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Students' Career Attitudes - How Entrepreneurial Are Prospective Scientists?

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Abstract:

The aim of this paper is to find out how entrepreneurial prospective scientists are compared to prospective entrepreneurs. This study investigates the relationship between the intention of students to become scientists or entrepreneurs and their attitudes towards self-realization, recognition, independence, innovation, role models, financial success and social welfare. The study is based on quantitative data from the universities in Hannover and Göttingen which was collected in the context of the Global University Entrepreneurial Spirit Students' Survey. The results of the multinomial and binary logistic regression analyses surprisingly show that prospective scientists in fact are well equipped with attitudes which are conducive for starting a business. Prospective scientists and prospective entrepreneurs both find the realization of their dreams, independency and role models to be more important than other individuals. At the same time, both groups evaluate financial success to be less important than other individuals.

Keywords: career attitude, entrepreneurial intention, prospective entrepreneur, prospective scientist, student survey

JEL Classifications: L26

1 Introduction

One objective of many universities nowadays is to encourage university spin-off creation as part of a new "third mission" (ETZKOWITZ et al. 2000). One of the basic ideas behind this is that scientists can also become entrepreneurs. However, these scientists were once students, who made the decision to become scientists (and not entrepreneurs).

However, while the reasons for starting a business have already been extensively investigated in the past (see for example CARTER et al. 2003; SCHEINBERG/MACMILLAN 1988; SHANE/KOLVEREID/WESTHEAD 1991; ZELLWEGER/SIEGER/HALTER 2011), we still know little about the motives for becoming a scientist, because these have been less researched especially in recent years (SAUERMANN/ROACH 2012). Despite intensive inquiry, a comparison between the career choice of becoming a scientist or an entrepreneur is to my best knowledge absent from scientific analyses.

Traditionally, most universities hire young scientists primarily with respect to their scientific capabilities. Yet, the young scientists that a university hires today might be those scientists that start a business tomorrow. Thus, if universities want their research staff to start up more companies, they need to decide whether they should select young scientists not only on scientific grounds but also with respect to their entrepreneurial attitudes. This, in turn, raises questions regarding the differences in entrepreneurial attitudes between individuals that are interested in a career in academia (prospective scientists) and individuals that are interested in starting a business (prospective entrepreneurs). The question is in other words, how entrepreneurial are prospective scientists?

If prospective scientists have pretty much the same entrepreneurial attitudes as prospective entrepreneurs, universities do not need to care whether they should select young scientists not only on scientific grounds but also with respect to their entrepreneurial attitudes. However, if prospective scientists substantially differ in their entrepreneurial attitudes from prospective entrepreneurs, and thus are more similar to individuals seeking dependent employment, it is rather unlikely that they will start a business later on. In this case, universities might either need to try to positively influence the entrepreneurial attitudes of their employees or hire graduates that already have these attitudes.

The aim of this paper is to investigate the relationship between students' career choice intentions, differentiating between academia and entrepreneurship, and their entrepreneurial

attitudes, meaning their attitudes towards self-realization, recognition, independence, innovation, role models, financial success and social welfare.

The empirical analysis is based on data collected within the context of the Global University Entrepreneurial Spirit Students' Survey (GUESSS). In this paper the focus is on quantitative survey data from the universities in Göttingen and Hannover, which are the two biggest universities in Lower Saxony measured by the number of students. Over 3,000 Bachelor, Master and PhD students were asked about their career plans and entrepreneurial attitudes. In order to compare the entrepreneurial attitudes of prospective scientists and entrepreneurs with each other as well as with other students, I conducted binary and multinomial logistic regression analyses.

This paper is structured as followed: First, I conduct a literature review from which I identify the career attitudes of scientists and entrepreneurs and derive two main hypotheses. Then, after describing the data and methods, I present and discuss the results of the multinomial and binary logistic regression analyses. Finally, I conclude with a summary, policy implications and indications for further research.

2 Literature Review on Career Attitudes

There are a number of theories dealing with career choice intentions, which originate from the fields of sociology and psychology. Examples are the theory of social learning (BANDURA 1977b), the entrepreneurial event theory (SHAPERO/SOKOL 1982), the self-efficacy theory (see BANDURA 1977a), the social cognitive career theory (LENT et al. 2002) and the theory of planned behavior (AJZEN 1991). All these theories argue that motivational elements determine an individual's intention for engaging in a specific behavior (HAASE/LAUTENSCHLÄGER 2011). AJZEN (1991) suggests in turn that the best predictor for a specific behavior is the intention. This study focuses on attitudes which influence career choice intentions.

The career choices of entrepreneurship and academia are of special interest because scientists and entrepreneurs have in principle two opposing value systems (SZYPERSKI/KLANDT 1981). These opposing value systems are reflected in the scientists' and entrepreneurs' attitudes and behaviors (JAIN/GEORGE/MALTARICH 2009). Thus, one would normally assume that prospective entrepreneurs and scientists differ greatly from one another in respect to their career attitudes. In the following, I conduct a literature review on the career attitudes of entrepreneurs and scientists and investigate how entrepreneurs and scientists differ, especially in regards to career attitudes that are considered to be entrepreneurial.

2.1 Career Attitudes of Entrepreneurs

Many studies on entrepreneurial career attitudes exist (see for example CARTER et al. 2003; SCHEINBERG/MACMILLAN 1988; SHANE/KOLVEREID/WESTHEAD 1991). An empirically based theory on career choice motives was derived from studies of the Society of Associated Researchers of International Entrepreneurship (SARIE) (SCHEINBERG/MACMILLAN 1988). These studies were developed in the 80's and 90's by several authors, whereby SCHEINBERG was in the core of the field (see CARTER et al. 2003). SCHEINBERG and MACMILLAN (1988) developed the groundwork and came to the result that the need for approval, perceived instrumentality of wealth, communitarianism and the need for personal development, independence and escape were important factors. Based on these studies, BIRLEY and WESTHEAD (1994) develop founder types. They also identify motives such as the need for approval, independence and personal development as well as welfare considerations (in terms of contributing to the community), perceived instrumentality of wealth, tax reduction, and the following of role models to be important for founders. In more recent years, CARTER et al. (2003) give a broad overview on prior research on the reasons for getting into business. They investigate the career motives of nascent entrepreneurs and developed five categories of reasons based on a literature review: innovation, independence, recognition, role models and financial success. Based on the literature presented above, I categorize entrepreneurial career attitudes into seven motivational groups: self-realization, status, independence, innovation, role models, financial success and contribution to society. In the following, I discuss each career attitude and derive the hypotheses at the end of this chapter.

The first entrepreneurial career attitude is self-realization. The category of self-realization describes an individual's desire to pursue self-directed goals, to realize one's dreams or visions and to challenge oneself (CARTER et al. 2003). Entrepreneurship is a very common path to self-realization which is an empirically developed career attitude and positively associated with the entrepreneurial choice (CARTER et al. 2003; CASSAR 2007; SCHEINBERG/MACMILLAN 1988). Furthermore, CASSAR (2007) reveals in his longitudinal study on entrepreneurial career reasons that especially the desire for self-realization underlies a recall bias and is thus underestimated in retrospective studies. This is a prospective study. It can therefore be supposed that the desire for self-realization has a strong influence on an entrepreneurial choice.

The second entrepreneurial career attitude is recognition. The category of recognition describes *"an individual's desire to have status and approval from one's family, friends, and*

from those in the community" (CARTER et al. 2003:14). An individual's need for achievement seems to positively influence the entrepreneurial choice (MCCLELLAND 1965; SHANE/KOLVEREID/WESTHEAD 1991). Compared to the general population, the desire for recognition seems to be higher for classical entrepreneurs in a strict sense but not for small business owners (STEWART JR et al. 1999). Furthermore, an entrepreneur's desire for recognition, especially because of a higher status, seems to correlate with the business performance (CASSAR 2007; MCCLELLAND 1965; STEWART JR et al. 1999).

The third entrepreneurial career attitude is independence. The category of independence comprises *"an individual's desire for freedom, control, and flexibility in the use of one's time"* (CARTER et al. 2003:14). Independence is an empirically developed career attitude which is positively associated with the entrepreneurial choice (CASSAR 2007; DOUGLAS/SHEPHERD 2002; KOLVEREID 1992). It is even considered to be one of the most important career attitudes for nascent entrepreneurs (CASSAR 2007) and therefore more important for the choice between self-employment and dependent employment (BIRD 1989; DOUGLAS/SHEPHERD 2002; KATZ 1994). A study by the Federal Ministry of Education and Research in Germany also reveals that the workplace flexibility as well as being one's own boss are the most important motives for students to become self-employed (JOSTEN et al. 2008).

The fourth entrepreneurial career attitude is innovation. The category of innovation comprises an individual's intention to create something new (CARTER et al. 2003) or doing something different (AMIT et al. 2001). Entrepreneurship and innovation are strongly linked processes (SCHUMPETER 2000). Especially SCHUMPETER described the entrepreneur as also being an innovator (HÉBERT/LINK 2006). Usually entrepreneurs want to generate new ideas in order to put them into practice. This might be especially true for high technology entrepreneurs (AMIT et al. 2001). AMIT et al. (2001) for example came to the result that the desire for innovation was the most important decision incentive for entrepreneurs and it was significantly more important for entrepreneurs than for non-entrepreneurs.

The fifth entrepreneurial career attitude is role models. The theories of role identification and social learning generally explain the phenomenon of role models (GIBSON 2003; GIBSON 2004). The category of role models comprises *"an individual's desire to follow family traditions or emulate the example of others"* (CARTER et al. 2003:14). It has been empirically proven that role models have an influence on an individual's career decisions (BOSMA et al. 2011). Especially in the literature on entrepreneurship the issue of role models has been quite popular and widely discussed (BOSMA et al. 2011; DUBINI 1989). Empirical studies show that

entrepreneurial role models are often found in the family background (ALDRICH/KIM 2007; SHAPERO/SOKOL 1982).

The sixth entrepreneurial career attitude derived from the literature is social welfare. The category of social welfare is rooted in the concept of collectivism (HOFSTEDE 1984) and communitarianism (ETZIONI 1995). Starting a business can be one way to contribute to the welfare of a community, people with the same background or family (DUBINI 1989), which is why it has been used as an entrepreneurial career attitude in prior empirical studies (BIRLEY/WESTHEAD 1994; SCHEINBERG/MACMILLAN 1988). Social entrepreneurship as a practice has already existed for a long time. Famous social entrepreneurs are Muhammad Yunus who established the Grameen Bank in 1976 and Bill Drayton who founded Ashoka in 1980, to give only two examples (MAIR/MARTÍ 2006). In the emerging field of social entrepreneurship, the career attitude of social welfare has recently received more attention (SCHEUERLE et al. 2013).

Finally, the seventh entrepreneurial career attitude is financial success. The category of financial success comprises *"an individual's intention to earn more money and achieve financial security"* (CARTER et al. 2003:14). Although financial success is an empirically developed career attitude which is strongly associated with the entrepreneurial choice (CASSAR 2007), money does not seem to be the most important reason for starting a business. AMIT et al. (2001) for example came to the result that wealth is significantly less important for entrepreneurs than an aggregate of other motives, and that entrepreneurs also do not find wealth more important than non-entrepreneurs. The desire for a higher income are rather strongly connected with the intention of becoming an employee (HAASE/LAUTENSCHLÄGER 2011). Especially larger companies provide better possibilities for a secure career and to earn higher wages compared to being self-employed, at least in the medium term (PEEL/INKSON 2004). For that reason, it can be supposed that the desire for financial success does not positively influence an entrepreneurial intention.

2.2 Career Attitudes of Scientists

In utmost contrast to entrepreneurs, scientists usually work in an environment without economic constraints (STEPHAN/LEVIN 1996). Due to the socialization process at the university (DING/CHOI 2011; JAIN/GEORGE/MALTARICH 2009; MERTON 1973), the current opinion is that scientists have hardly any entrepreneurial attitude (MANGEMATIN 2000). In contrast to entrepreneurial attitudes, motives for becoming a scientist have been less researched systematically (SAUERMANN/ROACH 2012). However, the classical motives for

becoming a scientist are expressed as "ribbon, puzzle and gold" (HAGSTROM 1975; MERTON 1973; STEPHAN/LEVIN 1992) or as a "taste for science" (ROACH/SAUERMANN 2010). Both are in contrast to the "taste for business" (PELLENS 2012) which entails a salary, job security and career progress. In the following, the seven entrepreneurial career attitudes described above are applied to the career choice of scientists from a theoretical perspective. I investigate whether the literature on science research provides information on to what extent scientists may also have entrepreneurial attitudes.

The term "ribbon" refers to recognition through publication, citation, peers and membership in honorary academies. It is probably the most important reward for scientists because it determines other secondary compensations such as research funding and salaries (MERTON 1957). WENTLAND, KNIE and SIMON (2011) reveal that German scientists improve their reputation mainly by publishing in peer-reviewed journals and secondly through teaching, whereas patenting, technology transfer and entrepreneurial activity are less important. PELLENS (2012) as well as ROACH and SAUERMANN (2010) also state that scientists are mainly interested in upstream research but not so much in the commercialization of knowledge. Nevertheless, scientists have the desire for innovation by creating something new and having a technological success (STEPHAN/LEVIN 1992, 1996). This persistent desire for intellectual challenge and learning can also be understood as a kind of self-realization, which is related with the term "puzzle" (HAGSTROM 1975; STEPHAN/LEVIN 1992). Furthermore, scientists want to have the freedom to choose research projects depending on their interests (ROACH/SAUERMANN 2010). The university environment is far apart from economic constraints and gives scientists the opportunity to pursue independent research (STEPHAN/LEVIN 1996). It can therefore be assumed that scientists have not only a desire for recognition, innovation and self-realization but also for independence (ROACH/SAUERMANN 2010).

Conducting research is also a way to contribute to social welfare (PELLENS 2012). According to the scientific norm of communalism, new knowledge is the result of a collective effort, and no single claim of ownership should exist (MERTON 1957, 1973). A single researcher's new findings are always built to a great extent on the knowledge of other researchers who previously made their results available to the research community. For this reason, researchers should always communicate their new insights. Only a collective process will lead to social development. The academic norms should therefore ideally emphasize openness and sharing

(ROACH/SAUERMANN 2010). An important recent trend in this regard is the open access movement, which makes research articles freely available on the Internet (ANTELMAN 2004).

The term "gold" stands for financial success in regards to salary and job security. However, financial success usually plays only a minor role for scientists (LAM 2010; PELLENS 2012), although recent studies argue that the reward system of scientists changed from "traditionalism" to "commercialism" especially in the USA since the Bayh–Dole Act was established (JOHNSON 2011). In Germany the commercialization of knowledge is not as common and recognized yet (DÖRRE/NEIS 2010). Furthermore, many university scientists have fixed-term contracts financed by external funding (ROACH/SAUERMANN 2010). Then, after habilitation it is very difficult to find a professorship. Due to the insecure employment status and comparatively small salary at a university, apart from receiving a full professorship, it can be assumed that financial success is not important for prospective scientists (BRIEDIS et al. 2013; JAKSZTAT/SCHINDLER/BRIEDIS 2010).

As role models generally have an influence on an individual's career decisions (BOSMA et al. 2011), it is quite conceivable that scientists are also confronted with role models. Although empirical studies in this field seem to be missing, SAUERMANN and ROACH (2012) state that advisors encourage their PhD students to follow a research career. This might be an indication that scientists also like to follow role models.

2.3 Summary of the Hypotheses

Although one would normally assume that prospective entrepreneurs and scientists differ greatly from another according to their career attitudes, the literature review indicates that entrepreneurs and scientists might surprisingly be more similar in regards to their entrepreneurial career attitudes than generally supposed. Referring to the literature presented above, I derive following hypotheses:

1. Prospective entrepreneurs and prospective scientists have a higher desire for self-realization (A), recognition (B), independence (C), innovation (D), role models (E), social welfare (F) and a lower desire for financial success (G) compared to other individuals.

A direct comparison of the attitudes of scientists and entrepreneurs is still absent from literature. However the literature review shows that scientists have similar career attitudes as entrepreneurs. Consequently, I assume that prospective scientists and entrepreneurs have the same entrepreneurial attitudes, not only in comparison to individuals with other career choice intentions but also in direct comparison to each other.

2. Prospective entrepreneurs and prospective scientists have the same desire for self-realization (A), recognition (B), independence (C), innovation (D), role models (E), social welfare (F) and financial success (G).

3 Data and Methods

In the empirical part of this paper, the above framework on career attitudes is used in order to investigate and analyze students' career choice intentions and to test the two hypotheses. A wide range of literature already exists on top universities and regions like Silicon Valley in California, Greater Boston in Massachusetts, or the Research Triangle in North Carolina (SAXENIAN 1983; STERNBERG 2010). The data used in this paper was collected in the context of a research project named "University spin-offs in Lower Saxony and their regional economic impact: empirical evidence from Hannover and Göttingen" in collaboration with the Global University Entrepreneurial Spirit Students' Survey (GUESSS).[1] GUESSS is an international annual online survey, which evaluates the entrepreneurial competence and activity of Bachelor, Master and PhD students (BERGMANN/CESINGER/OSTERTAG 2012). For the current study, the data was collected in 2011 at the universities of Hannover and Göttingen. The chosen universities are the two biggest universities in Lower Saxony, Germany with regard to the total number of students[2], the number of students in subjects which are common for university spin-offs[3], the number of scientific staff, and research expenditures (KULICKE et al. 2008:76 f.). The universities have the same education policies because in Germany, education is regulated on Federal State level (BARTSCH 2009). The two universities are also particularly suitable examples of German universities located in regions without high-tech clusters. At this kind of university, the individual abilities of students play an especially important role for prospective career intentions, because only a weak entrepreneurial culture and support structure exist. A total number of 3151 students were interviewed at the universities of Hannover and Göttingen, the greatest number of cases in the German GUESSS. The response rate for the university of Hannover was 7,9 % and for the university of Göttingen 6,5% in the survey year 2011 (BERGMANN/CESINGER/OSTERTAG

[1] See acknowledgements.

[2] Leibniz Universität Hannover had 21478 students and Georg-August-Universität Göttingen 26381 students in the summer semester 2013 (GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN 2013; LEIBNIZ UNIVERSITÄT HANNOVER 2013).

[3] These are the MINT subjects (mathematics, computer science, natural science and engineering) and medical science (KULICKE et al. 2008). MINT subjects are comparable with the STEM fields used in English that comprise science, technology, engineering and mathematics.

2012). Compared to other online surveys addressing students (see for example JOSTEN et al. 2008), the response rate is quite satisfactory.

The statistical analysis is based on a binary and multinomial logistic regression. The binary logistic regression compares prospective scientists and entrepreneurs only. The multinomial regression compares prospective scientists and entrepreneurs with a reference group. The large group of prospective employees is taken as a reference.

The dependent variable is the career choice intention of the students five years after finishing their studies. The time lag of five years ensures that a long-term career choice intention is obtained. This way, students who only want to complete a PhD and then leave academia do not bias the results. Three broad occupational groups are differentiated: prospective scientists, entrepreneurs and employees. Prospective scientists are students who plan to be employed at a university or follow an academic career. The category of prospective entrepreneurs includes students who want to start up a (franchise) company or did it already, who want to be a freelancer or who plan the succession in or acquisition of an existing enterprise. The category of prospective employees comprises students who want to be dependently employed in a small, medium or large enterprise or in the public service sector. This last category is used as the reference group in the multinomial logistic regression analysis. For the binary logistic regression prospective employees are excluded from analysis and prospective scientists are used as the reference category for prospective entrepreneurs.

The independent variables are career attitudes, identified and categorized according to the literature review above. The students were asked the question: "How important are the following attitudes for your future career?". The answers were assigned to a seven-point Likert scale (from 1 = "not important at all" to 7 = "very important"), while each rating point was not labeled with an individual descriptive. The seven career attitudes were operationalized by items following CARTER et al. (2003) and CASSAR (2007). "Self-realization" represents attitudes associated with the realization of one's own dream. "Financial success" describes an individual’s intention to earn a larger personal income. "Role models" represents an individual’s desire to follow the example of a person one admires. "Innovation" describes an individual’s aspiration to be innovative and at the forefront of technology. "Recognition" represents an individual’s desire to achieve and get recognition from peer groups. Finally, "independence" describes an individual’s desire to be self-employed. Additionally to the items suggested by CARTER et al. (2003) and CASSAR (2007), the career attitude "welfare" is included in the analysis. "Welfare" describes an individual's desire to

follow a social mission. These instruments have also been used in other GUESSS studies (see for example VIVIERS/VENTER/SOLOMON 2012; ZELLWEGER/SIEGER/HALTER 2011) and have been shown to be reliable as a measure of career attitudes.

Finally, I include a number of control variables, which are used in comparable surveys (ZELLWEGER/SIEGER/HALTER 2011). These are gender (female = 1, male = 0), nationality (foreign = 1, German = 0), family business background (yes = 1, no = 0) and university (Hannover = 1, Göttingen = 0). I exclude age, because the students in the sample are of the same age range. However, I include the level of studies with two dummies for Master and PhD students. For both dummies Bachelor students make up the reference category. Furthermore, I exclude the different fields of studies because of endogeneity. Individual attitudes influence what field of study students choose but the field of study can also have an effect on individual attitudes during the period of study.

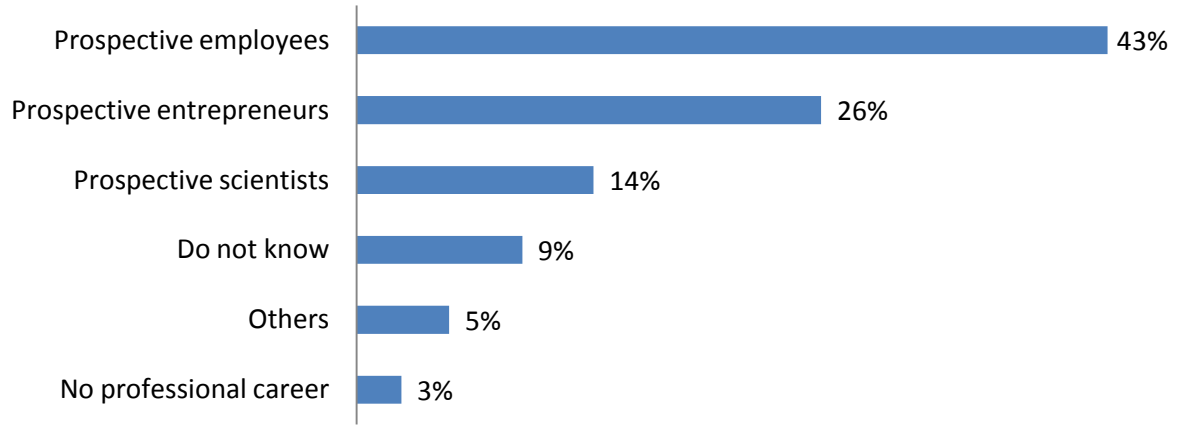
4 Results

In order to get an overview of the data, the data is first analyzed descriptively. Secondly, in order to verify the first hypothesis, a multinomial logistic regression analysis is conducted. In this analysis prospective entrepreneurs and prospective scientists are compared with the reference group of prospective employees. Thirdly, with regard to the second hypothesis prospective entrepreneurs and scientists are compared with each other by conducting a binary logistic regression analysis. For this calculation I only include students who plan to be either entrepreneurs or scientists five years after completion of their studies.

4.1 Descriptive Statistics

Figure 1 shows the students' career choice intentions five years after studies. The majority of students want to be dependently employed at a company or in public service. These students are defined as prospective employees. The second most common desired career is starting or taking over a business, defined as prospective entrepreneurs. One quarter of the students can imagine to be self-employed five years after studies. This number is quite high compared with the total early-stage entrepreneurial activity rate in Germany of about 5 % of the 25- to 30-year-olds (GLOBAL ENTREPRENEURSHIP MONITOR GERMANY 2011). However, this result is in line with the students' survey "Female Academic Entrepreneurs" (FACE), which also achieved results that imply a high untapped entrepreneurial potential among German students (JOSTEN et al. 2008). The third most important career choice intention is having a career at a

university or in academia, defined as prospective scientists. 14 % of the students can imagine following this career path. The remaining students still do not know which type of career they want to have, plan another career path or have no professional career plans. Each one of these intentions entails less than 10%, which is why students with these intentions are excluded from the multinomial regression analyses.



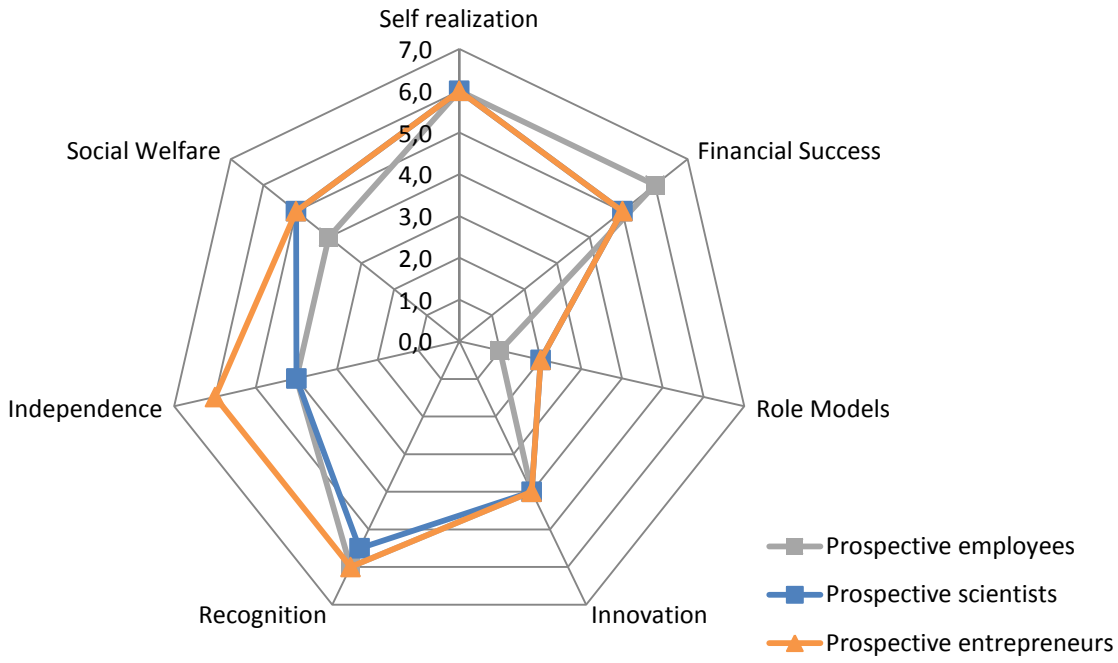
Note: Only students from the universities of Hannover and Göttingen are included.
Source: Own calculation based on GUESSS 2011.

Figure 1: Students' Career Choice Intentions Five Years After Studies

Figure 2 shows the seven career attitudes differentiating students with the career choice intentions of becoming an employee, a scientist or an entrepreneur. According to the hypotheses derived on the basis of the literature review, prospective scientists and entrepreneurs are expected to consider all career attitudes to be comparatively important, except the desire for financial success. The descriptive results indicate that this seems to be only true for the desire for role models, social welfare and financial success. The career attitudes of self-realization, innovation and recognition seem to be similarly rated by all students, whereas self-realization and recognition are most important. The desire to follow a role model is more important for prospective entrepreneurs and scientists than for employees, but surprisingly less important than it might be expected from the literature review (BOSMA et al. 2011; DUBINI 1989). In total, prospective entrepreneurs and scientists seem to share the same attitudes. Only the desire for independence is obviously rated higher by prospective entrepreneurs.

Further descriptive statistics for all indicators of the career attitudes and the control variables can be found in Annex

Annex 1 including medians, minimum and maximum values as well as the number of cases.



Note: Median depicted from 1=very unimportant to 7=very important.
Source: Own calculation based on GUESSS 2011.

Figure 2: Students' Career Attitudes

4.2 Results of the Regression Analyses

Firstly, in order to verify the first hypothesis I conduct a multinomial logistic regression (MLR) analysis. In this analysis, prospective entrepreneurs and prospective scientists are both compared with the reference group of prospective employees. This results in a total number of valid cases of 2,596 students in Model I and 2,548 students in Model II (see Table 1). Therefore, it is possible to compare a minority of students, who want to become scientists or entrepreneurs, with the majority of students who strive for employment in a company or in the public service.

Secondly, to verify the second hypothesis prospective entrepreneurs and scientists are compared with each other by conducting a binary logistic regression (BLR) analysis. For this calculation I only include students who either want to be entrepreneurs or scientists five years after their studies. This results in a total number of valid cases of 1,252 students in Model I and 1,230 students in Model II (see Table 2).

In both the binary and multinomial logistic regression analyses I only include the control variables in the first model. Overall, the results of the control variables are in line with my expectations. In both models, the control variables only explain a small part of the variance (BLR: 6.5 % and MLR: 5.1 %). In the second models, I include all seven career attitudes. The

Pseudo-R^2s increases considerably to 0.283 in the MLR (see Table 1) and to 0.224 in the BLR (see Table 2). This shows that career attitudes determine career choice intentions among students to a great extent. Thus, career attitudes seem to be able to explain and accurately predict career choice intentions among different types of students.

The descriptive analysis showed that the all types of students evaluate the desire for self-realization as important for their career choice intention. However, if one controls for further determinants that may also influence the career choice intention, as it is the case in the multinomial regression, the probability of being a prospective scientist or entrepreneur and not a prospective employee is higher for students who evaluate the desire for self-realization as more important. According to the Wald values in the multinomial logistic regression, self-realization has the second highest impact. Furthermore, the binary logistic regression shows that scientists and entrepreneurs do not significantly differ from each other in their desire for self-realization. Consequently, these results are in line with the hypotheses.

The desire for role models is also higher for prospective scientists and entrepreneurs compared to prospective employees, as the multinomial regression shows. The variable is significant for both groups. Furthermore, the binary logistic regression shows that scientists and entrepreneurs do not significantly differ in their desire for following an admirable person, which is also in line with my hypotheses - although the descriptive analysis showed that all students evaluate role models as relatively unimportant for their career choice. Also, according to the Wald values in the logistic regressions, the desire for role models has only a low influence on the likelihood of becoming a prospective entrepreneur or scientist. Nevertheless, it is obvious that not only prospective entrepreneurs but also prospective scientists have a higher desire to follow role models than prospective employees, even if on a low level. To my best knowledge the issue of role models has not yet been addressed in scientific research and according to the current results it may deserve more attention.

The desire for independence is also higher for prospective scientists and entrepreneurs compared to prospective employees as the multinomial regression shows. So far, this result is in line with the first hypothesis. However, not only the descriptive analysis but also the Wald values of the multinomial logistic regression analysis and the results of the binary logistic regression analysis show that independence is the most important predictor for prospective entrepreneurs and significantly less important for prospective scientists. The results indicate that although scientists conduct research independently, they are to some degree bound to directives and instructions of the university or research institution they are employed at. The

degree of independence is higher for entrepreneurs, and the second hypothesis has to be discarded in regard to this aspect.

The desire for financial success is significantly less important for prospective scientists and entrepreneurs than for employees. This result is in line with the first hypothesis and the descriptive analysis. Although financial success is an empirically developed career attitude, which is strongly associated with the entrepreneurial choice (CASSAR 2007), money does not seem to be an important reason for starting up a business (AMIT et al. 2001). However, the comparison of prospective scientists and entrepreneurs only, reveals that prospective entrepreneurs still have a significantly higher desire for financial success. The lower desire for financial success is the most significant predictor for the likelihood to be a prospective scientist and not a prospective entrepreneur or employee. This means that, compared to all other groups, prospective scientists are barely motivated by financial incentives. Therefore, the second hypothesis also has to be rejected in regard to this aspect.

Prospective scientists and entrepreneurs do not significantly differ in their desire for innovation, neither in comparison to each other nor to prospective employees. This corresponds to the descriptive analysis. These results contradict the first hypothesis but still verify the second hypothesis. Also, some empirical studies indicate that the desire for innovation was insignificant for the entrepreneurial decision (see for example CARTER et al. 2003). One explanation for the insignificant results may be that innovation does not primarily influence an initial entrepreneurial choice but rather the subsequent growth of a venture (CASSAR 2007). Another explanation could be that although there is no significant difference, it may be that prospective scientists, entrepreneurs and employees have different ideas on innovation and social welfare. While prospective scientists want to be innovative in their field of basic research, employees want to conduct applied research and prospective entrepreneurs rather wish to implement these ideas (SAUERMANN/ROACH 2012).

The descriptive analysis for the career attitude of social welfare indicates that prospective employees are less interested in following a social mission. However, if one controls for further determinants in the logistic regressions, it becomes clear that prospective scientists and entrepreneurs do not significantly differ in their desire for social welfare, neither from prospective employees nor from each other. In other words, the career attitude social welfare cannot be used to predict the career choice intentions of students. Accordingly, these results contradict the first hypothesis but still verify the second one. The reason for having the attitude of social welfare may be similar to the reason for having the career attitude of

innovation. The possibility to contribute to social welfare occurs in different ways. It does not seem to be related to a specific kind of occupation and can take place in the environments of entrepreneurship, academia and employment.

Surprisingly, receiving recognition is the least important for prospective entrepreneurs, while prospective scientists and dependent employees do not differ significantly in their desire for recognition. These results completely contradict both hypotheses, and also the previous descriptive analysis did not indicate such results. One possible explanation for the prospective entrepreneurs' low desire for recognition is that many different types of entrepreneurs exist. Empirical evidence indicates that an entrepreneur's need for achievement correlates with the company's performance. The correlation is higher for classical entrepreneurs in a strict sense but not for small business owners (STEWART JR et al. 1999). This suggests that only a more in-depth differentiation of the types of prospective entrepreneurs might lead to significant results. Another explanation could be that entrepreneurs need to assert their founding idea, even in spite of potential opposition. Therefore they might be less interested in the approval by third parties (CARTER et al. 2003).

In order to check whether the results are robust, I conducted statistical outlier tests using Cook's Distance (BACKHAUS/ERICHSON/PLINKE 2005). The values were below 0.2, therefore there are no influential outliers. Also, I tested for multicollinearity by calculating the Spearman's rank correlation coefficients and the variance inflation factor (VIF) for all independent variables used in the logistic regressions (BACKHAUS/ERICHSON/PLINKE 2005). The Spearman's rank correlation coefficients were all below 0.4 (see Annex 2). The VIF values were below 1.5. These results prove, that the models are not influenced in any significant or systematic way.

Table 1: The Prediction of Becoming a Prospective Entrepreneur or Prospective Scientist - Results of the Multinomial Logistic Regression Analysis

Career choice intentions: five years after studies		Model I				Model II			
		B	Wald	Sig.	Exp(B)	B	Wald	Sig.	Exp(B)
Prospective Scientist	Constant term	-1.047	77.531	.000		-1.187	12.038	.001	
	Dummy gender (female=1)	.234	4.248	.039	1.264	.284	5.289	.021	1.329
	Dummy nationality (foreign=1)	.764	11.354	.001	2.148	.708	8.756	.003	2.030
	Family business background (fbb=1)	.084	.486	.486	1.088	.017	.018	.894	1.017
	Dummy university (Hannover=1)	-.475	16.762	.000	.622	-.319	6.934	.008	.727
	Dummy PhD (PhD=1)	.362	4.826	.028	1.437	.400	5.321	.021	1.492
	Dummy Master (Master=1)	-.376	8.388	.004	.686	-.409	9.128	.003	.664
	Self-realization					.267	29.721	.000	1.305
	Financial success					-.426	93.706	.000	.653
	Role models					.094	7.506	.006	1.099
	Innovation					-.005	.020	.888	.995
	Recognition					-.025	.272	.602	.975
	Independence					.134	13.540	.000	1.143
	Social welfare					.022	.455	.500	1.023
Prospective Entrepreneur	Constant term	-.608	39.053	.000		-2.837	82.979	.000	
	Dummy gender (female=1)	-.044	.231	.631	.957	.124	1.340	.247	1.131
	Dummy nationality (foreign=1)	1.032	34.596	.000	2.807	.722	12.996	.000	2.059
	Family business background (fbb=1)	.570	38.236	.000	1.769	.446	18.546	.000	1.562
	Dummy university (Hannover=1)	-.093	1.021	.312	.912	.047	.209	.648	1.048
	Dummy PhD (PhD=1)	-.374	5.257	.022	.688	-.369	4.145	.042	.691
	Dummy Master (Master=1)	-.181	3.454	.063	.835	-.242	4.927	.026	.785
	Self-realization					.207	24.177	.000	1.230
	Financial success					-.181	20.974	.000	.834
	Role models					.109	14.291	.000	1.115
	Innovation					.002	.004	.953	1.002
	Recognition					-.195	21.965	.000	.823
	Independence					.576	279.882	.000	1.779
	Social welfare					.014	.238	.625	1.014
Model Fit	Chi²	134.782**				714.371**			
	Cox Snell Pseudo R^2	.051				.244			
	Nagelkerke Pseudo R^2	.058				.283			
	McFadden Pseudo R^2	.026				.140			
	N	2596				2548			

Notes: The reference category is prospective employee.
Source: Own calculations based on GUESSS 2011.

Table 2: The Prediction of Becoming a Prospective Entrepreneur - Results of the Binary Logistic Regression Analysis

Career choice intentions: five years after studies		Model I				Model II			
		B	Wald	Sig.	Exp(B)	B	Wald	Sig.	Exp(B)
Prospective Entrepreneur	Constant term	.432	11.021	.001	1.540	-1.383	12.570	.000	.251
	Dummy gender (female=1)	-.265	4.605	.032	.767	-.199	2.027	.155	.820
	Dummy nationality (foreign=1)	.251	1.313	.252	1.286	.094	.152	.697	1.099
	Family business background (fbb=1)	.491	14.808	.000	1.633	.416	9.091	.003	1.516
	Dummy university (Hannover=1)	.396	9.894	.002	1.486	.344	6.390	.011	1.410
	Dummy PhD (PhD=1)	-.746	15.170	.000	.474	-.914	19.265	.000	.401
	Dummy Master (Master=1)	.181	1.672	.196	1.198	.136	.806	.369	1.146
	Self-realization					-.082	2.125	.145	.921
	Financial success					.223	21.463	.000	1.250
	Role models					.035	.887	.346	1.036
	Innovation					.008	.047	.829	1.008
	Recognition					-.134	6.422	.011	.875
	Independence					.404	94.554	.000	1.498
	Social welfare					-.018	.222	.638	.983
Model Fit	Chi²	60.503**				216.995**			
	Cox Snell Pseudo R^2	.047				.162			
	Nagelkerke Pseudo R^2	.065				.224			
	N	1252				1230			

Notes: The reference category is prospective scientist.
Source: Own calculations based on GUESSS 2011.

5 Conclusions

The aim of this paper was to investigate the relationship between students' career choice intentions, differentiating between academia and entrepreneurship, and their attitudes towards self-realization, recognition, independence, innovation, role models, financial success and social welfare. Based on a literature review on the career attitudes comparing entrepreneurs and scientists, I derived following hypotheses: Firstly, prospective entrepreneurs and prospective scientists have a higher desire for self-realization, recognition, independence, innovation, role models, social welfare and a lower desire for financial success compared to other individuals. Secondly, prospective entrepreneurs and prospective scientists have a similar desire for self-realization, recognition, independence, innovation, role models, social welfare and financial success.

The results of the multinomial and binary logistic regression analyses show that career attitudes determine career choice intentions among students to a great extent. Thus, career attitudes may explain and accurately predict career choice intentions among different types of students. Table 3 summarizes the expected and empirical results of the multinomial and

binary logistic regression analyses. The results show that prospective entrepreneurs and scientists have similar career attitudes. Prospective scientists are therefore well equipped with attitudes which are (also) conducive for starting a business. They have the same desire for self-realization, innovation and social welfare, whereby the last two attitudes are important for all types of students. Furthermore, although prospective entrepreneurs have a higher desire for independence and financial success than prospective scientists, they both still have a lower desire for financial success and a higher desire for independence compared to the majority of students, who want to be employees. Recognition is the only career attitude in which prospective entrepreneurs and scientists differ from each other and from other students. Prospective entrepreneurs have a lower desire for recognition compared to prospective scientists and employees, while prospective scientists do not significantly differ from employees. Regarding the impact of the individual career attitudes, the strongest influence by far on becoming an entrepreneur is the desire to be the own boss, whereas the strongest influence on becoming a scientist is a low desire for financial success.

Table 3: Summary of the Results of the Binary and Multinomial Regressions

		H.1				H.2	
		Prospective entrepreneurs versus prospective employees		Prospective scientists versus prospective employees		Prospective entrepreneurs versus prospective scientists	
		Expected	Empirical	Expected	Empirical	Expected	Empirical
A	Self-realization	+	+	+	+	**o**	**o**
B	Recognition	+	-	+	**o**	**o**	-
C	Independence	+	+	+	+	**o**	+
D	Innovation	+	**o**	+	**o**	**o**	**o**
E	Role models	+	+	+	+	**o**	**o**
F	Social welfare	+	**o**	+	**o**	**o**	**o**
G	Financial success	-	-	-	-	**o**	+

Note: (+) significantly positive, (-) significantly negative, (o) not significant. Cells colored in grey indicate that the result meets the hypothesis.
Source: Own calculations based on GUESSS 2011.

5.1 Contributions to Literature

The topic of academic entrepreneurship has been widely discussed in the literature since the development of the "Entrepreneurial University" and "Triple Helix" concepts (ETZKOWITZ et al. 2000). Numerous studies deal with the career attitudes of (nascent) entrepreneurs (see for example CARTER et al. 2003; SCHEINBERG/MACMILLAN 1988; SHANE/KOLVEREID/WESTHEAD 1991). There are also more specific studies on the intention of students to become self-employed (BERGMANN/CESINGER/OSTERTAG 2012; HAASE/LAUTENSCHLÄGER 2011; TKACHEV/KOLVEREID 1999; ZELLWEGER/SIEGER/HALTER 2011). These kinds of studies mainly focus on why students choose to become entrepreneurs or not. Another stream of empirical studies focuses on why scientists leave an academic career in order to establish a company (see for example FINI/GRIMALDI/SOBRERO 2009; FRITSCH/KRABEL 2012; GÖTHNER et al. 2012; KRABEL/MUELLER 2009; LAM 2011; NÖRR 2010; STUART/DING 2006). In utmost contrast, hardly any research has recently been conducted on the career attitudes of scientists (SAUERMANN/ROACH 2012) and a direct comparison of the career attitudes of entrepreneurs or scientists is to my best knowledge still absent from the literature.

The current study augments the present research by examining the career attitudes of students with either entrepreneurial or scientific career intentions. In this way, it is possible to investigate the original career attitudes of students who choose between academia and entrepreneurship and to give an answer to the question "How entrepreneurial are prospective scientists?" The common view is that scientists and entrepreneurs are different in their attitudes (MANGEMATIN 2000). However, the present results indicate that prospective entrepreneurs and scientists do not differ that much from each other in their original career attitudes. In other words, prospective scientists are already relatively entrepreneurial compared to prospective employees. This in turn indicates that entrepreneurs and scientists become increasingly different only after they start their careers because of the different socialization processes at a university or in a company (DING/CHOI 2011). However, there are differences between the two groups. Most importantly, prospective entrepreneurs have a greater desire for financial success and independence and a lower desire for recognition compared to prospective scientists.

5.2 Policy Implications

The question "How entrepreneurial are prospective scientists?" is of special interest because one objective of many universities today is to encourage university spin-off creation, according to the new "third mission" (ETZKOWITZ et al. 2000). The young university scientists of today could become those entrepreneurs of tomorrow.

The empirical results indicate that prospective scientists have relatively similar entrepreneurial attitudes as prospective entrepreneurs, so that universities do not need to be concerned about choosing young scientists not only on scientific grounds but also with respect to their entrepreneurial attitudes. However, students with a relatively high desire for financial success and independence, might be more likely to start a company as scientists later on.

Overall, the results indicate that it is definitely possible that prospective scientists start a business later in their scientific career. However, reality is different. The actual entrepreneurial activities at the universities in Hannover and Göttingen are still quite nominal (BERGMANN/CESINGER/OSTERTAG 2012; SCHMUDE/AEVERMANN/HEUMANN 2011). This suggests that the period of time during which scientists work at a university influences their future entrepreneurial activities. At this stage, support and encouragement by a supervisor (NANDA/SORENSEN 2010) as well as a strong entrepreneurial infrastructure at university might help young scientists to start a business (DEGROOF/ROBERTS 2004).

Furthermore, universities can also encourage entrepreneurial activity by sensitizing their students and fostering the development of entrepreneurial attitudes. Entrepreneurship educators as well as university teachers could include those elements into their curricula which stimulate the development of entrepreneurial attitudes, and are also valuable for a career in academia or employment (DOUGLAS/SHEPHERD 2002). This is theoretically possible, because in the course of the Bologna Process elective elements are considered and also developing key competences has become a key element in many study programs (SCHAEPER 2008). In practice, these possibilities are still insufficiently used for developing entrepreneurial attitudes.

As another possibility, the university technology transfer office could bring together students with complementary career attitudes (BREITENECKER/SCHWARZ/CLAUSSEN 2011; ENSLEY/HMIELESKI 2005). While some technically interested students might want to be innovative, other more business oriented students want to exploit a business opportunity. Creating opportunities where students with complementary career attitudes get to know each

other can enhance entrepreneurial potential. For example, interdisciplinary classes in the field of entrepreneurship with a certain credit point value could be offered. Also, the technology transfer office could actively search for inventions and product ideas at the institutes. Study projects could be carried out, in which business students develop a business plan for these inventions.

As final note, it should be said, that the overall objective of universities should be to encourage socio-economic development by contributing to the efficient allocation of human resources. Universities should make sure that career choices meet the student's preferences and abilities as well as the demand on the labor market. In this way, the students will be able to contribute the most to the overall economic development (HAASE/LAUTENSCHLÄGER 2011).

5.3 Limitations and Further Research

Although the present empirical study fills certain research gaps, it also reveals the need for further research. Furthermore, the results should not be interpreted without taking note of the limitations of the study, which I address in the following.

Regarding the transferability of the results it should be considered that the results are solely based on a sample within two universities in the federal state of Lower Saxony at one point in time. The results are therefore hardly transferable to other regions or time periods. For example, a survey at one point in time can suffer from effects of a university course (i.e. a charismatic teacher or a very good entrepreneurship course).

There might be a bias in this study caused by an overrepresentation of students who are interested in entrepreneurial activities and are maybe more willing to answer questions on entrepreneurial intentions. Furthermore, the career attitudes used in the survey emphasize entrepreneurship, due to the aim of the GUESSS. Further research should also integrate specific career motives of scientists. Only a very few recent studies in this field exist (ROACH/SAUERMANN 2010; SAUERMANN/ROACH 2012). The academic system in Europe has changed in the last years because of the Bologna Process (CURAJ et al. 2012) and the ambition of many universities to become more entrepreneurial (ETZKOWITZ et al. 2000). It would be interesting to investigate what has changed within the last 50 years.

This study focuses only on variables on an individual level, where students' career attitudes are the focal point. Nevertheless, it should be considered that contextual support and barriers can also influence career choices in general (DUBINI 1989; LENT/BROWN/HACKETT 2000) and - in particular - the decision to start a new firm (RIZZO 2014; STERNBERG/WAGNER 2004). A

multilevel analysis which allows to analyze nested data could therefore confer an advantage in future research (HUNDT 2012).

Also, this study only considers intentions and not actual behavior. Nevertheless, analyzing intentions has an important advantage because it avoids a memory bias (CARTER et al. 2003). A panel study would be an ideal solution for analyzing how career attitudes change and if original career preferences come true over time. A first step in this direction could be projects such as the German National Educational Panel Study (NEPS) (SCHAEPER 2013). In this way, it may also be possible to outline the path from being a scientist to becoming an entrepreneur. It would be interesting to investigate if the path leads from basic to applied research and finally to a university spin-off.

The results of this study suggest that entrepreneurs and scientists become increasingly different only after they start their careers due to the different socialization processes at a university or in a company (DING/CHOI 2011). This should be investigated more thoroughly. Thereby it may be of particular interest to investigate the influence of a career not only on the university spin-off creation but also on the subsequent university spin-off development (GÖTHNER et al. 2012; JAIN/GEORGE/MALTARICH 2009; STUART/DING 2006).

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Annex

Annex 1: Descriptive Statistics of Students' Career Attitudes and Control Variables

			Career choice intentions: five years after studies															
			Prospective Scientists				Prospective Entrepreneurs				Prospective Employees				Total			
			Median	Min	Max	N	Median	Min	Max	N	Median	Min	Max	N	Median	Min	Max	N
Career Attitudes	Self-realization	Realize my own dream	6	1	7	423	6	1	7	829	6	1	7	1344	6	1	7	2596
	Financial Success	Earn a larger personal income	5	1	7	423	5	1	7	829	6	1	7	1344	5	1	7	2596
	Role models	Follow example of a person I admire	2	1	7	423	2	1	7	829	1	1	7	1344	2	1	7	2596
	Innovation	Be innovative, at the forefront of technology	4	1	7	423	4	1	7	829	4	1	7	1344	4	1	7	2596
	Recognition	Achieve something, get recognition	6	1	7	423	6	1	7	829	6	1	7	1344	6	1	7	2596
	Independence	Be my own boss	4	1	7	423	6	1	7	829	4	1	7	1344	4	1	7	2596
	Social Welfare	Follow a social mission	5	1	7	423	5	1	7	829	4	1	7	1344	4	1	7	2596
Control Variables	Dummy university	Göttingen				249				386				620				1255
		Hannover				174				443				724				1341
	Dummy PhD	No				350				763				1203				2316
		Yes				73				66				141				280
	Dummy Master	No				311				548				859				1718
		Yes				112				281				485				878
	Dummy gender	Male				207				473				755				1435
		Female				216				356				589				1161
	Dummy nationality	German				389				736				1284				2409
		Foreign				34				93				60				187
	Dummy Family Business Background	No				284				458				926				1668
		Yes				139				371				418				928

Source: Own calculations based on GUESSS 2011.

Annex 2: Correlation Matrix Spearman Rho for Students' Career Attitudes and Control Variables

		1	2	3	4	5	6	7	8	9	10	11	12	13
		Dummy gender (female=1)	Dummy nationality (foreign=1)	Self-realization	Financial Success	Role models	Innovation	Recognition	Independence	Social welfare	Dummy family business background (yes=1)	Dummy university (Hannover=1)	Dummy PhD (PhD=1)	Dummy Master (Master=1)
1	rho	1.000	.007	.072**	.027	-.050**	-.249**	.041*	-.070**	.124**	-.037*	.134**	-.019	-.006
	p	.	.682	.000	.130	.005	.000	.022	.000	.000	.039	.000	.282	.720
	N	3138	3138	3121	3123	3119	3111	3117	3116	3120	3138	3138	3138	3138
2	rho		1.000	.059**	.083**	.088**	.100**	.055**	.101**	.055**	.027	-.104**	.004	.070**
	p		.	.001	.000	.000	.000	.002	.000	.002	.135	.000	.826	.000
	N		3138	3121	3123	3119	3111	3117	3116	3120	3138	3138	3138	3138
3	rho			1.000	.171**	.051**	.134**	.298**	.286**	.218**	.049**	.060**	-.052**	-.043*
	p			.	.000	.005	.000	.000	.000	.000	.006	.001	.004	.016
	N			3121	3116	3112	3104	3110	3109	3113	3121	3121	3121	3121
4	rho				1.000	.021	.128**	.381**	.185**	-.123**	.011	-.072**	-.044*	-.016
	p				.	.231	.000	.000	.000	.000	.533	.000	.013	.378
	N				3123	3116	3108	3113	3112	3115	3123	3123	3123	3123
5	rho					1.000	.184**	.152**	.138**	.138**	.073**	.021	-.014	-.003
	p					.	.000	.000	.000	.000	.000	.239	.450	.878
	N					3119	3108	3112	3110	3112	3119	3119	3119	3119
6	rho						1.000	.267**	.218**	-.012	.061**	-.102**	.008	.011
	p						.	.000	.000	.497	.001	.000	.647	.554
	N						3111	3105	3103	3105	3111	3111	3111	3111
7	rho							1.000	.193**	.084**	.016	-.016	-.006	-.016
	p							.	.000	.000	.382	.374	.730	.364
	N							3117	3107	3110	3117	3117	3117	3117
8	rho								1.000	.146**	.083**	-.003	-.021	-.008
	p								.	.000	.000	.857	.237	.647
	N								3116	3111	3116	3116	3116	3116
9	rho									1.000	.014	.057**	-.024	-.019
	p									.	.429	.001	.175	.279
	N									3120	3120	3120	3120	3120
10	rho										1.000	.009	-.008	-.014
	p										.	.612	.667	.435
	N										3138	3138	3138	3138
11	rho											1.000	.116**	-.062**
	p											.	.000	.001
	N											3138	3138	3138
12	rho												1.000	-.238**
	p												.	.000
	N												3138	3138
13	rho													1.000
	p													.
	N													3138

Source: Own calculations based on GUESSS 2011.