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Entrepreneurial education and knowledge: empirical evidence on a sample of German undergraduate students

Andreas Oehler · Andreas Höfer · Henrik Schalkowski

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Abstract In this paper, we examine the current state of entrepreneurial education and knowledge of German undergraduate students. In our empirical analysis we examine a data set which comprises responses of 386 undergraduate students and which is not biased by program-specific effects. We analyze students' understanding of aspects that play a crucial role in business start-ups in order to identify gaps in knowledge and relevant competences. We find evidence that the students evaluate schools' imparting of relevant knowledge for entrepreneurs as rather moderate. Our findings indicate that students' age, their general level of entrepreneurship-related knowledge, their ambition to become entrepreneurs, the share of relevant material taught in school as well as the assessment of the transfer of competence by the school attended before the bachelors program substantially influence the gaps in knowledge and competences. Based on our findings about the current state of entrepreneurial knowledge and education in Germany, we discuss implications for relevant stakeholders.

Keywords Entrepreneurship policy · Entrepreneurial education · Entrepreneurial knowledge · Teaching · Universities · Technology transfer

JEL Classification L26 · I23 · I25

1 Introduction

Policy makers in the United States and in Europe regard entrepreneurship as a driving force to boost economic growth and innovation. Studies in the literature show that in an environment of more sophisticated entrepreneurial activities greater economic development

A. Oehler (✉)
Chair of Finance, Bamberg University, Kaerntenstr. 7, 96045 Bamberg, Germany
e-mail: andreas.oehler@uni-bamberg.de

A. Höfer · H. Schalkowski
Department of Finance, Bamberg University, Kaerntenstr. 7, 96045 Bamberg, Germany
e-mail: andreas.hoefer@uni-bamberg.de

and exposure is obtained (Gnyawali and Fogel 1994; Rosa et al. 1996; Maillat 1998; Acs et al. 1999; Bruyat and Julien 2001; Lee and Wong 2007; Blenker et al. 2006). In fact, major reasons for the failure of business start-ups range from inconsistent management accounting, funding gaps and indecisive leadership to insufficient market adjustment as well as tax and law-related aspects (Bradley and Cowdey 2004; Kearney 2009). Policy makers, therefore, attempt to promote entrepreneurship at the macro level through education as they believe that a greater understanding is likely to create more adept entrepreneurs. In the last few decades, research on entrepreneurial education and knowledge has advanced enormously (Sexton and Bowman 1984; Raffo et al. 2000); prior research, however, has not thoroughly examined the structured imparting of knowledge at universities and schools as well as aspects influencing students' relevant knowledge and competences.

It is our foremost motivation to holistically analyze the level of relevant knowledge that undergraduate students have obtained and, consequently, to draw inferences about entrepreneurial education and knowledge. Hereby, we examine a data set which is not biased by program-specific effects. We pay attention to the students' understanding of aspects that play a crucial role in business start-ups in order to identify gaps in knowledge and relevant competences. We use the data to address how effective the transfer of entrepreneurial related disciplines is. Also, we provide insights into the question whether structural knowledge acquired in the context of entrepreneurship teaching can fill an important educational gap for potential entrepreneurs. This is of particular importance in the light of the ongoing discussion on the effectiveness of higher education institutions to generate real value for the community and the economic development.

In this paper, we find that undergraduate students evaluate schools' imparting of relevant knowledge for entrepreneurs as moderate. Furthermore, understanding of *finance, accounting,* and *management accounting* as well as *corporate planning and management* is considered to be momentous for entrepreneurs. Since students characterize their know-how as merely *average* regarding these categories, we can infer a self-perceived knowledge gap between the individuals' perceived expertise and the actual knowledge of relevant areas that is considered to be momentous for business founders. In addition, we identify and examine gaps in *professional, social* and *personal competences*. Specifically, in the empirical analysis, we analyze gaps in knowledge and competences using a multivariate setting. We find that students' age, their general level of entrepreneurship-related knowledge, their ambition to become entrepreneurs, the share of relevant material taught in school as well as the assessment of the transfer of competence by the school attended before the bachelors program substantially influence the self-perceived gaps.

The paper is structured as follows: the next section gives an overview of related literature and provides a discussion on findings with respect to entrepreneurial education and knowledge. Section 3 introduces the data and methodology used in this research, while Sect. 4 outlines and discusses the results and presents implications for relevant stakeholders. Section 5 concludes.

2 Related research on entrepreneurial education and knowledge

In this paper, entrepreneurial knowledge is regarded as structural knowledge that is relevant when someone is setting up a business. This includes relevant competences (*professional*, *social* and *personal* competences) as well. The following literature review primarily focuses on relevant theories and previous studies in the context of entrepreneurial

research and on the applied methodologies used to examine entrepreneurial activities. Hence, we are able to illustrate how far our survey's methodology differs from others.

Two relevant theories that can be applied in the context of entrepreneurial research are the Human Capital Theory and the Jack-of-all-trades approach. The Human Capital Theory was primarily developed by Becker (Becker 1964). The term *human capital* itself refers to the skills, abilities and knowledge embodied in people (Coff 2002) and human capital—one's education and training in particular—plays an important role in organizations (Becker 1983; Mincer 1974). Specifically, the compensation for employees or managers is strongly adjusted accordingly to their education and experience (Becker 1964; Fisher and Govindarajan 1992) and to the investments in training designed to develop human capital (Combs et al. 2006).

Knowledge, skills and abilities, including experiences, education and training have consistently been considered as central drivers of strategy and performance (see e.g. Andrews 1965). The Jack-of-all-trades approach by Lazear (2002, 2005) shows that having experiences in a large number of different roles increases the probability of becoming an entrepreneur. The idea is that entrepreneurs must have sufficient expertise in various areas to put together the many ingredients needed for business success, while for employees it suffices and pays to be a specialist in the field demanded by the job taken (Wagner 2003). The approach also predicts that potential entrepreneurs should have human capital investment strategies balanced across different competences, highlighting a link between individual innate attitudes and the choice to acquire expertise across various fields (Silva 2006).

Garavan and O'Cinneide (1994) argue that "the portfolio of skills of many entrepreneurs is relatively narrow" (p. 8). After reviewing the literature von Graevenitz et al. (2010) argue that many studies describe entrepreneurship courses (Vesper and Gartner 1997), analyze material of good entrepreneurship education (Fiet 2001) and discuss the effect of entrepreneurship courses (Chrisman 1997). In particular, company founders are confronted with a variety of tasks in which a certain understanding is crucial—concerning, for instance, numeric skills and competences in management and leadership. Findings from the literature show that insufficient knowledge, in particular in the areas of *finance* and *management accounting*, is a major reason for corporate crises or insolvencies (Bradley and Cowdey 2004; Kearney 2009). Thus far, however, scholars have analyzed several data in which causal relationships between educational efforts in high school or university and entrepreneurial activities are presented (Matlay 2008). Hereby, studies suggest a positive relationship between the depth of entrepreneurial education and self-employment. There is coincident evidence which suggests that educational attainment is positively related with entrepreneurial activities (Dickson et al. 2008). Other studies, however, also discuss contrary effects (Souitaris et al. 2007). Specifically, van der Sluis et al. (2004) and Le (1999) discuss an inverse relationship by arguing that the well-educated ones are likely to attain high paid wage employment in countries with sound economic opportunities.[1]

From a methodological point of view, many studies emphasize on class-room questionnaires or experiments where typologies of potential entrepreneurs are stressed. For instance, Raposo et al. (2008) examine entrepreneurs' characteristics and the general knowledge of the potential business founders. However, most studies face serious methodological limitations (von Graevenitz et al. 2010). For instance, studies in the literature focus on certain (interdisciplinary) educational programs and analyze students' overall

[1] In addition, further work presents a non-linear relationship between the level of literacy and selection into entrepreneurship (Neck et al. 2003; Dickson et al. 2008).

level of knowledge before and after the respective class. As only a rather general level of knowledge has been examined (see e.g. Dickson et al. 2008), it remains undiscovered whether potential company founders' knowledge lacks in the field of, e.g., finance, accounting, management accounting, taxation, or law. Therefore, detailed evidence on the level of entrepreneurial knowledge and education with inferences about the imparting of knowledge in common education institutions is scarce. One major explanation for this limitation is that a substantial fraction of surveys evaluates very specific educational programs and initiatives by examining program-related data. As many authors use data from very specific programs or initiatives, questions in particular with regard to external validity arise. Furthermore, it is difficult to draw conclusions on causality between the educational program and knowledge and between knowledge and entrepreneurial activities.

3 Data, descriptive statistics and methodology

3.1 Data

In the end of 2011, we carried out a survey with 386 business administration undergraduate students of the Bamberg University in order to study empirically the current state of entrepreneurial knowledge and education.[2] The students come from areas across Germany and only a few are international students. Contrary to other studies that examine in particular students between the age of 25 and 34 in MBA programs (e.g. Wilson et al. 2007; Reynolds et al. 2002), we intentionally focus on younger students in Bachelor programs who have not gained extensive entrepreneurial experiences yet. The reason for this approach is that younger respondents are more eligible to thoroughly assess the transfer of relevant knowledge in organizations, e.g. schools they attended before their Bachelors program. However, the dataset has some advantages and disadvantages which are to be briefly discussed in the following. On the upside, the number of respondents is very high compared to other studies. Furthermore, due to our survey design we were able to ask every student individually in a thorough manner on topics including entrepreneurial intentions, knowledge and competences as well as personal backgrounds and the prior education process. On the downside, there are certain limitations. Since it is a German sample that comprises specifications on the German school system and the German higher education system, the findings cannot be generalized without restriction. In addition, a control sample of potential entrepreneurs, e.g. who do not attend Bamberg University, is missing.

In this survey, we utilized a standardized questionnaire with primarily closed-ended questions. The questionnaire was designed while considering the findings in the literature, such as setting defaults or introducing consistency and unambiguous questions. By following this approach we obtain a unique data set that gives insights into the status quo of students' entrepreneurial knowledge and education. Furthermore, as we handed out the questionnaire at the beginning of the academic turn, the data is not biased by lecture-related aspects. The original questionnaire is in German, an English translation is available on request. Besides questions about their personal environment and individual knowledge, students were asked to evaluate the transfer of competences and the imparting of knowledge of certain fields (e.g. *finance*, *accounting*, *human resource management* etc.) by the

[2] We conducted the survey at the beginning of a business administration seminar in the winter term.

organization that students attended before starting their studies. Furthermore, students assessed their individual knowledge as well as the momentousness of competences for business founders and individuals' understanding in relevant areas. In the final part of the questionnaire, accumulated needs with regard to educational institutions and areas of expertise were stressed. Appendix 1 provides an overview of questions examined in this paper.

3.2 Descriptive statistics

Our respondents are undergraduates who are on average 22 years old and who study business administration in their third semester. The gender distribution is counterbalanced between male (51 %) and female students (49 %). Roughly 93 % of the students graduated from secondary school before starting their academic studies immediately, whereas the remaining students obtained an advanced technical college entrance qualification to study at university. The standard period of study for a German bachelor's degree is six semesters. Since the majority of students is in their third semester, the average age (median value) is 22.[3] One-third of the students had already gained professional experience during internships and commercial traineeships before starting their studies and a fractional amount (nearly 4 %) of students in our data set is already self-employed, mostly in sales and events. Most students are acquainted with people who are self-employed, especially in the personal and family environment, for example parents (about 35 %) or friends (about 31 %) (see Table 1). The students evaluate their own knowledge on issues that are relevant for entrepreneurs on average as rather *poor*. Moreover, about 42 % of the students report that the prior education on issues that are relevant for entrepreneurs was rather *sketchy*.

One of the most discussed effects in the context of entrepreneurial research and entrepreneurship are gender effects and differences as well as entrepreneurial self-efficacy (Wilson et al. 2007), especially the focus on women's tendency to become entrepreneurs. Worldwide, women own 25 % of all businesses and the number of women-owned businesses around the world is rapidly growing (Estes 1999; Jalbert 2000). For example, Wilson et al. (2007) demonstrate that females have a significantly lower entrepreneurial self-efficacy than males. The authors posit that several expectations imposed by society may well shape self-efficacy at an early age, long before actual experiences take place that may further shape or solidify one's self-confidence in different domains (see also Eddleston et al. 2006). In this respect, even with work/life experience, gender differences in entrepreneurial self-efficacy persist. Empirical evidence suggests that women are likely to have lower expectations than men for success in a wide choice of occupations (Eccles 1994). The question of our research study includes, whether (female) students equally aspire to become self-employed and, in addition, how they evaluate their prior entrepreneurial-related education. For women, starting a business as one potential career comes along with risks and uncertainties. In order to show whether entrepreneurial-efficacy/-focus differs by gender, we conduct contingency analysis by modeling a crosstab with gender as characteristic on the one hand and the results of the answer pattern of question 12 (who wants to become an entrepreneur) on the other hand. The results in Table 2 reveal that half of the males aspires to become entrepreneurs while the other 50 % refuses self-employment. In contrast, the crosstab shows that females' aspiration to become entrepreneurs is less distinctive.

[3] The respondents are between 18 and 33 years old.

Table 1 Overview of descriptive results

Question 7: Are there any self-employed persons in your personal environment?		Question 9: Have you looked into the subject "business start-up" in the past?		Question 22: In which institutions do you see accumulated needs in entrepreneurship education?	
Response option	Percentage	Response option	Percentage	Response option	Percentage
Parents	35.4 %	Yes	38.2 %	Cooperative state university	38.5 %
Friends	31.2 %	Topics at university	15.6 %	Adult education center	29.3 %
Nobody	28.0 %	Research on your own	14.8 %	Others	28.8 %
Others	14.0 %	Current news, coverage in the press	12.2 %	Institutions, e.g. consumer organizations	14.1 %
Yourself	3.7 %	Topics at school	7.2 %	Schools	4.9 %
Spouse	2.4 %	Others	4.2 %	University	3.0 %
Brothers and Sisters	3.4 %	Seminar at adult education center	1.3 %	University of applied sciences	2.7 %

In this table we report the descriptive statistics of Questions 7 (are there any self-employed persons in your personal environment?), 9 (have you already looked into the subject "business start-up" in the past?) and 22 (in which institutions do you see accumulated needs in entrepreneurship education?). For each question the respective response options and the percentages are provided. The response option "others" represent alternative answers of the students

Table 3 provides an overview of results which indicate the *knowledge gap* between students' perceived expertise and the knowledge of relevant fields that is considered to be momentous for business founders. This inference can be drawn as students assess their own knowledge of the areas of *finance*, *accounting and auditing*, *corporate planning and management*, *management accounting*, *marketing*, *human resource management*, *basic law*, *fiscal and economic issues* as merely *satisfactory* (Question 21).[4] In contrast, the students evaluate knowledge of these fields as *very important* or *important*, respectively (Question 20). In addition, these findings become even more relevant when the transfer of knowledge in secondary schools is evaluated. Hence, students evaluate the imparting of know-how that is relevant for business founders as merely *fair* (Question 19). The findings in Table 3, especially the rather uniformly distributed response behavior to question 21, are in line with the rationale of the Jack-of-all-trades approach by Lazear (2002, 2005).

An identical response pattern can be observed when *professional, social* and *personal* competences are examined. Table 4 exhibits an overview of the results which indicate that schools' imparting of knowledge of professional competence like expertise and proficiency is evaluated on average as *satisfactory*; whereas the transfer of *social* and *personal* competences is evaluated as *good* (see Question 16). Although, the students finished their schooldays on average one and a half years ago, a similar pattern becomes apparent when they appraise their individual competences. Particularly, the professional competences are assessed to be merely *satisfactory*; whereas *social* and *personal* competences are regarded more positively (see Question 18). As these two competences are associated with soft skills such as the ability to work in teams, self-motivation, capability of conflict management, self-dependence or one's own initiative, individuals are more prone to regard themselves more positively (Oskamp 1965; Camerer and Lovallo 1999). Particularly, Table 4 displays the self-perceived *competence gap* insofar that the students evaluate their individual skills and abilities as rather moderate in terms of the competences that they regard to be important for entrepreneurs (see Question 17). Thus, students are more likely to believe they do not possess the relevant skills to become business founders.[5]

3.3 Methodology

We conduct our empirical analysis as follows: Firstly, we compute the median values of the aforementioned questions of interest. Secondly, in order to thoroughly analyze the self-perceived knowledge gap, we employ Model (1) which is a multivariate analysis using ordinary least squares (OLS):

$$gap_{i,j} = \alpha_{0,i} + \beta_1 age_i + \beta_2 exp_i + \beta_3 att_i + \beta_4 entre\_knowl_i + \beta_5 amb_i + \beta_6 share\_entre_i + \beta_7 compet\_school_i + \beta_8 compet\_assess_i + \varepsilon_{i,j,t} \quad (1)$$

where $gap_{i,j}$ is student's i self-perceived knowledge gap measured as the difference between student's i assessment of individual knowledge of the field j (Question 21) and the

[4] These fields are chosen as findings in the extant literature show that insufficient knowledge of founders in these areas is likely to result in corporate crisis or even insolvencies (Bradley and Cowdey 2004; Kearney 2009).

[5] With respect to the three competences that are stressed in Questions 16–18, Spearman's rank correlation coefficients were also computed (but are not reported in detail). Interestingly, students that evaluate the transfer of *social* competences in secondary schools as *good* tend to exhibit an identical response pattern towards *personal* competences.

Table 2 Contingency table of Question 2 (gender) and Question 12 (do you aspire to become self-employed?)

Gender	Yes	No
Male	25 %	25 %
Female	19 %	31 %

In this table we report the results of the contingency table using the answer pattern of Question 2 (gender) and Question 12 (who wants to become an entrepreneur). For each possible combination the respective percentages are provided

assessment of the importance of field j (Question 20).[6] If the difference between the aforementioned questions is a positive number, there is a gap between subjects' perceived expertise and the knowledge of field j that is considered to be important for business founders. If the difference is zero or negative, there is no such self-perceived gap. The variable age_i expresses how old student i is (Question 1), exp_i is the previous work experience of i (Question 6). The variable att_i specifies whether student i has looked into the subject entrepreneurship in the past (Question 9) and $entre\_knowl_i$ is the level of knowledge in terms of the formation of an enterprise (Question 10). The variable amb_i indicates whether the students aspire to become entrepreneurs (Question 12) and $share\_entre_i$ is the share of entrepreneurship-related material/content in the previous education (Question 15). The variable $compet\_school_i$ is the assessment of the transfer of competence by the school attended before the bachelors program (Question 16) and $compet\_assess_i$ replicates the own competences.

In the multivariate analysis using OLS we also examine the competence-specific gap:

$$gap_{i,k} = \alpha_{0,i} + \beta_1 age_i + \beta_2 exp_i + \beta_3 att_i + \beta_4 entre\_knowl_i + \beta_5 amb_i + \beta_6 share\_entre_i + \varepsilon_{i,j,t} \quad (2)$$

where $gap_{i,k}$ is student's i self-perceived competence gap measured as the difference between student's i assessment of own competences k (Question 18) and the assessment of the importance of the competences k (Question 17).[7]

Specifically, we apply a multivariate setting to analyze how the self-perceived gaps in knowledge and competence are related with student-specific characteristics including age (age_i), the share of entrepreneurship-related material/content in the previous education ($share\_entre_i$) and the transfer of competences by school ($compet\_school_i$). The dummy variables exp_i, att_i and amb_i as well as the variables $entre\_knowl_i$ and $compet\_assess_i$ are included as control variables. Specifically, using this procedure we can analyze how personal characteristics are related with gaps in knowledge and competences.

The questionnaire's response options range from 0 (No) to 1 (Yes), from 1 to 5 (1 = very important, 2 = important, 3 = neutral, 4 = rather not important, 5 = not important) or from 1 to 5 (1 = very good, 2 = good, 3 = satisfactory, 4 = fair, 5 = insufficient). The latter system is consistent with the grading scheme at German

[6] The respective fields j are *finance*, *accounting and auditing*, *corporate planning and management*, *management accounting*, *marketing*, *human resource management*, *basic law issues*, *financial aspects*, *subventions*, *subsidies* and *economic aspects*.

[7] The respective competences k are *professional* competences (know-how, expertise), *social* competences (teamwork, motivation etc.) and *personal* competences (one's own initiative, self-dependence, goal orientation etc.).

Table 3 Knowledge gap

Questions	Median values								
	Fields of competences								
	Finance	Accounting and auditing	Corporate planning and management	Management accounting	Marketing	Human resource management	Basic law Issues, particularly legal Forms	Fiscal aspects, subventions, subsidies	Economic aspects
Assessment of Education in the following Areas at the Institution that was attended before starting Bachelors studies (Question 19)	4	4	4	4	4	4	4	4	3
Importance of Knowledge of the following Areas of Expertise for Start-ups (Question 20)	1	2	1	2	2	2	2	2	2
Assessment of own Knowledge of the following Areas of Expertise (Question 21)	3	2	3	3	3	3	3	4	3

In this Table median values from Questions 19, 20 and 21 are reported. The response option for Questions 19 and 21 range from 1 to 5 (1 = very good, 2 = good, 3 = satisfactory, 4 = fair, 5 = insufficient). The response option for Question 20 ranges from 1 to 5 (1 = very important, 2 = important, 3 = neutral, 4 = rather not important, 5 = not important)

Table 4 Competence Gap

Questions	Median values		
	Competences		
	Professional competence	Social competence	Personal competences
Assessment of the transfer of competences by the institution that was attended before starting bachelor studies (Question 16)	3	2	2
Importance of the following competences (Question 17)	1	1	1
Assessment of own competences (Question 18)	3	2	2

In this Table median values from Questions 16, 17 and 18 are reported. The response option for Questions 16 and 18 range from 1 to 5 (1 = very good, 2 = good, 3 = satisfactory, 4 = fair, 5 = insufficient). The response option for Question 17 ranges from 1 to 5 (1 = very important, 2 = important, 3 = neutral, 4 = rather not important, 5 = not important)

universities. Further, in order to gain deeper insight into the students' response pattern, we report Spearman's rank correlation coefficients. Spearman's correlation provides a measure of a monotonic relationship between two items and can be used with ordinal data and is—contrary to Pearson's correlation—robust to outliers. By following this approach, we can describe the relationship between the assessed items more thoroughly.

4 Results and discussion

4.1 Regression and correlation analyses

Table 5 provides the results of the multivariate regression analysis of Model (1). By and large, for the coefficient *age* we find a statistically significant negative relationship between students' age and the self-perceived knowledge gap in the fields *finance, corporate planning and management, management accounting, marketing, human resource management* and *fiscal aspects*. This indicates that the individual knowledge gap diminishes as individuals get older and accumulate field-specific experience. Furthermore, the gaps' reduction can be explained with the accumulation of human capital (Becker 1964). However, researchers have employed a spectrum of variables that constitute human capital, like formal education, practical experience, family's background, skills, and others (Unger et al. 2011). We do not find such a statistically significant relationship for the fields *accounting and auditing, basic law issues* and *economic aspects* since the knowledge gap is less pronounced in these areas.

In order to assess the robustness of Model (1), we consider the variable *entre_knowl* which specifies the students' knowledge in the context of business formation. Throughout all areas the coefficient on *entre_knowl* is positive. Specifically, we find statistically significant positive coefficients for the fields *finance, corporate planning and management* and *marketing* suggesting that a decline in the level of knowledge by one unit (e.g. from 4 = "fair" to 5 = "insufficient") is associated with an increase of the knowledge gap by 0.157 (*finance*), 0.176 (*corporate planning and management*) and 0.234 units (*marketing*). Hence, the individuals' current knowledge reflects the status quo of his or her individual knowledge gap. This result links also to Unger et al. (2011) where "…entrepreneurs should

Table 5 Results of Model (1)

	Finance	Accounting and auditing	Corporate planning and management	Management accounting	Marketing	Human resource management	Basic law issues	Fiscal aspects, subventions, subsidies	Economic aspects
α	1.210	1.912**	1.380	3.216	1.020	1.533*	−0.578	2.023**	−0.683
	(0.828)	(0.945)	(0.924)	(1.092)	(0.961)	(0.897)	(1.042)	(1.013)	(1.052)
Age	−0.068**	−0.038	−0.075**	−0.151***	−0.077**	−0.063*	0.004	−0.082**	0.005
	(0.032)	(0.037)	(0.036)	(0.042)	(0.037)	(0.035)	(0.041)	(0.039)	(0.041)
Exp	−0.038	−0.076	0.178	−0.041	0.128	0.030	−0.019	0.238	−0.026
	(0.128)	(0.146)	(0.143)	(0.169)	(0.149)	(0.139)	(0.161)	(0.157)	(0.163)
Att	−0.045	−0.108	0.052	−0.040	0.508	0.213	0.128	0.238	−0.113
	(0.134)	(0.153)	(0.150)	(0.177)	(0.156)	(0.146)	(0.169)	(0.157)	(0.171)
Entre_knowl	0.157*	0.028	0.176*	0.085	0.234**	0.058	0.081	0.080	0.010
	(0.083)	(0.095)	(0.092)	(0.109)	(0.096)	(0.090)	(0.104)	(0.101)	(0.105)
Amb	−0.148	−0.155	−0.119	−0.173	−0.091	−0.291**	−0.241	−0.345**	−0.146
	(0.122)	(0.140)	(0.136)	(0.161)	(0.142)	(0.132)	(0.154)	(0.150)	(0.155)
Share_entre	0.183**	−0.167*	0.206**	0.093	0.037	0.068	0.132	0.282***	0.054
	(0.087)	(0.100)	(0.097)	(0.115)	(0.101)	(0.095)	(0.110)	(0.107)	(0.111)
Compet_school	0.103	−0.005	0.004	−0.068	−0.082	−0.033	0.097	−0.055	0.127
	(0.064)	(0.074)	(0.072)	(0.085)	(0.075)	(0.070)	(0.081)	(0.079)	(0.082)
Compet_assess	0.198**	0.137	0.147	0.301***	0.162	0.070	0.176	0.081	0.223**
	(0.086)	(0.098)	(0.096)	(0.113)	(0.100)	(0.093)	(0.108)	(0.105)	(0.109)
R^2	0.131	0.030	0.080	0.091	0.066	0.032	0.045	0.071	0.043
Observations	385	385	385	385	385	385	385	385	385

In this table we report the results of Model (1). The dependent variable $gap_{i,j}$ is student's i self-perceived knowledge gap measured as the difference between student's i assessment of individual knowledge of the field j (Question 21) and the assessment of the importance of field j (Question 20).We report the coefficients and standard errors (in brackets). If the difference between the aforementioned questions is a positive number, there is a gap between subjects' perceived expertise and the knowledge of field j that is considered to be important for business founders. If the difference is zero or negative, there is no such self-perceived gap. The independent variable age_i expresses how old student i is (Question 1), exp_i is the previous work experience of i (Question 6). The variable att_i specifies whether student i has looked into the subject entrepreneurship in the past (Question 9) and $entre\_knowl_i$ is the level of knowledge in terms of the formation of an enterprise (Question 10). The variable amb_i indicates whether the students aspire to become entrepreneurs (Question 12) and $share\_entre_i$ is the share of entrepreneurship-related material/content in the previous education (Question 15). The variable $compet\_school_i$ is the assessment of the transfer of competence by the school attended before the bachelors program (Question 16) and $compet\_assess_i$ replicates the own competences. The symbols ***, **, and * denote significance at the one, five, and ten percent level, respectively

invest in the acquisition of task-related knowledge because knowledge is more important than past experience." In turn, past experience itself is reflected in our model by the coefficient *exp*. A potential explanation is that our respondents are undergraduates and most of them have not gained any practical experience before their studies at university and only a few have built up a business.

In the empirical analysis, we propose that share of entrepreneurship-related material/content in the previous education (*share_entre*) has an impact upon students' self-perceived knowledge gap. With respect to the gap in the fields of *finance*, *corporate planning and management* as well as *fiscal aspects*, we find that a decrease of the previous share of entrepreneurship-related teaching (e.g. from 4="marginal share" to 5="no share") leads to an increase of the gap by 0.183 (*finance*), 0.206 (*corporate planning and management*) and 0.282 (*fiscal aspects*) units. These coefficients are significant at the five and one percent level. For the self-perceived knowledge gap in *accounting and auditing* we obtain contrary findings suggesting that a decrease of taught entrepreneurship-related material affects the knowledge gap negatively.

In the survey design, we ask students to assess their individual entrepreneurship-related *professional* competences (specialized knowledge, professional skills). The respective findings on the variable *compet_assess* indicate that an inferior competence assessment is associated with a larger knowledge gap in the fields *finance, management accounting* and *economic aspects*. These findings are significant at the five percent level. For the remaining fields the coefficient on *compet_assess* is also positive but not statistically significant.

For reasons of robustness, in the multivariate analysis the dummy variable *amb* is considered which takes a value of 1 when the student aspires to become an entrepreneur and 0 otherwise. In the areas of *human resource management* as well as *fiscal aspects* the self-perceived knowledge gap decreases at statistically significant levels by 0.291 and 0.345 units, respectively, when students intend to become self-employed. For the remaining areas of knowledge we do not obtain significant results. By and large, we find that older students tend to exhibit a less pronounced knowledge gap. The gap in *finance* and *corporate planning and management* decreases when the level of entrepreneurship-specific knowledge and the share of relevant material taught in school are larger. Specifically, in areas that require specialization to a greater extent (e.g. *fiscal aspects*) the self-perceived knowledge gap is larger when students do not aspire to become entrepreneurs and when the share of relevant material during the previous education at school was small. Overall, we do not find any specific patterns between the coefficients and the individual knowledge gaps.

Table 6 reports Spearman's rank correlation coefficients of the responses to Question 19. In all relevant areas the transfer of knowledge in secondary schools is assessed as rather moderate (see discussion in Sect. 3). Merely the transfer of know-how with regard to economic aspects is evaluated as *satisfactory*. By evaluating the results, substantially greater coefficients in the fields *finance, accounting and auditing* as well as *corporate planning and management* and *management accounting* become obvious. This indicates that students who assess the transfer of knowledge in educational institutions with respect to e.g. finance as rather unsatisfactory, tend to evaluate the aforementioned mathematics-related fields in a similar manner. One possible explanation for this finding can be that these fields are taught as one subject at school, possibly even by the same teacher.

In contrast to previous findings, when students are asked to evaluate their own knowledge with regard to the aforementioned categories, a different pattern becomes obvious (see Table 7). Generally, in all management and law-related fields and in those where numeric skills are crucial, the median values are at least one grade higher compared

Table 6 Assessment of Education at the Institution that was attended before starting Bachelors studies (Question 19)

Fields of Competences	Finance	Accounting and auditing	Corporate planning and management	Management accounting	Marketing	Human resource management	Basic law issues, legal forms	Fiscal aspects, subventions, subsidies	Economic aspects
Median values	4	4	4	4	4	4	4	4	3
Finance		0.72	0.71	0.72	0.56	0.58	0.51	0.53	0.50
Accounting and auditing			0.70	0.80	0.58	0.58	0.52	0.44	0.51
Corporate planning and management				0.78	0.64	0.66	0.53	0.57	0.45
Management accounting					0.66	0.61	0.48	0.51	0.46
Marketing						0.76	0.50	0.47	0.47
Human resource management							0.50	0.49	0.45
Basic law issues, particularly Legal forms								0.57	0.53
Fiscal aspects, subventions, subsidies									0.47
Economic aspects									

In this Table we report Spearman's rank correlation the pairwise comparison of the students' assessment of the quality of coefficients for education in the given fields of competences at the institution that was attended before starting bachelor studies. All correlation coefficients are significant at the one percent level

with the previous question. The findings above show that students evaluate their knowledge of these categories higher than the respective transfer of knowledge in secondary schools. In this respect, one explanation can be that due to further academic education and the time that has passed since completing school education, individuals' consider their knowledge to be superior.

Table 7 also exhibits a higher correlation among numeracy-related fields and a higher correlation between fiscal aspects and law issues. As these areas are based predominantly on hard facts, students who believe to have competences in judicial issues (law, regulation) tend to evaluate their knowledge of *finance, accounting and corporate planning* in a similar manner. As the latter are closely related, our overall results are plausible which highlights the robustness of the findings. Most interestingly, students' knowledge of quantitative fields such as *finance* tends to be unrelated to knowledge of creative areas including *marketing* and *human resource management*.

In order to draw inferences about entrepreneurial knowledge and education, the students were asked to evaluate the importance of knowledge of the aforementioned nine categories for business founders (see Table 8). In fact, the students evaluate knowledge of these fields as *very important* or *important*. As most median values differ statistically from each other, this indicates that student's responses with respect to the areas of competences are rather independent from each other.

Table 8 also emphasizes that rather quantitative areas tend to exhibit greater correlation coefficients, indicating that students who find competences in finance as important tend to evaluate knowledge of *accounting and auditing* or *management accounting* as rather important as well. One potential explanation for this observation is likely to be the students' specialization towards certain fields of expertise (e.g. numeracy-related fields such as *finance*, *corporate planning* and *management accounting*). Sometimes, this process of specialization already starts in school. Intensified by the *Bologna Process* in Europe, students are directed to emphasize on certain fields of competences at an early stage. For this reason specialized education gradually replaces broader education. In addition, when correlation tests between quantitative areas and those areas that require creatively and strategically thinking—such as human resource management or marketing—are conducted, lower correlation coefficients are obtained. This indicates that students' evaluation on the importance of knowledge of quantitative fields, in particular, of *finance* and *corporate planning and management*, tends not to be related to the perceptions of the importance of knowledge of, for instance, *marketing* or *human resource management*.

Table 9 provides the results of Model (2) which examines the self-perceived gap in *professional*, *social* and *personal* competences. In line with the findings about the knowledge gap, we find that older students exhibit a less pronounced gap in *professional* competences. This is plausible as individuals are more skilled when they accumulate professional experience. In contrast, we do not obtain significant findings about the impact of *age* on the gap in *social* and *personal* competences. This result pattern indicates that *social* and *personal* competences are expected to be less developable than professional competences.

Throughout all three competences the coefficient on *entre_knowl* is positive and statistically significant. This is particularly pronounced for professional competences suggesting that a decline in the level of knowledge by one unit (e.g. from 4 = "fair" to 5 = "insufficient") is associated with an increase of the competences gap by 0.196 (*professional* competences), 0.184 (*social* competences) and 0.133 units (*personal* competences).

Table 7 Assessment of own Knowledge (Question 21)

Fields of Competences	Finance	Accounting and auditing	Corporate planning and management	Management accounting	Marketing	Human resource management	Basic law issues, Legal Forms	Fiscal aspects, subventions, Subsidies	Economic aspects
Median Values	3	2	3	3	3	3	3	4	3
Finance		0.32	0.49	0.44	0.12	0.15	0.24	0.34	0.25
Accounting and Auditing			0.31	0.33	0.16	0.18	0.34	0.21	0.30
Corporate Planning and Management				0.47	0.26	0.29	0.31	0.41	0.29
Management Accounting					0.16	0.12	0.29	0.29	0.15
Marketing						0.49	0.12	0.12	0.22
Human Resource Management							0.18	0.20	0.20
Basic Law Issues, particularly Legal Forms								0.43	0.32
Fiscal Aspects, Subventions, Subsidies									0.23
Economic Aspects									

In this Table we report Spearman's rank correlation coefficients for the pairwise comparison of the students' assessment of their own knowledge of the given fields of competences. All correlation coefficients are significant at least at the five percent level

Personal competences comprise an individual's capacity to act self-aware, self-confident and to possess relationship building skills. Our empirical findings indicate that students who aspire to become entrepreneurs also exhibit a lower gap in *personal* competences. Since business founders detect market niches independently, they should be convincing and confident in order to find financiers, business partners, customers etc. Hence, it seems plausible that we do not find a significant relationship between students' intention to become entrepreneurs and their gap in *professional* and *social* competences. However, the fact that someone strives to become self-employed is associated with a diminishing effect on the gap in *personal* competences by 0.212 units.

For reasons of robustness, we included the variable *share_entre* in the empirical analysis. Unsurprisingly, the share of entrepreneurship-related material/content in previous education has an impact on students' self-perceived gap in professional competences. We find that a decrease of the share of entrepreneurship-related teaching (e.g. from 4="marginal share" to 5="no share") leads to an increase of this gap by 0.175 units. This is significant at the five percent level. The findings about the self-perceived gap in *social* and *personal* competences are statistically insignificant.

For robustness reasons, we also applied ordinal logistics regression analysis. Consistent with the methodological considerations described in Sect. 3.3 we use the self-perceived gaps in knowledge and competence as endogenous variables. Generally, the robustness tests confirm the result pattern discussed in the previous section. For instance, we find a statistically significant negative relationship between students' age and the self-perceived knowledge gap. In addition, the knowledge gap in the fields of *finance*, *corporate planning and management* and *fiscal aspects* is negatively related with the previous share of entrepreneurship-related teaching. This confirms our findings using ordinary least squares indicating that less entrepreneurship-related teaching leads to an increase of the knowledge gap.

The findings of our analysis contribute to the discussion on entrepreneurial knowledge and education because we have gained insight not only into the level of undergraduate students' understanding of the relevant areas but also into the individuals' assessment of the momentousness of know-how in these crucial areas for business founders. In detail, understanding of the categories finance, tax, and corporate planning and management are considered as most relevant which is consistent with results in the literature (Bradley and Cowdey 2004). As students, however, evaluate their individual knowledge merely as *satisfactory*, there is a gap between relevant know-how and the self-perceived expertise. We can infer knowledge and competence gaps, respectively. These findings indicate the existing lack of entrepreneurial knowledge which results from the difference between students' individual assessment of understanding and their evaluation of importance of relevant disciplines. In sum, these findings contribute to the literature because we thoroughly examine the gaps in knowledge and competences and find that the students' age, their general level of entrepreneurship-related knowledge, their ambition to become entrepreneurs, the share of relevant material taught in school as well as the assessment of the transfer of competence by the school attended before the bachelors program substantially affect the self-perceived gaps.

4.2 Implications

In general, entrepreneurial knowledge and education is relevant for many stakeholders, e.g. policy makers, private educational institutions, public educational institutions, creditor investors or potential entrepreneurs. However, we focus on policy makers, private

Table 8 Importance of knowledge (Question 20)

Fields of competences	Finance	Accounting and auditing	Corporate planning and management	Management accounting	Marketing	Human resource management	Basic law issues, legal Forms	Fiscal aspects, subventions, subsidies	Economic aspects
Median values	1	2	1	2	2	2	2	2	2
Finance		0.34	0.36	0.35	0.19	0.10	0.27	0.21	0.16
Accounting and auditing			0.32	0.42	0.14	0.22	0.37	0.31	0.30
Corporate Planning and management				0.41	0.21	0.31	0.29	0.31	0.25
Management accounting					0.36	0.27	0.28	0.29	0.35
Marketing						0.39	0.26	0.25	0.34
Human resource management							0.20	0.18	0.37
Basic law issues, particularly Legal forms								0.57	0.36
Fiscal aspects, subventions, subsidies									0.34
Economic aspects									

In this Table we report Spearman's rank correlation coefficients for the pairwise comparison of the students' assessment with regard to the importance of knowledge of the given fields of competences. All correlation coefficients are significant at least at the one percent level

Table 9 Results of Model (2)

	Professional competences	Social competences	Personal competences
α	1.251* (0.699)	−0.647 (0.646)	0.052 (0.558)
Age	−0.058** (0.028)	0.017 (0.026)	−0.008 (0.022)
Exp	0.006 (0.114)	0.189* (0.106)	−0.048 (0.091)
Att	0.105 (0.118)	0.234** (0.109)	0.208** (0.094)
Entre_knowl	0.196*** (0.072)	0.184*** (0.066)	0.133** (0.057)
Amb	−0.139 (0.108)	−0.061 (0.100)	−0.212** (0.086)
Share_entre	0.175** (0.076)	−0.046 (0.071)	0.125 (0.061)
R^2	0.084	0.039	0.070
Observations	385	385	385

In this table we report the results of Model (2). The dependent variable $gap_{i,k}$ is student's i self-perceived competence gap measured as the difference between student's i assessment of own competences k (Question 18) and the assessment of the importance of the competences k (Question 17). We report the coefficients and standard errors (in brackets). The symbols ***, **, and * denote significance at the one, five, and ten percent level, respectively

educational institutions and potential entrepreneurs because they are most affected by the implications that are based upon our findings.

As regulators, policy makers are responsible for—and have an interest in—a sound business environment. From their perspective the findings about the expectations of potential business founders are interesting for future political planning. The answer pattern shows that nearly 56 % of the students do not strive to start a business, whereas a high stake of 44 % aspires to become self-employed. In reference to the first group of students, policy makers shall attempt to inform students as potential founders in principle (e.g. road shows at high-schools and universities; internet portals; advertising) to draw attention to the issue. With regard to the second group of students that aims to become self-employed, policy makers can support potential founders more elaborately, for example by facilitating consulting activities, providing a wide range of information, launching subvention funds or issuing other grants. In consideration of the fact that educational institutions seem to have reached their limits of potential teaching subjects, policy makers should inform and educate about entrepreneurs' conditions in more detail, especially about endogenous and exogenous risks, bankruptcy or reasons for failure of business start-ups.

From the perspective of private educational institutions, the findings about both students' understanding of the topic and their motivation to become self-employed highlight the interest in more information and thorough education. Hence, potentially better educated business founders can be formed. Besides the interest in more information, there is a demand for education that can be accommodated by private educational institutions. These aspects are highly relevant as they point out the potential for the business model of private educational institutions. Hence, this stakeholder is able to organize and adjust future educational programs or extend current programs in form and content. Taking findings from our study into account, private educational institutions should focus on assisting potential entrepreneurs with *professional* competences, particularly in fields where numeric skills are required. Preliminary, finance, respectively the understanding of relations in the financial context, is one of the fields that seems to be very important,

particularly because the main reason for failure is the lack of finance management and finance strategy (illiquidity; indebtedness).

In contrast to the perspective of private educational institutions, it has to be considered that the formal educational system does not improve entrepreneurial competences (Garavan and O'Cinneide 1994). In this regard, one has to be aware of that former schools or other educational institutions are limited by their own capacities. In addition, there are several limits to entrepreneurial training and entrepreneurial knowledge, because of the practicability (Johannisson 1991).

In the view of potential entrepreneurs, both knowledge and education are crucial pillars of success. If they are provided with better relevant understanding, further decisions are made intentionally as a result of more and superior information. That is, potential entrepreneurs are more likely aware of their individual strengths and weaknesses and are able to assess the future success of a business. The findings in our study suggest that the older the individuals are the less pronounced their self-perceived knowledge gaps and professional gaps are. Instead of starting a business immediately after one's course of studies, it is advisable to gain sufficient professional experience (for example as employee), to develop certain competences and skills and to build a suitable network and business model.

5 Conclusion

Policy makers are aware that entrepreneurial activities play a momentous part in stimulating economic growth and innovation in national economies. In order to analyze the current state of entrepreneurial knowledge and education, we examine a unique data set which is not biased by program-specific effects. We analyze undergraduate students' understanding of aspects that play a crucial role in business start-up in order to identify specific gaps in entrepreneurial knowledge and education and relevant professional, social and personal competences. Based on our findings about the current state of entrepreneurial knowledge and education in Germany, we identify implications that are relevant for certain stakeholders.

In this paper, we find that undergraduate students evaluate schools' imparting of relevant knowledge for entrepreneurs as rather *moderate*. Furthermore, understanding in *finance*, *accounting*, and *management accounting* as well as *corporate planning and management* is considered to be momentous for entrepreneurs. Since students characterize their know-how as merely *average* regarding these categories, we can infer an obvious gap between the individuals' perceived expertise and the knowledge of the relevant fields that is considered to be of great importance for business founders. In addition, we identify and examine gaps in *professional, social* and *personal* competences. In the empirical analysis, we analyze gaps in knowledge and competences using a multivariate setting. We find that students' age, their general level of entrepreneurship-related knowledge, their ambition to become entrepreneurs, the share of relevant material taught in school as well as the assessment of the transfer of competence by the school attended before the Bachelors program substantially affect the self-perceived gaps. In our sample, a surprisingly large share of students (more than 40 % of students in our sample) aspires to become entrepreneurs in the future. Therefore, their assessment of the transfer of knowledge and competences by educational institutions and their self-evaluation in these fields clearly highlight the gap in entrepreneurial knowledge and education. It should therefore be policy makers' objective that business founders have a deeper understanding of crucial areas in order to become fully equipped entrepreneurs.

Further research is required in several aspects. First, data sets should be extended by students who will be finishing their studies in the near future (advanced undergraduate students) in order to measure their (individual) development, experiences and expectations. Second, research on entrepreneurial knowledge and education can be enhanced by studies on founders who have started their business recently (Early-Stage). Thus, practical inferences on an adequately designed and structured education for entrepreneurs can be drawn.

Appendix 1: Overview of questions examined in the paper

Question	Description
1	Your age?
2	Your gender?
6	Do you have any working experience (also apprenticeship)?
7	Are there any self-employed persons in your personal environment?
9	Have you already dealt with the topic entrepreneurial education in the past?
10	How do you assess your knowledge with regard to this topic?
12	Do you aspire to become self-employed during your career/working life?
15	What part has entrepreneurial education taken during your entire education?
16	How do you assess the transfer of competence by the organization you visited before your Bachelors program?
17	How important are the following competences [professional competences, social competences, personal competences] for founders of a new business/start-ups?
18	How do you assess your own competences?
19	How do you assess the education in the following areas of expertise [Finance, Accounting and Auditing, Corporate Planning and Management, Management Accounting, Marketing, Human Resource Management, Basic Law Issues, Fiscal Aspects, Economic Aspects] by the organization you visited before your Bachelors program?
20	How important is knowledge in the following areas of expertise [Finance, Accounting and Auditing, Corporate Planning and Management, Management Accounting, Marketing, Human Resource Management, Basic Law Issues, Fiscal Aspects, Economic Aspects] for start-ups?
21	How do you assess your own knowledge concerning these [see Question 20] areas of expertise?
22	In which institutions do you see accumulated needs in entrepreneurship education?

This table provides an overview of questions in the questionnaire that are thoroughly examined in this paper. In addition, for the reported questions the median values, maximum values and minimum values are provided. The findings with respect to questions that are not reported in the table are described in Sect. 3 (3.1 Data and 3.2 Descriptive Statistics)

References

Acs, Z., Dana, L., & Jones, M. (1999). Toward new horizons: The internationalisation of entrepreneurship. *Journal of International Entrepreneurship, 1*(1), 5–12.

Andrews, K. (1965). *The concept of corporate strategy*. Homewood, IL: Dow Jones-Irwin.

Becker, G. S. (1964). *Human Capital*. New York: Columbia University Press.

Becker, G. S. (1983). *Human capital: A theoretical and empirical analysis with special reference to education*. Chicago, IL: University of Chicago Press.

Blenker, P., Dreisler, P., & Kjeldsen, J. (2006). Entrepreneurship education: The New challenge facing the universities: A framework for understanding and development of entrepreneurial university communities. In *Working Paper 2006-02, Aarhus School of Business,* Department of Management.

Bradley, D. B., & Cowdey, C. (2004). Small business: Causes of bankruptcy. University of Central Arkansas. http://beyondeconomy.pbworks.com/w/file/fetch/44809076/Causes%20of%20Bankruptcy.pdf. Accessed July 2013.

Bruyat, C., & Julien, P. A. (2001). Defining the field of research in entrepreneurship. *Journal of Business Venturing, 16*(2), 165–180.

Camerer, C., & Lovallo, D. (1999). Overconfidence and excess entry: An experimental approach. *The American Economic Review, 89*(1), 306–318.

Chrisman, J. (1997). Program evaluation and the venture development program at the University of Calgary: A research note. *Entrepreneurship Theory and Practice, 22*, 59–74.

Coff, R. W. (2002). Human capital, shared expertise, and the likelihood of impasse on corporate acquisitions. *Journal of Management, 28*, 107–128.

Combs, J., Liu, Y., Hall, A., & Ketchen, D. (2006). How much do high-performance work practices matter? A meta-analysis of their effects on organizational performance. *Personnel Psychology, 59*, 501–528.

Dickson, P., Solomon, G., & Weaver, K. (2008). Entrepreneurial selection and success: Does education matter? *Journal of Small Business and Enterprise Development, 15*(2), 239–258.

Eccles, J. (1994). Understanding women's educational and occupational choices. *Psychology of Women Quarterly, 18*(4), 585–609.

Eddleston, K., Veiga, J., & Powell, G. (2006). Explaining sex differences in managerial career satisfier preferences: The role of gender self-schema. *Journal of Applied Psychology, 91*(2), 437–445.

Estes, V. (1999). Women and business development: Promoting economic growth and job creation. USAID/Europe and Eurasia Bureau.

Fiet, J. (2001). The theoretical side of teaching entrepreneurship. *Journal of Business Venturing, 16*, 1–24.

Fisher, J., & Govindarajan, V. (1992). Profit center manager compensation: An examination of market, political and human capital factors. *Strategic Management Journal, 13*, 205–217.

Garavan, T. N., & O'Cinneide, B. (1994). Entrepreneurship Education and training programmes: A review and evaluation—Part 1. *Journal of European Industrial Training, 18*(8), 3–12.

Gnyawali, D. R., & Fogel, D. S. (1994). Environments for entrepreneurship development: Dimensions and research implications. *Entrepreneurship Theory and Practice, 18*(4), 43–62.

Jalbert, S. E. (2000). *Women entrepreneurs in the global economy*. Washington, DC: Center for International Private Enterprise.

Johannisson, B. (1991). University training for entrepreneurship: Swedish approaches. *Entrepreneurship & Regional Development, 3*(1), 67–82.

Kearney, M.-L. (2009). Higher education, research and knowledge 2001–2009 higher education, research and innovation. In M. Lynn, U. Teichler, & M.-L. Kearney (Eds.), *Higher education, research and innovation: Changing dynamics* (pp. 7–25). Kassel: UNESCO Forum on Higher Education.

Lazear, E. P. (2002). Entrepreneurship, working paper. http://www.nber.org/papers/w9109.pdf. Accessed 10 July 2013.

Lazear, E. P. (2005). Entrepreneurship. *Journal of Labor Economics, 23*(4), 649–680.

Le, A. T. (1999). Empirical studies of self-employment. *Journal of Economic Surveys, 13*(4), 381–416.

Lee, L., & Wong, P. K. (2007). Entrepreneurship education a compendium of related issues. In S. Parker (Ed.), *The life cycle of entrepreneurial ventures. International handbook series on entrepreneurship* (Vol. 3, pp. 79–105). New York, US: Springer.

Maillat, D. (1998). Innovative milieu and new generation of regional policies. *Entrepreneurship and Regional Development, 10*, 1–16.

Matlay, H. (2008). The impact of entrepreneurship education on entrepreneurial outcomes. *Journal of Small Business and Enterprise Development, 15*(2), 382–396.

Mincer, J. (1974). *Schooling, experience, and earnings*. New York, NY: Columbia University Press.

Neck, H. M., Zacharakis, A. L., Bygrave, W. D., & Reynolds, P. D. (2003). *Global entrepreneurship monitor: 2002 Executive Report*. Babson MA: Babson College.

Oskamp, S. (1965). Overconfidence in case-study judgments. *Journal of Consulting Psychology, 29*(3), 261–265.

Raffo, C., Lovatt, A., Banks, M., & O'Connor, J. (2000). Teaching and learning entrepreneurship for micro and small businesses in the cultural industries sector. *Education + Training, 42*(6), 356–365.

Raposo, M., Paco, A., & Ferreira, J. (2008). Entrepreneur's profile: A taxonomy of attributes and motivations of university students. *Journal of Small Business and Enterprise Development, 15*(2), 405–418.

Reynolds, P., Carter, N., Gartner, W., Greene, P., & Cox, L. (2002). *The entrepreneur next door, characteristics of individuals starting companies in America*. Kansas City, MO: Ewing Marion Kauffman Foundation.

Rosa, P., Carter, S., & Hamilton, D. (1996). Gender as a determinant of small business performance: Insights from a British study. *Small Business Economics, 8*(6), 463–478.

Sexton, D. L., & Bowman, N. (1984). Personality inventory for potential entrepreneurs: Evaluation of a modified JPI/PRF-E test'. In J. A. Hornady, F. Tarpley, J. Timmons, & K. Vesper (Eds.), *Frontiers of entrepreneurship research* (pp. 513–528). Bason Park: Babson College.

Silva, O. (2006). The Jack-of-All-trades entrepreneur: Innate talent or acquired skill?. http://www.econstor.eu/bitstream/10419/33699/1/516439898.pdf. Accessed 10 July 2013.

Souitaris, V., Zerbinati, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing, 22*, 566–591.

Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing, 26*(3), 341–358.

van der Sluis, J., Van Praag, C. M., & Vijverberg, W. (2004). Entrepreneurship selection and performance: A meta-analysis of the impact of education in industrialized countries. In *Working Paper 03-046/3, Tinbergen Institute,* University of Amsterdam.

Vesper, K. H., & Gartner, W. B. (1997). Measuring progress in entrepreneurship education. *Journal of Business Venturing, 12*(5), 403–421.

von Graevenitz, G., Harhoff, D., & Weber, R. (2010). The effects of entrepreneurship education. *Journal of Economic Behavior & Organization, 76*, 90–112.

Wagner, J. (2003). Are nascent entrepreneurs Jacks-of-All-Trades? A test of Lazear's theory of entrepreneurship with German data. Discussion Paper No. 911, October 2003.

Wilson, F., Kickul, J., & Marlino, D. (2007). Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education. *Entrepreneurship Theory and Practice, 31*(3), 387–406.