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The Interplay between Entrepreneurship Education and Regional Knowledge Potential in Forming Entrepreneurial Intentions

Sascha G. Walter and Dirk Dohse

Abstract:

This study examines how the effect of entrepreneurship education on students' entrepreneurial intentions is (1) contingent on the mode of education (active, e.g. business plan seminar, vs reflective, e.g. theory lectures), (2) contingent on the regional context and (3) complemented by individual-level influences such as role models or work experience. Results show that active modes of entrepreneurship education directly increase intentions and attitudes, whereas the impact of reflective modes depends on the regional context. Parental role models and work experience are found to complement entrepreneurship education in different ways. The findings have important implications for theory building as well as for the practice of teaching entrepreneurship.

Key words: entrepreneurship education, knowledge spillover, entrepreneurial intentions, theory of planned behavior

JEL: A20, I23, O31, R19

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1. Executive Summary

The number of entrepreneurship classes at universities has grown rapidly in recent years. But (how) can such offers effectively motivate and qualify students for entrepreneurial careers? Insightful quasi-experimental studies have shown a positive relationship between taking entrepreneurship classes and students' entrepreneurial intentions (e.g. Souitaris et al., 2007; Peterman and Kennedy, 2003) but have not differentiated teaching styles and neglected the university and individual context. Teaching styles include active modes of entrepreneurship education such as business plan seminars or simulations that emphasize active experimentation and reflective modes such as theory lectures that emphasize reflective observation.

This study examines how the effect of entrepreneurship education on students' entrepreneurial intentions is (1) contingent on the mode of education (active vs reflective), (2) contingent on the regional context and (3) complemented by individual-level influences such as role models or work experience. Moreover, we also analyze how these variables affect drivers of intentions suggested by the theory of planned behavior (attitude toward the behavior, subjective norm, and behavioral control). Specifically, our multilevel study suggests that the effect of entrepreneurship classes is determined by the university-region-interaction and complemented by individual influences, after controlling for individual traits (need for achievement, risk-taking propensity, and need for independence).

To test our hypotheses, we employed hierarchical linear modeling (HLM) on data from 1,959 male students, 65 university departments (engineering, computer science, business) and 30 regions. Our findings reveal that active modes of entrepreneurship education directly raise students' entrepreneurial intentions, whereas reflective modes were only effective in regions rich in human capital density and characterized by high start-up intensity. Parental role models but not work experience were positively related to intentions. Regarding the nature of this effect, only

role models affected all drivers of entrepreneurial intentions suggested by the theory of planned behavior (attitude toward the behavior, subjective norms, and perceived behavioral control). In contrast, entrepreneurship education (alone or in interaction with the context) enhanced students' attitudes toward self-employment, while work experience was positively related to perceived behavioral control.

Our findings have important implications for entrepreneurship research and teaching. The study extends prior research by providing large-scale evidence that the supply with entrepreneurship education substantially raises entrepreneurial intentions by affecting attitudes. However, this effect is contingent on the mode and context of such education: Active modes directly affect intentions, whereas the impact of reflective modes is dependent on the regional context. Hence, in order to further enhance the impact of entrepreneurship education, university departments may align the curricular mix of reflective and active modes to the regional context. Another important result is that students at universities offering entrepreneurship education (in certain regions) are more likely to develop a positive attitude towards pursuing an entrepreneurial career, but are not more likely to feel encouraged or more competent to do so. Thus, complementary offers increasing students' skills and work experience might be helpful. Departments could, for instance, promote internships at start-ups or established firms with a strong culture of intrapreneurship among students in order to increase their perceived behavioral control. Future research should continue to consider contextual influences when explaining individual entrepreneurial behavior. Multilevel research promises to provide a richer picture of the entrepreneurial process.

2. Introduction

Education and experience play a key role in identifying entrepreneurial opportunities (Shane, 2000; Davidsson and Honig, 2003; Ucbasaran et al., 2008) and in successfully exploiting them (Robinson and Sexton, 1994; Bates, 1995; Gimeno et al., 1997). As evidenced by the rapid growth in the number of entrepreneurship classes and programs at universities (Vesper and Gartner, 1997; Katz, 2003; Klandt, 2004), many policy makers seem to share the belief that universities transfer essential entrepreneurial know-how and thus investments in educational offers may ultimately result in more (successful) entrepreneurship.[1] But can universities effectively motivate and qualify individuals to enter self-employment, leading to higher start-up rates within a region?

Scholars have intensively debated whether entrepreneurship can be formally taught and learned (Gorman et al., 1997; Aronsson, 2004; Gendron, 2004). Many commentators assume that university education can transfer at least some entrepreneurial know-how (Henry et al., 2005). Prior research has tracked the progress in entrepreneurship education (Robinson and Haynes, 1991; Vesper and Gartner, 1997; Katz, 2003), proposed and analyzed adequate teaching strategies (Fiet, 2000b; Fiet, 2000a) and course offers (Hills, 1988; Gartner and Vesper, 1994) and investigated the impact of entrepreneurship programs at a single universities (Chrisman, 1997). More recently, insightful quasi-experimental studies (Souitaris et al., 2007; Peterman and Kennedy, 2003) examined the impact of entrepreneurship education: Students in their sample were more interested in pursuing careers as self-employed after participating in such courses, but only in the latter study they also felt more competent to do so. However, to date, relatively little is known on how the effect of entrepreneurship education on entrepreneurial intentions is contingent on extra-university influences. The knowledge spillover theory of entrepreneurship

[1] It is important to note that the objectives of entrepreneurship education also include preparing for entrepreneurship-related careers, including a career as venture capitalist or intrapreneur in an established firm.

(Audretsch and Lehmann, 2005; Audretsch et al., 2008; Acs et al., 2009) and network-based research (Birley, 1985; Davidsson and Honig, 2003; Hoang and Antoncic, 2003) suggest two ways in which contextual variables may affect the formation of entrepreneurial intentions.

The first possibility is that the effectiveness of entrepreneurship courses depends on the regional context. Research on knowledge spillovers has found that such spillovers are localized (Glaeser et al., 1992; Jaffe et al., 1993). This implies that regional differences in knowledge stocks and R&D investment matter as regions with higher knowledge and more R&D activity provide more knowledge spillovers and thus more entrepreneurial opportunities than others. These differences in opportunities can explain why some regions have higher start-up rates than others (Reynolds et al., 1994; Audretsch and Fritsch, 2002; Rocha and Sternberg, 2005; Fritsch and Falck, 2007). Thus, some regions offer more profitable opportunities than others. This implies, for instance, that the impact of entrepreneurship education may systematically vary across regions. Students in regions rich in entrepreneurial know-how can draw on offers such as internships in start-ups that leverage the effect of university education. Similarly, a regional entrepreneurial culture can amplify the effect of educational offers by signaling that self-employment is accepted as legitimate career alternative. In other words: Some regions provide a more fertile soil for entrepreneurship education than others.

The second possibility is that social ties at the individual level complement entrepreneurship education in shaping future entrepreneurs. The personal network often serves as an effective source of entrepreneurial knowledge and socialization. Parental role models can transfer entrepreneurial values and know-how to their children during primary socialization and also in later life-stages (Scherer et al., 1989). Similarly, entrepreneurs were found to frequently tap into personal knowledge sources, such as industrial, commercial or research partners (Birley, 1985; Ravasi and Turati, 2005; Ozgen and Baron, 2007). This enables them to learn about potential markets for goods and services, sources of capital, and innovations (Dubini and Aldrich,

1991; Davidsson and Honig, 2003), but also about techniques taught at universities, such as business planning or market analysis. Social networks are also helpful in transferring tacit knowledge about how to exploit entrepreneurial opportunities (Busenitz and Lau, 1996; Reynolds, 1997). However, to date both possibilities on entre are relatively untested.

Drawing on a multilevel dataset of 1,949 male students, 65 university departments (computer science, electrical engineering, and business) and 30 regions, we examine how (1) entrepreneurship education in interaction with the regional context (start-up intensity, human capital density) and (2) individual sources of knowledge and motivation (role models, work experience) shape students' entrepreneurial intentions. Adopting a multilevel approach, we argue that organizational-level offers of entrepreneurship education are more effective in regions characterized by high start-up intensity and human capital endowments and that these effects are complemented by individual-level knowledge sources. By focusing on the offer (instead of use) of entrepreneurship education, we acknowledge that its effect is not limited to participants because it fosters the diffusion of entrepreneurial knowledge within a department. Moreover, we also explore the nature of this effect through the lens of the theory of planned behavior (Ajzen, 1991; Kolvereid, 1996b; Krueger et al., 2000; Souitaris et al., 2007): Do these influences form students' opinions towards entrepreneurship (i.e. increase their attitudes toward the behavior [ATB]), encourage them to pursue entrepreneurial careers (i.e. increase subjective norms [SN]), and/or make them feel more competent to pursue an entrepreneurial career (i.e. increase their perceived behavioral control [PBC])? Figure 1 summarizes the analytical framework presented above.

Our study makes several contributions to the literatures on entrepreneurship education, regional development, and entrepreneurial networks. First, our multilevel approach empirically tests the interaction of entrepreneurship education offers and the regional context in shaping entrepreneurial intentions, while controlling for important individual-level influences. Such a test

complements studies that have not controlled for contextual influences (Peterman and Kennedy, 2003; Souitaris et al., 2007). Our large sample of 65 university departments also allows us to provide a large-scale theory-driven test of education effects and to examine the generalizibility of prior findings from smaller samples (Peterman and Kennedy, 2003; Souitaris et al., 2007). Second, this study explores the mechanism through which these influences form entrepreneurial intentions. Insights into the nature of this effect help to further understand and improve the impact of educational offers. Third, a major innovation of this study is that it untangles reflective modes and active modes of entrepreneurship education. In reflective modes such as theory lectures the student acquires knowledge through reflective observation, in active modes such as business plan seminars or simulations knowledge is acquired through active experimentation (Randolph and Posner, 1979). Prior studies have not controlled whether these modes substantially differ in their impact on entrepreneurial intent and whether the moderating impact of contextual conditions differs between the two modes. Fourth, we use Hierarchical Linear Modeling to analyze our multilevel data and therefore avoid estimation problems reported for traditional regression analysis (Raudenbush and Bryk, 2002).

The paper is organized as follows. In the third section, we explain how contextual influences at the level of the individual, organization, and region may affect the decision to found a firm. In the fourth section, we describe the dataset and methods used for analysis. In the fifth section, we present the results. In the final section, we discuss our findings and their implications for future research on and the practice of entrepreneurship education.

Pls. insert Figure 1 about here

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3. Theoretical development

3.1. Entrepreneurship education

For students, curricular lectures or courses on entrepreneurship are a direct source of entrepreneurial motivation and knowledge. Three separate arguments have been put forth for why they should increase entrepreneurial intentions. First, entrepreneurship students learn methods to generate basic business ideas (e.g. creativity techniques) and to confirm that a given idea is new and valuable (e.g. market analysis). Such knowledge can increase both the number and innovativeness of opportunities that they associate with the same technology (Shepherd and DeTienne, 2005). Second, such courses provide knowledge how to bring business ideas better and faster to market and thus how to realize higher value from the same opportunity than others (Zhao et al., 2005; Davidsson and Honig, 2003). Course participants are likely to share some of their new know-how with fellow students and thus contribute to the diffusion of entrepreneurial knowledge and inspiration within a department, affecting course participants and other students (Caputo and Dolinsky, 1998). Third, the number of courses reflects the degree to which the department considers self-employment as a legitimate career alternative. Studies have found a positive link between social desirability and entrepreneurial intentions (Kolvereid, 1996b).

In empirical studies by Souitaris et al. (2007) and Peterman and Kennedy (2003), university and high school students, respectively, reported higher entrepreneurial intentions after taking entrepreneurship classes. However, these studies have not differentiated teaching styles. To complement, our analysis examines two modes of entrepreneurship education proposed by Learning Style Theory (Kolb, 1976; Randolph and Posner, 1979): Active modes, where the student acquires knowledge through active experimentation (e.g. business plan seminars or simulations), and reflective modes, where the student acquires knowledge through reflective observation (e.g. theory lectures). We presume that both modes of entrepreneurship education

have a positive impact on students' entrepreneurial intentions but they may differ in their strength of impact.

Hypothesis 1a. The higher the extent of reflective modes of entrepreneurship education at a university department, the stronger the students' entrepreneurial intention (ATB, SN, PBC).

Hypothesis 1b. The higher the extent of active modes of entrepreneurship education at a university department, the stronger the students' entrepreneurial intention (ATB, SN, PBC).

3.2. Entrepreneurship education and the regional context

Scholars have long observed that entrepreneurial activity tends to vary across regions (Reynolds et al., 1994; Audretsch and Fritsch, 2002; Rocha and Sternberg, 2005; Fritsch and Falck, 2007). Because universities are not isolated from, but embedded into the wider region, we argue that two regional characteristics, start-up intensity and human capital density, should amplify the positive impact of entrepreneurship education. Start-up intensity measures the relative frequency of new firm formation in a region. It should complement academic education in several ways. First, regions with high start-up rates are more likely to have great stocks of expertise that entrepreneurs have developed in a learning-by-doing process. Students can access this knowledge, for instance, via internships at young firms or presentations by entrepreneurs at their universities and thus tap into an additional source of entrepreneurial knowledge. Second, start-ups provide a credible example that entrepreneurship is feasible. Thereby, they illustrate text-book knowledge often taught at universities and further sensitize for an entrepreneurial career. Third, the existence of start-ups can reflect and further add to a regional entrepreneurial

culture. Such culture can signal students that entrepreneurship is socially desirable and accepted as a legitimate career alternative.

Hypothesis 2a. The start-up intensity in a region moderates the relationship between entrepreneurship education and entrepreneurial intention (ATB, SN, PBC) in such a way that the positive effect of reflective modes of entrepreneurship education is enhanced.

Hypothesis 2b. The start-up intensity in a region moderates the relationship between entrepreneurship education and entrepreneurial intention (ATB, SN, PBC) in such a way that the positive effect of active modes of entrepreneurship education is enhanced.

Human capital density measures the share of highly-qualified individuals in the regional labor force. Human capital density measures the share of highly-qualified individuals in the regional labor force. A high human capital density may be seen as an indicator that a region is rich in knowledge. There is extensive empirical evidence for a positive relationship between regional human capital and entrepreneurial activities (e.g. Bates, 1990). Such regions provide a context that complements and further amplifies the effect of formal education. Therefore, potential entrepreneurs in regions rich in human capital have access to superior knowledge which increases the profitability (and accelerates the growth) of their prospective ventures relative to competitors in regions less well endowed with human capital

Moreover, regions rich in human capital offer more entrepreneurial opportunities through knowledge spillovers. Knowledge spillover theory posits that incumbent firms and research organizations do not exploit all of their new knowledge they create (e.g. by R&D investment) themselves and thus generate entrepreneurial opportunities for others (Audretsch and Keilbach, 2007, Audretsch et al., 2008). That the spillover of knowledge is more likely in regions with a

high human capital density has been formally shown in a seminal paper by Jovanovich and Rob (1989). In their model, individual agents (e.g. entrepreneurs) augment their knowledge through pairwise meetings with a finite number of randomly chosen other agents. The higher the average level of human capital, the higher is the likelihood that these meetings prove successful and the more rapid will be the diffusion and growth of knowledge. Acs and Armington (2004:256), in the same vein, argue that "higher education trains individuals to rationally assess information, and to seek new ideas. Therefore more educated people are more likely to acquire useful local knowledge spillovers from others who are involved in research or in managing some service business". Students within the region are more likely than others to perceive and exploit such opportunities, in particular after being sensitized and inspired by academic education.

Hypothesis 3a. The human capital density in a region moderates the relationship between entrepreneurship education and entrepreneurial intention (ATB, SN, PBC) in such a way that the positive effect of reflective modes of entrepreneurship education is enhanced.

Hypothesis 3b. The human capital density in a region moderates the relationship between entrepreneurship education and entrepreneurial intention (ATB, SN, PBC) in such a way that the positive effect of active modes of entrepreneurship education is enhanced.

3.3. Individual sources

Social learning theory holds that parental role models are a powerful source of entrepreneurial knowledge and motivation (Krumbholtz, 1976). Playing the key role in the primary socialization of their children, they can consciously or unconsciously transfer entrepreneurial attitudes, norms and know-how, thereby increasing the likelihood of their

children turning to an entrepreneurial career themselves (Scherer et al., 1989). While there is rich empirical evidence for a positive relationship between the existence of role models and entrepreneurial activity (e.g. Matthews and Moser, 1996; Davidsson and Honig, 2003; Tervo, 2006), little is known about the nature of this effect.

Hypothesis 4a. Students' entrepreneurial intention (ATB, SN, PBC) will be stronger, if a role model exists.

Work experience is another source of entrepreneurial expertise and motivation. Through experience, students acquire knowledge in areas that are relevant for an entrepreneurial career, such as finance and marketing. It also provides training in essential skills, such as selling, negotiation, leading, planning, decision-making, problem solving, organizing, and communicating (Shane, 2003). Firms emphasizing intrapreneurship can inspire students to think and act entrepreneurially, making them more likely to perceive and exploit opportunities.

Hypothesis 4b. The higher the students' work experience, the stronger the entrepreneurial intention (ATB, SN, PBC).

4. Methods

4.1. Sample and procedure

To test our hypotheses, we assembled a multilevel data set of individual-level and organizational-level information. To collect individual-level data, we first drew a stratified random sample of 30 universities from the general population of 72 public universities in Germany. Strata were based on (1) the intensity of university entrepreneurship support (low, mid,

high – according to ranking data by Schmude and Uebelacker, 2003) and (2) affiliation to federal states because we wanted to achieve sufficient variability and a high regional representativeness of our data. Within universities, we concentrated on three department types (computer science, electrical engineering, and business) because new firms in these fields are known for their growth and employment potential.[2] Moreover, departments (or schools) instead of universities are our level of analysis. This acknowledges that departments and not universities control curricula and thus students' access to entrepreneurship education and that students are more likely to interact within the sphere of their departments than across.

The survey was conducted by trained interviewers in one lecture per department. To achieve highly representative subsamples, we selected lectures that student representatives had labeled as very popular or compulsory. 6,037 from 7,925 questionnaires were returned. To ensure that students could access entrepreneurship education and were no part of any group with special founding behavior (e.g. Cooper and Dunkelberg, 1986), we retained respondents that had passed their second year of studies, had worked less than four years full time, did not plan on succeeding a family business, were German citizens and had not primarily selected their university for its entrepreneurship support. These criteria reduced our final sample to 1,949 males at 65 departments (23 in computer science, 17 in electrical engineering and 25 in business). Because respondents had on average about one year to the next career step (age: mean 23.85 years, s.d. 1.80; number of semesters: mean 6.96, s.d. 2.30), we assume a high validity of self-reported entrepreneurial intentions as predictor of actual behavior (Ajzen, 1991).

Organizational-level data on entrepreneurship education came from curricula. As each university in Germany is embedded in a larger functional region, referred to as planning region

[2] A study by Briedis and Minks (2004) indicates similar start-up rates among graduates from these three fields.

(or "Raumordnungsregion" in German), we were able to consider characteristics of the regional environment as well.[3]

4.2. Measures

4.2.1. Dependent variables

Entrepreneurial intention refers to the subjective likelihood that a person becomes self-employed after the successful completion of his or her studies. We study entrepreneurial intentions instead of venturing decisions of actual founders (e.g. Eisenhauer, 1995) or differences between founders and others (e.g. Stewart Jr. and Roth, 2001) for two reasons. First, psychological research suggests that intentions are the best predictor for behavior, such as entrepreneurial behavior, that is rare, difficult to observe, or involves unpredictable time lags (Bird and Jelinek, 1988; Krueger and Brazeal, 1994; Souitaris et al., 2007). Intentions were found to explain up to 31% of the variance in general, self-reported behavior and 20% of the variance in observed behavior (Armitage and Conner, 2001). Second, intentions directly reflect organizational-level influences, without being distorted by a potential survival bias, an ex-post rationalization by the respondents, or the risk of identifying consequences instead of determinants of self-employment. Like all other items (unless stated otherwise), intentions were measured on a 7-point Likert-scale (1 = "I completely disagree"; 7 = "I completely agree"). The three-item measure is based on Kolvereid (1996b) and is reliable at an alpha of 0.81. Appendix A provides details for this and further measures used in our study.

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[3] These regions comprise several counties (NUTS 3 level) and are intended to be comparable units "that reflect in acceptable approximation the spatial and functional interrelation between core cities and their hinterland." (BBR, 2001:2). Our datasets contains 65 university departments in 30 regions because up to three departments are nested within the same region.

Attitude to the behavior refers to the degree to which a person has a favorable or unfavorable appraisal of becoming self-employed (Ajzen, 1991). Respondents were asked to state how likely twelve advantages or disadvantages (based on an elicitation study) would occur if they opted for self-employment (1 = "very unlikely; 7 = "very likely") and how they would evaluate these consequences (-3 = "very bad", +3 = "very good"). To arrive at the final attitude measure, the product of likelihood and evaluation was summed up over all twelve items. *Subjective norm* refers to the perceived social pressure or encouragement to become self-employed. It was measured as the average of two items capturing encouragement through important others (α = .77) times one item capturing the willingness to comply (Krueger et al., 2000). *Perceived behavioral control* refers to the perceived ease or difficulty of being self-employed and was measured with four items (α = .70). While acknowledging other reliable and valid measures for the theory of planned behavior (e.g. Kolvereid, 1996b; Krueger et al., 2000), we derived own measures for two reasons. First, this allowed us to adjust items to the cultural context, particularly regarding attitudes. Second, the design of our study required a shorter questionnaire. However, a validity study confirmed that Kolvereids (1996b) and our measures do not significantly differ in term of validity and results (Appendix B).

4.2.2. Independent variables

We measure *entrepreneurship education* as the total number of credit points for curricular and entrepreneurship-specific courses offered at university departments. Two researchers independently reviewed descriptions of courses and coded them into reflective modes (i.e., lectures, literature-based seminars) and active modes (i.e., business plan seminars, business simulations, project seminars). After two days this procedure was repeated. A comparison of the results, first with the own records and then with those of the other researcher, revealed no

discrepancies. Two randomly selected faculty-members per scientific field confirmed that the curricula were complete.

We measure *start-up intensity* as the number of start-ups per 10,000 inhabitants between 2002 (average respondents' first year of study) and 2005 (year of our survey) in the sectors technology-oriented services and knowledge-intensive, non-technical advisory and consulting services (Source: ZEW Start-up Panel). We focus on these sectors because they were most frequently stated by the respondents as areas for potential self-employment. We measure *human capital density* as the number of highly-qualified employees, i.e. employees holding a degree from a university, college (Fachhochschule), or higher vocational school (Fachschule), per square-kilometer in a region (Sources: German Federal Office for Building and Regional Planning; German Federal Statistical Office). We measure *role model* with a dummy variable that was coded 1 if the respondent had previously or currently self-employed parents and 0 else. We measure *work experience* as the number of months as a wage-employee, including professional training and full time.

4.2.3. Control variables

On the individual level, we control for traits that are stable in the short run and therefore can complement or countervail organizational-level determinants in forming students' entrepreneurial intentions. *Need for achievement* refers to expectations of doing something better or faster than anybody else or better than the person's own earlier accomplishments (Hansemark, 2003). Achievement motivated people are more likely to self-select into entrepreneurship because it includes activities typically associated with this motive, such as striving for concrete feedback on individual performance (Collins et al., 2004). We used a formative measure of vocational achievement motivation developed and validated by Cassidy and Lynn (1989). *Need for independence* can be defined as the need to do and say as one likes despite conventional

expectations. It belongs to the most frequently stated reasons for becoming self-employed (Kolvereid, 1996a) and was measured with four items (α = .75). *Risk-taking propensity* captures the tendency of a decision maker either to take or to avoid risks (Sitkin and Pablo, 1992). An entrepreneur takes more risks than others as she or he faces more unstructured and uncertain problem and has to bear the ultimate responsibility for all decisions (Stewart Jr. and Roth, 2001). This construct was measured by the established Risk Style Scale (Schneider and Lopes, 1986). Moreover, individuals are more likely to turn to self-employment after recognizing a business idea with market potential (Bhave, 1994). We included a dummy variable for *opportunity perception* (0 = "no opportunity perceived"; 1 = "opportunity perceived").

On the organizational level, we controlled for three additional influences. The *university quality* in terms of the average student quality is likely to reduce entrepreneurial intentions because established firms tend to recruit from high-quality institutions, thus increasing opportunity costs of self-employment. Alternatively, it increases entrepreneurial intentions because higher quality universities provide better entrepreneurs, thus increasing the potential payoff from self-employment. We employed a measure provided by the "Studentenspiegel" survey (Friedmann et al., 2004) that consists of several dimensions, such as high school marks and internships. Moreover, specific programs aim at sensitizing and qualifying students for entrepreneurial careers, which could increase entrepreneurial intentions. We included a dummy variable for the existence of an *entrepreneurship program* that was coded 1, if the university participated in the largest German program "EXIST" and 0 else. *Academic unemployment* is expected to increase entrepreneurial intentions because of lacking alternative job opportunities. We measure it as the ratio of unemployed academics to employed academics within a region (Source: Institute for Employment Research, IAB).

4.3. Analysis

We draw on hierarchical linear modeling (HLM; Raudenbush and Bryk, 2002) with restricted maximum likelihood estimates. The HLM approach overcomes statistical shortcomings of traditional methods and allows us to analyze "the influence of higher level units on lower level outcomes while maintaining the appropriate level of analysis" (Hofmann, 1997: 726). Because our hypotheses examine main effects of variables at both levels on an individual-level outcome (students' entrepreneurial intentions), we use intercepts-as-outcomes models to test them. Another option is slopes-as-outcome models that address the issue of whether, in our case, organizational-level variables moderate the relationship between individual-level predictors and the outcome. However, the individual-level slopes in our models do not significantly vary across university departments. We employ product terms to analyze interactions of entrepreneurship education with regional start-up intensity and regional human capital density, respectively. Tests similar to ANOVAs by departments confirm that there is sufficient between-department variance in most outcomes to warrant further analysis. This includes entrepreneurial intention, attitude to the behavior, and subjective norm, but not perceived behavioral control. Consequently, perceived behavioral control lacks inter-department variance possibly attributable to higher-level influences, and is therefore excluded from the cross-level analysis.

To evade multicollinearity, all individual-level and organizational-level predictors were centered around their group mean (Raudenbush and Bryk, 2002; Aiken and West, 1991). This also makes the intercept more directly interpretable: It represents the entrepreneurial intention of a student with a group average score on all individual-level predictors (Hofmann, 1997). The pattern of the results was the same as for uncentered data. Moreover, tests recommended by Raudenbush and Bryk (2002) and Snijders and Bosker (1999) confirmed that the assumptions of

hierarchical linear models with two levels were met. To control for common method bias in individual-level items, we conducted Harman's one-factor test. No single factor emerged, nor did one factor account for most of the variance, suggesting little threat of common method bias.

5. Results

Table 1 provides the descriptive statistics and correlation matrix. Table 2 reports the regression results. Organizational-level results, adjusted for individual-level differences, showed the presence or absence of support for our hypotheses regarding the effects of entrepreneurship education and regional context. Hypotheses 1a and 1b stipulate a positive impact of entrepreneurship education on students' entrepreneurial intentions. Model 2 shows that only active modes of entrepreneurship education are positively related to intentions ($\gamma_{01j} = .04$, $p < .01$), supporting Hypothesis 1b, but not Hypothesis 1a. We also examined the nature of these effects through the lens of the theory of planned behavior. As predicted by the theory, attitude to the behavior (ATB, $\beta_{01j} = .21$, $p < .001$), subjective norm (SN, $\beta_{02j} = .25$, $p < .001$), and perceived behavioral control (PBC, $\beta_{03j} = .18$, $p < .001$) are positively related to entrepreneurial intentions (Table 3). We estimated additional models with ATB and SN as outcomes to explore the mechanism by which individual-level and organizational-level factors impact entrepreneurial intentions. PBC was excluded from this analysis because it does not significantly vary between departments. The results reveal positive relationships between active modes and ATB (model 5: $\gamma_{02j} = .07$, $p < .01$) and between reflective modes and SN (model 8: $\gamma_{01j} = .04$, $p < .10$).

Pls. insert Tables 1, 2, and 3 about here

Two sets of our hypotheses predict interaction effects between entrepreneurship education and the regional context on entrepreneurial intentions. The first set suggests that regional start-up intensity positively moderates the education-intention-relationship. As shown in model 3, this was confirmed for reflective modes ($\gamma_{05j} = .06$, $p < .05$), but not for active modes. Thus, Hypothesis 2a, but not Hypothesis 2b received support. Regarding the nature of these effects, only one significant relationship was found: the interaction of start-up intensity and reflective modes of education increases ATB (model 6: $\gamma_{05j} = .06$, $p < .05$). The second set of hypotheses posits that human capital density positively moderates the education-intention-relationship. Again, this was confirmed only for reflective modes (model 4: $\gamma_{07j} = .15$, $p < .01$), but not for active modes. Thus, Hypothesis 3a, but not Hypothesis 3b received support. Similarly, regarding the nature of these effects, only ATB is increased by the interaction between human capital density and reflective modes of education (model 7: $\gamma_{07j} = .15$, $p < .01$). As shown in Figure 2, we plotted the relationship between reflective modes of entrepreneurship education and entrepreneurial intention for low and high levels (one standard deviation below and above the mean) of human capital density and start-up intensity, respectively.

Pls. insert Figure 2 about here

The results presented in Table 2 indicate some support for our individual-level hypotheses. Hypothesis 4a, concerning the effects of role models, was supported, demonstrating that role models increase entrepreneurial intentions (model 1: $\beta_{1j} = .21$, $p < .001$). More interesting are the findings for the nature of this relationship: role models, as the only influence, simultaneously increase ATB (model 5: $\beta_{1j} = .12$, $p < .01$), SN (model 8: $\beta_{1j} = .28$, $p < .001$), and PBC (model 11: $\beta_{1j} = .19$, $p < .001$). Conversely, we found no support for Hypothesis 4b regarding a positive relationship between work experience and entrepreneurial intentions.

However, the results show a positive impact of work experience on PBC (model 11: $\beta_{2j} = .07$, $p < .01$).

6. Discussion

Can universities effectively motivate and qualify individuals to enter self-employment, leading to higher start-up rates within a region? Our study suggests three answers: First, it reveals that the effect of entrepreneurship education depends on the concrete form and content of such courses: Active modes of entrepreneurship education (such as business plan seminars) have a direct positive impact on entrepreneurial intentions, whereas the impact of reflective modes of entrepreneurship education (such as theory lectures) critically depends on the regional context. These findings lend some support to the configurational perspective of this study. Similarly, results of quasi-experimental studies that yielded a positive impact of taking entrepreneurship classes on entrepreneurial intentions fit into this picture: Peterman and Kennedy (2003) sampled courses emphasizing learning-by-doing (active modes) and Souitaris et al. (2007) universities located in economically-strong regions (indicating a high start-up intensity).

Second, our results indicate that offers of both modes, if effective in a certain context or alone, only form students' opinions (ATB), but do not encourage them (SN) or make them feel more competent (PBC) to pursue entrepreneurial careers. Consequently, on average students at university departments offering such education evaluate the advantages and disadvantages of entrepreneurship differently than other students. Similarly, Souitaris et al. (2007) also found that entrepreneurship education increased entrepreneurial intentions, but affected SN rather than ATB. One possible explanation lies in the different designs of our studies. Souitaris et al. examined how taking entrepreneurship classes affects intentions and its drivers, while we investigated how offers of entrepreneurship courses explain the variance in these variables

between university departments. Interestingly, in both studies no impact on PBC was found. If the believe to be capable of mastering entrepreneurial tasks is critical to the start-up decision, this finding suggests that entrepreneurship education alone does not suffice to form future entrepreneurs.

Third, parental role models most effectively motivate and qualify students for self-employment, significantly increasing entrepreneurial intentions. While this finding replicates prior studies (e.g. Matthews and Moser, 1996; Davidsson and Honig, 2003; Tervo, 2006), a look at the nature of this effect provides new insights: Role models surpass the effect of entrepreneurship education by simultaneously raising ATB, SN, and PBC. Consequently, only role models appear to fulfill all functions in motivating and qualifying students for entrepreneurship. This result may also reflect the dominant role of parents in the primary socialization of their children. Contrary to our expectations, work experience was not related to a greater interest in self-employment. One possible explanation is that students in our sample had primarily worked in established companies instead of start-ups or companies with a strong intrapreneurship culture. The insignificant effect of work experience on ATB or SN supports this notion. However, as suggested by its positive impact on PBC, such experience helps students acquiring some skills and know-how essential to entrepreneurship. This finding is interesting because it suggests that promoting more work experience among students, particularly in start-ups, could complete and leverage the effect of entrepreneurship education.

6.1. Limitations

This study is not without limitations. First, data limitations preclude testing the effect of course participation. This limitation should not seriously handicap our investigation because the study demonstrates that offers of entrepreneurship courses explain a significant share of the

between-department-variance in students' entrepreneurial intentions. However, we tested the robustness of our results by separately inserting self-constructed dummies for course participation. These dummies simulate different effect strengths of course participation on entrepreneurial intentions (ranging from $r = .25$, $p < .001$ to $r = .85$, $p < .001$). Although the pattern of our results did not change, regardless of the dummy used, future research could corroborate our findings by demonstrating how entrepreneurship education stimulates the diffusion of entrepreneurial knowledge within an organization.

Second, the predictive validity of intentions has been established only for general behavior (Armitage and Conner, 2001), not for entrepreneurial behavior. Thus, we cannot predict (1) how many students will actually realize their self-reported intentions and (2) how many students will select self-employment opportunity-driven, without intending it to date (Bhave, 1994). Third, entrepreneurship education aims at preparing students not only for self-employment, but also for other occupations, e.g. as intrapreneur or venture capitalist. Because our study does not consider these additional goals, future research is necessary to analyze their achievement through entrepreneurship education.

Fourth, we cannot rule out that a common method bias distorts our findings for individual-level influences. Although Harman's one-factor test suggested little threat, these findings should be interpreted with caution. However, because organizational-level and regional-level data was drawn from different sources, our cross-level results should be unaffected by such bias. Finally, our study focuses on the German universities. Therefore, the results presented are conditional on the cultural and economic background of Germany and are mostly generalizable to this context.

6.2. Implications for research

The major implication of this study is straightforward. Entrepreneurship education does not generally raise students' entrepreneurial intentions, but its effect is contingent on the mode and context of such courses. Active modes directly affect intentions, whereas the impact of reflective modes is dependent on the regional context. These findings extend the literature on entrepreneurship education by adding modes and context of courses to previous findings about the outcomes of education. The finding that active modes rather than reflective modes have a direct effect empirically supports assessments by entrepreneurship teachers that deemed courses requiring development of business plans rather than courses requiring introspective activities successful (Gartner and Vesper, 1994). The finding that the effect of reflective modes depends on the regional context provides an explanation for why prior findings vary across universities (Gorman et al., 1997).

The specific findings also have important implications for future and related research. This study provides empirical evidence that students at universities offering entrepreneurship education (in certain regions) are more likely to develop a positive attitude towards pursuing an entrepreneurial career, but are not more likely to feel encouraged or more competent to do so. In the ongoing discussion about the teachability of entrepreneurship, this result suggests opinion forming rather than encouraging or qualifying as main function of such courses. To further improve educational offers, researchers should examine how university departments can enhance the effect of such courses through complementary activities such as promoting internships at start-ups.

The results also have useful implications for cross-level research on the development of entrepreneurial intentions. By bridging the gap between the individual, organizational, and regional level, our multilevel study provides empirical evidence that influences at different levels

interactively or simultaneously drive entrepreneurial intentions. Prior research on entrepreneurial traits, networks, regional development and entrepreneurship education has mainly focused on a single level. Because the organizational and regional context significantly explains variance in entrepreneurial intentions after controlling for individual-level influences further research examining the interplay of cross-level effects in forming entrepreneurial intentions may provide a richer picture of the entrepreneurial process.

6.3. Implications for practice

This study offers several practical implications. The results for the impact of entrepreneurship education suggest that departments should align portfolios of entrepreneurship courses to the regional setting. In regions rich in human capital and characterized by high start-up intensity both reflective modes (e.g. theory lectures) and active modes (e.g. business plan seminars, simulations etc.) were found to be equally effective options. Consequently, in such regions cost considerations may decide on their relative weight in curricula. However, departments in other regions should give a higher emphasis to active modes if inspiring future entrepreneurs is regarded as one key objective of entrepreneurship education.

Irrespective of the mode, our results suggest that formal education raises entrepreneurial intentions by motivating rather than qualifying students (as indicated by PBC) for an entrepreneurial career. Because this finding is also consistent with prior case studies (Gorman et al., 1997) and quasi-experimental studies (Souitaris et al., 2007), entrepreneurship teachers and researchers are encouraged to discuss how complementary offers can help to transfer essential entrepreneurial know-how and skills. Our findings for work experience indicate one possibility. Departments could promote internships at start-ups or established firms with a strong culture of intrapreneurship among students. To fully capitalize on the motivating function of

entrepreneurship education and the qualifying function of work experience, outstanding entrepreneurship students could be rewarded with internship positions in such firms.

In a nutshell, our findings confirm believes of many entrepreneurship teachers and policy makers that formal education is useful to draw students´ attention to entrepreneurship as a legitimate career alternative. However, the impact of entrepreneurship education depends on the mode of education (active or reflective) and on the regional context, suggesting that it is important to attune the mix of active and reflective modes of education to regional circumstances. Moreover, as formal entrepreneurship education was found to have a motivating rather than a qualifying impact it should be complemented by internships and on-the-job training.

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Figure 1

Conceptual framework of this paper.

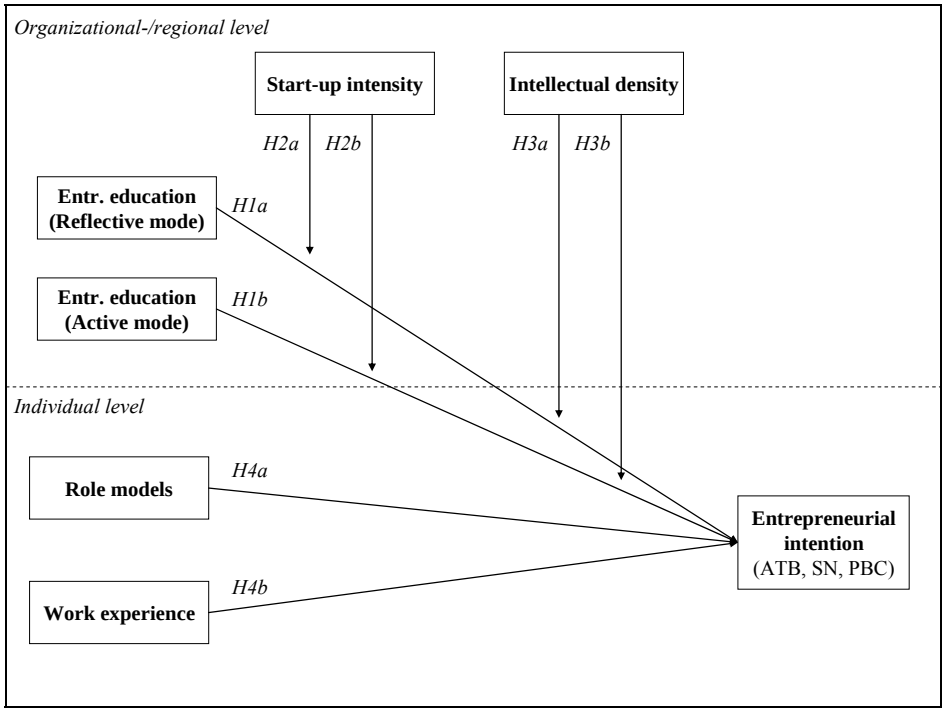
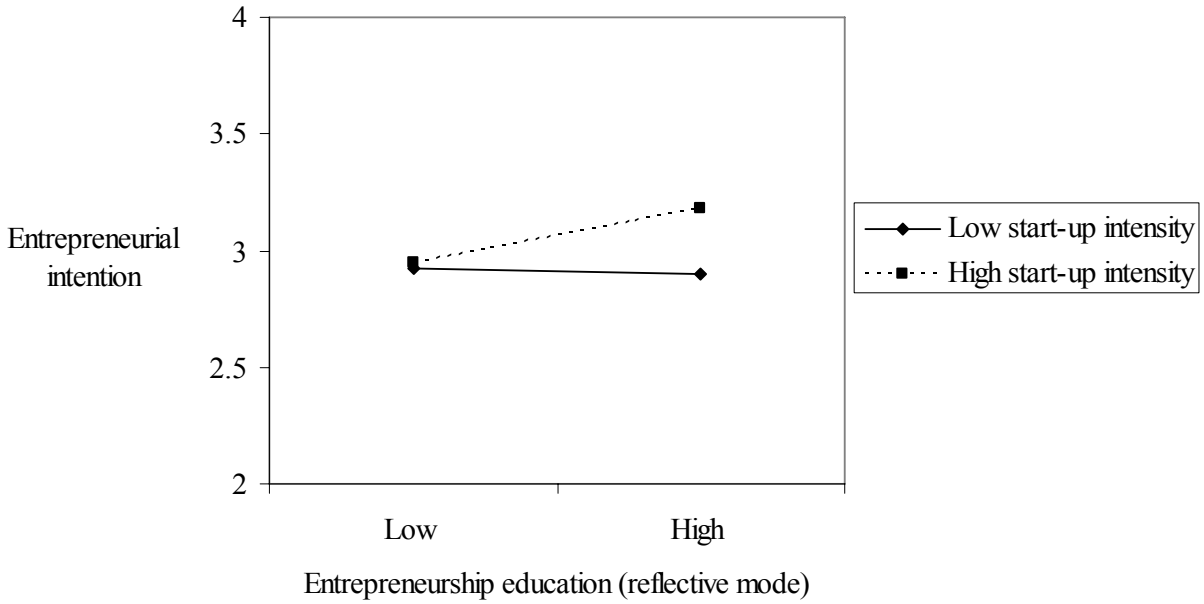


Figure 2

Moderating effects of contextual influences on the relationship between entrepreneurship education (reflective mode) and entrepreneurial intentions



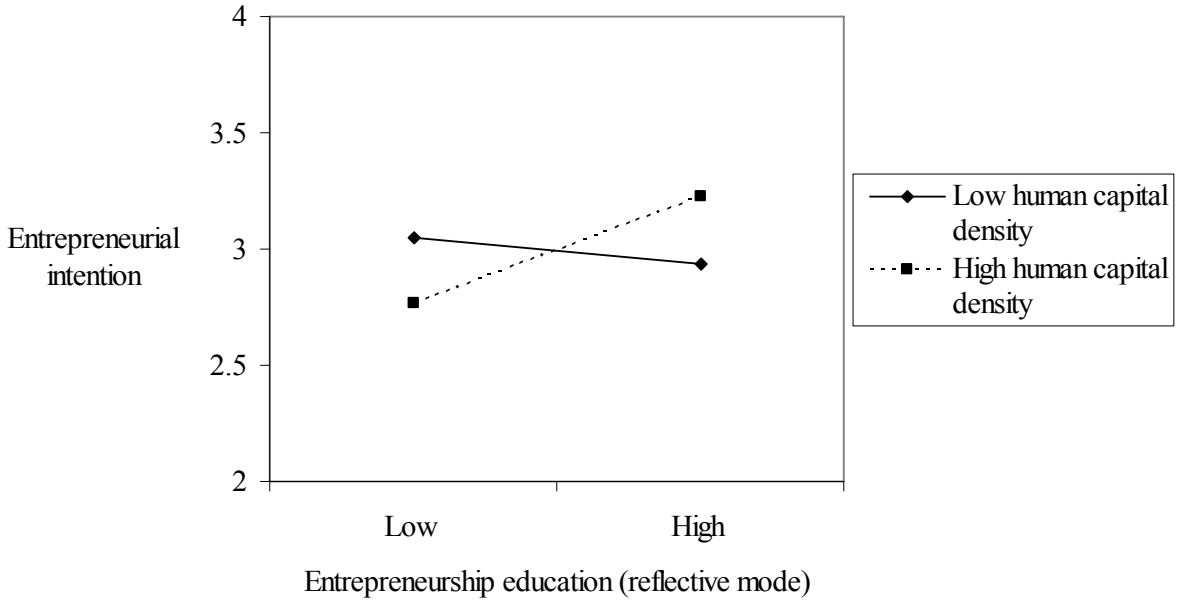

4
3.5
3
2.5
2
Entrepreneurial intention
Low
High
Entrepreneurship education (reflective mode)
Low human capital density
High human capital density

Table 1
Descriptive statistics and cross-level correlations[a].

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Entrepreneurial intention	3.25	1.39	-															
Level 2: Departments and regions																		
2. Entr. educ. (refl. mode)	5.00	8.91	.05 *	-														
3. Entr. educ. (act. mode)	1.77	5.52	.06 *	.22 ^{t}	-													
4. Start-up intensity	6.16	2.96	.05 *	.02	.03	-												
5. Human capital density	24.95	37.32	.03	-.12	-.09	.50 ***	-											
6. University quality	54.96	2.73	-.06 **	-.05	-.02	.18	-.07	-										
7. Entrepreneurship program[b]	0.38	0.49	.01	.15	.06	-.08	.09	.01	-									
8. Academic unemployment	0.07	0.03	.05 *	.00	.00	-.22 ^{t}	.42 ***	-.23 ^{t}	.16	-								
Level 1: Individuals																		
9. Attitude toward the behavior	-31.77	56.14	.38 ***	.07 **	.08 ***	.00	-.01	-.08 ***	-.06 **	-.63 **	-							
10. Subjective norm	7.06	7.22	.38 ***	.06 **	.04 ^{t}	.01	-.02	-.04 ^{t}	.01	-.01	.22 ***	-						
11. Perceived behavioral control	4.45	1.17	.30 ***	.00	.01	.02	-.01	.02	.00	-.01	.22 ***	.08 ***	-					
12. Need for achievement	4.65	0.79	.20 ***	.03	.03	.01	-.02	-.04 ^{t}	-.04 ^{t}	-.05 *	.32 ***	.11 ***	.13 ***	-				
13. Need for independence	4.69	1.05	.13 ***	.02	-.02	.00	.01	.03	.02	.02	.05 *	.03	.07 **	.25 ***	-			
14. Risk-taking propensity	1.68	1.29	.14 ***	.04 ^{t}	.03	-.03	-.08 ***	-.03	-.01	-.01	.18 ***	.08 ***	.08 ***	.09 ***	-.01	-		
15. Role model	0.28	0.45	.14 ***	.02	.04	.02	-.01	.00	-.02	-.02	.09 ***	.15 ***	.11 ***	.04 ^{t}	.02	.07 **	-	
16. Work experience	7.14	11.66	.04 ^{t}	.06 **	.03	.00	.00	-.05 *	-.07 **	-.05 *	.03	.02	.08 ***	.04 ^{t}	.00	.01	.02	-
17. Opportunity perception[c]	0.16	0.36	.32 ***	.04	.03	.02	.03	-.02	.02	.01	.16 ***	.18 ***	.14 ***	.11 ***	.10 ***	.04	.07 **	.10 **

[a] n = 1,949 for evaluating pairwise correlations between level 1- variables or between level 1- and level 2-variables; n = 65 for evaluating pairwise correlations between level 2-variables. Pearson product moment correlations are reported for pairs of continuous variables, Spearman rank correlations are reported for pairs of continuous and dichotomous variables. [b] Coding: 0 = no regional entrepreneurship program, 1 = regional entrepreneurship program, [c] Coding: 0 = no opportunity perceived, 1 = opportunity perceived.

^{t} $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$ (two-tailed test).

Table 2
Results for HLM analysis of individual-level entrepreneurial intentions, ATB, SN, and PBC.[a]

	Entrepreneurial intention							
	Model 1		Model 2		Model 3		Model 4	
Variables	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**
Organizational and regional level-hypotheses								
Entrepreneurship education (reflective mode, γ_{01j})			0.03	0.02	0.04	0.02	0.06 *	0.02
Entrepreneurship education (active mode, γ_{02j})			0.04 **	0.02	0.05 *	0.02	0.02	0.02
Start-up intensity (γ_{03j})			0.07 [t]	0.04	0.05	0.04	0.05	0.04
Human capital density (γ_{04j})			-0.02	0.04	-0.01	0.04	0.00	0.04
Entr. educ. (refl. mode) x start-up intensity (γ_{05j})					0.05 *	0.02		
Entr. educ. (act. mode) x start-up intensity (γ_{06j})					0.01	0.03		
Entr. educ. (refl. mode) x human capital density (γ_{07j})							0.10 *	0.04
Entr. educ. (act. mode) x human capital density (γ_{08j})							-0.06	0.05
Organizational and regional level-controls								
Academic unemployment (γ_{09j})	0.04 [t]	0.02	0.06	0.04	0.06	0.04	0.07 [t]	0.04
University quality (γ_{10j})	-0.04	0.03	-0.05 [t]	0.03	-0.04	0.03	-0.04	0.02
Entrepreneurship program (γ_{11j})	0.01	0.05	0.03	0.05	0.03	0.05	0.03	0.05
Individual level-hypotheses								
Role model (β_{1j})	0.21 ***	0.05	0.21 ***	0.05	0.21 ***	0.05	0.21 ***	0.05
Work experience (β_{2j})	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02
Individual level-controls								
Need for achievement (β_{3j})	0.13 ***	0.02	0.13 ***	0.02	0.13 ***	0.02	0.13 ***	0.02
Need for independence (β_{4j})	0.07 ***	0.02	0.07 ***	0.02	0.07 ***	0.02	0.07 ***	0.02
Risk-taking propensity (β_{5j})	0.10 ***	0.02	0.10 ***	0.02	0.10 ***	0.02	0.10 ***	0.02
Opportunity perception (β_{6j})	0.83 ***	0.06	0.83 ***	0.06	0.82 ***	0.06	0.82 ***	0.06

[a] Level 1 n = 1,949; level 2 n = 65; standardized coefficients are reported.
[t] $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$ (two-tailed test).

Table 2 (continued)
Results for HLM analysis of individual-level entrepreneurial intentions, ATB, SN, and PBC.[a]

	Attitude toward the behavior						Subjective norm						Perc. beh. control[b]	
	Model 5		Model 6		Model 7		Model 8		Model 9		Model 10		Model 11	
Variables	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**
Organizational and regional level-hypotheses														
Entrepreneurship education (reflective mode, γ_{01j})	0.05	0.04	0.06	0.04	0.10 *	0.04	0.04 ^{t}	0.02	0.05 ^{t}	0.03	0.05	0.03		
Entrepreneurship education (active mode, γ_{02j})	0.07 **	0.02	0.07 *	0.03	0.06	0.04	0.02	0.02	0.01	0.03	-0.02	0.04		
Start-up intensity (γ_{03j})	0.04	0.05	0.02	0.05	0.01	0.05	0.05	0.05	0.05	0.05	0.06	0.05		
Human capital density (γ_{04j})	-0.04	0.06	-0.03	0.07	0.01	0.07	-0.07 ^{t}	0.04	-0.08 ^{t}	0.04	-0.10 ^{t}	0.06		
Entr. educ. (refl. mode) x start-up intensity (γ_{05j})			0.06 *	0.02					0.04	0.02				
Entr. educ. (act. mode) x start-up intensity (γ_{06j})			-0.01	0.03					-0.04	0.04				
Entr. educ. (refl. mode) x human capital density (γ_{07j})					0.15 **	0.04					0.03	0.07		
Entr. educ. (act. mode) x human capital density (γ_{08j})					-0.04	0.08					-0.13	0.09		
Organizational and regional level-controls														
Academic unemployment (γ_{09j})	0.10 *	0.05	0.10 *	0.05	0.12 *	0.05	0.06 ^{t}	0.03	0.06 ^{t}	0.03	0.06 ^{t}	0.03		
University quality (γ_{10j})	-0.06	0.04	-0.05	0.04	-0.05	0.04	-0.03	0.03	-0.03	0.03	-0.03	0.03		
Entrepreneurship program (γ_{11j})	-0.16 *	0.08	-0.16 *	0.07	-0.16 *	0.08	0.02	0.05	0.01	0.05	0.03	0.05		
Individual level-hypotheses														
Role model (β_{1j})	0.12 **	0.03	0.12 **	0.03	0.12 **	0.03	0.28 ***	0.06	0.27 ***	0.06	0.27 ***	0.06	0.19 ***	0.05
Work experience (β_{2j})	0.00	0.02	0.00	0.02	0.00	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.07 **	0.02
Individual level-controls														
Need for achievement (β_{3j})	0.27 ***	0.03	0.27 ***	0.03	0.27 ***	0.03	0.07 **	0.02	0.07 **	0.02	0.07 **	0.02	0.11 ***	0.02
Need for independence (β_{4j})	-0.03	0.03	-0.03	0.03	-0.03	0.03	-0.01	0.02	-0.01	0.02	-0.01	0.02	0.03	0.02
Risk-taking propensity (β_{5j})	0.13 ***	0.02	0.13 ***	0.02	0.13 ***	0.02	0.04 ^{t}	0.02	0.04 ^{t}	0.02	0.04 ^{t}	0.02	0.06 **	0.02
Opportunity perception (β_{6j})	0.33 ***	0.06	0.33 ***	0.06	0.32 ***	0.06	0.52 ***	0.08	0.51 ***	0.08	0.51 ***	0.08	0.31 ***	0.05

[a] Level 1 n = 1,949; level 2 n = 65; standardized coefficients are reported.
[b] Because perceived behavioral control does not significantly vary across Level 2-units, no level 2-effects are estimated.
^{t} $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$ (two-tailed test).

Table 3
Results for the theory of planned behavior.[a]

	Parameter estimates			
	Model 1		Model 2	
Variables	**b**	**s.e.**	**b**	**s.e.**
Theory of planned behavior				
Attitude toward the behavior (β_{1j})			0.21 ***	0.02
Subjective norm (β_{2j})			0.25 ***	0.02
Perc. beh. control ($\beta_{3}j$)			0.18 ***	0.02
Controls				
Role model (β_{4j})	0.21 ***	0.05	0.09 *	0.04
Work experience ($\beta_{5}j$)	0.01	0.02	0.00	0.02
Need for achievement (β_{6j})	0.13 ***	0.02	0.04 [t]	0.02
Need for independence (β_{7j})	0.07 ***	0.02	0.07 ***	0.01
Risk-taking propensity (β_{8j})	0.10 ***	0.02	0.06 **	0.02
Opportunity perception (β_{9i})	0.83 ***	0.06	0.59 ***	0.06

[a] n = 1,949; standardized coefficients are reported.
[t] $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$ (two-tailed test).

APPENDIX A- Study Measures

Entrepreneurial intention (7-point Likert-scale from 1 = "I completely disagree" to 7 = "I completely agree"; $\alpha = .81$)
(1) "There is no doubt that I will become self-employed as soon as possible.", (2) "I plan on becoming self-employed within 5 years of the successful completion of my studies."; (3) "I plan on becoming self-employed sometime after the successful completion of my studies".

Attitude toward the behavior (7-point Likert-scale from 1 = "very unlikely" to 7 = "very likely" and 7-Point bipolar Likert-scale from -3 = "very bad" to +3 = "very good")
"As self-employed person; I would…"(1) "receive particular appreciation from society at large"; (2) "be subjected to intense competition"; (3) "be my own boss"; (4) "bear great responsibilities"; (5) "be able to contribute to the well-being of my home-region or country"; (6) "earn a higher salary than as an ordinary employee"; (7) "deal with challenging tasks"; (8) "be able to fulfill myself"; (9) "have an uncertain income"; (10) "probably lose my private means"; (11) "be tied to my firm"; (12) "have to work long hours and have little leisure time"

Subjective norm (7-point Likert-scale from 1 = "I completely disagree" to 7 = "I completely agree"; $\alpha = .77$)
(1) "People that I care about would like to see me become self-employed."; (2) "I feel a certain encouragement emanating from my family and circle of close friends to choose a career of self-employment."; plus one item "People that I care about have great influence in my choice of profession." measuring motivation to comply.

Perceived behavioral control (7-point Likert-scale from 1 = "I completely disagree" to 7 = "I completely agree"; $\alpha = .70$)

(1) “I would be difficult for me to become self-employed after my studies.” (r); (2) “If I wanted I could certainly become self-employed after my studies.”; (3) “There are many things I cannot control that keep me from choosing self-employment after completion of my studies.” (r); (4) “It is largely up to me whether I will become self-employed after my studies.”

Need for achievement (Measure adopted from Cassidy and Lynn, 1989; 7-point Likert-scale from 1 = “I completely disagree” to 7 = “I completely agree”)
(1) “Hard work is something I like to avoid.” (r), (2) “I frequently think about ways I could earn a lot of money.”, (3) “I believe I would enjoy having authority over other people.”, (4) “I find satisfaction in exceeding my previous performance even if I don’t outperform others.”, (5) “I care about performing better than others on a task.”, (6) “I would rather do tasks at which I feel confident and relaxed than ones which appear challenging and difficult.”, (7) “I would like an important job where people look up to me.”

Need for independence (7-point Likert-scale from 1 = “I completely disagree” to 7 = “I completely agree”, $\alpha = .75$)
“In group- and projectized work…” (1) “having freedom of choice over when I do my work is important to me.”, (2) “I prefer to determine the content of my work as far as possible on my own.”, (3) “I would rather set the sequence of my work tasks on my own.”, (4) “I dislike being subordinated to other people.” (r)

Risk-taking propensity (Measure based on; 7-point Likert-scale from 1 = “I completely disagree” to 7 = “I completely agree”; $\alpha = .81$)
“In the following you will be confronted with 5 situations in which you please either decide on being paid a safe amount of money or instead participating in a lottery. Your answers for these situations should be independent of each other. In every situation please imagine that you can dispose of a total wealth of 1000€.” (1) “an 80% chance of winning € 400, or receiving € 320 for sure.”; (2) “receiving € 300 for sure, or a 20% chance of winning € 1,500.”; (3) “a 90% chance of winning € 200, or receiving € 180 for sure.”; (4) “receiving € 160 for sure, or a 10% chance of winning € 1,600.”; (5) “a 50% chance of winning € 500, or receiving € 250 for sure.”

(r) = reverse coded

APPENDIX B- Validity Study

A second data set was collected to test the convergent and discriminant validity of a number of variables. Surveys were administered to 200 business students at the bachelor and master level enrolled in management courses at a large, urban university in northern Germany. Missing or incomplete responses resulted in a final sample of 171 (86% response rate). This survey included measures for entrepreneurial intention, attitude toward the behavior, subjective norm, and perceived behavioral control developed for this study. It also included alternative measures for the same variable developed by Kolvereid (1996b). Table B1 shows descriptive statistics and the correlation matrix and Table B2 the regressions results from this validity study.

Table B1
Descriptive statistics and correlations[a]

Variable	MW	SA	1	2	3	4	5	6	7
1. EI	3.42	1.64	(.86)						
2. EI (Kolvereid 1996a)	3.82	1.52	.81 ***	(.85)					
3. ATB	23.54	3.63	.51 ***	.50 ***	-				
4. ATB (Kolvereid 1996a)	8.04	5.24	.46 ***	.54 ***	.52***	-			
5. SN	11.67	9.33	.35 ***	.34 ***	.21**	.14[t]	(.76)		
6. SN (Kolvereid 1996a)	16.24	7.37	.41 ***	.38 ***	.16*	.19*	.56 ***	(.80)	
7. PBC	4.19	1.26	.45 ***	.51 ***	.34***	.38***	.31 ***	.22**	(.74)
8. PBC (Kolvereid 1996a)	3.98	.84	.50 ***	.54 ***	.46***	.49***	.29 ***	.35***	.66 ***(.73)

[a] n = 171, Cronbach's alphas are in parentheses.
[t] p < .10
* p < .05
** p < .01
*** p < .001 (two-tailed test).

Table B2
Regression results[a]

	Parameter estimates							
	EI				EI (Kolvereid 1996)			
Variables	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**	**b**	**s.e.**
Measures used in this study								
ATB	0.38***	0.00			0.35***	0.00		
SN	0.20**	0.01			0.16*	0.01		
PBC	0.26***	0.09			0.34***	0.08		
Measures used in Kolvereid (1996a)								
ATB			0.28***	0.02			0.35***	0.00
SN			0.26***	0.01			0.16*	0.01
PBC			0.27***	0.14			0.34***	0.08
R^2 adj.	0.37		0.36		0.39		0.43	
VIFmax	1.21		1.43		1.21		1.43	
CI	8.87		14.15		8.87		14.15	

[a] n = 171; standardized coefficients are reported.
[t] p < .10
* p < .05
** p < .01
*** p < .001 (two-tailed test).