feldman, and Lowe 2018). In Finland, innovation and new venture development rely on strong governmental stewardship (Kao 2009), and governmental funding is central in the early phases of commercialization. In Finland, much of this funding is channeled via Business Finland's (formerly Tekes) funding instrument, New Knowledge and Business from Research Ideas (Tutkimuksesta uutta tietoa ja liiketoimintaa TUTL). In the Finnish context, the current TUTL-funding, introduced in 2012, aims at supporting the creation of new internationally competitive growth companies. TUTL-funding helps research organizations prepare for commercializing their research ideas, and thus the funding is targeted at projects involving the preparation for the commercialization of these ideas, such as innovation searches and the determination of customer value.

According to the regulations, TUTL-funded projects need to allocate at least 40 percent of the money to business development activities—the rest of the money can be used for research. Further, intellectual property rights need to be in the hands of the university, and several alternative commercialization routes are to be explored: the beneficiary of the commercialization must not be evident during the project. Once the project ends, the research organization will be able to hand over the rights to the research results to the party in charge of commercialization (Valtakari et al. 2018). However, the use of public financing to boost AE is not just a Finnish phenomenon. The financing gap experienced by university spin-offs all over the world is related to the usually large investments needed at the spin-offs' early stage; in addition, financiers, such as venture capitalists, are reluctant to invest in such projects (Lockett et al. 2002). Because of this gap, public funds have become a crucial source of early-stage funding for academic spin-offs (Rasmussen and Sørheim 2012). Angel funding represents an alternative source of financing, but, because these financiers often invest smaller amounts than more traditional investors, they are in general not the main source of funding for academic spin-offs (Wright et al. 2007). Regarding other available funding opportunities, one of the specific challenges of the Finnish innovation system is the lack of a systematic structure and processes to reach global networks and investors (Valtakari et al. 2018). Altogether, securing funds for one's commercialization is a challenge that many Finnish academics face (Meyer 2005; Nikulainen and Tahvanainen 2013).

The Academics' Perspective to the "Third Role" and Its Requirements

For the individual academic, the act of engaging with commercial activity is not unproblematic. Prior research has shown that balancing between academic and commercial demands poses a great challenge for the academics (Yang, Yang, and Chen 2010; Holloway 2015). Pursuing commercialization while maintaining their academic positions has involved various conflicts, such as the contradicting roles of acting as an academic vs. an entrepreneur, the use of university equipment by the company, the definition of intellectual property rights, and the academic credit challenges resulting from commercialization activities (Tuunainen and Knuuttila 2009). Commercialization can turn into a constant bargaining process between academic duties and business (Palo-oja and Kivijärvi 2015). Addressing the academics' needs is important particularly in Finland because Finnish researchers have been reported to face nearly twice as many challenges as their U.S. counterparts regarding research commercialization. It is the distinctions between academic and commercial worlds that bring the academics face-to-face with contradictory demands. The possible conflict of interest between research and entrepreneurial activities, as well as risk-aversion, constitutes the scientists' reluctance toward commercialization (Ranga, Perälampi, and Kansikas 2016). It is thus important to find mechanisms that foster the maintenance of the

hybrid role identities of business and academia (Rasmussen and Wright 2015) and provide the required support for commercialization.

With increasing pressures for university-business collaboration, universities now confront the questions of whether or not to be involved in academic commercialization and how to support this activity most efficiently (Siegel and Wright 2015). As we can see from the literature review above, the extant research has rather extensively described the macrolevel policies, structures, and procedural mechanisms through which different stakeholders affect academic entrepreneurship. However, to understand the complexities involved in commercialization further, more microlevel analyses are required. Scholars in our field have called for more analyses from the scientists' perspective (Grimaldi et al., 2011; Guerrero et al., 2014; Holloway 2015; Balven et al. 2018).

In this article, we wish to integrate the stakeholder perspective with a microlevel analytic lens. First, we approach academic entrepreneurship from the perspective of the entrepreneurial ecosystem and wish to shed further light on the issue of how diverse stakeholders become involved in supporting the birth and development of academic spin-offs/commercialization projects. Our focus will be on the early phases of commercialization. Second, we examine the issue from the perspective of academic scientists, focusing on how they perceive their relations with these different stakeholders. While the extant literature has provided a relatively well-founded picture of the key stakeholders and the typical barriers to academic commercialization, the novelty of our study is that it focuses on the stakeholders' influence and role as perceived by the academic scientists.

Methodology

Data Collection: Internal Development Project and Qualitative Interviews

The qualitative data for this study are derived from twenty thematic interviews of a Finnish university's scientists who have been involved in the process of seeking to commercialize their academic knowledge. In the following, we provide some background information regarding the chosen university and the way it supports the entrepreneurial activities of its researchers.

The university in question is one of the thirteen Finnish universities. The research activity of the university is among the top three percent of all universities in global rankings. The university supports the entrepreneurial activities of its researchers in, for example, the following ways. First, its TTO, which goes by the name "Research and Innovation Services," offers services in funding, innovation, and research. The main task of innovation services is to support the commercialization of research results and advise in intellectual property rights matters. Regarding the TUTL-funding, "Research and Innovation Services" proactively informs researchers about the application periods through visible campaigns. It

also offers multi-stage coaching for the interested project teams in order to help them succeed in securing the funding. Regarding other funding sources, the university has itself established a financing company in order to support the start-up of research-based businesses. As a part of the its engagement to foster AE, the university has established an in-house company with other local partners in order to support the creation of successful startups including research-based ones. The in-house company offers, for example, entrepreneurship-related courses, pre-incubator and incubator services, and networking events.

The interviews for this study were conducted as a part of the university's internal development project. The project aimed at advancing the commercialization process of the university's research-based business ideas and entrepreneurial attitudes and competences, as well as fostering a university-industry collaboration. The internal development project is one example of the proactive means through which universities aim at fostering academic entrepreneurship. The project was funded by the "Innovation Scout" funding established by Business Finland (formerly Tekes) in 2015. "Innovation Scout" funding is directed to organizations, and its task is to build the higher education institutions' and the research institutes' capacity and tools to increase innovation and international-level, high-growth entrepreneurship (Valtakari et al. 2018).

All three authors of the article were involved in the project, taking part in activities, such as organizing networking events for the commercialization teams, benchmarking the commercialization processes and practices of other universities, and collecting a pool of external mentors. We were also responsible for collecting the university's scientists' experiences with commercialization for the purposes of helping to evaluate and develop the university's commercialization services during the project.

We collected the academics' views through personal interviews. All interviewees gave their consent for their interviews to be used for research. In the interviews we were seeking primarily to determine what kinds of stakeholders have been involved in the scientists' commercialization processes, how the scientists have experienced these stakeholders, and what the possible pitfalls have been in their commercialization processes. More specifically, the interviews covered issues from the formulation of a business idea to funding, the use of commercialization support services/stakeholder relations, building the entrepreneurial team, and the status and prospects of their business and commercialization path. The outline of the thematic interview remained the same for all interviewees. However, the interviewees were allowed to depart from the outline, and the interviewer was also free to pose ad hoc questions in case relevant new topics were raised during the interviews. By using this protocol, we wanted to assure the free flow of storytelling (Czarniawska 2004). The interviews lasted from one to two hours, and they were tape-recorded and transcribed. During the first interview, all three authors were present and acted as interviewers in order to become familiar with the thematic interview

outline and to assure its functionality. The remainder of the interviews were conducted mainly by only one of the authors.

In developing the sample, we relied on the university's TTO personnel's expertise regarding existing cases of research commercialization. The interviewees represent differing fields of research, covering areas such as chemicals, computer sciences, and humanities. Thus, we have explored the commercialization of academic research from multiple points of view, instead of limiting our research results to apply only to a particular field. The interviewees were at different stages of commercialization. Some had already set up spin-off companies, while others were participating in university projects at an exploration phase. Some of the ongoing university projects had received government commercialization funding. In a couple of cases, the exploration phase had resulted in the decision not to continue with commercialization. Altogether, twenty academic scientists were interviewed. We thus have a rich dataset regarding the perceptions of scientists with different types of commercialization paths and experiences.

Data Analysis

We conducted a qualitative content analysis of the entrepreneurial ecosystem, with a focus on the scientists' experiences with diverse stakeholder relations. In our content analysis we used an abductive strategy (Coffey and Atkinson 1996; Levin-Rozalis 2004; Morgan 2007). According to this strategy, we moved back and forth between data observations and prior understanding based on our theoretical framework (Coffey and Atkinson 1996). The data analysis involved three major steps. First, we mapped all the diverse stakeholders that appeared in the interviews. These included the commercialization team, the university (university management, TTO, department, department head, colleagues), external stakeholders (TUTL steering-committee members, angel investors, government funder representatives, mentors, professional business advisors, pilot customers, local accelerator), and informal stakeholders (family, friends). At this stage, our dialogue between data and theory refers to the fact that during our analysis process we were guided by extant literature on stakeholders involved in research commercialization.

Second, we focused on the most frequently mentioned stakeholders in the interviews, the so-called key stakeholders, by examining how the scientists perceive their relation to these stakeholders and how the academics perceive the contribution of these stakeholders to the commercialization process. In order to deepen our understanding of the influence of these key stakeholder relations on the commercialization process, our data analysis was at this stage guided by Balven et al. (2018), who identify three levels of micro processes affecting academic entrepreneurship. These include factors that are intra-individual, relational, and organizational. We discovered that the three-level model helped us to explain how the scientists' in our dataset made sense of their commercialization and the stakeholders involved. According to Balven et al. (2018), the

intra-individual level incorporates cognitive or affective phenomena that could influence AE behavior. It includes the researchers' entrepreneurial identity as well as the motivation of both researchers and TTO personnel to engage in research commercialization. At the relational level, micro processes reflect the interaction between individual researchers and other individuals, such as TTO personnel and the department. This may include for example TTO communication and educational campaigns, interpersonal and informational justice (i.e., being treated with respect and having access to complete information), and the departments' ability to champion commercialization. At the third level, micro processes are associated with how organization-level factors such as a university's technology transfer policies affect individual researchers in their research commercialization process. This level includes distributive and procedural justice (i.e., fair compensation and treatment), deontic justice (benefits to society), and sustaining work-life balance (Balven et al. 2018).

The third step in our data analysis refers to the point in which, based on the analysis of the micro processes within the stakeholder relations, we ascertained that each stakeholder relation involves both benefits as well as challenges. We thus further organized the data into these two major categories, examining either the positive or the negative contribution of the key stakeholder relations in regards to the commercialization of research.

Research Findings

In the Finnish academic context, we describe the early-stage academic entrepreneurship ecosystem as it appears from the perspective of the academic/stakeholder relationship. From the point of view of individual Finnish researchers, the key stakeholders relations affecting the research commercialization process at its early stages are the ones involving the following stakeholders: the commercializing team, the university's innovation services/TTO, the university's departments, business advisors and mentors from public and private sector organizations (including consultants, the TUTL-steering committee members, and the experts working in incubator/accelerator programs), the government's funder/its representatives, and business angels. The study illustrates the contradictory nature of the stakeholder relations. In the following, we first describe the perceived benefits from these stakeholder relations and then discuss the challenges involved in these relations. The micro processes of AE are incorporated within the benefits and challenges.

Key Benefits

Igniting the Motivation for Commercialization

The intra-individual micro process of motivation is clearly affecting the relationships between scientists and stakeholders. In the context of AE the micro process of motivation refers to the impetus for individual

researchers as well as individual stakeholders, such as TTO personnel, to engage in AE efforts (Balven et al. 2018). The emotional and knowledge support particularly from the university's innovation services and different mentors or accelerator programs proved significant. In many cases, these external stakeholders turned out to be the people who first enabled the initiation of commercialization. According to the interviewees, the TTO campaigns (yearly campaigning about the possibilities to apply for government funding to turn one's academic ideas into business) and other events organized by the TTO were instrumental in igniting the motivation to examine the possibilities for commercialization. For example, one of the scientists commented on the initiation of their commercialization in the following manner:

It was some event where the university's innovation officer dragged me into.

The TTO in our study also had the habit of organizing events to which private consultants of particular fields had been invited. In some cases, the persistence of these experts was the key driver for igniting the motivation to apply for the TUTL-funding. In the following quote, the scientist emphasizes the role of the consultant by relating it to the micro process of identity that refers to asking the question "Who am I?" This question is especially important in the context of AE as scientists have many different roles: faculty member, researcher, inventors, teacher, entrepreneur (Balven et al. 2018). In the following quote, the micro process of identity is visible as the scientist admits that, as an academic, it would be easier to settle with the traditional research and teaching:

(The consultant) was so assured (of our commercialization potential) that I even had to interrupt my summer holiday and come here to the office (to write the funding application for commercialization). It was because of that consultant's persistence. Because it would be easier for an academic to just stay with his/her academic duties of writing articles and supervising doctoral dissertations.

In addition to having a crucial role in the starting stage of the commercialization process, the TTO personnel's catalyzing effect was perceived important at later stages as well. For example, the motivational support given by the TTO personnel is illustrated by the researchers' statements asserting that they were "motivated" or "slightly pressured" by the innovation officer to take care of the "unpleasant" activities involved in the commercialization process:

(The innovation officer) kicked us forward in a motivated way [. . .] also that, kind of a slight pressure [. . .] especially in such

unpleasant issues as, for example, IPR-related matters or the freedom to operate for related bids [. . .].

Offering Commercialization Expertise

In addition to igniting the motivation for research commercialization, the private consultants also assisted the research teams in certain early-stage activities, such as in the drafting of the governmental funding applications. Thus, they represented the type of commercialization expertise that the TUTL-funding was seen as requiring from the teams. In the following quotes, the private consultants' knowledge support and expertise is contrasted with the academic identity and its lack of commercial expertise:

[. . .] and we had a good situation in the sense that (the private consultant) was along for the whole process, and so he/she helped us also with the drafting of the application. Just that commercial mumbo jumbo that we do not possess...this is our science, we are good with it [. . .] and then someone (the private consultant) comes to tell us that we have a market segment worth billions.

[. . .] and of course one of the requirements of this (TUTL) project is that there is someone who has commercial expertise, as well [. . .] (the commercial expert) is able to look at it from differing angles, and this has opened our eyes regarding the understanding of how we should really communicate with the outside world about these things.

Trustworthy Knowledge Support

The micro processes of informational and interpersonal trust in relation to the people at TTO clearly affected the commercialization process. In the context of AE, informational trust refers to answering the question of whether scientists perceive that they have received both complete and timely information from stakeholders involved in the commercialization process. Interpersonal trust, on the other hand, refers to answering the question of whether scientists perceive that they are treated with respect as well as dignity when interacting with stakeholders involved in the commercialization process (Balven et al. 2018). In our data, the scientists emphasized that they “were able to ask stupid questions” and pointed out that the TTO personnel did not use “jargon” when interacting with them. The scientific background of the innovation officers was seen to affect their trustworthiness positively, as the interviewees expressed that the officers’ “way of doing things is very research-like” and that, thus, they are trustworthy. Additionally, the regular communication and face-to-face meetings were seen to increase the researchers’ trust in the innovation officer:

[. . .] and we were able to ask (the innovation officer) stupid questions and ask many times too [. . .] (the innovation officer) has given the impression that he/she is trustworthy [. . .] that regular communication and face-to-face meetings, every once in a while, increased trust, we learned to trust (the innovation officer) and understand [. . .] (the innovation officer) doesn't use jargon, but will, without asking, open and explain what such and such means [. . .] (the innovation officer's) way of doing things is very research-like, and thus we trusted him/her when he/she said that these are the realities.

The motivation of the innovation officer to support the researchers was also addressed during the interviews. The scientists appreciated the fact that, even after the IPR issues between them and the university had already been resolved, the innovation officer informed them about relevant events and funding opportunities. In other words, the scientists appreciated the fact that the innovation officer seemed to be intrinsically motivated to support them:

(The innovation officer) still informs us regularly by email, like "Hi, have you noticed this?" It might be about funding-related stuff, like funding for startups and such, or about some events [. . .]. One has to appreciate that [. . .]. You see, the university does not actually profit from us anymore.

The interviews also clarified that physical distance affects the supporting role of the TTO. Those researchers who were physically situated near the innovation officer mentioned that this proximity made it easier to reach out for help:

Interviewee: (The innovation officer) had his/her office on the same aisle, just one floor upper, so we regularly met each other.

Interviewer: So, the close proximity also is meaningful in this case, in practice?

Interviewee: Yes [. . .] you are able to quickly visit if there is something that you need to sort out.

Fair Handling of IPR

The researchers also referred to the central role of the TTO in handling issues related with intellectual property protection. They acknowledged the support that they had received in this area from the innovation officer. This support illustrates the micro process of procedural justice with reference to answering whether the researchers perceive that they are being treated in an unbiased and consistent manner (Balven et al. 2018). In our

data the micro process of procedural justice is visible as the researchers stated that they were being treated in an unbiased manner:

In my opinion, (the innovation officer) produced a very good and fair end result.

Educational Support

All things considered, the university's innovation services clearly comprised more than just the handling of the IPR. Their hands-on approach supported the researchers along the commercialization process. The TTO and the university's innovation services were typically considered to be the most important sources of support. The educational elements provided by the TTO were identified as some of the most central arenas through which the scientists received information about commercialization. For example, the commercialization clinic (intensive training programme for teams applying for commercialization funding from governmental programs) run by the innovation services was considered to provide just the right kind of help with applying for funding and pitching. The researchers also mentioned the decisive role of the clinic in securing funding:

Of course during the clinic, you see, at that time, the two most important things were the application for Tekes and pitching, and we were given practical tips regarding both of these.

In my opinion, the clinic was really good and definitely important. Without it (we) probably would not have received a positive decision from Tekes.

The local accelerator/incubator was also seen as an important collaborator and stakeholder, especially with regard to educational support in the form of developing one's business plan, creating marketing materials, and networking. One of the specialties of the local accelerator/incubator was providing coaching on pitching. The researchers found this coaching helpful in terms of clarifying the business idea:

[. . .] in my opinion, (they) gave us good ideas regarding pitching. It was helpful and, compared to other things, we were seriously concentrating on issues, such as our problems with this issue, which was a bit unclear at the moment.

“Risk-Free” Exploration of Commercialization

Naturally, through its TUTL-funding, Tekes (currently Business Finland) had a central role in supporting the teams financially. First, the scientists appreciated the fact that the financial support provided by Tekes offered them the opportunity to explore commercialization to an extent that

would not have been possible, had they had to resort to their own financial resources:

[. . .] if we had had to do this with our own money, well, it could be that at some stage we would have had a tighter focus; you know, the 1.5 years that we had the TUTL project, we were traveling a lot, really conducting market research, taking an active part in fairs [. . .], so many things would not have happened, you know, it's not cheap to travel and visit international fairs.

Thus, according to the researchers, their entrepreneurial commitment is positively affected by the financial support of the governmental funding agency:

Well, it was probably the best feature of TUTL that it is kind of quite versatile, And we were able to experiment, pilot with customer [. . .] in my opinion, the Tekes-project was good in the sense that it kind of eased the transition of becoming entrepreneurs.

[. . .] but of course, the TUTL-funding was rather decisive in the sense that, with it, we dared to take the step of establishing the business.

Emotional Support

As our key unit of observation was an individual researcher involved in the commercialization process of academic research, we were able to pay attention to the relationships among the members of the commercializing team. The interviews revealed that the commercializing process is mainly initiated by individual faculty members who then gathers a team around them. With this in mind, the other team members represent the stakeholders of the originator of the commercialization process. In the following quote, the originator of the commercialization process talks about the emotional support and entrepreneurial commitment of the team members:

Probably, it was the excitement and the fact that we were constantly on the same line. We had a really good team; we encouraged each other. Everybody was ready to work extra and participate.

To summarize, the stakeholder relationships offer scientists a variety of benefits that support their commercialization process at its early stages. The role of the university's TTO seems to be especially crucial. The scientists acknowledged that the innovation officer has not only ignited the commercialization process in many cases but has also offered them trustworthy informational support and a fair handling of IPR-related matters, while also arranging for them the type of educational support that has

helped in securing the governmental funding for the commercialization. The TTO has also arranged for business consultants to provide commercialization expertise to the scientists. The governmental funding agency was acknowledged for offering the scientists a “risk-free” opportunity to explore commercialization, which in turn was seen to have eased the transition to becoming an entrepreneur. The scientists also brought up the role of the team in offering emotional support.

Key Challenges

Contradictory and Ambiguous Stakeholder Demands

First, the scientists raised concerns over the contradictory expectations from the university and the governmental funding agency. As one scientist commented: “The funding agency does not require publications, but our university does.” The scientists found that the publication demands conflicted with their entrepreneurial aims, and they had trouble coping with the time-allocation for different tasks. Thus, according to the researchers, these stakeholder relationships are affected by the micro process of role balance that in the context of AE refers to the question of whether researchers believe that they have appropriate work requirements relative to responsibilities that stem from other work duties (Balven et al. 2018). The researchers experienced role conflict as they expressed pressure related to their academic role and pressure associated with their entrepreneurial role (for the definition of role conflict, see Kopelman, Greenhaus, and Connolly 1983). The scientists also voiced their uncertainty regarding the university’s stance on commercialization and called for the university to clarify its objectives:

(We need) to have that signal from the university: what does it want from us? Does it want us to do these things? Does it want us to set up a company? If so, on what terms, and does the university think that it is a good thing? Does it want to revive the companies in this area or not?

For our research participants, the university appeared to be a stakeholder that prioritized academic merits and traditional activities. In this situation, the benefits from taking part in academic commercialization remained unclear. The scientists were hoping to receive clearer roadmaps for pursuing commercialization and understanding its role in the university’s strategy. For example, the university’s human resource policy appeared to be a mystery, making the interviewees insecure about whether or not it was possible to “allocate your working time on preparing for commercialization.” One interviewee described how the university seems to “operate in a bubble,” referring to the idea that the university does not take the need for industry collaboration seriously enough.

The academics raised concerns over the uncertainties and contradictions related to balancing the university's requirements with those of the governmental funding agency. The next two quotes by one scientist raise concerns for what the Business Finland funding aims at:

The TUTL-project is not supposed to aim directly at company establishment, yet it would be good if it leads to the formation of a company. So, you can't directly say.

What are we allowed to do?

Bureaucracy and Sufficiency of Governmental Funding

In Finland, governmental funding instruments supporting the commercialization of research results are pivotal at the early stages. However, the scientists were conflicted over the terms of the funding, and they reported having to struggle with the funding terms. One of the scientists expressed the following:

I have mixed feelings. It was good money. I felt the funding instrument was handicapped. There was red tape around it.

Bureaucratic practices slowed the processing of purchase decisions, and the scientists felt there were too many restrictions. One interviewee explained how the projects receiving Business Finland funding were expected to have a steering group but that paying the members of the steering group was not possible under the funding terms. This was seen to affect the "quality" of the steering group:

We had to have a steering group, but we were not allowed to pay them. So, we couldn't get anyone decent.

The scientists also noted a stark contrast between academia and business when explaining the bureaucracy related to the process:

We couldn't really do anything with the money. I wanted to make decisions on how to use the money. I feel like we were held back by the process. It wouldn't happen in business. Someone would make the decision.

Some of the interviewees also stated that the governmental funding is not sufficient in regard to its aims of creating global businesses:

I think that, yeah, we can [. . .] get the basics, and what we have promised on here, but [. . .] I think that it could be very good to have another commercialization considering the internationalization.

It's not enough. Like one year and a half is not enough for this kind of work.

Lack of Business-Specific Support and the Question of Its Timing

The scientists also expressed their frustration over standardized solutions, and they felt that stakeholders did not share their interpretation of how commercialization should be conducted. According to our research participants, the standardized commercialization strategy offered by certain stakeholders (for example, the local accelerator/incubator) was not compatible with all kinds of business ideas. One scientist explained this in the following way:

There's one commercialization strategy—it's very strongly, like, directed at consumer-markets-based business. For example, it fits that entertainment-type of software business. Like, you start building the hype [. . .], create excitement in the markets [. . .]. Like, repeat it over and over again [. . .]. Like, (our) markets are that much conservative [. . .]. Like, we do not approach consumers, and so that kind of a commercialization strategy is not the right kind of approach in our case.

Some of the scientists also voiced that, instead of public coaching events in which there are other commercialization projects present as well, they would rather have individual coaching:

[. . .] others were quite good, but then on the other hand, we lost a lot of time as we had to listen to the “twaddle” of others as well; like, if we would have had more individual coaching, we would probably have gone there more often [. . .]; like, when you just need help with your own thing for a specific issue, you are not really interested in other cases [. . .]; like, we would mostly need individual coaching.

The research participants also felt that the current support structures both within and outside the university were still limited in terms of their ability to provide access to networks and mentors who would be able to understand the academic starting point of their commercialization projects. In the following excerpt, a researcher voiced frustration over the fact that the personnel of the local enterprise agency were unsure about who could coach the team, as their team's business idea with its academic background was seen to be “*so strange and new*”:

Interviewer: What about the help from the local enterprise agency at that stage?

Interviewee: Well, not helpful, like I have to say that our case was kind of like so strange and new for them, as well, it was like, “Should we usher them to this or that person?” Like, “Who could coach them?”

The lack of mentors and experts with scientific background was considered a crucial issue. The scientists hoped that the university would have a wider pool of mentors to offer. Moreover, gaining access to international networks was considered difficult. Additionally, the university’s innovation services were considered to be insufficient in providing industry-specific commercialization support. Altogether, the scientists also expressed a need to receive more education on starting up a business, being an entrepreneur, seeking seed funding, and making international connections. Team building and team leadership were key challenges for which they hoped to receive help.

The researchers also brought up the timing of business-specific support. The coaching related to the establishment of the spin-off felt somehow distant if the coaching occurred before the researchers were actually about to establish the spin-off:

[. . .] like, every once in a while, I feel like we need the basics [. . .], like, what are these numbers, and where do they come from; like, what kind of business forms are there and other stuff. But, yeah, given that, like, I would think that the timing was not for us [. . .], like, it was somehow a bit distant because it was during the project [. . .].

Transparency: How to Negotiate IPR?

Some of the scientists also commented on the university’s lack of transparency at a processual or policy level. From their perspective, the handling process of intellectual property rights seemed “unclear”:

It was really unclear like what kind of demands the university has regarding our spin-off. Like, if we will establish the business, like all these rights and these, like there was no clear agreement draft.

The above quote illustrates how the micro processes of distributive and procedural justice (Balven et al. 2018) affect the commercialization process. In the context of AE, distributive justice refers to the question of whether researchers believe that they are being compensated or recognized fairly. Procedural justice, on the other hand, refers to the question of whether researchers perceive that they are being treated in an unbiased and consistent manner by stakeholders involved in the commercialization process (Balven et al. 2018). According to our data, researchers perceived that the universities’ compensation and the treatment received from the university and TTO were inconsistent and unfair. Some researchers also

expressed their disappointment over how the ownership had been agreed upon:

I still have a very big issue with this intellectual property, that we have to surrender everything to the university, and I think that's really quite inappropriate.

Challenges Related to Entrepreneurial Commitment

In the relationships within the commercializing team, there were tensions related to the entrepreneurial commitment level of individual team members. These differences affected the process of selecting the ones who would be allowed to join the business that was expected to result from the commercializing efforts. The scientists pointed out that not all team members were seen to be equally committed to the project, even though "everybody" wanted to join the business. These situations led to "tough discussions" and "painful" situations:

Interviewee: [. . .] we had quite tough discussions during the (TUTL) project regarding who will join the business, or who will be taken into it [. . .].

Interviewer: I remember that Toni mentioned in the video (that he did for another university course and in which he told the story of their commercialization process) that it was not painless [. . .].

Interviewee: No, you see, everybody wanted to join the business [. . .] and there was also the question of the level of commitment to the project; some (of us) just worked around the clock during the project, and some, let's say, from nine to four, and after four o'clock, they were not interested in (working anymore).

Finding the courage to commit to the commercialization appeared central. Our interviewees stated that compared to the "safety net" provided by the university and the potentially high level of wages that the university offers for university professors, the uncertain financial income that results from the decision to become an entrepreneur creates a challenge for academics. Within the commercialization process, the entrepreneurial commitment of individual researchers is crucial, as it affects the decision of who will be on the board of the spin-off, or whether there will be a spin-off, in the first place:

Well, kind of the idea of jumping out of the university, when you have been working in there for a long time, that means that you will lose that safety net when you decide to become an entrepreneur. And you kind of need to take a loan in order to pay your

shares [. . .], and what if it doesn't work out; and like, that is, in my opinion, the most challenging personally.

I don't think that anyone thinks that I, he, or she will become an entrepreneur. Would it be worth it for you to become an entrepreneur, when you would earn six thousand euros a month anyway?

Last, the concept of entrepreneurial commitment also sheds light on the challenges involved in the relationships between scientists and the commercialization experts. According to our research participants, the best possible case would be that the commercialization expert who joins the team during the commercialization project would also join the established spin-off. As in the case of individual scientists, the individual commercialization experts were, however, also forced to consider—based on their own financial situation—the decision of whether to join the academic spin-off or not:

In my opinion, the best possible scenario would be that if the project team involves a commercialization expert, like we had, who got a very good job offer half a year before the end of the project and, at that time, we had discussions about what we could offer for him/her. You hit the realities of life. Like, if you have kids who you need to support, and you have at one end of the scale a good and secure monthly salary and at the other end of the scale a startup, even if the latter would be a tempting option, the uncertainty meant that he/she could not choose us. The best possible scenario would have been that the commercialization expert would have joined us in some way.

Coexistence of Academic and Business Orientation

The coexistence of an academic and a business orientation in academic entrepreneurship creates challenges and tensions. First, individual scientists have different motivations for engaging in commercialization efforts, as the creation of social good might override the assumed quest for financial success. In the relationships with stakeholders, this in turn may create tensions regarding the offered model for commercialization:

I have pondered many times that I see commercialization much wider than how, for example, the Tekes applications express it, or the local accelerator/incubator expresses it. Like, I feel that they far too easily put it in a certain process model, and for us, also based on our background, we see commercialization in a much more humane way. Like, we don't think about it from the point of view of money or some models, or business purpose, but rather, like there are people who have needs like we have, and we could together create new needs and ways how to fulfill them.

The coexistence of both an academic and a business orientation also creates challenges among the members of the commercializing team. For example, these challenges were expressed in discussions that revolved around the issue of who should be allowed to join the soon-to-be established academic spin-off. In the following excerpt, the originator of the commercialization process pointed out that not all academic team members understood the basics of entrepreneurship and the notion that the future owners of the spin-off should share a common vision of its future. Because of that, not all academic team members were allowed to join the established spin-off. This led to resentment on the part of some of the cast-off team members:

What is entrepreneurship? How does one build a business? Our team did not have an understanding of it, and then this had very dramatic and unpleasant consequences [. . .]. And finally I came to the conclusion that I just need to do this: I had to take on board those who shared with me the same vision, and that apparently lead to resentment [. . .].

Trustworthiness of Stakeholders

The scientists also voiced their concern regarding the trustworthiness of certain stakeholders, thus explaining their relationships with these stakeholders in the light context of interpersonal trust. One of the interviewees recited an incident where a commercialization expert they made contact with through the TTO turned out to be “a fraud”:

One commercialization expert was a total “fraud.” (This person) had deceived us about everything [. . .], had “badmouthed” us and our experts to (other parties). He/she wanted to establish the spin-off with (the originator of the commercialization process) alone [and] never did practically anything that was supposed to be done [. . .].

The lack of interpersonal trust was also related to the TUTL steering group. In the following quote, one scientist implies that there is a need to guard the commercial secrets from being shared with the TUTL steering group, as the group includes representatives of companies that might “steal the idea”:

[. . .] like, these are so secret things that we won’t even reveal what we do in there. Like, we can’t even necessarily mention these things to the steering group either, because there are representatives of companies in these groups. And even though they have signed agreements [. . .], if they think that this is a really good thing, they would go home and do it themselves.

To summarize, while acknowledging the benefits involved in the various stakeholder relationships, the scientists also voiced their frustration with certain challenges. To begin with, the academics experienced role conflict, as they felt that their academic role was incompatible with the pressures that arise within their entrepreneurial role. Further, the scientists were conflicted over the terms of the governmental funding. They also voiced their concern over whether the funding was sufficient in regards to its aim of creating a global- scale business. The scientists were also frustrated with the stakeholders' lack of understanding of their academic orientation and unique needs. Some of the scientists were dissatisfied with the university's IPR-related policy and its lack of transparency. The financial safety provided by the university was also seen as creating a challenge for entrepreneurial commitment, as it significantly increased the opportunity costs involved in entrepreneurship. Regarding the commercializing team, both the co-existence of academic and business orientation, as well as differences in the level of entrepreneurial commitment, created challenges among team members that affected the commercialization process. Finally, the scientists were also voicing their concern regarding the trustworthiness of certain stakeholders, such as certain commercialization experts and members of the TUTL steering committees.

Discussion

In the Finnish context, our study describes the academic entrepreneurship ecosystem as it appears from the perspective of the academics and their relationships with the stakeholders involved in the commercialization process. Through our qualitative analysis, we attempt to shed some light on the “human dimension of AE” (Balven et al. 2018) and thus contribute to the microlevel understanding of AE from the perspective of the entrepreneurial ecosystem and stakeholder relations. We portray both the Finnish AE ecosystem's benefits and the challenges that academics wishing to commercialize their ideas are faced with.

As our study illustrates, the stakeholders' “pull effect” is particularly significant, as it initially mobilizes the commercialization exploration phase. This effect is crucial in the Finnish context where the researchers experience more reasons not to participate in commercialization than they do in some other countries, especially in the United States (Nikulainen and Tahvanainen 2013). The motivational support of the university's TTO, including the encouragement from invited commercialization experts, is of great importance. Finnish researchers are indeed quite willing to commercialize their research, but they suffer from pronounced passiveness related to the actual implementation of their intentions through specific action (Tahvanainen and Nikulainen 2010).

Our findings also point to the hands-on support of the TTO. Prior research has emphasized that TTOs are currently expected to go beyond the protection of intellectual property to support the actual commercialization

process and entrepreneurship (Siegel and Wright 2015). Our study indicates that in the Finnish context, the universities TTOs are on the right path: the university's innovation services had the ability to provide extensive, hands-on support during the commercialization process, thus signaling its competences and preparedness to act as a key stakeholder in the early phases of academic entrepreneurship. According to the scientists, one of the key contributions of the TTO was the assistance in accessing financial resources through the intensive training program. Thus, our findings confirm the current role of TTOs in enabling faculty members to access critical resources, expertise, and support in the commercialization process (Clarysse and Moray 2004; Colombo and Delmastro 2002; Markman et al. 2005; Siegel, Waldman, and Link 2003).

According to our findings, the governmental funding agency was also seen as a beneficial stakeholder during the early phases of research commercialization. This is no surprise, as public funds have become a crucial source of early-stage funding for academic spin-offs worldwide (Rasmussen and Sørheim 2012). The governmental funding agency was acknowledged for offering the scientists the “risk-free” possibility to explore commercialization, which in turn was seen to have eased the transition to becoming an entrepreneur. Thus, our findings do seem to confirm that the governmental TUTL funding is succeeding in its aim of supporting the creation of new companies (Valtakari et al. 2018).

In addition to the above discussed benefits of certain stakeholder relationships, the scientists also brought up several challenges and tensions involved in the Finnish AE ecosystem. Coping with different stakeholder expectations is a significant problem and a major stress-factor for the scientists, as this issue can delay time-to-market or even kill the whole commercialization process. Based on our findings, we indicate several areas where the ambiguities surrounding academic commercialization could be resolved. Therefore, we wish to outline some suggestions on how the stakeholder relations and the involvement of certain stakeholders in the AE process could be improved.

To begin with, the contradictory and ambiguous demands posed by the university and the governmental funding agency resulted in role conflict among the scientists, as they felt that their academic role was incompatible with pressures that arose within their entrepreneurial role. Our study shows that the “conflict” between academia and business, so often reported in studies on academic commercialization (e.g., Tuunainen and Knuuttila, 2009; Ranga, Perälampi, and Kansikas 2016), persists. These findings are relevant for university policies. This study invites the Finnish university in question (as well as other universities) to evaluate its ability to create a supportive atmosphere for entrepreneurial activity (Ambos et al. 2008). The findings also give us reason to believe that resolving the time-allocation strain of scientists who are interested in commercialization is key to bridging the gap between academia and business. Moreover, the academics' involvement in commercialization could be supported

by increasing the transparency of the commercialization process and the university policies regarding the ownership of intellectual property. This is ever more important as the University Inventions Act itself has left room for interpretation in the allocation of inventions into invention categories determining the assignment of IPRs (Tahvanainen 2009). As to IPR-related matters, we admit that the role of the TTO is arguably critical yet challenging because the TTO has to operate as a dual agent for university academics and university management (O’Kane et al. 2015). Our notion of the importance of increasing the transparency of the university policies regarding the ownership of intellectual property is in line with the remarks of other scholars, who note that university management is able to improve the academic-TTO engagement by promoting an entrepreneurial culture with transparent regulations around IPR (Debackere and Veugelers 2005; Tartari, Salter, and D’Este 2012). Additionally, we suggest that universities pay attention to the background of the TTO personnel, as our findings indicate that the scientific background of TTO personnel enhances the researchers trust in the role of these individuals as academic agents interested in research commercialization. However, we do not imply that the commercial skills of TTO personnel are to be overlooked; existing research has indicated that the broad-based commercial skills of TTO personnel enhances the formation of academic spin-offs (Lockett and Wright 2005).

The scientists also brought up the contradictory role of the team. On the one hand, the team was an important source of emotional support, but on the other hand the team members’ different levels of commitment and expectations for the commercialization caused friction. Academic spin-offs in general are typically operated by teams, not by individuals (Bonardo, Paleari, and Vismara 2011; Mustar and Wright 2010). Thus, our findings are in line with the notion of the significant role of teams in AE, but they also confirm the need for more research on the exploration of team functioning—a stream of research that is in its infancy in the context of academic spin-offs (Nikiforou et al. 2018). The requirement for academic spin-off teams to be able to combine the scientific world and the business world is likely to create disagreement among team members regarding the team’s vision, strategy, and day-to-day operations. The balancing of these two distinct worlds can lead to communication and collaboration problems among team members (Nikiforou et al. 2018), which was the case in our study as well. This points out the need for more support in team-building during the commercialization process. Moreover, future research could explore, among other things, the significance of the team members’ emotional support for the success of AE endeavors.

Our research results also indicate that “standardized” strategies for commercialization fail to take into account the fact that individual researchers may have different motivations for engaging in commercialization efforts. As the “standardized” models are generally based on the quest for financial success, they do not cater to the needs of researchers

to whom the creation of social good is a priority. Therefore, the standardized commercialization strategy offered by some stakeholders—for example, the local accelerator/incubator—was not seen to be compatible with all kinds of business ideas, especially in cases where the creation of social good was acknowledged to override the assumed quest for financial success. This is in line with the extant research results of, among others, Tahvanainen and Nikulainen (2010), who found that the drive to have a beneficial impact on society is among top motives to commercialize research among Finnish researchers.

Thus, following the suggestions of Tahvanainen and Nikulainen, we urge universities to consider the different motivations of researchers when creating incentive systems for them to commercialize research, as the purely monetary compensation schemes do not seem to fit the most pressing motives of researchers. The researchers' demands for such networks and mentors who could understand the academic starting point of their commercialization projects can also be understood to be in line with the notion of the noncommercial motives of researchers engaging in research commercialization. Thus, we suggest that universities pay closer attention to locating and inviting into their network of mentors those commercialization experts who understand the point of view of academics, for example, those experts with the appropriate academic background. This suggestion is directed at the global audience, for based on the problem-driven nature of academic discovery, the share of academic entrepreneurs who are driven by nonpecuniary motives is probably more prominent than our theories have allowed (Wright and Phan 2018). Our findings also point to the dissatisfaction among researchers toward generalized support offered by certain stakeholders, for example, the local accelerator/incubator. On one hand, this relates to the researchers' demands for industry-specific support. We argue that it may probably not be possible (nor do we think it is necessary) to provide tailor-made commercialization support to each sector/discipline. Instead, we propose that academics should be even more involved in the process (discovering themselves rather than being told how to commercialize). The stakeholders serve as discussants and coaches with whom the scientists can themselves discover how business planning tools and commercialization models can best be customized to their specific scientific field or industry. We suggest that this be achieved through deeper collaboration between the university and local development organizations.

Regarding governmental funding instruments, the scientists were conflicted over the terms of the governmental funding. They also voiced their concern over whether the funding was sufficient regarding its aim of creating a global-scale business. It seems that more flexibility is needed from the point of view of scientists. The findings point to a need to examine critically the current public funding tools available to early-stage academic commercialization and introduce models that are more flexible. Moreover, when an academic team becomes involved with

commercialization, a funding period of one to one and a half years is seen to be too short if the aim is to generate internationally competitive growth companies. Our findings are in line with the results of recent research on public funding for academic spin-offs. For example, Rasmussen and Sørheim (2012) point out that government instruments need to be part of a value chain in order to make sure that once a project receives support, the availability of public or private funding is secured for follow-up in the next phase of development. Thus, in the Finnish context, the TUTL funding should probably be “marketed” as the “first step” in the funding of new internationally competitive growth companies. In addition to this, researchers should be made aware of the next steps in funding the further development of the commercialization project. Current government programs worldwide also largely acknowledge the importance of improving the demand-side of financing by seeking to improve the “investment readiness” of academic spin-offs (Murray 1999). However, this also requires that these government programs be accompanied by a wider range of initiatives that include such “soft” activities as training and networking. Thus, while on the one hand universities should assist researchers in accessing necessary financial resources to commercialize research, on the other hand, universities should also ensure that researchers have the needed commercial capabilities by taking actions, such as including entrepreneurship education in doctoral studies (Rasmussen and Sørheim 2006, 2012). Our interviewees also raised the question of whether there should be more business education for Finnish researchers. The same question has also been raised by Tahvanainen and Nikulainen (2010), as they reflect on their research results according to which roughly only 9 percent of the researchers in Finland reported having received business education in any form. Tahvanainen and Nikulainen continue that, at the very least, a basic knowledge of business opportunities can be argued to be a prerequisite for engaging in research commercialization. The inclusion of business or entrepreneurship education in doctoral studies is even more important, as Finnish researchers seem to have entered their field of research in the first place because of their personal interest in the particular field as opposed to the search for and pursuit of opportunities to commercialize research (Tahvanainen and Nikulainen 2010).

Last, our research participants were also voicing a concern regarding the trustworthiness of certain stakeholders, such as certain commercialization experts and TUTL steering groups. The researchers’ concerns regarding the trustworthiness of TUTL steering groups could be seen as an application of the negative externalities from the networking role of intermediaries. Pahnke et al. (2015) presented evidence of competitive information leakage across shared intermediaries. In situations where firms are indirectly linked because they share the same intermediary, there is a chance that information may be leaked to a competitor.

Additionally, this in turn rather hinders than supports innovation. In our case, the researchers talked about the possibility of information

leaks because governmental funding agency's regulations require that each funded project appoint a steering group whose composition may include, among others, external experts and representatives of companies. Considering this, based on our findings, we suggest that universities, and especially TTOs pay closer attention to assisting researchers in finding trustworthy commercialization experts and steering-group members who do not represent a threat for researchers and their commercialization endeavors.

Conclusions

This study contributes to the understanding of academic entrepreneurship through a microanalytical lens: the findings point out to the variety of ways by which stakeholders' support is experienced by academics. The findings will help universities and policy makers to pay attention even to such aspects which at first may appear mundane—such as sending people reminders of application deadlines—but which may in the end prove significant for the commercialization process. As a conclusion to our study, we would like to emphasize the importance of building trust-based personal relations between the academic teams and innovation services. We also argue that the contradictions and uncertainties involved with stakeholder relations may be partially explained by the seeming lack of discussion and coordination between the different stakeholder groups. We conclude with the idea that bringing academic innovation to industry necessitates the development of integrated models and changes in policies that allow the university, local support agencies, and governmental funding agents to work together flexibly. We suggest that there is a need to further bridge the gap between academia and business by resolving the time-allocation strain of scientists who are interested in commercialization, by increasing the transparency of commercialization policies, by critically examining the suitability of current funding tools, and by incorporating entrepreneurship education in the doctoral studies syllabus. Additionally, we suggest that scientists should be more involved in the process rather than being told how to commercialize.

References

- Agrawal, Ajay, and Rebecca Henderson. 2002. "Putting Patents in Context: Exploring Knowledge Transfer from MIT." *Management Science* 48 (1): 44–60.
- Aiginger, Karl, Paavo Okko, and Pekka Ylä-Anttila. 2009. "Globalization and Business: Innovation in a Borderless World Economy." In *Evaluation of the Finnish National Innovation System: Full Report*, 103–46. Helsinki: Taloustieto Oy (on behalf of the Ministry of Education and the Ministry of Employment and the Economy), Helsinki University Print.

- Ambos, Tina C., Kristiina Mäkelä, Julian Birkinshaw, and Pablo D'Este. 2008. "When does University Research Get Commercialized? Creating Ambidexterity in Research Institutions." *Journal of Management Studies* 45 (8): 1424–47.
- Arundel, Anthony, and Aldo Geuna. 2004. "Proximity and the Use of Public Science by Innovative European Firms." *Economics of Innovation and New Technology* 13 (6): 559–80.
- Baglieri, Daniela, Francesco Baldi, and Christopher L. Tucci. 2018. "University Technology Transfer Office Business Models: One Size Does not Fit All." *Technovation* 76 & 77: 51–63.
- Balven, Rachel, Virgil Fenters, Donald S. Siegel, and David Waldman. 2018. "Academic Entrepreneurship: The Roles of Identity, Motivation, Championing, Education, Work-Life Balance, and Organizational Justice." *Academy of Management Perspectives*, 32 (1): 21–42.
- Berman, Elizabeth Popp. 2008. "Why did Universities Start Patenting?" *Social Studies of Science* 38 (6): 835–71.
- Bill on the University Inventions Act. 2004. "Hallituksen esitys Eduskunnalle laiksi oikeudesta korkeakouluissa tehtäviin keksintöihin sekä laiksi oikeudesta työntekijän tekemiin keksintöihin annetun lain muuttamisesta" [Government bill to parliament as a law on amendments to the rights related to academic inventions and inventions created by employees]. Retrieved online from: <http://www.finlex.fi/fi/esitykset/he/2004/20040259.pdf>.
- Bonardo, Damiano, Stefano Paleari, and Silvio Vismara. 2011. "Valuing University-Based Firms: The Effects of Academic Affiliation on IPO Performance." *Entrepreneurship Theory and Practice* 35 (4): 755–76.
- Clarysse, Bart and Nathalie Moray. 2004. "A Process Study of Entrepreneurial Team Formation: The Case of a Research-Based Spin-Off." *Journal of Business Venturing* 19: 55–79.
- Clayton, Paige, Maryann Feldman, and Nichola Lowe. 2018. "Behind the Scenes: Intermediary Organizations that Facilitate Science Commercialization Through Entrepreneurship." *Academy of Management Perspectives* 2018, 32(1): 104–24.
- Coffey, Amanda Jane, and Paul A. Atkinson. 1996. *Making Sense of Qualitative Data: Complementary Research Strategies*. Thousands Oaks, CA: Sage.
- Cohen, Wesley M., Richard R. Nelson, and John P. Walsh. 2002. "Links and Impacts: The Influence of Public Research on Industrial R&D." *Management Science* 48 (1): 1–23.
- Colombo, Massimo G., and Marco Delmastro. 2002. "How Effective are Technology Incubators? Evidence from Italy." *Research Policy* 31, 1103–22.
- Czarniawska, Barbara. 2004. *Narratives in Social Science Research*. London: SAGE Publications.

- Debackere, Koenraad, and Reinhilde Veugelers. 2005. "The Role of Academic Technology Transfer Organizations in Improving Industry Science Links." *Research Policy* 34: 321–42.
- D'Este, Pablo, and Parimal Patel. 2007. "University–Industry Linkages in the UK: What Are the Factors Underlying the Variety of Interactions with Industry?" *Research Policy* 36 (9): 1295–313.
- Dosi, Giovanni, and Richard R. Nelson. 2010. "Technical Change and Industrial Dynamics as Evolutionary Processes." In *Handbook of the Economics of Innovation*, Vol 1, edited by Bronwyn Hall and Nathan Rosenberg, 51–127. Amsterdam: NorthHolland.
- Druilhe, Celine, and Elizabeth Garnsey. 2001. "Academic Spin-Off Ventures: A Resource Opportunity Approach." In *New Technology-Based Firms in the New Millennium*, edited by Wim Daring, Ray Oakey, and Saleema Kause. Oxford: Elsevier.
- Ejermo, Olof, and Hannes Toivanen. 2018. "University Invention and the Abolishment of the Professor's Privilege in Finland." *Research Policy* 47 (4): 814–25.
- Etzkowitz, Henry. 2003. "Innovation in Innovation: The Triple Helix of University-Industry-Government Relations." *Social Science Information* 42 (3): 293–337.
- . 2013. "Anatomy of the Entrepreneurial University." *Social Science Information* 52 (3): 486–511.
- Etzkowitz Henry, Andrew Webster, Christiane Gebhardt, and Branca Terra. 2000. "The Future of the University and the University of the Future: Evolution of Ivory Tower to Entrepreneurial Paradigm." *Research Policy* 29 (2): 313–30.
- European Commission. 1995. *Green Paper on Innovation*, COM (95): 688 final, December 20.
- . 2007. *Improving Knowledge Transfer between Research Institutions and Industry across Europe*, DG Research and DG Enterprise and Industry, EUR 22836, Brussels.
- Farrell, Lisa, Colm Harmon, Carol Laffan, and Conor O'Carroll. 2006. "The Economic and Social Impact of Higher Education." Dublin: Irish Universities Association.
- Fredrickson, Barbara L., and Marcial F. Losada. 2005. "Positive Affect and the Complex Dynamics of Human Flourishing." *American Psychologist* 60: 678–86.
- Galán-Muros, Victoria, Peter van der Sijde, Peter Groenewegen, and Thomas Baaken. 2017. "Nurture over Nature: How do European Universities Support their Collaboration with Business?" *Journal of Technology Transfer* 42 (1): 184–205.
- Grimaldi, Rosa, Martin Kenney, Donald S. Siegel, and Mike Wright. 2011. "30 Years after Bayh–Dole: Reassessing Academic Entrepreneurship." *Research Policy* 40 (8): 1045–57.
- Guerrero, Maribel, David Urbano, James A. Cunningham, and Damien Organ. 2014. "Entrepreneurial Universities in Two European

- Regions: A Case Study Comparison.” *Journal of Technology Transfer* 39 (3): 415–34.
- Hayter, Christopher S., Andrew J. Nelson, Stephanie Zayed, and Alan C. O’Connor. 2018. “Conceptualizing Academic Entrepreneurship Ecosystems: A Review, Analysis and Extension of the Literature.” *Journal of Technology Transfer* 43 (4): 1039–82.
- Himananen, Laura, and Hanna-Mari Puuska. 2011. “Yliopistoissa tehtävän tutkimuksen kaupallistamisen ja patentoinnin kehitys” [The development of research commercialization and patenting in universities]. In *Tutkimuksen tuottavuuden kehitys Suomen yliopistoissa* [The development of research productivity in Finnish universities], edited by Erkki Kaukonen, Laura Himanka, Reetta Muhonen, Hanna-Mari Puuska, Nina Talola, and Otto Auranen, 35–46. Opetus ja kulttuuriministeriön julkaisuja 2011:2. Helsinki: Yliopistopaino.
- Holloway, Kelly Joslin. 2015. “Normalizing Complaint: Scientists and the Challenge of Commercialization.” *Science, Technology & Human Values*, 40 (5): 744–65.
- Kao, John. 2009. “Tapping the World’s Innovation Hotspots.” *Harvard Business Review* 87 (3), 109–14.
- Kauppinen, Ilkka. 2014. “A Moral Economy of Patents: Case of Finnish Research Universities’ Patent Policies.” *Studies in Higher Education* 39 (10): 1732–49.
- Kodama, Toshihiro. 2008. “The role of Intermediation and Absorptive Capacity in Facilitating University–Industry Linkages: An Empirical Study of TAMA in Japan.” *Research Policy* 37 (8), 1224–40.
- Konttinen, Jari, Nina Suvinen, and Mika Nieminen. 2009. Välittäjäorganisaatiot tutkimuslähtöisen yritystoiminnan edistäjinä [The role of intermediary organizations in promoting research-based spin-offs]. VTT TIEDOTTEITA 2501.
- Kopelman, Richard E., Jeffrey Greenhaus, and Thomas F. Connolly. 1983. “A Model of Work, Family, and Interrole Conflict: A Construct Validation Study.” *Organizational Behavior and Human Performance* 32: 198–215.
- Koskenlinna, Markus, Anssi Smedlund, Pirjo Stähle, Lasse Köppä, Marja-Liisa Niinikoski, Ville Valovirta, Kimmo Halme, Juha Saapunki, and Jari Leskinen. 2005. “Välittäjäorganisaatiot: Moniottelijat innovaatioita edistämässä.” [Intermediary organizations: Advancing innovations]. *Technology Review* 168. Helsinki: Tekes.
- Kotiranta, Annu, and Antti-Jussi Tahvanainen. 2018. “Tutkimustiedon hyödyntäminen kestävästä hyvinvoinnin lähteenä: Tuloksia yliopistomaailman valmiuksista edistää löydösten käyttöönottoa” [Exploitation of research findings as a source of well-being]. *ETLA Raportit* 80.
- Levin-Rozalis, Miri. 2004. Searching for the Unknowable: A Process of Detection; Abductive Research Generated by Projective Techniques. *International Journal of Qualitative Methods* 3 (2): 1–18.

- Link, Albert N., Donald S. Siegel, and Barry Bozeman. 2007. "An Empirical Analysis of the Propensity of Academics to Engage in Informal University Technology Transfer." *Industrial and Corporate Change* 16 (4): 641–55.
- Link, Albert N., Donald S. Siegel, and Mike Wright. 2015. *The Chicago Handbook of University Technology Transfer and Academic Entrepreneurship*. Chicago: The University of Chicago Press.
- Lockett, Andy, Murray Gordon, and Mike Wright. 2002. "Do UK Venture Capitalists Still Have a Bias against High Tech Investments?" *Research Policy* 31 (6): 1009–30.
- Lockett, Andy, Donald Siegel, Mike Wright, and Michael D. Ensley. 2005. "The Creation of Spin-Off Firms at Public Research Institutions: Managerial and Policy Implications." *Research Policy* 34 (7): 981–93.
- Lockett, Andy, and Mike Wright. 2005. "Resources, Capabilities, Risk Capital and the Creation of University Spin-Out Companies." *Research Policy* 34 (7): 1043–57.
- Mansfield, Edwin, and Jeong-Yeon Lee. 1996. "The Modern University: Contributor to Industrial Innovation and Recipient of Industrial R&D Support." *Research Policy* 25 (7): 1047–58.
- Markman, Gideon D., Peter T. Gianiodis., Phillip H. Phan, and David B. Balkin. 2005. "Innovation Speed: Transferring University Technology to Market," *Research Policy* 34: 1058–75.
- Mason, Colin, and Ross Brown. 2014. "Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship." Background Paper Prepared for the Workshop Organised by the OECD LEED Programme and the Dutch Ministry of Economic Affairs. Discussion Paper. OECD.
- Meyer, Martin. 2005. "Independent Inventors and Public Support Measures: Insights from 33 Case Studies in Finland." *World Patent Information* 27 (2): 113–23.
- Miller, Paul, and Kirsten Bound. 2011. *The Startup Factories: The Rise of Accelerator Programmes to Support New Technology Ventures*. [s.l.]: NESTA.
- Morgan, David L. 2007. "Paradigms Lost and Pragmatism Regained: Methodological Implications of Combining Qualitative and Quantitative Methods." *Journal of Mixed Methods Research* 1(1): 48–76.
- Mowery, David C., Richard R. Nelson, Bhaven N. Sampat, and Arvids A. Ziedonis. 2001. "The Growth of Patenting and Licensing by U.S. Universities: An Assessment of the Effects of the Bayh-Dole Act of 1980." *Research Policy* 30 (1): 99–119.
- Murray, Gordon. 1999. "Early-Stage Venture Capital Funds, Scale Economies and Public Support." *Venture Capital: An International Journal of Entrepreneurial Finance* 1: 351–84.
- Mustar, Philippe, and Mike Wright. 2010. "Convergence or Path Dependency in Policies to Foster the Creation of University Spin-Off

- Firms? A Comparison of France and the United Kingdom.” *Journal of Technology Transfer* 35 (1): 42–65.
- Nieminen, Mika, Torsti Loikkanen, and Antti Pelkonen. 2016. “Science, Technology and Innovation Systems of Small Economies under Pressure: Sketching Three Possible Future Pathways of the Finnish System.” *Foresight* 18 (3): 297–319.
- Nikiforou, Argyro, Tatiana Zabara, Bart Clarysse, and Marc Gruber. 2018. “The Role of Teams in Academic Spin-Offs.” *Academy of Management Perspectives* 32 (1): 78–103.
- Nikulainen, Tuomo, and Antti-Jussi Tahvanainen. 2013. *Commercialization of Academic Research: A Comparison between Researchers in the U.S. and Finland*, ETLA Working Papers 8, April 23, 2013. Available at: <http://pub.etla.fi/ETLA-Working-Papers-8.pdf>.
- O’Kane, Conor, Vincent Mangematin, Will Geoghegan, and Ciara Fitzgerald. 2015. “University Technology Transfer Offices: The Search for Identity to Build Legitimacy.” *Research Policy* 44 (2), 421–37.
- Pahnke, Emily Cox, Rory McDonald, Dan Wang, and Benjamin Hallen. 2015. “Exposed: Venture Capital, Competitor Ties, and Entrepreneurial Innovation.” *Academy of Management Journal*, 58 (5): 1334–60.
- Palo-oja, Outi-Maaria, and Marke Kivijärvi. 2015. “Commercialization of Academic Research: A Sensemaking Analysis of Key Participants’ Roles.” *International Journal on Human Resources Development and Management* 15 (2&3&4): 154–69.
- Perkmann, Markus, Valentina Tartari, Maureen McKelvey, Erkko Autio, Anders Broström, Pablo D’Este, Riccardo Fini, Aldo Geuna, Rosa Grimaldi, Alan Hughes, Stefan Krabel, Michael Kitson, Patrick Llerena, Francesco Lissoni, Ammon Salter, and Maurizio Sobrero. 2013. “Academic Engagement and Commercialisation: A Review of the Literature on University–Industry Relations.” *Research Policy* 42: 423–42.
- Phan, Phillip H. 2004. “Entrepreneurship Theory: Possibilities and Future Directions.” *Journal of Business Venturing* 19 (5): 617–20.
- Phan Phillip H., Donald S. Siegel, and Mike Wright. 2005. “Science Parks and Incubators: Observations, Synthesis and Future Research.” *Journal of Business Venturing* 20: 165–82.
- Pirnay, Fabrice, Bernard Surlemont, and Frederic Nlemvo. 2003. “Toward a Typology of University Spin-Offs.” *Small Business Economics* 21 (4): 355–69.
- Ranga, Marina, Juha Perälampi, and Juha Kansikas. 2016. “The New Face of University–Business Cooperation in Finland.” *Science and Public Policy* 43 (5): 601–12.
- Rasmussen, Einar, and Roger Sørheim. 2006. “Action-Based Entrepreneurship Education.” *Technovation* 26 (2): 185–94.

- . 2012. “How Governments Seek to Bridge the Financing Gap for University Spin-Offs: Proof-of-Concept, Pre-Seed, and Seed Funding.” *Technology Analysis & Strategic Management* 24 (7): 663–78.
- Rasmussen, Einar, Simon Mosey, and Mike Wright. 2014. “The Influence of University Departments on the Evolution of Entrepreneurial Competencies in Spin-Off Ventures.” *Research Policy* 43: 92–106.
- Rasmussen, Einar, and Mike Wright. 2015. “How Can Universities Facilitate Academic Spin-Offs? An Entrepreneurial Competency Perspective.” *Journal of Technology Transfer* 40 (5): 782–99.
- Sanberg, Paul R., Morteza Gharib, Patrick T. Harker, Eric W. Kaler, Richard B. Marchase, Timothy D. Sands, Nasser Arshadiand, Sudeep Sarkar. 2014. “Changing the Academic Culture: Valuing Patents and Commercialization toward Tenure and Career Advancement.” *Proceedings of the National Academy of Sciences of the United States of America*. Proc Natl Acad Sci U S A. May 6; 111(18): 6542–47.
- Segarra-Blasco, Agusti, and Josep-Maria Arauzo-Carod. 2008. Sources of Innovation and Industry-University Interaction: Evidence from Spanish Firms.” *Research Policy* 37 (8): 1283–95.
- Siegel, Donald S., David Waldman, and Albert Link. 2003. “Assessing the Impact of Organizational Practices on the Productivity of University Technology Transfer Offices: An Exploratory Study.” *Research Policy* 32: 27–48.
- Siegel, Donald S. and Mike Wright. 2015. *Academic Entrepreneurship: Time for a Rethink?* ERC Research Paper 32, June 2015. ERC The Enterprise Research Centre.
- Ståhle, Pirjo, Anssi Smedlund, and Lassi Köppä. 2004. *Välittäjäorganisaatioiden rakenteelliset ja dynaamiset haasteet: Osaselvitys innovatiivisesta monen toimijan verkostossa* [Structural and dynamic challenges of intermediary organizations: A report of an innovative network]. Helsinki: Kauppa- ja teollisuusministeriö.
- Statistics Finland. 2014. Suomen virallinen tilasto: Tutkimus- ja kehittämistoiminta. Korkeakoulusektorin tutkimus- ja kehittämistoiminta [Statistics Finland: Research and development in higher education sector]. http://www.stat.fi/til/tkke/2013/tkke_2013_2014-10-30_kat_004_fi.html; accessed 9 August 2019.
- Stephan, Paula E. 2009. “Tracking the Placement of Students as a Measure of Technology Transfer.” In *Measuring the Social Value of Innovation: A Link in the University Technology Transfer and Entrepreneurship Equation*, edited by Gary D. Libecap, 113–40. Bingley: Emerald Group.
- Suvinen, Nina, Jari Kontinen, and Mika Nieminen. 2010. “How Necessary are Intermediary Organizations in the Commercialization of Research?” *European Planning Studies* 18 (9): 1365–89.
- Tahvanainen, Antti-Jussi. 2009. *Finnish University Technology Transfer in a Whirl of Changes: A Brief Summary*. Helsinki: ETLA,

- Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, Keskusteluaiheita, Discussion papers 1188.
- Tahvanainen, Antti-Jussi, and Tuomo Nikulainen. 2010. *Commercialization at Finnish Universities: Researchers' Perspectives on the Motives and Challenges of Turning Science into Business*. Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy 47, Keskusteluaiheita, Discussion papers 1234.
- Tartari, Valentina, Ammon J. Salter, and Pablo D'Este. 2012. "Crossing the Rubicon: Exploring the Factors that Shape Academics' Perceptions of the Barriers to Working with Industry." *Cambridge Journal of Economics* 36: 655–77.
- Thursby, Jerry G., and Marie C. Thursby. 2002. "Who is Selling the Ivory Tower? Sources of Growth in University Licensing." *Management Science* 48 (1): 90–104.
- Tuunainen, Juha, and Tarja Knuuttila. 2009. "Intermingling Academic and Business Activities: A New Direction for Science and Universities?" *Science, Technology & Human Values* 34 (6): 684–704.
- Valtakari, Mikko, Juho Nyman, Mari Hjelt, Susanna Sepponen, Anne-Mari Järvelin, Kimmo Halme, and Katri Haila. 2018. *Evaluation of Pre-Commercialization Activities of Tekes: TUTL and Innovation Scout*. Evaluation Report 2, Business Finland. https://www.business-finland.fi/globalassets/julkaisut/evaluation_of_precommercialisation_activities_of_tekes_tutl_and_innovation_scout.pdf.
- Vohora, Ajay, Mike Wright, and Andy Lockett. 2004. "Critical Junctures in the Development of University High-Tech Spinout Companies." *Research Policy* 33 (1): 147–75.
- Wright, Mike, Bart Clarysse, Andy Lockett, and Mirjam Knockaert. 2008. "Mid-Range Universities' Linkages with Industry: Knowledge Types and the Role of Intermediaries." *Research Policy* 37 (8): 1205–23.
- Wright, Mike, Bart Clarysse, Philippe Mustar, and Andy Lockett. 2007. *Academic Entrepreneurship in Europe*. Cheltenham: Edward Elgar.
- Wright, Mike, and Phillip Phan. 2018. "The Commercialization of Science: From Determinantes to Impact." *Academy of Management Perspectives* 32 (1): 1–3.
- Yang, Phil Y., Yi Chang Yang, and Hong-Tien Chen. 2010. Developing Organizational Ambidexterity in Academic Research Commercialization. *Proceedings of PICMET 2010 Technology Management for Global Economic Growth*, Phuket, Thailand, July 18–22, 2010, 1-8. Institute of Electrical and Electronics Engineers.
- Zhang, Yan, and Haiyang Li. 2010. "Innovation Search of New Ventures in a Technology Cluster: The Role of Ties with Service Intermediaries." *Strategic Management Journal* 31: 88–109.