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Erkenntnisse zum Wissens- und Technologietransfer

Academic entrepreneurship: Why do university scientists play the entrepreneurship game?

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Research on entrepreneurial motivation of university scientists is often determined by quantitative methods without taking into account context-related influences. According to different studies, entrepreneurial scientists found a spin-off company due to motives like independency, market opportunity, money or risk of unemployment (short-term contracts). To give a comprehensive explanation, it is important to use a qualitative research view that considers academic rank, norms and values of university scientists. The author spoke with 35 natural scientists and asked professors and research fellows for their entrepreneurial motivation. The results of this study are used to develop a typology of entrepreneurial and non-entrepreneurial scientists within German universities. This paper presents the key findings of the study (Sass 2011).

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Sample and analysis

The sample is composed of 35 university scientists working in the fields of biochemistry, chemistry, physics and agricultural sciences (Sass 2011). The sample contains 12 professors (9 full-time-professors) and 23 research fellows. Some of the professors have an outstanding scientific reputation and are involved in a lot of technology transfer projects. The structured interview served as an empirical research method. The scientists were asked questions like “*Why did you found a spin-off company?*” and “*What influences were most important regarding your entrepreneurial motivation?*”. The structured interviews took an average of 45 minutes. A transcription and content analysis were used to find *main motives*, *activating environments* and *socializing effects* that determine entrepreneurial and non-entrepreneurial behavior. According to Schmidt (2008), five steps were used to analyze the material of the structured interviews: *I. Development of analysis categories*, *II. Development of coding guidelines*, *III. Data or material coding*, *IV. Development of a quantified summarized overview of material*, *V. Interpretation of cases*^{2,3}. Similar *motives* and *activating environments* were summarized to create types and functions of entrepreneurial and non-entrepreneurial motivation according to the theoretical basic structure

$$\text{entrepreneurial motivation} = f(\text{motive, activating environment})^4.$$

Each function represents one type and characterizes the main motivation of a certain number of entrepreneurial and non-entrepreneurial scientists. In addition, socializing effects were used to explain deep-rooted factors for entrepreneurial and non-entrepreneurial behavior.

A typology of entrepreneurial and non-entrepreneurial scientists

According to the results of the study, entrepreneurial motivation of university natural scientists can be explained by six types: *The Breadwinner*, *The Disappointed Scientist*, *The Independent Person*, *The Moneymaker*, *The Curious Scientist* and *The Competitive Athlete* (Sass 2011). In addition to entrepreneurial scientists, there are two types representing the non-entrepreneur: *The Puzzle Solver* and *The Transfer Researcher*. Table I presents a typology of entrepreneurial and non-entrepreneurial scientists within German universities. Table I also contains *main motivation*, *activating environment* and *behavioral function* derived by the simplified function *entrepreneurial motivation* = *f(motive, activating environment)*. The statistical population is 35 (n=35).

² The multi-stage model of Kluge (1999) was used for type creation.

³ See Schmidt (2008), 447, next pages.

⁴ Human motivation is a result of motives (*needs*) and situational influences (*activating environment*). See Rheinberg (1995), 68-69.

Table I: A typology of entrepreneurial and non-entrepreneurial scientists within German universities

| Type | Main motivation | Activating environment | Behavioural function |
|--|--------------------------|------------------------------------|--|
| <i>Entrepreneurial scientists</i> | | | |
| The Competitive Athlete | Challenge | Competitive environment | Motivation=f(challenge, competitive environment) |
| The Curious Scientist | Scientific curiosity | Applications | Motivation=f(scientific curiosity, applications) |
| The Moneymaker | Exploitation of know-how | Market opportunities | Motivation=f(exploitation of know-how, market opportunities) |
| The Independent Person | Autonomy | <i>No effect!</i> | Motivation=f(autonomy) |
| The Disappointed Scientist | Growth and development | Demotivating working environment | Motivation=f(grow and development, demotivating working environment) |
| The Breadwinner | Securing livelihood | Risk of losing the job | Motivation=f(securing livelihood, risk of losing the job) |
| <i>Non-entrepreneurial scientists</i> | | | |
| The Transfer Researcher | Scientific curiosity | Existence of research applications | Motivation=f(scientific curiosity, existence of research applications) |
| The Puzzle Solver | Scientific curiosity | Challenging problems | Motivation=f(scientific curiosity, challenging problems) |

Entrepreneurial and non-entrepreneurial types

The first type is *The Breadwinner*. The entrepreneurial motivation is a result of a blunted job perspective. The main motivation can be described as *securing livelihood*. He is the most important breadwinner of his family. The activating environment contains the risk of losing the job forced by limited-term contracts.

The second type – *The Disappointed Scientist* – becomes an entrepreneur because of the unsatisfying reward system. The main motivation is to *grow and develop*. Entrepreneurial scientists of this type are disappointed with norms like *publish or perish* and do not agree with the dominant role publishing plays for their scientific work performance. They want to see their research applied and transferred into the market outside the university. In that sense, entrepreneurial motivation is a result of a demotivating working environment. Only research fellows are represented in this type. A possible explanation is that full-time professors – in contrast to research fellows – enjoy a lot of scope in Germany. They have the freedom to

create their own research as well as teaching and additionally to make money outside the university.⁵

The third entrepreneurial type is *The Independent Person*. This type looks for independence in his job environment. The main motivation is *autonomy*. Scientists of this type want to decide independently without the influence of other people and teammates. The own company is the only way to live life to the fullest. An activating environment has no effect for entrepreneurial motivation. Scientists of this type were influenced at an early stage of life. The entrepreneurial father served as role-model. Scientists of this type received much recognition for their excellent achievements at school.

The fourth type – *The Moneymaker* – wants to transform his knowledge and business ideas into money. The startup company is one possibility to make money in addition to university salary. The main motivation is *exploitation of know-how*. The activating environment contains market opportunities. Existing companies and people of the working environment are interested in the know-how and technologies developed by the *Moneymaker*. Only research fellows are presented in this type. A possible explanation is that full-time professors – in contrast to research fellows – have the possibility to earn money outside the university because of their rank and reputation.

The fifth entrepreneurial type is *The Curious Scientist*. This type wants to explore the business feeling. Scientists of this type want to try if they are able to found a company. The main motivation is *scientific curiosity*. The activating environment contains research applications that are suitable for the development of startup companies. Scientists of this type do not leave the university after founding a company. Scientists of this type play multiple roles. They found a company; they offer teachings and they do contract research. They never give up their role as university scientist.

The last entrepreneurial type is *The Competitive Athlete*. The entrepreneurial motivation can be compared to a sports event. A scientist of this type wants to jump one centimeter higher than his scientific competitor. He knows that only the first one receives recognition within the scientific community. The main entrepreneurial motivation is *challenge*. The Competitive Athlete is inspired by a competitive environment that contains other successful entrepreneurs or technical problems which have not yet been solved. Scientists of this type are *star scientists*. They are very well-known in scientific communities, publish in high impact journals and transfer research results into the market. The Competitive Athlete is a serial entrepreneur and founds more than two companies. Scientists of this type use their reputation and skills to develop business ideas and to receive money from external investors.⁶

In addition to the six entrepreneurial types, there are two types describing non-entrepreneurial scientists. *The Puzzle Solver* is a traditional basic researcher. He is driven by the original scientific motivation. He is eager to solve a demanding riddle that allows to explore nature

⁵ According to Dilger (2007, 110-111), reputation is an essential precondition for generating additional income.

⁶ Outstanding scientists have the reputation needed for mobilization of resources. See Stuart/Ding (2006), 136, next pages. The reputation of a scientist influences the evaluation of the invention. See Shane/Khurana (2003), 531, next pages.

and to understand reasons of elemental phenomena. In that sense, the main motivation is *scientific curiosity*. The activating environment contains challenging scientific problems that have still not been solved. The second non-entrepreneurial type is *The Transfer Researcher*. He is driven by the same motivation as *The Puzzle Solver*. In addition to the traditional basic researcher, this type is inspired by existing research applications. Scientists of this type belong to application-oriented research fields.

Lessons learned about entrepreneurial motivation

Why do university scientists play the entrepreneurship game? The research results reveal that entrepreneurial motivation can be an expression of the original scientific motivation, especially to solve a challenging puzzle and to be the first one who solves the riddle *spin-off company*. In that sense, *The Competitive Athlete* looks for entrepreneurial challenge. Entrepreneurship is a further option to demonstrate performance skills. It therefore functions as an adequate alternative to publishing articles or doing industrial contract research. Entrepreneurship is also another way to transfer scientific curiosity into transfer fields outside scientific work (*The Curious Scientist*). The research results also reveal that entrepreneurial motivation of university scientists can only be understood by taking into account academic norms and values. Entrepreneurship and science are not mutually exclusive. This conclusion is supported by the star scientist approach. According to this approach, high performance scientists have a great passion for entrepreneurial activities.⁷

The research results also show that entrepreneurial motivation is not only an expression of the original scientific motivation. The entrepreneurship game is an expression of the dissatisfaction with academic culture and working conditions within German universities. Scientists are faced with limited-term contracts (*The Breadwinner*). Scientists do not accept norms like *publish or perish* (*The Disappointed Scientist*). Entrepreneurial motivation is also a result of a high self-determination (*The Independent Person*).

Despite the fact that only 35 natural scientists are in the sample, it is obvious that the academic rank is closely linked to the entrepreneurial type. The largest accumulation of full-time-professors belongs to the entrepreneurial types *The Competitive Athlete* and *The Curious Scientist*. In contrast to full-time-professors, most of the research fellows belong to the entrepreneurial types *The Moneymaker* and *The Disappointed Scientist*. On the basis of the above, it could be concluded that entrepreneurial motivation – in a positive sense – is linked to the rank of a *full-time-professor*.

⁷ Zucker et al. (1998, 290, next pages.) confirm the link between star scientists and the emergence of new biotechnology companies. There is a positive link between scientific performance and entrepreneurial activities. See Stuart/Ding (2006), 136, next pages; see O'Shea et al. (2005), 996, next pages; see Siegel et al. (2007), 497; see Gulbrandsen/Smeby (2005), 945-946.

Critical remarks

The theoretical framework of this study is a simplified model to explain entrepreneurial and non-entrepreneurial motivation. The intention of this research study is to develop an abstract explanation of entrepreneurial motivation without using implicit and quantitative techniques of motive research. Entrepreneurial and non-entrepreneurial types are formed by one main motive and an activating environment. Indeed, one could argue that human motivation is determined by a complex motive bundle.⁸ Another important and critical point is the generalization of the typology. The creation of entrepreneurial and non-entrepreneurial types is based on a sample size of 35 university scientists. To give a valid answer, a quantitative study with an adequate sample size is a fundamental requirement. An adequate sample size would also be essential to aggregate information about the relation between entrepreneurial types and demographic factors (sex, age, nationality). Another critical issue is the scientific discipline in the sample. Most interviewees are biochemists. It can be assumed that scientific disciplines are faced with different norms and values.⁹ It is therefore important that the research sample contains a representative number of physicists, biologists, chemists and biochemists.

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⁸ According to Holtkamp/Imsande (2001, 7), a separate analysis of different motives is very difficult. The motivation to start enterprises is a result of a complex motive bundle.

⁹ For example, McClelland (1967, 203) studied the personality traits of scientists of experimental natural sciences. He points out that these traits can differ among scientists.

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