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Effects of entrepreneurship education at universities

Viktor Slavtchev [a], Stavroula Laspita [b,c], Holger Patzelt [b]

Abstract

This study analyzes the impact of entrepreneurship education at universities on the intentions of students to become entrepreneurs or self-employed in the short-term (immediately after graduation) and in the long-term (five years after graduation). A difference-in-differences approach is applied that relates changes in entrepreneurial intentions to changes in the attendance of entrepreneurship classes in the same period. To account for a potential bias due to self-selection into entrepreneurship classes, only individuals having no prior entrepreneurial intentions are analyzed. Our results indicate a stimulating effect of entrepreneurship education on students' intentions to become entrepreneurs or self-employed in the long-term but a discouraging effect on their intentions in the short-term. These results support the conjecture that entrepreneurship education provides more realistic perspectives on what it takes to be an entrepreneur, resulting in 'sorting'. Overall, the results indicate that entrepreneurship education may improve the quality of labor market matches, the allocation of resources and talent, and increase social welfare. Not distinguishing between short- and long-term intentions may lead to misleading conclusions regarding the economic and social impact of entrepreneurship education.

Keywords: entrepreneurship education; university; entrepreneurial intentions; academic entrepreneurship; difference-in-differences approach

JEL Classification: A20, I20, J24, L26, M13, H43.

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1. Introduction

New firms, in particular those in technology and knowledge-intensive industries, can trigger innovation, productivity and economic growth (Aghion et al. 2004, 2009; Audretsch et al. 2006; Disney et al. 2003; Foster et al. 2006; Geroski 1989). Following this line of reasoning, entrepreneurship education at universities has become a popular issue among policy makers and university administrators around the world (Astebro and Bazzazian 2011; Katz 2003; Klandt 2004; Kuratko 2005; Shane 2004; Wright et al. 2007). For instance, the European Commission (2008) acknowledges entrepreneurship education as a means to foster economic development and strives to encourage entrepreneurship among students and academics.

A precise assessment of entrepreneurship education's impact is of crucial importance for public policy and university administration. To address this issue, previous studies have typically compared average entrepreneurial intentions or entrepreneurship rates among students with and without entrepreneurship education, yielding controversial results (e.g., Oosterbeek et al. 2010; Souitaris et al. 2007). However, recent approaches start increasingly recognizing the importance of considering 'behavioral' and quality-related, rather than merely quantity-related, aspects when evaluating the impact of entrepreneurship education (von Graevenitz et al. 2010). In particular, it seems often overlooked that a key function of entrepreneurship education is to prepare individuals for entrepreneurship rather than to merely increase the total rate of entrepreneurship. Another largely neglected issue is the effect of entrepreneurship education on students' intentions to become entrepreneurs in the short-term (immediately or short after graduation) or in the long-term (later, after some time in paid employment). This issue is important in assessing the impact of entrepreneurship education on students' entrepreneurial intentions not only because 'entrepreneurship spirit' might be sown at universities, while actual entrepreneurial actions might occur much later. Rather, it is related to the quality aspect mentioned above, as this time can be used to 'prepare' for entrepreneurship, which increases success (Shane 2004; Wright et al. 2007; Parker 2009).

In this paper, we investigate the impact of entrepreneurship education at universities on students' entrepreneurial intentions, while distinguishing between short- and long-term intentions. The empirical analysis is performed at the example of the University of Otago (New Zealand), where entrepreneurship education is a significant part of university's mission. Short- and long-term entrepreneurial intentions of students are operationalized by means of their self-declared ambitions to become entrepreneurs or self-employed (as compared to paid employment) immediately and five years after graduation, respectively. To assess the impact entrepreneurship education, we survey students at two subsequent points in time and apply a difference-in-differences (DD) approach that compares the change in the average entrepreneurial intentions of those who attend entrepreneurship courses in the period of observation with the change in the intentions of students who do not. This approach allows us to remove potential biases due to permanent differences between these two groups as well as biases from comparisons over time that could be the result of differential trends in the two groups. Furthermore, to deal with the issue of self-selection into entrepreneurship courses and the parallel trend assumption underlying the DD approach, we focus on students having no entrepreneurial intentions prior to enrolling in entrepreneurship courses.

The empirical results indicate that entrepreneurship education may influence students' entrepreneurial intentions. Entrepreneurship education has a discouraging effect on students' intentions to become entrepreneurs or self-employed in the short-term (immediately after graduation) and stimulating effect on the intentions to become entrepreneurs or self-employed in the long-term (after graduation and five years in paid employment). The methodological approach applied in this paper does not only allow a more detailed assessment of the impact of entrepreneurship education and help explain the contradictory findings in previous studies. Rather, our findings suggest that entrepreneurship education might provide more realistic perspectives on what it takes to be an entrepreneur, resulting in 'sorting' (Oosterbeek et al. 2010; von Graevenitz et al. 2010). Moreover, as to the degree in which entrepreneurship education discourages 'over-hasty' entrepreneurship and encourages entrepreneurship after a period in paid

employment during which individuals can prepare (develop practical competences and contacts, and accumulate capital), our results point that entrepreneurship education might stimulate comparably more prospective entrepreneurship. Overall, the results suggest that entrepreneurship education may improve the quality of labor market matches, the allocation of resources and talent, and increase social welfare. Not distinguishing between short- and long-term intentions may lead to misleading conclusions regarding the economic and social impact of entrepreneurship education.

The study is structured as follows. Section 2 reviews of recent research on the effects of entrepreneurship education. Section 3 presents the empirical strategy to assess the causal impact of entrepreneurship education on entrepreneurial intentions. Section 4 introduces the data and discusses the effectiveness of our strategy to arrive at unbiased estimates for the impact of entrepreneurship education. Section 5 presents the results of the empirical analysis. Section 6 summarizes the findings and outlines implications for policy and for future research.

2. The effects of entrepreneurship education

Entrepreneurship education programs are based on the assumption that entrepreneurial intentions and skills can be taught and learned (Clark et al. 1984; Gorman et al. 1997; Peterman and Kennedy 2003; Pittaway and Cope 2007). In particular, it is assumed that entrepreneurship programs can influence students' awareness of entrepreneurship as an alternative career path to paid employment and provide students with skills needed to start and successfully run their own businesses.

An often applied approach to assess the impact of entrepreneurship education is the comparison of entrepreneurial intentions of students who attended entrepreneurship courses to the intentions of an appropriate control group without entrepreneurship education.[1] For instance, in a quasi-

[1] Over the last decades, a number of studies have attempted to empirically assess the impact of entrepreneurship education on the entrepreneurial intentions of students. The number of such studies is too large to be reviewed completely here. Moreover, limited data availability and quality as well as methodological challenges (e.g., bias due to omitted variables and/or self-selection into

experimental pre-test post-test control group design, Souitaris et al. (2007) analyzed data on students from two major European universities (163 and 87 students respectively) and found that entrepreneurship courses did indeed provide trigger-events that inspired students and increased their entrepreneurial intentions. However, a study by Oosterbeek et al. (2010) investigating the impact of the Junior Achievement Young Enterprise student mini-company (SMC) program at the example of 250 students at the Dutch vocational college AVANS Hogeschool came to different results. Using an instrumental variable approach in a difference-in-differences framework, the authors found that entrepreneurship education did not have the intended effects. Oosterbeek et al. (2010) concluded that entrepreneurship education does not necessarily stimulate the entrepreneurial intentions and skills of students, but may even have a discouraging effect since students attending entrepreneurship classes may obtain more realistic perspectives of both themselves as well as what it takes to be an entrepreneur.

Recent discussion on 'behavioral' and quality-related aspects of entrepreneurship education and entrepreneurial learning provides insightful results. For example, using data on 196 students from the Department of Business Administration at the University in Munich (Germany), von Graevenitz et al. (2010) found that entrepreneurship education provides individuals with signals about their entrepreneurial ability, resulting in 'sorting'. The authors found that some students learned they were well suited for entrepreneurship, while others that they were not. After completing the course, students with strong ex ante entrepreneurial predispositions were less likely to change their intentions than students who were comparably indifferent at the beginning. Students who were initially uncertain about their entrepreneurial ability were able to determine more clearly whether or not they were still positively inclined towards entrepreneurship.

Lerner and Malmendier (2011) analyzed data from the Harvard Business School and found that learning about entrepreneurial opportunities, risks, and one's own abilities can have a positive impact on the quality of entrepreneurs.

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entrepreneurial programs, lack of appropriate control groups, etc.) make the identification of a causal effect of education on entrepreneurial intentions in some of these studies difficult. Hence, in the following we focus on methodologically more advanced recent studies.

In particular, Lerner and Malmendier (2011) found that having contact with entrepreneurial peers lowers the average rate of entrepreneurship among students. However, the negative effects seemed to be driven by a decrease in the rate of unsuccessful entrepreneurship, while there were positive effects on the rate of successful entrepreneurship. Having contact with entrepreneurial peers helped individuals detect flaws in business ideas and reduced uncertainty associated with entrepreneurship (i.e., the variance in entrepreneurship rates).

Overall, previous literature findings indicate that the impact of entrepreneurship education is more complex than simply increasing or decreasing in average entrepreneurial intentions of students attending entrepreneurship courses in comparison to those who do not. These findings have important implications for the evaluation of entrepreneurship education programs. In particular, it appears important to consider quality-related aspects when evaluating the impact of entrepreneurship education rather than merely quantity-related effects (higher/lower average entrepreneurial intentions or entrepreneurship rates). Entrepreneurship education may not have the intended effects if it increases the intentions and startup rates among unsuccessful entrepreneurs. Similarly, a decline in entrepreneurial intentions does not necessarily indicate ineffectiveness of entrepreneurship education (and misallocation of public resources). Rather, discouraging less prospective entrepreneurship may indicate that 'socially wasteful' activities can be reduced, labor market matches improved, and social welfare increased.

In this paper, we propose a new methodological approach that distinguishes between the impact of entrepreneurship education on students' short-term and long-term entrepreneurial intentions.[2] This approach allows us to add to the discussion on quality-related aspects regarding the impact of entrepreneurship education programs (von Graevenitz et al. 2010; Lerner and Malmendier 2011). In fact, previous research point to the key importance of professional and industry-specific experience, managerial competencies, business networks, customer contacts, and accumulated financial capital for

[2] Though related, in this paper we do aim at a direct welfare analysis or a direct analysis of the social 'value' of entrepreneurship education (cf., Section 6 for discussion).

the success of entrepreneurs from universities (Shane 2004; Wright et al. 2007; Parker 2009). Hence, as to the degree in which students are made aware of the key importance of these factors, and decide to spend some time in paid employment outside academia to obtain and accumulate these skills and recourses before starting own businesses, entrepreneurship education might stimulate well-prepared and comparably more prospective entrepreneurship. Thus, distinguishing between the short-term and long-term entrepreneurial intentions allows for a more detailed assessment of the impact of entrepreneurship education. Not least, this approach helps explain previous studies' contradictory findings regarding the effect of entrepreneurship education on students' entrepreneurial intentions.

3. Empirical strategy

To assess the causal impact of entrepreneurship education on the entrepreneurial intentions of students, we apply a difference-in-differences (DD) approach. In particular, we observe students in two subsequent points in time and collect information about their entrepreneurial intentions. In that period (i.e., between the two points in time), some individuals took entrepreneurship courses (treatment group), while others did not (control group). A simple, effective model to assess the impact of entrepreneurship education on entrepreneurial intentions is then

$$(1) \quad Entr\_Int_{it} = \alpha + \eta d2_t + \delta Entr\_Educ_{it} + \mu_i + \varepsilon_{it}, \; t = 1, 2,$$

where $Entr\_Int_{it}$ and $Entr\_Educ_{it}$ are dichotomous (0 = no; 1 = yes) variables indicating whether individuals intend to become entrepreneurs or self-employed and whether they have taken an entrepreneurship course, respectively. $d2_t$ is a time-period dummy such that $d2_t = 1$ if $t = 2$ and zero otherwise. The time-period dummy captures aggregate factors that would cause change in individuals' entrepreneurial intentions even if they did not take entrepreneurship courses. μ_i is a time-invariant individual-specific effect, and ε_{it} are idiosyncratic errors. The coefficient δ is the simple DD estimator for the effect of entrepreneurship education on entrepreneurial intentions. A simple procedure is to first difference to remove μ_i:

(2)$(Entr\_Int_{i2} - Entr\_Int_{i1}) = \eta + \delta(Entr\_Educ_{i2} - Entr\_Educ_{i1}) + (\varepsilon_{i2} - \varepsilon_{i1})$

or

(3)$\Delta Entr\_Int_i = \eta + \delta \Delta Entr\_Educ_i + \Delta\varepsilon_i$.

This step removes biases that could result from all kinds of time-invariant differences between individuals as well as biases from comparisons over time that could result from trends.

The simple DD estimator is the difference between the average change in entrepreneurial intentions of students attending entrepreneurship classes and that of students not attending entrepreneurship classes:

(4) $\overline{\delta} = \overline{\Delta Entr\_Int_{Entr\_Educ}} - \overline{\Delta Entr\_Int_{No\_Entr\_Educ}}$.

The accuracy of the DD estimator for the causal impact of entrepreneurship education on entrepreneurial intentions depends crucially on the 'exogeneity' of the treatment (i.e., the attendance of entrepreneurship education) ($E(\Delta Entr\_Educ_i \Delta\varepsilon_i = 0)$). However, the students' attendance of entrepreneurship courses might not be random. In particular, some individuals may have already developed some entrepreneurial intentions. For such individuals, it is plausible to assume they would seek to acquire further knowledge, skills, and competences that are important for establishing and successfully running an own business. In other words, individuals with already developed entrepreneurial intentions may self-select into entrepreneurship education (Kolvereid and Moen 1997; Oosterbeek et al. 2010). The DD approach addresses this problem to the extent that differences between 'treated' and 'non-treated' individuals are included in the baseline level of entrepreneurial intentions. However, the DD estimator has limitations if there are differences in changes in the entrepreneurial intentions between 'treated' and 'non-treated' individuals due to individual-specific effects that are not accounted for. In this case, the parallel trend assumption—namely, that the before-after differences between 'treated' and 'non-treated' individuals would be the same in the absence of treatment—would be violated, and the estimator would be biased.

One possible way to deal with the self-selection problem is to use an instrumental variable (IV) approach (cf., Oosterbeek et al. 2010). However,

finding a valid instrument—in our case, a variable explaining course attendance without impacting entrepreneurial intentions—is difficult and not always possible. Moreover, the IV estimator generally does not have finite sample properties (i.e., inference is based on asymptotic approximations to the sampling distribution of the estimator), it suffers from efficiency losses, and it is not robust with respect to misspecifications in the first stage (e.g., due to omitted variables). Therefore, in this study, we use a different strategy. In particular, we exclude both individuals who, at the beginning of the period of observation, had already developed some entrepreneurial intentions ($Entr\_Int_{i1} = 1$) and individuals who had already taken entrepreneurship courses ($Entr\_Educ_{i1} = 1$). Such a rigorous and conservative empirical strategy is necessary because we aim for rather unbiased results for the impact of entrepreneurship education on students' intentions to become entrepreneurs.

Following this strategy, $Entr\_Int_{i1} = 0$ for all individuals in the final sample and $Entr\_Int_{i2} = \{0,1\}$ (i.e., $\Delta Entr\_Int_i = \{0,1\}$) with zero if individuals still prefer dependent employment in t = 2 and one if they prefer entrepreneurship/self-employment. Similarly, $Entr\_Educ_{i1} = 0$ for all individuals in the sample and $Entr\_Educ_{i2} = \{0,1\}$ (i.e., $\Delta Entr\_Educ_i = \{0,1\}$) with zero if individuals did not take entrepreneurship courses between t = 1 and t = 2 and one if they did. Moreover, below we will show (cf., Section 4) that, in the final sample, there are virtually no differences between individuals who attended entrepreneurship education and those who did not regarding a number of individual characteristics, particularly such associated with entrepreneurship. Hence, it seems reasonable to assume that individuals who attended entrepreneurship courses did so for other 'exogenous' reasons than due to already developed entrepreneurial intentions. These other 'exogenous' reasons for taking entrepreneurship courses might be curiosity, certain numbers and types of courses prescribed by the curricula, etc. Under these conditions, the DD approach will yield unbiased estimates for the causal impact of entrepreneurship education.

In addition, we estimate δ in equation (3) using ordinary least squares (OLS) (a linear probability model) as OLS is robust with respect to miss-specifications and small sample size (Angrist and Pischke 2009; Angrist

2001). Given the binary nature of the dependent variable, we also provide the results of a logit estimation.

4. Data

4.1. Data collection

The data used for the empirical analysis are from the University of Otago (New Zealand). Using data from one university provides a more 'controlled' setting and reduces potential confounding effects due to unobserved heterogeneity (Oosterbeek et al. 2010; von Graevenitz et al. 2010; Lerner and Malmendier 2011). Entrepreneurship education is an important issue at the University of Otago (Goth 2006). In particular, supporting student entrepreneurship is a significant part of the university's self-declared mission. For instance, a specialized Centre for Entrepreneurship was established, which offers dedicated entrepreneurship programs (e.g., Master of Entrepreneurship, Postgraduate Certificate in Technology and Entrepreneurship). The University of Otago not only offers various types of support for students who intend or have already started an own business but also strives to promote 'entrepreneurial spirit' in general in a first place (i.e., to call students' attention to entrepreneurship as a career alternative to paid employment). Accordingly, along with courses to teach knowledge and skills needed to run a business, the university pays significant attention to developing and encouraging general entrepreneurial attitudes and perceptions of students from all disciplines and departments.

Data were collected by means of two student surveys (incl. Ph.D. students) at the University of Otago, one in 2006 and one in 2008.[3] The data contain comprehensive information—in terms of both quantity and quality—about students' entrepreneurial intentions and entrepreneurship courses as well as a large number of other characteristics (e.g., entrepreneurial

[3] These surveys are part of the Global University Entrepreneurial Spirit Students' Survey (GUESSS), which has been specifically designed to analyze entrepreneurship at universities (Fueglistaller et al. 2009; Goth 2006).

background and experience, family background and demographics, psychological traits, etc.). Participation in each survey wave was voluntary. Some questions asked in the survey changed from wave to wave. However, information about entrepreneurial intentions and entrepreneurship education was collected each time.

Students who participated in the both surveys were identified by their email addresses. Hence, we are able to relate changes in students' entrepreneurial intentions between the two subsequent points in time to their attendance in entrepreneurship classes during the same period. In particular, we can compare changes in the average entrepreneurial intentions of students who attended entrepreneurship courses between 2006 and 2008 with those of students who did not (see section 2 for a description of our identification strategy and the DD approach).

To track entrepreneurial intentions over time, the students were asked in both surveys if they intended to become entrepreneurs or self-employed (yes or no) (i) immediately after graduation and (ii) five years after graduation. Besides selecting entrepreneurship/self-employment, individuals could choose dependent employment or not to participate in the labor market (e.g., because they were already employed, self-employed, or entrepreneurs; due to family planning; or because of other reasons).

Entrepreneurship education was assessed by asking the students if they had taken (yes or no) one or more of the following courses: general seminars and lectures on the topic of entrepreneurship, business games, or business planning seminars.

4.2. Characteristics the final sample and self-selection bias

In 2006, 4,298 students and Ph.D. students participated voluntarily in the survey, and in 2008, there were 3,116 participants. Before identifying students who participated in both surveys, we excluded subsamples of individuals who may bias the results. First, we excluded students in humanities because, for these individuals, entrepreneurship/self-employment is a rather atypical carrier path. Second, we excluded Ph.D. students because post-graduate

entrepreneurship education programs differ from those designed for bachelor and master students. Third, we excluded students who did not intend to participate in the labor market, both immediately after graduation or five years later. This left us with 3,189 and 2,307 observations from the 2006 and 2008 surveys, respectively. This corresponds to 25.51% and 25.08% of the total number of students at the University of Otago in all disciplines except humanities.

We were able to identify 319 students who participated in both survey waves and provided an email address. However, among these there are students who had developed some entrepreneurial intentions prior our period of observation and are, therefore, more likely to attend entrepreneurship courses in subsequent periods (cf., Table 1). Thus, to avoid self-selection and an upward bias in the results for the effect of entrepreneurship education on students' entrepreneurial intentions, we dropped (i) students who, in 2006, intended to become entrepreneurs or self-employed (immediately after graduation or five years later) and (ii) students who had already taken some entrepreneurship courses by 2006. Thus, for the empirical analysis (i.e., the DD approach) of the impact of entrepreneurship education on entrepreneurial intentions, we used a sample of 184 students who had neither taken any entrepreneurship courses nor intended to become entrepreneurs/self-employed as of 2006 (final sample).[4]

[4] Students with pre-developed entrepreneurial intentions who were enrolled in dedicated entrepreneurship programs (e.g., Master of Entrepreneurship) offered by the Centre for Entrepreneurship were also not included in our sample because the Centre for Entrepreneurship was established in 2007 (one year after the first survey wave covered in our analysis).

Table 1: Self-selection of students who already took entrepreneurship courses as well as students who have already developed some entrepreneurial intentions into entrepreneurship courses in subsequent periods

	Self-selection of students who had already taken some entrepreneurship courses by 2006 (N=319)	
	No entrepreneurship education between 2006 and 2008	Entrepreneurship education between 2006 and 2008
No entrepreneurship education by 2006	239 (83.57%)	47 (16.43%)
Entrepreneurship education by 2006	19 (57.58%)	14 (42.42%)

	Self-selection of students who, in 2006, intended to become entrepreneurs or self-employed (N=319)	
	No entrepreneurship education between 2006 and 2008	Entrepreneurship education between 2006 and 2008
In 2006, do not intend to become an entrepreneur or self-employed (immediately after graduation/five years after graduation)	232/198 (81.98%/84.62%)	51/36 (18.02%/15.38%)
In 2006, intend to become an entrepreneur or self-employed (immediately after graduation/five years after graduation)	26/60 (72.22%/70.59%)	10/25 (27.78%/29.41%)

Note: Sample consists of 319 students surveyed in both 2006 and 2008 except Ph.D. students, students in the humanities, and students unavailable for the labor market (because they were already employed, entrepreneurs, self-employed, and due to family planning or other reasons).

Table 2: Characteristics of students in the 2006 survey, students in the 2008 survey, students in both surveys, and students in the final sample

Variable	Description	Survey 2006 [a)]	Survey 2008 [b)]	Individuals participating in both surveys [c)]	Final sample [d)]		
		All	All	All	All	Students who in 2008 **do not intend to become entrepreneurs or self-employed**	Students who in 2008 **do intend to become entrepreneurs or self-employed**
		Mean	Mean	Mean	Mean	Mean	Mean
		(1)	(2)	(3)	(4)	(5)	(6)
		Immediately after graduation/five years after graduation					
Intend to become an entrepreneur/self-employed	1=yes; 0=no	.136/ .375	.126/ .374	.091/ .307	.065/ .228	.000	1.000/ 1.000
Entrepreneurship course prior 2006	1=yes; 0=no	.165	not surveyed	.103	.000	.000	.000/ .000
Entrepreneurship course prior 2008	1=yes; 0=no	not surveyed	.201	.191	.109	.077	.000/ .238**
Male	1=male; 0=female	.430	.450	.401	.353	.284	.500/ .523**
Age (in 2006)	Years	22.076	22.202	22.682	22.781	22.674	24.750/ 22.548
At least one of the parents is/was an entrepreneur/self-employed	1=yes; 0=no	.559	not surveyed	.591	.538	.515	.750/ .548
Skills and competences	Self-assessment measured on a Likert-type scale from 1 “very bad” to 6 “very good”		not surveyed				

Communication skills		4.670		4.628	4.539	4.554	4.650/ 4.462
Organizational skills		4.826		4.798	4.786	4.772	4.833/ 4.817
Ability to work in a team		4.703		4.682	4.649	4.615	4.792/ 4.714
Technical skills		4.824		4.779	4.728	4.735	4.708/ 4.714
Office skills		5.196		5.227	5.223	5.258	5.167/ 5.131
Locus of control	Self-assessment measured on a Likert-type scale from 1 “completely disagree” to 6 “completely agree”	4.351	not surveyed	4.318	4.284	4.270	4.417/ 4.289
Personality traits	Self-assessment measured on a Likert-type scale from 1 “completely disagree” to 6 “completely agree”		not surveyed				
Neuroticism		4.479		4.530	4.479	4.451	4.600/ 4.563
Extraversion		4.525		4.528	4.480	4.452	4.700/ 4.505
Openness to experience		4.292		4.298	4.247	4.263	4.233/ 4.200
Conscientiousness		4.491		4.513	4.558	4.615	4.617/ 4.362*
Agreeableness		4.577		4.645	4.677	4.678	4.950/ 4.595
Department	1=yes; 0=no						
Business Administration/Economics		.254	.211	.172	.136	.107	.083/ .238*
Law		.090	.088	.119	.130	.138	.167/

						.095
Natural Sciences	.193	.199	.182	.168	.177	.167/ .142
Medicine/Health Sciences	.248	.273	.320	.348	.377	.083/ .333
Civil engineering/Engineering	.014	.047	.016	.011	.008	.000/ .024
Social sciences, Sports	.201	.182	.191	.207	.192	.500*/ .167
N	3,189	2,307	319	184 (100%)	130 (70.65%)	12 (6.52%)/ 42 (22.83%)

Note: */** indicate differences in means between individuals who do not intend to become entrepreneurs or self-employed and individuals who do intend to do so (two-group t test) significant at 5%/1%.
Figures before slash "/" refer to students who intend to become entrepreneurs or self-employed immediately after graduation. Figures after slash "/" refer to students who intend to become entrepreneurs or self-employed five years after graduation.
[a)] Students surveyed in 2006, except Ph.D. students, students in humanities, and students unavailable for the labor market (because they were already employed, entrepreneurs, or self-employed or and due to family planning or other reasons).
[b)] Students surveyed in 2008, except Ph.D. students, students in humanities, and students unavailable for the labor market (because they were already employed, entrepreneurs, or self-employed or and due to family planning or other reasons).
[c)] Students surveyed in both, 2006 and 2008, except Ph.D. students, students in humanities, and students unavailable for the labor market (because they were already employed, entrepreneurs, or self-employed or and due to family planning or other reasons).
[d)] Same as [c)] but additionally excluding individuals who stated in 2006 that they intend to become entrepreneurs/self-employed as well as individuals who had already taken some entrepreneurship courses as of 2006.

In Table 2, we compare the characteristics of students in the final sample (i.e., after excluding individuals that are likely to self-select into entrepreneurship education and to upward bias the results) with the characteristics of students in the 2006 survey, students in the 2008 survey, and participants in both surveys. Regarding the final sample, we additionally distinguish between students with entrepreneurial intentions and those without.

There are no major differences between students surveyed in 2006, students surveyed in 2008, and students participating in both surveys (columns 1, 2, and 3 in Table 2). In the 2006 and 2008 surveys (columns 1 and 2), about half of the surveyed students intended to become entrepreneurs or self-employed (immediately after graduation or five years later). The portion of individuals with entrepreneurial intentions among those who participated in both surveys is with about 40% somewhat lower (column 3). However, there are no major differences regarding entrepreneurship education. On average, 19–20% of the surveyed individuals took entrepreneurship courses. Similarly, regarding the other individual characteristics (i.e., gender, age, entrepreneurship in the family, skills/competences, personality traits, etc.), there are virtually no significant differences. Overall, the results indicate that (i) students with similar characteristics were surveyed in both 2006 and 2008 and (ii) students' voluntary participation in both surveys is unlikely to have been driven by specific individual characteristics and/or strategic considerations.

Comparing the final sample (column 4) to the other samples (columns 1 and 2) indicates, however, some differences that result from our strategy to avoid potential bias due to self-selection by excluding individuals who had already developed some entrepreneurial intentions or taken entrepreneurship courses by 2006. In particular, less than one-third of the individuals in the final sample intend to become entrepreneurs or self-employed (6.5% immediately after graduation, 22.8% five years after graduation), which is significantly less than in the 2006 and 2008 samples (~50%) as well as for participants in both surveys (~40%). Similarly, when excluding students with already developed entrepreneurial intentions, the share of individuals with entrepreneurship education in the final sample cuts in half to 10.9%. Moreover, the individuals

in the final sample tend to have, on average, lower values on other characteristics that are typically associated with entrepreneurship (Parker 2009). For instance, there seem to be fewer males and fewer students with entrepreneurial parents. This indicates that in the final sample, we successfully exclude students with above-average entrepreneurial intentions who are likely to self-select into entrepreneurship courses and thus upward bias the results. However, the students in the final sample do not differ from the average regarding further individual characteristics. Regarding age, skills/competences, and personality traits, there are virtually no differences between the individuals in the final sample and those in the other samples.

In the final sample, there also seem to be no major differences between students who intend to become entrepreneurs or self-employed and students who do not (columns 5 and 6).[5] Moreover, even the students in the final sample who intend to become entrepreneurs or self-employed (column 6) show characteristics similar to the average student before accounting for self-selection (columns 1 and 3).

Finally, to demonstrate that the results of the DD approach are not biased by self-selection of individuals with specific characteristics into entrepreneurship courses, we report the results of univariate (cf., Table 3) and multivariate (cf., Table 4) comparison of students who took entrepreneurship courses between 2006 and 2008 and those who did not. The results do not indicate statistically significant differences between the two groups regarding most of the personal characteristics (i.e., gender, age, entrepreneurial parents, skills/competences, locus of control, and personality traits). In other words, on basis of these observable characteristics, there is no indication for self-selection of individuals with above-average entrepreneurial orientation into entrepreneurship courses. Some differences can be observed, however, regarding the entrepreneurial intentions of students in different departments. Accounting for that in the empirical analysis will remove possible remaining differences and provide a rather unbiased estimate for the impact of entrepreneurship education on entrepreneurial intentions (cf., section 2 for DD approach).

[5] The results for students who intended to become entrepreneurs or self-employed immediately after graduation need to be interpreted cautiously due to their small number.

Table 3: Characteristics of students with and without entrepreneurship education between 2006 and 2008 in the final sample

	Individuals without entrepreneurship education between 2006 and 2008	Individuals with entrepreneurship education between 2006 and 2008
	Mean	Mean
Male	.348	.400
Age	22.833	22.350
At least one of the parents is/was an entrepreneur/self-employed	.518	.700
Skills and competences		
Communication skills	4.546	4.480
Organizational skills	4.766	4.950
Ability to work in a team	4.625	4.850
Technical skills	4.713	4.850
Office skills	5.220	5.250
Locus of control	4.309	4.081
Personality traits		
Neuroticism	4.490	4.390
Extraversion	4.485	4.440
Openness to experience	4.248	4.240
Conscientiousness	4.562	4.520
Agreeableness	4.674	4.700
Department		
Business Administration, Economics	.098	.450**
Law	.146	.000*
Natural sciences	.182	.050
Medicine/Health sciences	.372	.150*
Civil engineering/Engineering	.013	.000
Social science, Sports	.189	.350
N	164 (89.13%)	20 (10.87%)

N Note: */** indicate differences in means between students with and students without entrepreneurship education (two-group t test) significant at 5%/1%.
Final sample consists of 184 students participating in both surveys (2006 and 2008) except (i) Ph.D. students, (ii) students in humanities, (iii) students unavailable for the labor market (because they were already employed, entrepreneurs, self-employed, and due to family planning or other reasons), and (iv) students who in 2006 already intended to become entrepreneurs/self-employed or had already taken some entrepreneurship courses by 2006.
All individual characteristics were measured in 2006 and thus prior to enrollment in entrepreneurship courses (between 2006 and 2008).

Table 4: Characteristics of students with and without entrepreneurship education between 2006 and 2008 in the final sample (self-selection)

	Dependent: Entrepreneurship education between 2006 and 2008 (0 = no; 1 = yes)									
	Logit					OLS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Male	.205				.015	.020				.015
	(.498)				(.740)	(.050)				(.052)
Age	-.026				-.043	-.002				-.007
	(.038)				(.042)	.002				(.003)
At least one of the parents is/was	.762				.629	.070				.052
an entrepreneur/self-employed	(.515)				(.577)	(.045)				(.045)
Skills and competences										
Communication skills		-.572			-.459		-.056			-.025
		(.415)			(.532)		(.044)			(.043)
Organizational skills		.529			.948		.050			.082
		(.424)			(.579)		(.039)			(.047)
Ability to work in a team		.409			.172		.037			.011
		(.334)			(.399)		(.029)			(.031)
Technical skills		.111			.085		.010			.009
		(.249)			(.330)		(.022)			(.022)
Office skills		.017			.449		-.000			.031
		(.406)			(.586)		(.038)			(.039)
Locus of control			-.643		-.827			-.064		-.075
			(.400)		(.464)			(.042)		(.043)
Personality traits										
Neuroticism			-.187		-.265			-.018		-.018
			(.342)		(.451)			(.035)		(.040)
Extraversion			.032		-.044			.003		-.019
			(.242)		(.466)			(.024)		(.034)
Openness to experience			.076		-.108			.005		-.007
			(.299)		(.429)			(.028)		(.031)
Conscientiousness			.039		-.050			.004		-.002

			(.368)		(.497)			(.034)		(.037)
Agreeableness			.061		-.182			.006		-.017
			(.493)		(.590)			(.047)		(.048)
Department										
Business Administration,				.913	.680				.176	.130
Economics				(.592)	(.872)				(.117)	(.127)
Law				omitted	omitted				-.184**	-.207**
									(.064)	(.076)
Natural sciences				-1.913	-2.303*				-.152*	-.172*
				(1.103)	(.900)				(.072)	(.074)
Medicine/Health sciences				-1.524*	-1.561				-.137*	-.154
				(.727)	(.952)				(.069)	(.080)
Civil engineering/Engineering				omitted	omitted				-.184**	-.244*
									(.064)	(.121)
Social science, Sports				ref.	ref.				ref.	ref.
Constant	-2.071*	-4.652*	.505	-1.488**	-.525	.106	-.097	.378	.184**	.385
	(.928)	(1.906)	(2.748)	(.420)	(3.869)	(.060)	(.153)	(.275)	(.064)	(.326)
N	184	184	184	158	158	184	184	184	184	184
Mc Fadden's R^2	.02	.03	.02	.15	.23	-	-	-	-	-
R^2	-	-	-	-	-	.01	.02	.02	.14	.19

Note: Heteroskedasticity-robust standard errors in parentheses. */** significant at 5%/1% level.
Final sample of 184 students participating in both surveys (2006 and 2008) except (i) Ph.D. students, (ii) students in humanities, (iii) students unavailable for the labor market (because they were already employed, entrepreneurs, self-employed, and due to family planning or other reasons), and (iv) students who in 2006 already intended to become entrepreneurs/self-employed or had already taken some entrepreneurship courses by 2006.
In columns 4 and 5, the number of observations is smaller than 184 because there are no students from law and civil engineering/engineering among those taking entrepreneurship courses between 2006 and 2008. In logit estimation, these variables predict events perfectly, and the respective observations are dropped.
All RHS variables were measured in 2006 and thus prior to enrollment in entrepreneurship courses (between 2006 and 2008).

5. Results

This section reports the results for the impact of entrepreneurship education on entrepreneurial intentions. First, we report some general results regarding the entrepreneurial intentions of the students while distinguishing between those with and without entrepreneurship education (Table 5). The results of the DD estimator for the strength of the impact of entrepreneurship education on students' entrepreneurial intentions are reported in Table 6. The sample we drew upon to arrive at rather unbiased estimates for the impact of entrepreneurship education on entrepreneurial intentions consists of 184 students participating in both surveys (2006 and 2008) except (i) Ph.D. students, (ii) students in humanities, (iii) students unavailable for the labor market (because they were already employed, entrepreneurs, self-employed, and due to family planning or other reasons). Most importantly, by the beginning of the period of analysis in 2006, none of the students in the final sample had already taken some entrepreneurship courses or had intended to become entrepreneurs/self-employed.

Table 5 provides some general indication that entrepreneurship education might influence entrepreneurial intentions. The share of students with entrepreneurial intentions is 50% among those who took entrepreneurship courses but only 26.83% among those who did not take entrepreneurship courses. However, entrepreneurship education seems to have a differential effect on students' short- and long-term entrepreneurial intentions. Of the students who took entrepreneurship courses between 2006 and 2008, none intends on becoming entrepreneurs or self-employed immediately after graduation, but 50% intend to do so five years after graduation. Of the students who did not take entrepreneurship courses, 7.32% intend to become entrepreneurs or self-employed immediately after graduation, and 19.51% intend to so five years after graduation.

Table 5: Entrepreneurial intentions of students with and without entrepreneurship education in the final sample

	Do not intend to become an entrepreneur or self-employed	Intend to become an entrepreneur or self-employed immediately after graduation	Intend to become an entrepreneur or self-employed five years after graduation
No entrepreneurship education between 2006 and 2008	120	12	32
Entrepreneurship education between 2006 and 2008	10	0	10

Note: Final sample consists of 184 students participating in both surveys (2006 and 2008) except (i) Ph.D. students, (ii) students in humanities, (iii) students unavailable for the labor market (because they were already employed, entrepreneurs, self-employed, and due to family planning or other reasons), and (iv) students who in 2006 already intended to become entrepreneurs/self-employed or had already taken some entrepreneurship courses by 2006.

The main results from the DD analysis of the strength of the impact of entrepreneurship education on students' entrepreneurial intentions are reported in Table 6. Columns 1 and 2 report the average entrepreneurial intentions of the students attending entrepreneurship education (treatment group) prior treatment (t = 1) and after attending entrepreneurship courses (t = 2), respectively. Column 3 contains the difference between these two columns. Columns 4–6 provide the same information for the control group of students who did not attend entrepreneurship courses. Column 7 shows the simple DD estimator (i.e., the difference between changes in the average entrepreneurial intentions in the treatment and the control groups). In addition, column 8 reports the results of a linear probability model for the strength of the impact of entrepreneurship education on students' entrepreneurial intentions estimated by OLS with (i) robust standard errors and (ii) with standard errors clustered by department in order to account for intra-department correlation in the error term (Moulton 1986) (cf., Table A1 in the appendix). In column 9, we additionally account for department-specific differences in attending entrepreneurship courses (cf., Tables 2 and 3 in section 4).

Table 6: The impact of entrepreneurship students' education on entrepreneurial intentions—results of the difference-in-differences approach

	Impact on the intentions to become an entrepreneur or self-employed immediately after graduation (i.e., short-term intentions)								
	Entrepreneurship education between 2006 and 2008 (Treatment group)			No entrepreneurship education between 2006 and 2008 (Control group)			DD	OLS (No controls)	OLS (Department controls)
	1	2	3 (=2-1)	4	5	6 (=5-4)	7 (=3-6)	8	9
Intention to become an entrepreneur or self-employed immediately after graduation	2006	2008	Diff	2006	2008	Diff			
	.000	.000	.000	.000	.091	.091**	-.091	-.091**/-.091	-.125**/-.125*
	(.000)	(.000)	(.000)	(.000)	(.025)	(.025)	(.092)	(.025/.040)	(.047/.054)
N	10	10	10	132	132	132	142	142	142

	Impact on the intentions to become an entrepreneur or self-employed five years after graduation (i.e., long-term intentions)								
	Entrepreneurship education between 2006 and 2008 (Treatment group)			No entrepreneurship education between 2006 and 2008 (Control group)			DD	OLS (No controls)	OLS (Department controls)
	1	2	3 (=2-1)	4	5	6 (=5-4)	7 (=3-6)	8	9
Intention to become an entrepreneur or self-employed five years after graduation	2006	2008	Diff	2006	2008	Diff			
	.000	.500	.500**	.000	.211	.211**	.289**	.289*/.289*	. 258*/.258
	(.000)	(.114)	(.114)	(.000)	(.033)	(.033)	(.100)	(.117/.128)	(.125/.119)
N	20	20	20	152	152	152	172	172	172

Note: * significant at 5%; ** significant at 1%.

Final sample consists of 184 students participating in both surveys (2006 and 2008) except (i) Ph.D. students, (ii) students in humanities, (iii) students unavailable for the labor market (because they were already employed, entrepreneurs, self-employed, and due to family planning or other reasons), and (iv) students who in 2006 already intended to become entrepreneurs/self-employed or had already taken some entrepreneurship courses by 2006.

Columns 1 and 2 show the average entrepreneurial intentions of the students attending entrepreneurship education (treatment group) at t = 1 (prior treatment) and t = 2 (after entrepreneurship courses), respectively. Column 3 contains the differences between these two columns. Columns 4–6 provide the same information for the control group except that the individuals in this group were not subject to the treatment (i.e., entrepreneurship education). Column 7 shows the simple DD estimator (i.e., the difference between changes in the average entrepreneurial intentions in the treatment and the control groups). Column 8 presents the results of a linear probability model for the effect of entrepreneurship education on students' entrepreneurial intentions estimated by

OLS with both robust standard errors and standard errors clustered by department (separated by "/") in order to account for intra-department correlation in the error term (Moulton 1986) (cf., Table A1 in the appendix). In column 9, we additionally account for department-specific differences in attending entrepreneurship courses (cf., Tables 2 and 3 in section 3).
For the analysis of the impact of entrepreneurship education on students' intentions to become entrepreneurs or self-employed immediately after graduation, students who intended to become entrepreneurs or self-employed five years after graduation are excluded (cf., Table 5).
For the analysis of the impact of entrepreneurship education on students' intentions to become entrepreneurs or self-employed five years after graduation, students who intended to become entrepreneurs or self-employed immediately after graduation are excluded (cf., Table 5).

Regarding the intentions to become entrepreneurs or self-employed immediately after graduation the results of the difference-in-differences analysis indicate a discouraging effect of entrepreneurship education. None of the students taking entrepreneurship courses (treatment group) intended to become entrepreneurs or self-employed immediately after graduation (column 3), while the average entrepreneurial intentions increased by 9.1% among students in the control group who did not take entrepreneurship courses (column 6). The DD estimate for the impact of entrepreneurship education indicates that the average intention to become an entrepreneur or self-employed immediately after graduation was 9.1% lower for students who took entrepreneurship courses than for students who did not (column 7). The estimate for the effect of entrepreneurship education is statistically not significant in the DD approach (column 7), presumably due to the relatively small size of the treatment group, which results in relatively large standard errors. In the OLS approach, however, it becomes not only statistically significant (column 8) but also increases in magnitude when department-specific probabilities to take entrepreneurship courses are accounted for (column 9). The results indicate that entrepreneurship education may provide more realistic perspectives both about themselves as well as about what it takes to be an entrepreneur, resulting in 'sorting' (cf., Oosterbeek et al. 2010; von Graevenitz et al. 2010). In particular, in contrast to their peers, students who attend entrepreneurship courses might have learned that professional and industry-specific skills and competences, business and customers contacts, capital, developed and accumulated during paid employment are important for subsequent entrepreneurial success,so that starting a business immediately after graduation is likely an 'inferior' strategy.

Regarding the intention to become an entrepreneur or self-employed five years after graduation, the results indicate stimulating effects of entrepreneurship education. We find that 50% of the students who took entrepreneurship courses developed entrepreneurial intentions (column 3), while the increase in entrepreneurial intentions in the reference group of students without entrepreneurship education was only 21.1% (column 6). The difference is the simple DD estimator for the strength of the impact of entrepreneurship education on students' entrepreneurial intentions (column

7). Accordingly, students taking entrepreneurship courses were 28.9% more likely to intend to become entrepreneurs or self-employed in the long term than those who did not attend such courses. This indicates that entrepreneurship education can indeed call students' attention to entrepreneurship as a career alternative to paid employment and/or improve their skills and competences in running an own business. The results of the OLS estimation largely confirm these findings.

6. Summary and conclusions

This study analyzes the impact of entrepreneurship education in universities on students' intentions to become entrepreneurs and self-employed (as compared to paid employment). The research question is motivated by the increasing popularity of publicly funded entrepreneurship education programs in universities as a means to stimulate the commercialization of academic knowledge, firm creation, and economic development on the one hand and the often contradictory findings in previous studies on the effectiveness of such programs on the other hand.

This study contributes to the existing literature on the effects of entrepreneurship education programs by proposing a new methodological approach that distinguishes between students' intentions to become entrepreneurs or self-employed in the short-term (immediately after graduation) and in the long-term (after some time in paid employment). We argue that it is important to distinguish between entrepreneurial intentions in the short- and the long-term for at least two reasons. On the one hand, 'entrepreneurial spirit' might be sowed at universities, while the actual entrepreneurial act might occur later. On the other hand, work experience and the time spent in dependent employment outside academia is crucial for the success for academic startups. In particular, during this time individuals gain professional and industry-specific experience and managerial competences, develop business networks, find potential customers, accumulate financial capital, etc. Hence, as to the degree in which students are made aware of the importance of these factors, and decide to spend some time in paid

employment outside academia to obtain and accumulate these skills and recourses before starting own businesses, entrepreneurship education might stimulate comparably more prospective entrepreneurship. In fact, a key function of entrepreneurship education in universities is to prepare students for entrepreneurship rather than to increase total entrepreneurship rates. Hence, distinguishing between short-term and long-term intentions allows us to add to the emerging discussion on quality-related aspects when evaluating the impact of entrepreneurship education rather than merely quantity effects. Finally, this approach allows a more detailed assessment of the impact of entrepreneurship education and sheds some more light on the often contradictory findings in previous studies.

To assess the causal impact of entrepreneurship education on entrepreneurial intentions, we tracked students over time and applied a difference-in-differences approach relating changes in students' entrepreneurial intentions to their attendance in entrepreneurship classes during the same period. This approach enables us to account for unobserved individual-specific effects. Further, to avoid a potential bias due to self-selection into entrepreneurship classes, we analyze only students who had not developed any entrepreneurial intentions prior to course enrollment and had not attended any entrepreneurship courses. We show that, for these students, attendance in entrepreneurship courses is not related to individual characteristics typically associated with entrepreneurship.

The results indicate that it is important to distinguish between students' entrepreneurial intentions in the short-term and the long-term. Entrepreneurship education may, indeed, influence students' entrepreneurial intentions but the effect differs with respect to short- and long-term intentions. Regarding short-term intentions, we found that students who took entrepreneurship courses had, on average, lower intentions to become entrepreneurs or self-employed immediately after graduation than students who did not take entrepreneurship courses. These findings indicate that students attending entrepreneurship classes obtain more realistic perspectives on both themselves and on what it takes to be an entrepreneur, which results in 'sorting' (cf., Oosterbeek et al. 2010; von Graevenitz et al. 2010). As to the degree in which 'early' entrepreneurship is 'over-hasty' and

thereby (perhaps) less prospective, our results indicate that entrepreneurship education may help prevent socially undesirable activities. Regarding students' long-term intentions, we find a strong positive effect of entrepreneurship education. This indicates that entrepreneurship education can indeed call students' attention to entrepreneurship as a career alternative to paid employment and/or improve their skills and competences in running an own business. Overall, the results suggest that entrepreneurship education may improve the quality of labor market matches, the allocation of resources and talent, and increase social welfare. Not distinguishing between short- and long-term intentions might yield misleading assessment of the economic and social impact of entrepreneurship education.

Can entrepreneurship education at universities be used as a policy tool to foster the commercialization of academic knowledge, firm creation, and economic development? Though appealing, our results need to be dealt with carefully when it comes to policy recommendations. While we focus on the impact of entrepreneurship education on the intentions of students to become entrepreneurs or self-employed, sophisticated policy advice requires more detailed cost-benefit analyses. On the one hand, such analyses require further study of entrepreneurship education's impact on both the actual number of entrepreneurs as well as on the performance of new business. On the other hand, it assumes knowledge about the direct and indirect economic and social impact of new businesses. The survey we draw upon potentially allows tracking individuals and new business development over time; however, the time series available so far are still too short to perform such an analysis. Moreover, a policy advice assumes a comparison of effectiveness of universities in preparing entrepreneurs with that of alternatives, for instance vocational training and education outside academic institutions. Finally, in this study we focus on the impact of entrepreneurship education on students without entrepreneurial intentions prior to taking entrepreneurship courses. However, to obtain a more complete picture, further information is needed about entrepreneurship education's impact on the entrepreneurship and success of individuals who have already developed some intentions to pursue entrepreneurship or self-employment. These are all important avenues for future research.

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APPENDIX

Table A1: Logit and OLS estimates for the impact of entrepreneurship education on students' entrepreneurial intentions (final sample)

	Dependent variable: Intend to become an entrepreneur or self-employed immediately after graduation (1 = yes, 0 = no)									
	Logit	Logit	Logit	Logit	Logit	Logit	OLS	OLS	OLS	OLS
	Coeff. [a]	Coeff. [b]	Prob. change	Coeff. [a]	Coeff. [b]	Prob. change	Coeff. [a]	Coeff. [b]	Coeff. [a]	Coeff. [b]
Entrepreneurship education (1 = yes, 0 = no)	omitted [c]	omitted [c]	omitted [c]	omitted [c]	omitted [c]	omitted [c]	-.091**	-.091	-.125**	-.125*
							(.025)	(.040)	(.047)	(.054)
Department dummies				Yes	Yes	Yes			Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	132	132		131	131		142	142	142	142
McFadden's R^2	.00	.00		.10	.10					
R^2							.01	.01	.07	.07

	Dependent variable: Intend to become an entrepreneur or self-employed five years after graduation (1 = yes, 0 = no)									
	Logit	Logit	Logit	Logit	Logit	Logit	OLS	OLS	OLS	OLS
	Coeff. [a]	Coeff. [b]	Prob. change	Coeff. [a]	Coeff. [b]	Prob. change	Coeff. [a]	Coeff. [b]	Coeff. [a]	Coeff. [b]
Entrepreneurship education (1=yes, 0=no)	1.322**	1.322**	.290	1.189*	1.189**	.256	.289*	.289*	.258*	.258
	(.491)	(.502)		(.536)	(.450)		(.117)	(.128)	(.125)	(.119)
Department dummies				Yes	Yes	Yes			Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	172	172		172	172		172	172	172	172
McFadden's R^2	0.04	0.04		0.05	0.05					
R^2							.05	.05	.06	.06

Note: * significant at 5%; ** significant at 1%.
[a)] Heteroskedasticity-robust standard errors in parentheses.
[b)] Standard errors clustered by department in parentheses.
[c)] There are no students attending entrepreneurship courses among those who intend to become an entrepreneur or self-employed immediately after graduation (cf., Table 5).
Final sample consists of 184 students participating in both surveys (2006 and 2008) except (i) Ph.D. students, (ii) students in humanities, (iii) students unavailable for the labor market (because they were already employed, entrepreneurs, self-employed, and due to family planning or other reasons), and (iv) students who in 2006 already intended to become entrepreneurs/self-employed or had already taken some entrepreneurship courses by 2006.
For the analysis of the impact of entrepreneurship education on students' intentions to become entrepreneurs or self-employed immediately after graduation, students who intended to become entrepreneurs or self-employed five years after graduation are excluded and the number of observations is 132. (cf., Table 5).
For the analysis of the impact of entrepreneurship education on students' intentions to become entrepreneurs or self-employed five years after graduation, students who intended to become entrepreneurs or self-employed immediately after graduation are excluded and the number of observations is 172 (cf., Table 5).