



A dynamic view on interactions between academic spin-offs and their parent organizations



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ABSTRACT

Literature on academic spin-offs gives evidence of different modes of interaction between spin-offs and their parent and their relative role in different modes of knowledge production. In this article, we examine the development of interactions between academic spin-offs and their parent organizations over a mid- to long-term period (4–15 years), drawing on a series of 25 case studies of spin-off/parent pairs from France and Switzerland. We show that the relational trajectories can be captured by four major dynamic patterns. These patterns range from an early cut-off of interactions in line with a linear model of innovation to sustained interactions supporting joint production of knowledge. Some patterns even include a change in the mode of knowledge production over time. In addition, we identify a number of determinants, internal or external to the pair, affecting the dynamic pattern. We conclude that management of spin-off processes and support policies for academic spin-offs should embrace this dynamic diversity.

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1. Introduction

Due to their emblematic quality, academic spin-offs have received increasing attention in various literatures, such as in innovation economics and management, science policy and science studies. Academic spin-offs, that is, firms founded by staff or graduates of academic institutions that exploit research outcomes, are raising high hopes for bridging scientific research and economic exploitation. By this they support the contribution of science to innovation, and ultimately economic and societal welfare. The hopes attached to spin-offs can be related to different assumptions on how technology transfer actually takes place, which in turn is linked to the type, intensity and duration of interactions between the academic spin-off and its parent organization.

Following a 'linear' innovation model (Marquis, 1969), spin-offs are a very effective means for 'transferring' knowledge from the lab into the economy (Rothwell, 1994; Godin, 2006). In this view, one may basically expect a unilateral transfer of a more or less confined set of codified knowledge, epitomized for instance in the transfer of intellectual property rights. This has consequences for

the type of interactions we expect to take place between the spin-off and its parent organization. Except for an early incubation phase, there would be no need for further substantial interaction. The second view maintains that knowledge is not so much transferred from academia to industry, but rather co-produced in an interactive process which entails continuous interaction between industry and academia (Etzkowitz and Leydesdorff, 2000). Spin-offs may be seen as palpable candidates for exemplifying this mode of knowledge production. We would then expect rather a continuous exchange of knowledge or a co-production of knowledge, with strong and long lasting interactions between spin-offs and their parent organizations.

These diverging interpretations of the role of spin-offs in technology transfer suggest quite different policy and management implications on how to support academic spin-off processes. The linear knowledge transfer model recommends focusing on the creation phase and setting up incentives for a frictionless separation. In turn, the co-production of knowledge model would propose improving conditions for sustained and mutually beneficial collaborations.

Empirical literature on spin-off processes gives evidence for both models, showing that some firms do cut off their linkage to the parent soon after their foundational act (Autio, 1997; Perez and Sanchez, 2003), whereas others maintain more or less intense interactions with their parent organization long after the creation

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phase (Johansson et al., 2005). Thus, we assume that the two views represent different modes of knowledge production and technology transfer respectively, which may co-exist and ask how these relate to interactions between spin-offs and their parent organizations. More specifically, we ask how long interactions last, to what extent they are actually related to a co-production of knowledge, and if spin-off/parent unit pairs (SPP) fall in one or the other category or rather shift modes over time.

Investigating these questions requires a dynamic and longitudinal perspective on interactions between spin-offs and their parent organizations. We examine how the interactions evolve over the mid- to long-term (4–15 years), which forms of knowledge transfer and joint production of knowledge are taking place, and how the evolution relates to structural characteristics, processes and events on the side of both partners. In this, we differentiate from other studies that consider similar research questions from the point of view of the spin-off only (Bathelt et al., 2010). Do we observe specific patterns in how interactions and modes of knowledge production evolve? We analyze these questions with a sample of 25 qualitative case studies of French and Swiss SPPs chosen from the domains of information technology, biotechnology and micro/nanotechnology. In so doing, we expect to develop a differentiated understanding of the conditions that shape the relationship between spin-offs and their parent organizations. Our study provides a unique, longitudinal view on the dynamic relationship between research organizations and their academic spin-offs and on the conditions for particular modes of knowledge production. This perspective complements the vast literature, which focuses on the creation phase and the short-term development of academic spin-offs. In so doing, we contribute to a better understanding of what might be appropriate patterns of interaction and how these may be facilitated by institutional frameworks and an adequate management by both partners.

The argument in the paper proceeds as follows: the next section will review literature on spin-offs and science–industry interactions, with regard to conceptual and empirical insights on interactions between spin-offs and their parent organizations, their determinants and dynamics. In the Section 3, we will introduce the methodological approach, our empirical sample and specify the operationalization of the core variables that characterize our case studies. Section 4 analyzes the observed interactions and derives four ideal type dynamic patterns for spin-off/parent organization dynamics. Section 5 discusses a set of variables that affect the dynamic patterns. Section 6 concludes by reflecting on the academic, management and policy implications.

2. Conceptual framework: Spin-off–parent interaction, its determinants and dynamics

2.1. Interactions

Prior research on SPP interactions has demonstrated the broad variety in their types and intensity (Autio, 1994; Johansson et al., 2005; Perez and Sanchez, 2003; Rappert and Webster, 1998; Rappert et al., 1999). Interactions may take the form of highly circumscribed transactions, usually confined to points in time or short periods, such as the transfer, licensing or selling of intellectual property rights, the recruitment of personnel or the selling of products. Furthermore, they may expand over longer periods with regularly occurring interactions, which are related to joint research projects, Ph.D. and master theses, joint publications or the joint use of facilities and instruments. Finally, they may be of a continuous and intense kind, particularly if academic staff holds an operative position within the spin-off or a position as a board

member. While these forms of interaction are largely formal, underpinned by a contract or an official agreement, informal interactions such as meetings and discussions take place as well. Informal interactions have been reported to be at least as, or even more, important for technology transfer than formal interactions, be it in their own right by facilitating the exchange of tacit knowledge or as supports to formal interactions by building trust (Autio, 1994; Rappert, 1997). This is in line with findings on more general university–industry interactions (Bekkers and Bodas Freitas, 2008; D'Este and Patel, 2007) and findings on corporate spin-offs (Johansson et al., 2005).

Related to the types and intensity of interactions taking place, spin-offs may fulfill different roles in knowledge production and ultimately innovation, driving technical change (Kirchhoff, 1994). Spin-offs can be seen as very effective means for a predominantly unidirectional, ‘linear’ transfer of knowledge from science to industry, based largely on highly circumscribed types of interactions such as the transfer of intellectual property rights or transfer of personnel. This type of technology transfer is in line with a view according to which the institutional spheres of academia and industry should be kept rather separate with highly circumscribed relations among the spheres (Etzkowitz and Leydesdorff, 2000). Accordingly, spin-offs are expected to ‘emancipate’ themselves from the parent organization and move from the academic sphere to the industry sphere rather quickly. In this way, the spin-off is expected to be able to focus on product development and market needs, instead of remaining too much oriented on the academic world (Gilsing et al., 2010). Researchers should thus decide very clearly whether to participate in a spin off or to stay in academia, in order to avoid conflicts of interests (Bekkers et al., 2006; Krimsky, 2006). Otherwise, publicly funded research, i.e., personnel, space and equipment, may be diverted to the support of private profits (Ndonzuau et al., 2002).

According to an innovation model where mutual, interactive exchange and joint learning are at the core of technology ‘transfer’ (Meyer-Krahmer and Schmoch, 1998; Etzkowitz, 2003; Balconi and Laboranti, 2006), spin-offs can fruitfully engage in intense and sustained interactions with their parent organizations even beyond the creation phase including joint research, joint publications and informal ways of exchange of more or less tacit knowledge. In this model spin-offs may be interpreted as boundary-spanning organizations facilitating knowledge production and innovation, which takes place in overlapping institutional spheres (Etzkowitz and Leydesdorff, 2000; Perez and Sanchez, 2003; Youtie and Shapira, 2008). Relationships between the spin-off firm and its parent organization may therefore be rather intense. This model assumes that in this way science is contextualized with respect to societal or economic needs (Nowotny et al., 2001) and that industry gets an easy access to scientific findings. Spin-offs and their academic parents may even be seen as preferential partners, as they are likely to hold a shared cultural and educational background, a shared stock of tacit knowledge and similar research interests. In line with learning theories, such an overlapping knowledge base has been considered as an important precondition for realizing mutual learning, both for academic and corporate spin-offs and their respective parents (Cohen and Levinthal, 1990; Johansson et al., 2005; Sapienza et al., 2004). Proximity, established personal links and trust relations support additional complementarities (Johansson et al., 2005). On the other hand, long term relationships can lead to growing interdependence, not only as a source of synergies and knowledge creation, but also creating a risk for the firm to become dependent on the knowledge of the parent (Riordan and Williamson, 1985; Parhankangas and Arenius, 2003; Johansson et al., 2005).

As divergent as these models may seem at first glance, literature on spin-offs or science–industry interactions provides

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