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THE ROLE OF ENTREPRENEURSHIP EDUCATION AND REGIONAL CONTEXT IN
FORMING ENTREPRENEURIAL INTENTIONS

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Cities and Innovation

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ABSTRACT: This study examines how the extent of entrepreneurship education within university departments influences students' entrepreneurial intentions in three careers: computer science, electrical engineering, and business. Specifically, it proposes that the effect of such education is (1) contingent on its mode (active, e.g. business plan seminars, 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.

JEL Codes: L26, M13, M59, R12

Keywords: Entrepreneurship education, entrepreneurial intentions, regional economy, knowledge spillover

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1. 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 scholars and 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 (Oosterbeek et al., forthcoming).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, 2000a; Fiet, 2000b) and course offers (Hills, 1988; Gartner and Vesper, 1994) and examined entrepreneurship programs at single universities (Chrisman, 1997). More recently, quasi-experimental research on the impact of entrepreneurship courses on entrepreneurial intentions and its antecedents yielded some contradictory results. Students in two studies were more interested in pursuing careers as self-employed after taking such courses, but only in one study they also felt more competent to do so (Peterman and Kennedy, 2003; Souitaris et al., 2007). In contrast, a third study found no significant effect on self-assessed skills and a negative effect on intentions (Oosterbeek et al., forthcoming).

Part of these inconsistent results may be explained by the fact that some regions offer more favorable conditions for entrepreneurship activity than others and that the effect of entrepreneurship education is contingent on the regional context. Regional economists have long observed that entrepreneurial activity tends to vary substantially across regions (e.g., Reynolds et al., 1994; Audretsch and Fritsch, 2002). Hence, a student observing numerous start-ups in her or

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.

his regional environment should be more likely to believe in the feasibility of entrepreneurship - a message often taught in entrepreneurship courses - than someone living in a region where start-up activity is hardly observed. Thus, considering the regional context in multi-institutional studies of entrepreneurship education may help reconcile prior findings (Pittaway and Cope, 2007). Moreover, trait research has linked entrepreneurial intentions to several individual characteristics, such as need for achievement (Collins et al., 2004), need for independence (Lee and Wong, 2004), and risk-taking propensity (Stewart Jr. and Roth, 2001). It is therefore important to consider such individual traits as control variables.

In this study, we examine how the extent of entrepreneurship education offered at university departments affects male students' entrepreneurial intentions in three fields (computer science, electrical engineering, and business) after controlling for individual characteristics. Specially, we build on learning style theory (Kolb, 1976) and the knowledge spillover theory of entrepreneurship (Audretsch, 1995; Audretsch et al., 2006) to argue that the effect of such education is not the same in all contexts, but (1) depends on its mode (active, e.g. business plan seminars, vs. reflective, e.g. theory lectures) and (2) is higher in regions characterized by a high level of general and entrepreneur-specific human capital. Moreover, we also explore the nature of this effect through the lens of the theory of planned behavior (Ajzen 1991; 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])? We test our arguments in a multilevel sample of 1,949 male students, 65 university departments, and 30 regions. We drawn on hierarchical linear modeling as it permits to juxtapose educational offers with individual and regional characteristics that cause university departments to differ from each other in students' entrepreneurial intentions (Raudenbush and Bryk, 2002; Klein et al., 1999).

Our study makes three contributions to the literature. First, it empirically shows the interplay between 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 examined universities isolated from the context (Peterman and Kennedy, 2003; Souitaris et al., 2007). Second, our multilevel analysis of 65 institutions tests the external validity of prior findings that were restricted to up to two institutions. While quasi-experimental studies typically investigate changes in entrepreneurial intentions after taking

entrepreneurship courses, we examine how intentions vary across university departments as a function of individual, organizational, and regional influences. Third, a major innovation of this study is that it untangles reflective modes and active modes of entrepreneurship education. Prior work has not tested whether these modes substantially differ in their impact on entrepreneurial intent and whether the moderating impact of contextual conditions differs between the two modes.

The paper is organized as follows. In the next 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 third section, we describe the dataset and methods used for analysis. In the fourth section, we present the results. In the final section, we discuss our findings and their implications for future research and for the practice of entrepreneurship education.

2. Theoretical development

Scholars have viewed starting a business as a conscious and intended act (Bird, 1988). In this perspective, entrepreneurial intentions serve as the key to understanding the entrepreneurial process as they guide subsequent action and motivation to create a new venture (Katz and Gartner, 1988; Boyd and Vozikis, 1994). Studying intentions rather than venturing decisions of actual founders (e.g., Eisenhauer, 1995) or differences between founders and others (e.g., Stewart Jr. and Roth, 2001) has two key advantages. First, psychological research suggests that intentions are the best predictor for behavior, such as entrepreneurial activity, that is rare, difficult to observe, or involves unpredictable time lags (Bird and Jelinek, 1988; Ajzen, 1991; Souitaris et al., 2007). Intentions account for 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.

Ajzen's (1991) theory of planned behavior (TPB) has been widely applied to study entrepreneurial intentions.² According to this model, people act in accordance with their

² Shapero's model of the entrepreneurial event (SEE, Shapero and Sokol, 1982) is an alternative framework used in several studies (e.g., Krueger, 1993; Segal et al., 2005). It has considerable overlap with TPB (Krueger and Brazeal, 1994). Both models have received strong empirical support (Krueger et al., 2000; Armitage and Conner, 2001). We draw on TPB as it permits us to separately examine ATB and SN, which are subsumed by SEE's perceived desirability.

intentions and perceptions of control over behavior, while intentions in turn are determined by attitudes toward the behavior (ATB; i.e., in this study the degree to which a person has a favorable or unfavorable appraisal of becoming self-employed), subjective norms (SN; i.e., the perceived social pressure or encouragement to become self-employed), and perceived behavioral control (PBC; i.e., the perceived ease or difficulty of being self-employed). Overall, the theory has received strong empirical support in explaining entrepreneurial career choices (Kolvereid, 1996b; Krueger et al., 2000; Peterman and Kennedy, 2003; Souitaris et al., 2007). However, given its parsimonious and widely-applicable structure (Ajzen, 2001), TPB does not include several person or situation variables that were empirically linked to entrepreneurial intentions, such as personality traits (Hull et al., 1980; Crant, 1996; Douglas and Shepherd, 2002; Lee and Wong, 2004; Segal et al., 2005), family background (Scott and Twomey, 1988; Matthews and Moser, 1996; Hmieleski and Corbett, 2006), self-employment experience (Hills and Welsch, 1986; Tkachev and Kolvereid, 1999), or gender (Scherer and Brodzinski, 1990; Matthews and Moser, 1996; Zhao et al., 2005).

To increase predictive accuracy, entrepreneurship scholars have therefore incorporated exogenous influences into the original TPB framework, which are believed to have an indirect rather than a direct impact on intentions (Krueger and Carsrud, 1993; Davidsson, 1995; Ajzen, 2001). Kolvereid (1996b), for instance, has found that family background, gender, and past experience indirectly affect intentions by changing their antecedents. Specifically, researchers have proposed entrepreneurship education as another key influence (Robinson et al., 1991; Dyer, 1994; Krueger and Brazeal, 1994; Krueger et al., 2000). In the subsections below, we argue why entrepreneurship education should influence entrepreneurial intentions and their antecedents and why this relationship should be contingent on the regional context.

2.1. Entrepreneurship education

An extensive body of research has addressed outcomes of entrepreneurship education. Several studies have found higher start-up rates or entrepreneurial intentions of individuals who had taken entrepreneurship classes but failed to disentangle cause and effect of course participation (Kolvereid and Moen, 1997; Charney and Lidecap, 2002; Menzies and Paradi, 2003; Noel, 2002; Clouse, 1990). Entrepreneurs rated such courses as having a high impact on their subsequent venturing decision (Clark et al., 1984). Similarly, reviews of the extant literature report a positive effect on intentionality. They also call for multi-institutional studies to establish

the external validity of prior findings (Gorman et al., 1997; Pittaway and Cope, 2007). While no substantial impact on the financial performance of start-ups was found (Hindle and Cutting, 2002; Menzies and Paradi, 2003), other than monetary considerations could primarily drive venturing decisions (Hartog et al., forthcoming). More recently, scholars have started to also consider antecedents of intentions in outcome studies. Taking entrepreneurship classes seems to raise ATB and SN at least in the short run. However, its impact on entrepreneurial intentions and PBC remains unclear (Peterman and Kennedy, 2003; Souitaris et al., 2007; Oosterbeek et al., forthcoming).

We argue that curricular lectures or courses on entrepreneurship are positively related to entrepreneurial intentions and their antecedent for three reasons. 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). Teaching critical entrepreneurial competencies can also make students perceive own ventures as more feasible, thus affect PBC (Krueger et al., 2000; Zhao et al., 2005). Second, 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). Education plays a critical role in socializing individuals into entrepreneurial careers (Robinson et al., 1991; Dyer, 1994; Krueger and Brazeal, 1994) and may therefore shape ATB and/or SN. Third, 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).

To complement prior studies that have not differentiated teaching styles, 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 (Hills, 1988; Gartner and Vesper, 1994). Therefore, we test them separately.

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

2.2. Entrepreneurship education and the regional context

We consider the regional setting next. Regional economists have found that start-up activity tends to vary across regions (e.g., Reynolds et al., 1994; Audretsch and Fritsch, 2002). Although many regional factors, such as unemployment rates (Van Praag and Van Ophem, 1995), industry growth (Fritsch and Falck, 2007), or clusters (Rocha and Sternberg, 2005), might account for this variance, we believe that knowledge spillovers are salient in the educational context of our research. According to the knowledge spillover theory of entrepreneurship (Audretsch, 1995; Audretsch et al., 2006), incumbent firms or research institutions are unable to fully exploit all of the new knowledge they create. The reason is that new knowledge is inherently uncertain and asymmetric (Arrow 1962). Knowledge production processes are hardly predictable and create lots of accidental and unplanned knowledge as by-product. The newly created knowledge often appears to be useless at first glance and only small part of the economic potential of this new knowledge is recognized, correctly assessed and commercially exploited by the investors.

This remaining gap results in entrepreneurial opportunities for newcomers who dispose of the necessary entrepreneurial motivation and qualification. Because the transfer of tacit knowledge typically requires face-to-face contact, knowledge spillovers from institutions to enterprising individuals are believed to be geographically localized (Glaeser et al., 1992; Jaffe et al., 1993; Audretsch et al., 2008). Thus, as shown by recent studies (Audretsch and Lehmann, 2005; Audretsch et al., 2008; Acs et al., 2009), regions with higher levels of knowledge creation provide more knowledge spillovers, leading to more entrepreneurial opportunities and activity.

The theory treats entrepreneurial motivation and qualification as exogenous factors. However, prior research has revealed that individuals with extensive general and entrepreneurship-specific human capital are more likely to identify and (successfully) exploit

opportunities (Bates, 1990; Gimeno et al., 1997; Davidsson and Honig, 2003; Ucbasaran et al., 2008; Unger et al., forthcoming). Universities offer a community where individuals can acquire such knowledge, as we argue above, either by taking courses (Dyer, 1994; Souitaris et al., 2007) or by tapping the knowledge of others (Birley, 1985; Ravasi and Turati, 2005). Because universities are not isolated from, but embedded into the wider region, it is likely that the regional context also affects individual learning processes. For instance, entrepreneurship courses often teach that starting a venture is feasible but a student living in a region characterized by a high start-up rate may be more likely to believe this message than someone living in a region where new ventures are rarely observed. To advance the premises and extend the framework of knowledge spillover theory, we therefore suggest that spillovers from general and entrepreneurship-specific knowledge can enhance or mute the entrepreneurial motivation and qualification students gain in university.³

The regional level of general knowledge has frequently been measured in terms of human capital density, i.e. the share of highly-qualified individuals in the regional labor force (Acs and Armington 2004; Audretsch and Dohse 2006). While prior research has found a positive relationship between regional human capital and firm formation (e.g., Bates, 1990; Acs and Armington 2004), regions abundant in general knowledge may also, as we argue, provide a fruitful soil for reinforcing the impact of entrepreneurship education. Taking entrepreneurship courses or talking to persons who did so can lead students to evaluate their own ability to become an entrepreneur (PBC; Peterman and Kennedy, 2003). This evaluation should be more positive in regions where potential entrepreneurs can draw on superior knowledge to overcome critical start-up barriers. Such regions are conducive to spillovers of useful knowledge not taught at universities (Jovanovic and Rob, 1989; Acs and Armington, 2004), including information on markets for goods and services, sources of capital, and innovation (Dubini and Aldrich, 1991; Davidsson and Honig, 2003). Individuals within such regions are also more likely to perceive and successfully exploit entrepreneurial opportunities (Arenius and De Clercq, 2005; Ucbasaran et al., 2008; Unger et al., forthcoming), in particular after being sensitized and inspired by academic education. Consequently, entrepreneurship education should have a stronger impact on PBC in regions well endowed with general knowledge, as such regions can compensate for lacking knowledge.

³ Although regional influences were also found to directly affect firm formation rates (e.g., Audretsch and Fritsch, 2002), our research focuses on the conditional effect of university offers, which implies testing moderation effects.

In a similar vein, arm-length access to general knowledge provides favorable conditions for firm formation, as it can accelerate the start-up process and growth of prospective ventures (Davidsson and Honig, 2003). Disadvantages arising from knowledge gaps should be less salient in regions, where prospective entrepreneurs can draw on rich and diverse knowledge-base. Because individuals form attitudes by weighting pros and cons of entrepreneurship (Ajzen, 1991), the level of general knowledge in a region should moderate the education-attitude-relationship. Moreover, Acs and Armington (2004:256) argue that “higher education trains individuals to rationally assess information, and to seek new ideas.” Regions high in human capital are likely to establish norms that are supportive to or at least tolerant towards knowledge-based entrepreneurship (Audretsch, Dohse, Niebuhr 2008). While departmental offers of entrepreneurship education signal that self-employment is desirable, such a regional background may amplify their impact on SN.

Hypothesis 2a. The level of general knowledge in a region moderates the relationship between entrepreneurship education offers and entrepreneurial intention (ATB, SN, PBC) such that the positive effect of reflective modes of entrepreneurship education is enhanced.

Hypothesis 2b. The level of general knowledge in a region moderates the relationship between entrepreneurship education offers and entrepreneurial intention (ATB, SN, PBC) such that the positive effect of active modes of entrepreneurship education is enhanced.

It is important to distinguish between the impact of general and entrepreneurship-specific knowledge. A suitable indicator for regional entrepreneurship-specific knowledge is the relative frequency of new firm formation in a region (start-up intensity, Audretsch, Dohse, Niebuhr 2008). A high start-up intensity can illustrate and complement text-book knowledge taught at universities and thus moderate the education-intention-relationship. While entrepreneurship education often focuses on transferring codified knowledge and on sensitizing students for entrepreneurial careers, starting a new venture also requires tacit knowledge. 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 tacit knowledge, for instance, via internships at young firms or presentations by entrepreneurs at their universities. Start-ups within the region also serve as credible examples that entrepreneurship is feasible. Thus,

entrepreneurship education offers should have a stronger impact on PBC in regions with high levels of entrepreneurship-specific knowledge.

A high start-up activity reflects and further adds to a regional entrepreneurial culture. Such culture indicates that entrepreneurship is socially desirable and accepted as a legitimate career alternative. Universities can send, as we argue above, a similar signal by offering entrepreneurship education. However, students simultaneously perceiving both signals are more likely to develop strong SN than students only perceiving institutional signals. A similar point can be made for ATB. High start-up rates indicate that pro-entrepreneurship attitudes in a region prevail. According to findings by social psychologists, prior information can shape attitudes (Maio et al., 1994). Consequently, students are more likely to form positive attitudes in regions, where positive information is more readily accessible and where access to entrepreneurial expertise reduces disadvantages caused by a lack of knowledge. This suggests that entrepreneurship education offers have a stronger impact on ATB in regions with high levels of entrepreneurship-specific knowledge.

Hypothesis 3a. A high level of entrepreneurship-specific knowledge in a region enhances the impact of reflective modes of entrepreneurship education on entrepreneurial intention (ATB, SN, PBC).

Hypothesis 3b. A high level of entrepreneurship-specific knowledge in a region enhances the impact of active modes of entrepreneurship education on entrepreneurial intention (ATB, SN, PBC).

Figure 1 summarizes the conceptual framework presented above.

Pls. insert Figure 1 about here

3. Methods

3.1. Sample and procedure

To test our hypotheses, we assembled a multilevel data set of individual-level (level 1) and organizational/regional-level (level 2) 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.⁴ 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 and had not primarily selected their university due to its entrepreneurship support.⁵ 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

⁴ A study by Briedis and Minks (2004) indicates similar start-up rates among graduates from these three fields.

⁵ To measure self-selection, respondents were asked whether they have heard of programs for entrepreneurship education and sponsoring at their university before starting their studies (1 = "No", 2 = "Yes, but I did not primarily chose my university for that.", 3 = "Yes, and I primarily chose my university for that.").

(or “Raumordnungsregion” in German), we were able to consider characteristics of the regional environment as well.⁶

3.2. Measures

3.2.1. Dependent variables

Entrepreneurial intention refers to the subjective likelihood that a person becomes self-employed after the successful completion of his or her studies. 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.

We measured *attitude to the behavior* by asking respondents 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* was measured as the average of two items ($\alpha = .77$) multiplied by one item reflecting the willingness to comply (Krueger et al., 2000). *Perceived behavioral control* was measured with four items reflecting the self-assessed ease or difficulty of being an entrepreneur ($\alpha = .70$). 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 Kolvereid’s (1996b) and our measures do not significantly differ in term of validity and results (Appendix B).

3.2.2. Independent variables

We measure offers of *entrepreneurship education* at the department level as the total number of credit points for curricular and entrepreneurship-specific courses offered at university

⁶ 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 dataset contains 65 university departments in 30 regions because up to three departments are nested within the same region.

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). In cases mixing both modes the dominant element decided on the classification. 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 the *density of entrepreneurship-specific* knowledge 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. The *density of general (i.e. not entrepreneurship-specific) knowledge* is measured 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).

3.2.3. 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 ($\alpha = .75$). *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 who have parents with entrepreneurial experience (Scherer et al., 1989), who have recognized a business idea with market potential (Bhave, 1994), or who have gained work experience (Davidsson and Honig, 2003) are more likely to enter self-employment. We therefore controlled for *role models* (1 = “parents are currently or have been previously self-employed”, 0), *opportunity perception* (1 = “opportunity perceived”, 0 = else) and *work experience* (number of months as a wage-employee, including professional training and full time).

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 government 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.⁷ *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).

3.3. 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

⁷ The federally funded EXIST-Program provides selected universities with additional entrepreneurship support, including promotion activities, extracurricular training, counseling, business plan and idea competitions, and material support.

outcomes while maintaining the appropriate level of analysis” (Hofmann, 1997: 726). HLM allows us to simultaneously estimate individual- and organizational-/regional-level parameters without sample size distorting the results, as typical for ordinary least squares (OLS) methods. Moreover, HLM computes parameter estimates and standard errors by weighting group-level sample size by reliabilities at the individual level for the dependent variable within each group (in this case, department/region). The estimates usually correspond closely to OLS estimates, except that the group level standard errors avoid the deflation inherent in OLS.

As 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 and therefore do not warrant any further analysis along this line. Moreover, 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 the outcomes to warrant further analysis.⁸ As an exception, 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.

⁸ The one-way ANOVA with random effects predicts individual entrepreneurial intentions based on the grand mean of intentions, an error term at the individual level, and an error term at the organizational/regional level. The error terms provide information in the within-department variance and the between-department variance, respectively (Raudenbush and Bryk, 2002: 24).

4. 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 ($\gamma_{01j} = .04, p < .01$). To explore the nature of these effects through the lens of the theory of planned behavior, we estimated additional models with ATB and SN as outcomes.⁹ 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: $\gamma_{01j} = .04, p < .10$). However, PBC was excluded from this analysis because it does not significantly vary between departments. Our results suggest that students at departments with comprehensive offers of entrepreneurship education do not feel more capable to cope with entrepreneurial challenges than students at other departments. In sum, our results partially support Hypothesis 1b, but not Hypothesis 1a.

Pls. insert Tables 1 and 2 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 a high density of entrepreneurship specific knowledge (as measured by regional start-up intensity) positively moderates the education-intention-relationship. As shown in model 3, this was confirmed for reflective modes ($\gamma_{05j} = .05, p < .05$), 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: $\gamma_{05j} = .06, p < .05$).

⁹ 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.

The second set of hypotheses posits that the density of general (i.e. not entrepreneurship-specific) knowledge (as measured by 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

With regard to our control variables, academic unemployment is a statistically significant predictor of entrepreneurial intention (model 1: $\gamma_{09j} = .04, p < .10$), ATB (model 5: $\gamma_{09j} = .10, p < .05$) and SN (model 8: $\gamma_{09j} = .06, p < .10$). While we found no significant effect of university quality, entrepreneurship programs were negatively related to ATB (model 5: $\gamma_{11j} = .16, p < .05$). Several influences at the individual level were strong predictors of entrepreneurial intention as well as ATB, SN, and PBC. This includes role models, need for achievement, risk-taking propensity, and opportunity perception. However, risk-taking propensity was significantly related only to entrepreneurial intentions. In sum, the results for the control variables confirm prior research that has found personality, family background, and the possession of a business idea as key drivers of entrepreneurial behavior.

5. Discussion

Can universities effectively motivate and qualify individuals to enter self-employment, leading to higher start-up rates within a region? Our study suggests four answers:

First, the effect of entrepreneurship education is contingent on its mode. Our findings indicate that offers of active modes of entrepreneurship education (such as business plan seminars) rather than reflective modes (such as theory lectures) account for between-department variance in students' entrepreneurial intentions. In a similar vein, entrepreneurship teachers have

deemed courses requiring development of business plans rather than courses requiring introspective activities successful (Gartner and Vesper, 1994). Thus, education outcomes seem to depend on the concrete form and content of courses, while prior empirical research has not explicitly separated teaching styles. This finding suggests distinguishing modes of education in subsequent studies on education outcomes. However, a number of important questions remain unanswered. For instance, do synergy effects between both modes exist? To what extent can such education foster the diffusion of entrepreneurial knowledge within an organization? How do both modes relate to entrepreneurial success?

Second, the effect of entrepreneurship education is – at least partly – contingent on the regional context. Specifically, reflective modes were found to be more effective in regions high in general and entrepreneurship-specific knowledge, whereas active modes were found to be effective irrespective of the regional characteristics we investigated. Results of quasi-experimental studies that yielded a positive impact of taking entrepreneurship classes on entrepreneurial intentions also 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 rich in general and/or entrepreneurship-specific knowledge.

These findings lend support to the notion that entrepreneurship education does not exist in vacuum but its impact depends on regional conditions. Thus, the regional setting might account for some of the discrepancies in prior research. In addition to the level of general and entrepreneurship-specific knowledge studied here, other regional characteristics, such as industrial structure may also provide a fruitful soil for entrepreneurship education and provide, likewise, an interesting field for future studies.

Third, 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. Both modes were, if effective in a certain context or alone, positively related only to ATB, but not to SN or PBC. 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 course participation affects intentions and its drivers, while we investigated how course offers explain the variance in these variables between university departments. Interestingly, in both studies (and also in Oosterbeek et al., forthcoming) no impact on PBC was

found. 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. If the believe to be capable of mastering entrepreneurial tasks is critical to the start-up decision, entrepreneurship education alone might not suffice to form prospective entrepreneurs. To further improve such offers, researchers might examine how university departments can enhance the effect of such courses through complementary activities, such as promoting internships at start-ups.

Fourth, university or regional influences seem to be less salient than the personal background in raising entrepreneurial interests. Effect sizes for individual-level influences (ranging from $\beta_{5j} = .06$ to $\beta_{6j} = .83$) were clearly higher than for university influences (ranging from $\gamma_{02j} = .04$ to $\gamma_{07j} = .15$). This finding is consistent with observations in the field of organizational behavior that dispositional effects tend to surface in “weak” situations. In such situations, the environment provides ambiguous cues as to appropriate behaviors (House et al., 1996). Universities offer a wide range of courses and specializations other than entrepreneurship. In keeping with the weak-situation-argument, such offers may suggest other, alternative career paths to students and might partly explain the relatively small effect size of university variables. Moreover, 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.

5.1. Limitations

This study is not without limitations. First, data limitations preclude testing the effect of course participation in our multilevel models. Our study attributes the between-department variance in intentions to the extent of entrepreneurship course offers but we cannot explicitly distinguish course participants from other students. However, we have performed robustness checks for a subsample ($n = 249$ students) with full information showing that the results for course participants at a given department do not differ significantly from the results for all

interviewed students at that department. Hence, our additional analyses and prior research give us no reason to believe that this limitation seriously handicaps our investigation. Moreover, social interaction may lead to some spillovers of qualification and motivation between both groups. This suggests an indirect (probably weaker) effect of education offers also on non-participants. However, future research could corroborate our findings by demonstrating how such education stimulates the diffusion of entrepreneurial knowledge within an organization and is dependent on course participation.

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 and importantly, our study focuses on German universities and male students in three concrete careers. Therefore, the results presented are conditional on and are mostly generalizable to this context. Testing the model for other universities, female students, and/or other careers constitutes interesting avenues for further research.

5.2. Implications for entrepreneurship education

This study offers several practical implications. The results for the impact of entrepreneurship education suggest that departments could optimize portfolios of entrepreneurship courses by attuning the mix of active and reflective modes to regional circumstances. In regions rich in general and entrepreneurship-specific knowledge both reflective modes (e.g. theory lectures) and active modes (e.g. business plan seminars, simulations etc.) should be 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 they consider inspiring future entrepreneurs 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.

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Figure 1

Conceptual framework of this paper.

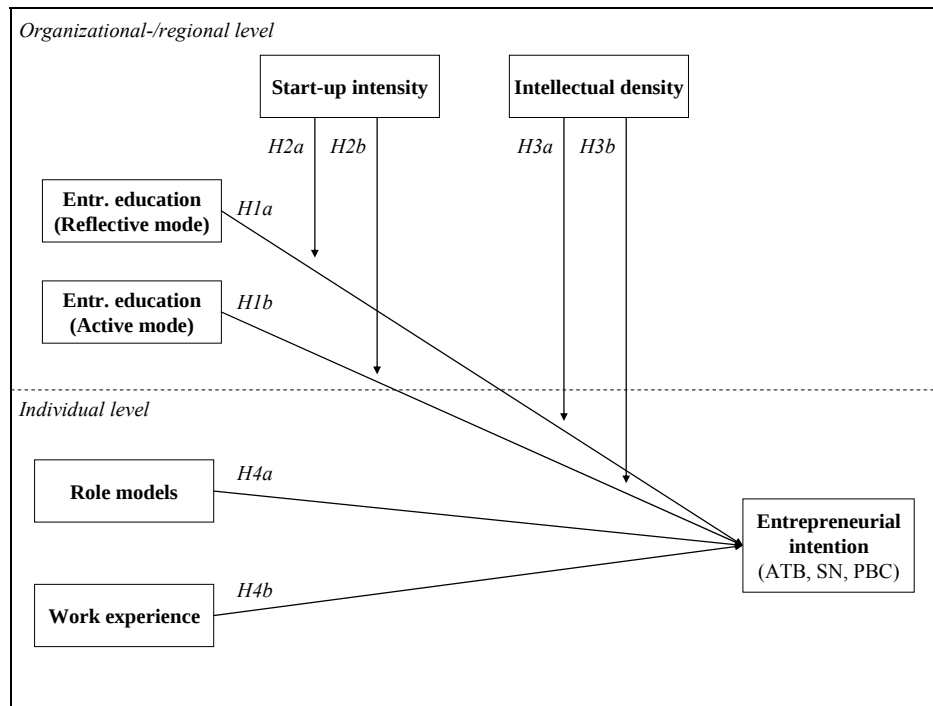


Figure 2

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

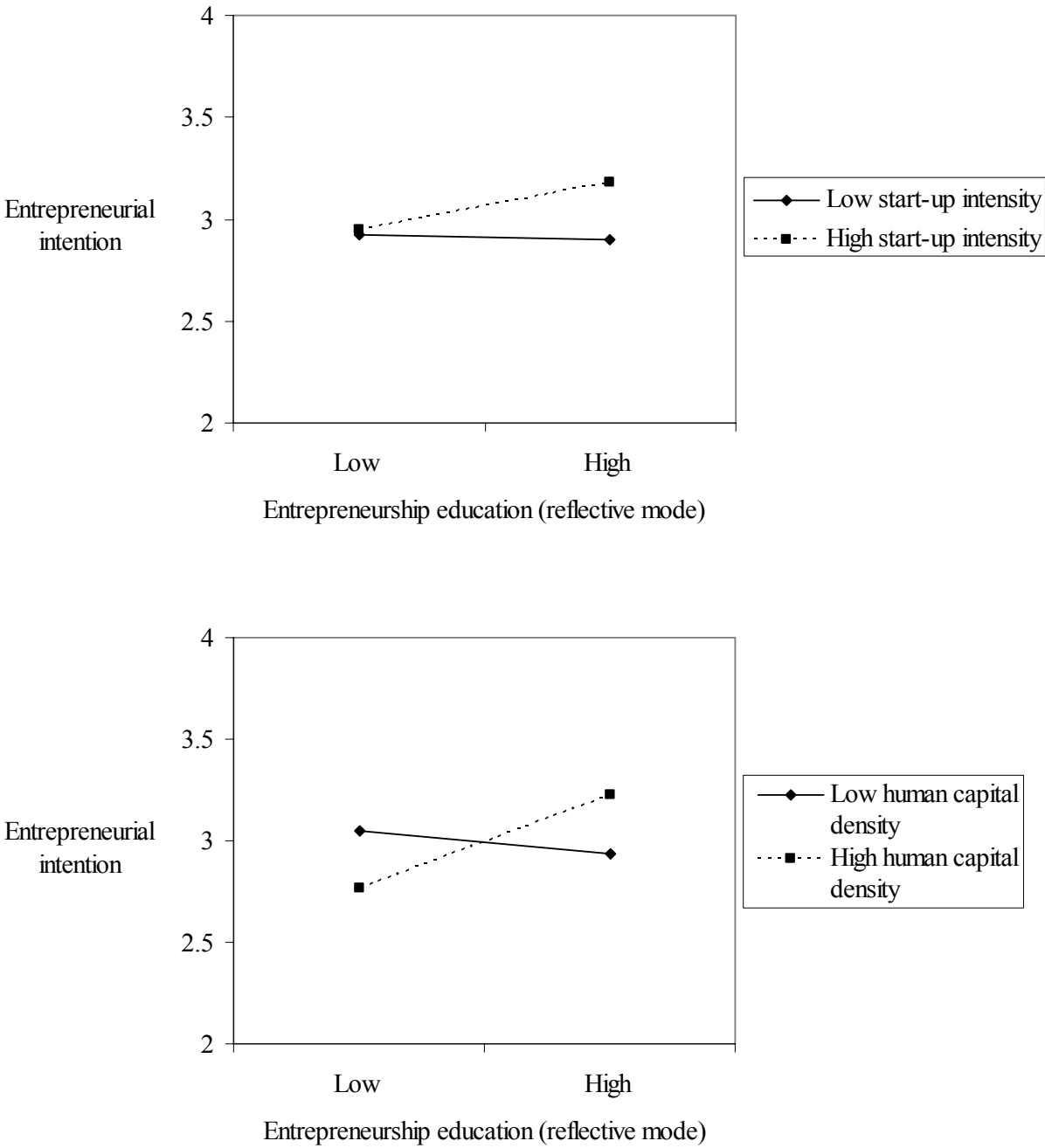


Table 1
Descriptive statistics and cross-level correlations^a.

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	-															
<i>Level 2: Departments and regions</i>																		
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	-								
<i>Level 1: Individuals</i>																		
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 2Results for HLM analysis of individual-level entrepreneurial intentions, ATB, SN, and PBC.^a

Variables	Entrepreneurial intention							
	Model 1		Model 2		Model 3		Model 4	
	b	s.e.	b	s.e.	b	s.e.	b	s.e.
<i>Organizational and regional level-hypotheses</i>								
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
<i>Organizational and regional level-controls</i>								
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
<i>Individual level-controls</i>								
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
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
R ² (organizational and regional level) ^b		0.42		0.55		0.58		0.59
R ² (individual level)		0.15		0.15		0.15		0.15

^a Level 1 n = 1,949; level 2 n = 65; standardized coefficients are reported. ^b Variance-explained statistics recommended by Raudenbush and Bryk (2002:74).

^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

Variables	Attitude toward the behavior						Subjective norm				Perc. beh. Control ^c			
	Model 5		Model 6		Model 7		Model 8		Model 9		Model 10		Model 11	
	b	s.e.	b	s.e.	b	s.e.	b	s.e.	b	s.e.	b	s.e.	b	s.e.
<i>Organizational and regional level-hypotheses</i>														
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		
<i>Organizational and regional level-controls</i>														
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		
<i>Individual level-controls</i>														
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
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
R ² (organizational and regional level) ^b		0.29		0.30		0.32		0.42		0.45		0.43		-
R ² (individual level)		0.12		0.12		0.12		0.06		0.06		0.06		0.18

^a Level 1 n = 1,949; level 2 n = 65; standardized coefficients are reported. ^b Variance-explained statistics recommended by Raudenbush and Bryk (2002:74). ^c 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).

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 variables 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	43.63	.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

Variables	Parameter estimates							
	EI				EI (Kolvereid 1996)			
	b	s.e.	b	s.e.	b	s.e.	b	s.e.
<i>Measures used in this study</i>								
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		
<i>Measures used in Kolvereid (1996a)</i>								
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).

2007

- 2007/1. Durán Cabré, J.M^a.; Esteller Moré, A.: "An empirical analysis of wealth taxation: Equity vs. tax compliance"
- 2007/2. Jofre-Monseny, J.; Solé-Ollé, A.: "Tax differentials and agglomeration economies in intraregional firm location"
- 2007/3. Duch, N.; Montolio, D.; Mediavilla, M.: "Evaluating the impact of public subsidies on a firm's performance: A quasi experimental approach"
- 2007/4. Sánchez Hugalde, A.: "Influencia de la inmigración en la elección escolar"
- 2007/5. Solé-Ollé, A.; Viladecans-Marsal, E.: "Economic and political determinants of urban expansion: Exploring the local connection"
- 2007/6. Segarra-Blasco, A.; García-Quevedo, J.; Teruel-Carrizosa, M.: "Barriers to innovation and public policy in Catalonia"
- 2007/7. Calero, J.; Escardíbul, J.O.: "Evaluación de servicios educativos: El rendimiento en los centros públicos y privados medido en PISA-2003"
- 2007/8. Argilés, J.M.; Duch Brown, N.: "A comparison of the economic and environmental performances of conventional and organic farming: Evidence from financial statement"

2008

- 2008/1. Castells, P.; Trillas, F.: "Political parties and the economy: Macro convergence, micro partisanship?"
- 2008/2. Solé-Ollé, A.; Sorribas-Navarro, P.: "Does partisan alignment affect the electoral reward of intergovernmental transfers?"
- 2008/3. Schelker, M.; Eichenberger, R.: "Rethinking public auditing institutions: Empirical evidence from Swiss municipalities"
- 2008/4. Jofre-Monseny, J.; Solé-Ollé, A.: "Which communities should be afraid of mobility? The effects of agglomeration economies on the sensitivity of firm location to local taxes"
- 2008/5. Duch-Brown, N.; García-Quevedo, J.; Montolio, D.: "Assessing the assignation of public subsidies: do the experts choose the most efficient R&D projects?"
- 2008/6. Solé-Ollé, A.; Hortas Rico, M.: "Does urban sprawl increase the costs of providing local public services? Evidence from Spanish municipalities"
- 2008/7. Sanromà, E.; Ramos, R.; Simón, H.: "Portabilidad del capital humano y asimilación de los inmigrantes. Evidencia para España"
- 2008/8. Trillas, F.: "Regulatory federalism in network industries"

2009

- 2009/1. Rork, J.C.; Wagner, G.A.: "Reciprocity and competition: is there a connection?"
- 2009/2. Mork, E.; Sjögren, A.; Svaleryd, H.: "Cheaper child care, more children"
- 2009/3. Rodden, J.: "Federalism and inter-regional redistribution"
- 2009/4. Ruggeri, G.C.: "Regional fiscal flows: measurement tools"
- 2009/5. Wrede, M.: "Agglomeration, tax competition, and fiscal equalization"
- 2009/6. Jametti, M.; von Ungern-Sternberg, T.: "Risk selection in natural disaster insurance"
- 2009/7. Solé-Ollé, A.; Sorribas-Navarro, P.: "The dynamic adjustment of local government budgets: does Spain behave differently?"
- 2009/8. Sanromà, E.; Ramos, R.; Simón, H.: "Immigration wages in the Spanish Labour Market: Does the origin of human capital matter?"
- 2009/9. Mohnen, P.; Lokshin, B.: "What does it take for and R&D incentive policy to be effective?"
- 2009/10. Solé-Ollé, A.; Salinas, P.: "Evaluating the effects of decentralization on educational outcomes in Spain?"
- 2009/11. Libman, A.; Feld, L.P.: "Strategic Tax Collection and Fiscal Decentralization: The case of Russia"
- 2009/12. Falck, O.; Fritsch, M.; Heblich, S.: "Bohemians, human capital, and regional economic growth"
- 2009/13. Barrio-Castro, T.; García-Quevedo, J.: "The determinants of university patenting: do incentives matter?"
- 2009/14. Schmidheiny, K.; Brühlhart, M.: "On the equivalence of location choice models: conditional logit, nested logit and poisson"
- 2009/15. Itaya, J.; Okamura, M.; Yamaguchix, C.: "Partial tax coordination in a repeated game setting"
- 2009/16. Ens, P.: "Tax competition and equalization: the impact of voluntary cooperation on the efficiency goal"
- 2009/17. Geys, B.; Revelli, F.: "Decentralization, competition and the local tax mix: evidence from Flanders"
- 2009/18. Konrad, K.; Kovenock, D.: "Competition for fdi with vintage investment and agglomeration advantages"
- 2009/19. Loretz, S.; Moorey, P.: "Corporate tax competition between firms"

- 2009/20. Akai, N.; Sato, M.: "Soft budgets and local borrowing regulation in a dynamic decentralized leadership model with saving and free mobility"
- 2009/21. Buzzacchi, L.; Turati, G.: "Collective risks in local administrations: can a private insurer be better than a public mutual fund?"
- 2009/22. Jarkko, H.: "Voluntary pension savings: the effects of the finnish tax reform on savers' behaviour"
- 2009/23. Fehr, H.; Kindermann, F.: "Pension funding and individual accounts in economies with life-cyclers and myopes"
- 2009/24. Esteller-Moré, A.; Rizzo, L.: "(Uncontrolled) Aggregate shocks or vertical tax interdependence? Evidence from gasoline and cigarettes"
- 2009/25. Goodspeed, T.; Haughwout, A.: "On the optimal design of disaster insurance in a federation"
- 2009/26. Porto, E.; Revelli, F.: "Central command, local hazard and the race to the top"
- 2009/27. Piolatto, A.: "Plurality versus proportional electoral rule: study of voters' representativeness"
- 2009/28. Roeder, K.: "Optimal taxes and pensions in a society with myopic agents"
- 2009/29. Porcelli, F.: "Effects of fiscal decentralisation and electoral accountability on government efficiency evidence from the Italian health care sector"
- 2009/30. Troumpounis, O.: "Suggesting an alternative electoral proportional system. Blank votes count"
- 2009/31. Mejer, M.; Pottelsberghe de la Potterie, B.: "Economic incongruities in the European patent system"
- 2009/32. Solé-Ollé, A.: "Inter-regional redistribution through infrastructure investment: tactical or programmatic?"
- 2009/33. Joanis, M.: "Sharing the blame? Local electoral accountability and centralized school finance in California"
- 2009/34. Parcerro, O.J.: "Optimal country's policy towards multinationals when local regions can choose between firm-specific and non-firm-specific policies"
- 2009/35. Cordero, J.M.; Pedraja, F.; Salinas, J.: "Efficiency measurement in the Spanish cadastral units through DEA"
- 2009/36. Fiva, J.; Natvik, G.J.: "Do re-election probabilities influence public investment?"
- 2009/37. Haupt, A.; Krieger, T.: "The role of mobility in tax and subsidy competition"
- 2009/38. Viladecans-Marsal, E.; Arauzo-Carod, J.M.: "Can a knowledge-based cluster be created? The case of the Barcelona 22@district"

2010

- 2010/1. De Borger, B.; Pauwels, W.: "A Nash bargaining solution to models of tax and investment competition: tolls and investment in serial transport corridors"
- 2010/2. Chirinko, R.; Wilson, D.: "Can Lower Tax Rates Be Bought? Business Rent-Seeking And Tax Competition Among U.S. States"
- 2010/3. Esteller-Moré, A.; Rizzo, L.: "Politics or mobility? Evidence from us excise taxation"
- 2010/4. Roehrs, S.; Stadelmann, D.: "Mobility and local income redistribution"
- 2010/5. Fernández Llera, R.; García Valiñas, M.A.: "Efficiency and elusion: both sides of public enterprises in Spain"
- 2010/6. González Alegre, J.: "Fiscal decentralization and intergovernmental grants: the European regional policy and Spanish autonomous regions"
- 2010/7. Jametti, M.; Joanis, M.: "Determinants of fiscal decentralization: political economy aspects"
- 2010/8. Esteller-Moré, A.; Galmarini, U.; Rizzo, L.: "Should tax bases overlap in a federation with lobbying?"
- 2010/9. Cubel, M.: "Fiscal equalization and political conflict"
- 2010/10. Di Paolo, A.; Raymond, J.L.; Calero, J.: "Exploring educational mobility in Europe"
- 2010/11. Aidt, T.S.; Dutta, J.: "Fiscal federalism and electoral accountability"
- 2010/12. Arqué Castells, P.: "Venture capital and innovation at the firm level"
- 2010/13. García-Quevedo, J.; Mas-Verdú, F.; Polo-Otero, J.: "Which firms want PhDs? The effect of the university-industry relationship on the PhD labour market"
- 2010/14. Calabrese, S.; Epple, D.: "On the political economy of tax limits"
- 2010/15. Jofre-Monseny, J.: "Is agglomeration taxable?"
- 2010/16. Dragu, T.; Rodden, J.: "Representation and regional redistribution in federations"
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