



# Enterprising scientists: The shaping role of norms, experience and scientific productivity



Truls Erikson<sup>a</sup>, Mirjam Knockaert<sup>a,b</sup>, Maw Der Foo<sup>b,c</sup>

<sup>a</sup> University of Oslo, Centre for Entrepreneurship, Gaustadalléen 23B, N-0318, Oslo, Norway

<sup>b</sup> Ghent University, Faculty of Economics and Business Administration Tweekeerkenstraat 2, 9000 Gent, Belgium

<sup>c</sup> National University of Singapore, Singapore

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## ABSTRACT

This paper studies the determinants of enterprising aspirations of university-based research scientists, using an approach which factors in individual and organizational characteristics. Specifically, we provide an understanding of the individual and departmental characteristics that affect the research scientist's aspirations to engage in patenting and licensing, industry-science interactions, and the establishment of start-up companies. Building on institutional theory and self-efficacy theory in combination with human capital theory, we find that start-up experience positively affects start-up aspirations, whereas patenting experience helps researchers to foster patenting and licensing aspirations. At the organizational level, we find that enterprising norms of the research department positively affect the aspirations to engage in both industry-science interactions and patenting activities but not start-up creation. Further, we find that scientific productivity positively moderates the relationship between industry experience and industry-science interaction aspirations, but negatively affects the relationship between patenting experience and patenting and licensing aspirations. Our findings have important implications for academics and practitioners, such as policy makers and technology transfer officers.

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## 1. Introduction

Over the past decade, there has been an increasing emphasis on the generation of commercial outcomes from university-based research (Ambos et al., 2008). Universities have become more engaged in their so-called third mission, in which they engage in entrepreneurship and economic development, next to the traditional activities of research and teaching (Etzkowitz, 2003; Rasmussen et al., 2006; Wright et al., 2008). Subsequently, academic entrepreneurship has increasingly become a popular research area (Etzkowitz, 1998, 2003; Mowery et al., 2002; Shane, 2003; Wright et al., 2007; Rothaermel et al., 2007; Siegel et al., 2007; Larsen, 2011).

Research on enterprising activities among academics has mainly focused on the university or local context by studying, among others, the productivity and effectiveness of technology commercialization (Owen-Smith and Powell, 2001, 2003), university strategies (Feldman et al., 2002), university incentives and licensing revenues (Siegel et al., 2003), university patenting activity (Coupe, 2003), firm linkages to universities (Cohen et al., 2002) and the creation and performance of university spin-offs (Link and Scott, 2005; Knockaert et al., 2011). What remains rather unexplored in the academic entrepreneurship literature is why some individual research scientists foster enterprising aspirations, while others do not.

Understanding enterprising and enterprising aspirations in an academic context is important as academic enterprises can stimulate economic activity, generate jobs, build ties between universities and industry (Prodan and Drnovsek, 2010), and

E-mail addresses: truls.erikson@sfe.uio.no (T. Erikson), Mirjam.knockaert@ugent.be (M. Knockaert), etmfmd@nus.edu.sg (M.D. Foo).

provide additional sources of financing to universities (Siegel et al., 2007). Moreover, academia is a complex context in which research commercialization is difficult. At the heart of the problem is the inherent tension between academic and commercial demands (Hackett, 2001; West, 2008). Indeed, the third mission has to be integrated with traditional research and teaching activities (Van Looy et al., 2011) and as such, universities have to become ambidextrous organizations, at the same time striving for research excellence and promoting research commercialization (Tushman and O'Reilly, 1996; Birkinshaw and Gibson, 2004; Raisch and Birkinshaw, 2008). Whereas organizational ambidexterity has been achieved by universities through the establishment of technology transfer offices, a tension resides at the level of the individual, who has to engage in a range of activities simultaneously (Ambos et al., 2008).

A large stream of research has focused on understanding individual characteristics as determinants of entrepreneurial aspirations (Lüthje and Franke, 2003; Souitaris et al., 2007; Thompson, 2009; Lee et al., 2011). In academia, however, researchers are embedded in departments. Department norms can play crucial roles in determining the behaviors that are valued and consequently affect individual behaviors. We therefore contend that, in order to understand enterprising aspirations among research scientists, organizational norms should be considered alongside individual characteristics. Furthermore, we do not only focus on aspirations to start a business as the main commercialization route. Consistent with Wright et al. (2008), we include other important commercialization routes such as patenting and licensing, and industry-science interactions (including contract research and consulting). We assess individual and organizational factors which may drive the research scientist's aspirations to engage in these enterprising routes.

As such, our paper contributes to both entrepreneurship and technology transfer literatures.

First, it contributes to the entrepreneurship literature, which has mainly focused on start-up aspirations, by complementing these aspirations with other enterprising alternatives. It further adds to this stream of research by showing how enterprising aspirations are shaped by both individual and organizational determinants. As such, we provide more clarity to this body of work by showing that the stimulation of different types of aspirations requires different sets of individual and organizational characteristics.

Second, our research contributes to the technology transfer literature by indicating which type of enterprising aspirations in *academia* benefit from which individual or organizational factors. As such, we respond to the call by D'Este et al. (2012) for research on academics' willingness to engage in entrepreneurship to integrate organizational characteristics.

Finally, by studying the relationship between both sets of activities, our research adds to the ongoing debate on whether basic research and academic enterprising are complementary rather than competing activities (Larsen, 2011; Huang et al., 2011). Generally, our study finds that scientific productivity and past enterprising experience reinforce each other in predicting higher enterprising aspirations. Concretely, high levels of scientific productivity together with more industry working experience are related to higher levels of industry-science interaction aspirations. The picture is different for

patenting for which the highest patenting and licensing aspirations are linked to researchers with higher levels of prior patenting experience but with lower scientific productivity. We reason that publishing, requiring public disclosure, can negatively affect patenting efforts, and that patenting and publishing activities may compete with one another for time and resources.

This article is structured as follows. In the next section, we introduce our conceptual framework and build hypotheses on how organizational and individual factors shape enterprising aspirations. We subsequently present our methodology, the results, and discuss the implications of our study for future research and practice.

## 2. Conceptual framework

We build upon institutional theory and self-efficacy theory, in combination with human capital theory, to study the determinants of research scientists' enterprising aspirations. We first develop hypotheses on the relationship between organizational characteristics and enterprising aspirations, followed by the hypothesis development on how individual characteristics can affect enterprising aspirations. Thereafter, we hypothesize about how scientific productivity affects the relationship between individual characteristics and enterprising aspirations.

### 2.1. The organizational perspective—the role of enterprising norms

North (1990) categorizes institutions as formal or informal. Scott (1995) groups institutions into regulative, normative and cognitive pillars, of which the two latter refer to informal institutions. According to Greenwood et al. (2008, p.4), informal institutions are “more-or-less taken for granted repetitive behavior that is underpinned by normative systems and cognitive understandings that give meaning to social exchange and thus enable self-producing social order”. These informal institutions are typically tacit, cognitive and normative, taken-for-granted social rules that govern people's behavior. In other words they serve as “the rules of the game” and contribute to shaping human interaction (North, 1990, p. 3); and typically take the form of conventions, codes of conduct, and norms of behavior (Thornton et al., 2011). For instance, Hayek (1945: 528) notes that “we make constant use of formulas, symbols, and rules whose meaning we do not understand and through the use of which we avail ourselves of the assistance of knowledge which individually we do not possess. We have developed these practices and institutions by building upon habits and institutions which have proved successful in their own sphere and which have in turn become the foundation of the civilization we have built up.” Tsoukas (1996) extends Hayek's understanding of distributed knowledge in society to the firm, understood as an organization, and equates Hayek's notion of institutions with the routines in firms. These routines typically take the form of conventions, codes of conduct, and norms of behavior. Such routines can be supportive for enterprising endeavors, or they can be hindering. Often, they come from subunit or departmental policies in organizations, as such serving as knowledge filters for knowledge transfer (Guerrero and Urbano, 2014).

We reason that if the norms of the organizational unit of the research scientist work in favor of enterprising behavior, this will

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