Entrepreneurship education: when less is more

Abstract: We examine the effects of a large government-sponsored entrepreneurship education program aimed at university students. The results suggest a weak positive effect of the program's limited training interventions (e.g., workshops, inspirational lectures, etc.) on entrepreneurial entry and income but no similar effect can be discerned for the more all-encompassing university courses. Longer university courses seemed to only modestly increase self-efficacy and entrepreneurial intentions but not entrepreneurial entry. Our interpretation is that less may be more when it comes to entrepreneurship education: small interventions can be more beneficial than large interventions in promoting entrepreneurship. Implications for theory, education, and policy are discussed.

INTRODUCTION

Can authorities foster entrepreneurship through education and training? A tentative answer to this question based on previous evidence would be "Yes." Results from meta-analytical studies suggest a positive relationship between entrepreneurship education and outcomes like entrepreneurial knowledge, skills, perceptions, and intentions (Bae, Qian, Miao, & Fiet, 2014; Martin, McNally & Kay, 2013) as well as outcomes like entrepreneurial entry, income from entrepreneurship, and venture performance (Martin et al., 2013).

However, much remains to be learned concerning these phenomena. In their recent review of the literature, Loi, Castriotta, and Guardo (2016) label impact evaluation of entrepreneurship education programs as an emerging theme in entrepreneurship education research. Loi and colleagues argue that future research should seek to paint a comprehensive picture of entrepreneurship education, for example, by looking beyond entrepreneurial intentions to other outcomes, such as actual entrepreneurial entry or performance among entrants. Further, Bae et al. (2014) suggest that self-selection may drive most of the positive association between entrepreneurship education and entrepreneurial intentions. Research also has a long way to go before we fully understand the conditions under which entrepreneurship education is beneficial—that is, whether a particular type of training is more or less efficient than another in terms of promoting entrepreneurship and whether the effect in question depends on participants' characteristics.

Theoretically, a truly effective entrepreneurial education entails a causal chain running from (1) entrepreneurship training to entrepreneurial self-efficacy; from (2) self-efficacy to entrepreneurial intentions; and (3) from entrepreneurial intentions to entrepreneurial outcomes, such as entrepreneurial entry and income. In this paper, we study an entrepreneurship education and training (EET) program for university students sponsored by the Swedish government. We investigate the program's effects with respect to entrepreneurial

self-efficacy, entrepreneurial intentions, and entrepreneurial entry and income. Two broad categories of interventions can be discerned under the program's umbrella: first, those interventions that take the form of *university courses* providing full course credits and, second, what we label *limited training interventions*, which take the form of workshops, inspirational lectures, idea contests, etc.

We undertake two studies to test the program interventions' effectiveness in terms of realizing the suggested theoretical mechanisms. In the first study, we use longitudinal register data on 1,420 participants and a control group population of more than 600,000 Swedish university students to analyze whether the program as a whole has the intended effects on entrepreneurial outcomes (i.e., whether it resulted in higher rates of entrepreneurial entry and higher business income among participants). To determine this, we use propensity score matching to compare participants to a matched control group of similar students who did not participate.

The analysis suggests that overall, participating individuals are no more likely to start businesses one to three years after program participation than comparable individuals. Decomposition of the sample reveals a more heterogeneous picture, however. While individuals who take part in the program's limited training interventions are more likely to enter entrepreneurship by setting up a new venture after participation, participants in university course interventions are *less* likely to engage in entrepreneurship after participation. This finding indicates that less is more: more encompassing interventions decrease the probability that an individual will engage in entrepreneurship. A possible reason for this finding may be the fact that greater knowledge concerning the entrepreneurial process discourages some individuals from taking the leap into entrepreneurship.

In the second study, we focus on participants in the program's university courses. We use a survey analyzing entrepreneurial efficacy, entrepreneurial perceptions, and entrepreneurial intentions among participants and a matched control group of non-participants. Results from structural equation models provide marginal support to the notion that increased exposure to EET enhances entrepreneurial intentions, which is in contrast to the results from Study 1. To the extent that exposure to EET enhances entrepreneurial intentions, this seems to be because such training increases self-efficacy in the area of creativity. In contrast, the effect of increased exposure to EET on self-efficacy in financial knowledge appears to be negative, but this type of self-efficacy does not appear to have any effect on entrepreneurial intentions.

Taken together, our results suggest that less training may actually be more beneficial when it comes to entrepreneurship education. Our paper contributes to research on the impact evaluation of entrepreneurship education programs, specifically considering both proximate and long-term outcomes. In line with experiential learning theory, our results suggests that entrepreneurship education seems to be more effective when delivered as shorter—often practice-based—interventions, during which knowledge is created through the transformation of experience rather than through theoretically oriented education in a classroom setting. In conclusion, under the right circumstances, small interventions may be more beneficial than large programs for promoting entrepreneurial efficacy, entrepreneurial intentions, and entrepreneurial entry and business income from entrepreneurship.

THEORY AND RESEARCH ON ENTREPRENEURSHIP EDUCATION

Human capital, learning, and entrepreneurship education

A longstanding claim in the entrepreneurship literature is that human capital, such as education, training, and relevant labor market experience, is a central determinant of whether an individual is successful in entrepreneurship (Gimeno, Folta, Cooper & Woo, 1997; Iyigun & Owen, 1998). Following earlier studies, we depict the acquisition of human capital as a learning process whereby life experiences are transformed into knowledge and skills (Marvel, Davis & Sproul, 2016). Such human capital investments, however, are shrouded in uncertainty in the sense that education and work experience *may* or *may not* lead the individual to acquire knowledge and skills (i.e. actual human capital assets) (Unger et al., 2011). This perspective is important to keep in mind when considering the debate on whether entrepreneurship can be taught (Haase & Lautenschläger, 2011; Neck & Greene, 2011).

Many universities have sought to include entrepreneurship education and training in their curricula (e.g. Fayolle, 2000; Katz, 2003; Kuratko, 2005; O'Connor, 2013; Fayolle, 2013). According to Fayolle, Gailly, and Lassas-Clerc (2006, p. 702), entrepreneurship education consists of "any pedagogical (program) or process of education for entrepreneurial attitudes and skills," the idea being that such efforts should increase students' entrepreneurial knowledge (Souitaris, Zerbinati & Al-Laham, 2007; Haase & Lautenschläger, 2011).

An individual's investments in human capital, such as entrepreneurship education, should—if successful—result in the absorption and combination of new knowledge that is of relevance to entrepreneurship (Bae et al. 2014; Souitaris et al. 2007). Meta-analyses have suggested this to be generically so in that more often than not, EET enhances entrepreneurial human capital, intentions, entry, and performance (Bae et al., 2014; Martin et al., 2013).

Studies have found EET programs to have a positive effect on participants' intermediate outcomes, such as their understanding of key entrepreneurial concepts (Volery, Müller, Oser, Naepflin & Rey, 2013), ability to discover new opportunities (DeTienne & Chandler, 2004), attitudes towards entrepreneurship (Peterman and Kennedy, 2003, Souitaris et al. 2007; Walter & Dohse, 2012), and entrepreneurial intentions (Athayde, 2009). Other studies suggests that the effects of EET programs may be substantial in terms of long-term outcomes, such as enhancing participants' non-cognitive entrepreneurial skills (Rosendahl Huber, Sloof, & Van Praag, 2014) and increasing their likelihood of engaging in entrepreneurship several years after program participation (Elert, Andersson & Wennberg, 2015).

Nevertheless, several experimental and quasi-experimental studies have found that EET has small or non-existent effects in the short term (Astebro & Hoos, 2016; Oosterbeek, van Praag & Ysselstein, 2010; von Graevenitz, Harhof & Weber, 2010). These mixed results could stem from a variety of sources, including differences in the type of EET intervention studied, the type of participants, and the time horizon between participation and follow-up (Martin et al., 2013). The mixed evidence to date regarding the effectiveness of EET efforts raises the following question: *Under which circumstances* are students able to learn and develop their entrepreneurial human capital from participating in EET efforts (Hahn, Minola, Van Gils & Huybrechts, 2017)?

Entrepreneurship differs from many other careers in that there is no straightforward way to develop the necessary skills in advance—or to even to be sure what skills are necessary (Eesley & Wang, 2017). For example, researchers who view entrepreneurs as jacks-of-all-trades have increasingly emphasized that rather than being specialized, entrepreneurs require a breadth of skills to handle the variety of tasks they face (Eesley, Hsu & Roberts, 2014; Lazear, 2004; Astebro & Thompson, 2011). Such entrepreneurial skills include abstract reasoning, divergent thinking, synthesizing disparate ideas, and frame-breaking (Baron, 1998) as well as improvisation, experimentation, questioning, and observation (Baker, Miner & Eesley, 2003; Dyer, Gregersen, & Christensen, 2008). Unsurprisingly, traditional lecture-based classrooms struggle to teach all these skills.

One alternative to the classroom is real-world experience. The type of human capital that matters for entrepreneurship is suggested to be tied to specific entrepreneurial tasks, such as owner experience, start-up experience, industry experience, and entrepreneurial knowledge (Unger, Rauch, Frese & Rosenbusch, 2011; Martin et al., 2013; Toft-Kehler, Wennberg & Kim, 2014), and research has suggested that much of the learning that takes place within the entrepreneurial context is experiential in nature (Minniti & Bygrave, 2001; Politis, 2005;

Rueber & Fischer, 1993; Sarasvathy, 2001). Experiential learning can be described as "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p.41). Just like there is a difference between human capital investments and the human capital assets acquired, there is a difference between a particular (entrepreneurial) experience and the actual knowledge derived from it (Reuber, Dyke & Fischer, 1990). Consequently, scholars have argued that entrepreneurship is best depicted as a form of experiential learning and that entrepreneurship education needs to be taught in an experience-based manner (Sarasvathy, 2004; Politis, 2005; Wright, Siegel & Mustar, 2017). This point is echoed by a report from the European Commission (2008, p. 66): "The use of experience-based teaching methods is crucial to developing entrepreneurial skills and abilities."

In summary, the extent to which EET leads to realized knowledge and skills relevant for entrepreneurship depends on several important boundary conditions, such as the design and duration of the EET effort in question, (Martin et al., 2013) including the extent to which the EET effort is based on experiential learning methods or not.

Entrepreneurship education: Less or more?

A central component of human capital theory is that investments in education and training have positive effects on an individual's future career (Becker, 1964). However, when it comes to investment in EET, it may not simply be the case that more education and training is always better.

In most studies on the impact of entrepreneurship education, participation in an EET program is operationalized as a dichotomous variable (Naia, Baptista, Januário, & Trigo, 2014). Hahn and colleagues study exposure to various EET efforts in a large sample of students, finding that exposure to more EET efforts increases up to a point from which the positive effect of more exposure levels off and becomes negative at high levels of exposure (Hahn et al., 2017). However, the outcome variable is limited to students' perceived entrepreneurial learning, and their measure of EET interventions ranges from educational initiatives to tangible support,[1] leading the authors' to suggest that "future research could use more elaborated measures of EE," such as "weighing each offering by number of credits attached" (p. 32).

There are several reasons to doubt that increased exposure to education and training will necessarily increase entrepreneurial outcomes. First, entrepreneurship education may be

[1] Their measure of EET initiatives was based students' self-reported participation in (1) lectures/seminars, (2) network and coaching offerings, and (3) provision of resources for founders/entrepreneurs.

subject to diminishing returns (Becker, 1964), meaning that such initiatives only contribute to increased entrepreneurial learning up to a certain threshold. Individuals will keep learning only as long as they are exposed to novel events and are able to interpret and build knowledge from them thanks to the cognitive abilities they acquired from previous experience (Morris, Kuratko, Schindehutte & Spivack, 2012). Beyond that point, students cannot further develop their level of entrepreneurial knowledge (Mueller & Anderson, 2014), and the relationship between additional education or training and entrepreneurial skills levels off or may even turn negative as more education makes students more aware of their learning gaps (Hahn et al., 2017).

Second, the value of the human capital assets acquired through entrepreneurial education can be subject to a depreciation process (Becker, 1964, Martin et al., 2013; Toft-Kehler et al., 2014), meaning that they become inadequate to cope with new emerging features of the surrounding environment. For example, this depreciation can occur because of economic developments that cause changes in job requirements or restructurings within certain firms or sectors (De Grip & Van Loo, 2002). In this respect, more learning can actually become a liability—at least if it is path dependent and results in behavioral and attitudinal lock-in.

Third, more entrepreneurial education may have the contradictory effect of enabling students to realize that they are not yet ready to engage in entrepreneurship (Oosterbeek et al., 2010, von Graevenitz et al., 2010). While a little entrepreneurship education may simply spur confidence, increased exposure could make students reflect on their cumulated stock of entrepreneurial knowledge and cause them to recognize they still have a lot to learn (Mueller & Anderson, 2014), which could result in discouragement and resignation if the classroom cannot satisfy their matured cognitive expectations (Honig, 2004). As such, more extensive entrepreneurship education may in fact negatively affect students' evaluation of their entrepreneurial prospects. This is not necessarily undesirable if students realize that they need further life and work experience before they can successfully engage into entrepreneurship—a form of higher-order learning (Cope, 2005).

Fourth, the effects of human capital investments largely depend on the type of investments made (Marvel et al., 2016), and we may expect that the pedagogic features of a training program affect the extent to which its students learn (Béchard & Gregoire, 2005; Martin et al., 2013). Broadly speaking, entrepreneurship education pedagogies can be classified as either practice or theory oriented (Piperopoulos and Dimov, 2015). The practice-oriented approach is generally held up as the ideal since students themselves are responsible

for constructing learning through experience (Gielnik et al., 2015), and teachers adjust their training in relation to their students' needs (Honig, 2004; Mustar, 2009). While it may be expected that students will benefit from additional education initiatives of this type (Béchard & Gregoire, 2005; Hahn et al., 2017), the same is not the case for theory-oriented EET approaches. When the focus is mainly on imparting hard facts of business creation, students are more likely to perceive the knowledge they acquire as inadequate. In view of these issues, our paper addresses the following two research questions:

Study 1: Does the effect of EET initiatives on students' entrepreneurial outcomes (i.e., likelihood of entrepreneurial entry and business income from entrepreneurship) differ between shorter and more extensive EET initiatives?

Study 2: Does the effect of EET initiatives on students' entrepreneurial efficacy, perceptions, and intentions differ between shorter and more extensive EET initiatives?

Outcome variables under consideration

In order to answer our first research question, we consider several outcome variables. Below, we discuss these variables and how they are theoretically and empirically related to EET initiatives.

Self-efficacy. With roots in the broader self-efficacy literature in cognitive psychology (e.g., Bandura, 1997; Maddux & Gosselin, 2003), entrepreneurial self-efficacy refers to a person's belief in his or her ability to successfully perform the roles and tasks of entrepreneurship (Chen, Greene & Crick, 1998; McGee, Peterson, Mueller & Sequeira, 2009). As such, it can be conceived as a form of psychological capital that emphasizes strengths instead of weaknesses (Bandura, 1994; Luthans, Luthans, & Luthans, 2004). The link to human capital is straightforward in that an individual's knowledge, skills, and experience are vital determinants of his or her confidence, hope, and optimism. Of course, causality need not be unidirectional since an individuals' existing level of self-efficacy will likely affect their education choices and career choices, thus affecting their human capital (Bandura 1994).

A key aspect of self-efficacy within a domain like entrepreneurship is that it is not a static trait but something that can developed (Hollenbeck & Hall, 2004). Theoretically, this highlights the potential that an individual's entrepreneurial self-efficacy can be increased through training and education. A few studies have empirically examined whether this is the case, and while results remain inconclusive (Peterman, 2000; Chowdhury & Endres, 2005), a positive effect from entrepreneurship education on self-efficacy may be expected. For the reasons described above, however, it is not evident that more EET always results in more self-efficacy since, for example, increased exposure may cause the student to recognize his or her

knowledge gaps, which could potentially decrease self-efficacy (Mueller & Anderson, 2014; Honig, 2004).

Entrepreneurial intentions. Entrepreneurial intentions are usually defined as an individual's desire to start a business (Krueger, Reilly & Carsrud, 2000). In his theory of planned behavior (TPB), Ajzen (2002) argues that intentions typically depend on perceptions of personal attractiveness, social norms, and feasibility. Such intentions have been found to be generally important predictors of realized behavior: in a meta-analysis covering 422 studies over 10 years from a number of academic fields, Sheeran (2002) finds that intentions account for 28% of the variance in behavior. The validity of intentions-based models for explaining entrepreneurship has been tested in many studies, lending strong support and predictive power for such models (e.g., Krueger et al., 2000; Kautonen, Gelderen & Fink, 2015; Lee, Wong, Foo, & Leung, 2011). However, some scholars state that entrepreneurial intentions are necessary but not sufficient factors for realizing entrepreneurial behavior; without sufficient opportunities and resources, the intentions may stay just at that (Douglas & Shepherd, 2002).

There is also a theoretical link between entrepreneurial self-efficacy and intentions. Individuals who have more confidence in their skills and abilities to start their own business should have more desire to do so than people who lack such confidence (Schlaegel and Koenig 2014). Indeed, a host of studies do see a positive association between entrepreneurial self-efficacy and entrepreneurial intentions and belief in one's ideas (e.g., Chen et al., 1998; Krueger et al., 2000; McGee et al., 2009; Piperopoulos & Dimov, 2015; Schlaegel & Koenig, 2014). Chen et al. (1998) even find that entrepreneurial self-efficacy is a positive mediator of the relationship between entrepreneurship education and entrepreneurial intentions, suggesting that the effect from entrepreneurship education on intentions may run through this construct.

More generally, recognizing entrepreneurial intention as an important precursor of realized entrepreneurship, many entrepreneurship education initiatives have sought to enhance participants' perception of entrepreneurship as an attractive career opportunity, introduce participants to role models, and enhance their knowledge and skills so that the act of starting a new venture is perceived as something feasible (Peterman, 2000; Galloway & Brown, 2002; Peterman & Kennedy, 2003; Chowdhury & Endres, 2005; Souitaris et al., 2007; Athayde, 2009; Oosterbeck et al., 2010; Sánchez, 2013; Walter, Parboteeah, & Walter, 2013). The same line of reasoning was evident in the program we study in this paper: it had the specific goal of "making entrepreneurship visible as a possible career path for university students" (SAERG 2015a, b). This reasoning corresponds well with an intentions-based approach and motivates

intentions as a useful outcome variable for investigation. Just as with self-efficacy, however, it is not theoretically clear whether more exposure necessarily results in greater entrepreneurial intentions.

Entrepreneurial entry and income. While studies of entrepreneurial outcomes following participation in entrepreneurial education have covered an array of characteristics and behaviors (Kuratko 2005; Bae et al., 2014; Martin et al., 2013), the majority of such studies have focused on proximal outcomes measured just after or shortly after an intervention, such as knowledge acquisition/human capital formation or enhanced entrepreneurial intentions. There is a relative dearth of studies considering more distal outcomes, such as actual entrepreneurial behavior in terms of nascent entrepreneurship, new venture startup, or new venture performance (Martin et al., 2013). However, given the proposed relationships between self-efficacy, intentions, and entrepreneurial behavior, it is reasonable to expect entrepreneurship education to have a positive effect on entrepreneurial entry as well.

Based on the studies that do exist, there seems to be a positive link between EET and realized entrepreneurial behavior, especially in long-term follow-up studies (Kolvereid & Moen, 1997; Elert et al., 2015; Rausch & Hulsink, 2015). For example, Souitaris et al., (2007) find no effects on entrepreneurial behavior when investigating individuals' likelihood of starting a new venture right at the end of an entrepreneurship course, whereas Elert et al. (2015) find a higher likelihood of starting a new venture when studying individuals several years after completing a one-year entrepreneurship course. Consequently, evaluations of entrepreneurship programs should distinguish between proximal outcomes, such as enhanced entrepreneurial self-efficacy or higher entrepreneurial intentions, and more distal outcomes, such as new venture startup or new venture performance. Given the strong results in earlier studies on the link between entrepreneurial intentions and realized entrepreneurship (see Kautonen et al., 2015 for a review), we expect a positive effect from entrepreneurial intentions on entrepreneurial entry and entrepreneurial income, although our line of reasoning above casts some doubt on the strength of this relationship.

THE PROGRAM *ENTREPRENEURSHIP IN HIGHER EDUCATION*

In order to connect conceptual knowledge to a range of entrepreneurial skills, educators have adopted a range of methods, such as conventional lectures, seminars, workshops, focus groups, and peer mentoring (Gibb, 1996). Such teaching methods are directed at entrepreneurship education in a range of academic programs (Pittaway & Cope, 2007). For

example, scholars have argued that providing entrepreneurial knowledge to students in non-business education is important because they often lack the business skills to turn their ideas into viable businesses (Mustar, 2009; Shinnar, Pruett & Toney, 2005).

In 2007, the Swedish Agency for Economic and Regional Growth (SAERG) launched the program *Entrepreneurship in Higher Education* as an effort within the overarching program *Promoting Women's Entrepreneurship* (Ministry of Enterprise and Innovation, 2007). The program aimed to "integrate entrepreneurship as a topic in various educational options in order to make it visible as a possible career path for students" (SAERG, 2015a, b). The design included two broad types of interventions directed toward students and teachers, respectively. This study focuses on the former intervention, which tried to equip students with the necessary knowledge and tools to explore a business idea and aimed to increase the number of students engaging in new ventures by means of starting a business (SAERG, 2015a).

The goal of the program rests on two assumptions. The first is that entrepreneurship is not an innate ability or preference that develops during childhood only but is instead something that can be learned by adults (Neck & Greene, 2011; Hoffman, Junge & Malchow-Møller 2014; Lindquist, Sol & van Praag, 2015). The second assumption is that entrepreneurship education may increase the total number of entrepreneurs and/or the quality of entrepreneurs. Based on these two assumptions, the purpose of the program was to enable students, particularly female students, to develop their entrepreneurial abilities during their university years. During the time period under consideration, the proportion of women who received interventions was only slightly higher than the proportion of women in the overall population. For this reason, we consider the program reach as general (although estimations considering the effect on women only will be provided in the appendix).

We investigate the second program period (2011–2014) (Ministry of Enterprise and Innovation, 2011), which included a total of 14 different projects at different universities (for a summary, see Table A1 in the Appendix). The projects were allocated a total sum of about 8.6 million Swedish krona (≈ 875,000 euros).

A total of 2,148 participants with social security numbers were identified in the reports that project owners were required to hand over to SAERG. When matching participants' social security numbers to public register data, we omitted individuals who had moved abroad or died. After participants were matched to the register data, 1,891 individuals who participated in an intervention between 2011 and 2015 remained. About one-third of the

participants (642 individuals) were men even though the program primarily targeted women.[2] While the interventions differed in terms of duration, structure, and content, they came in two main forms. The first type of intervention comprises full-length *university courses* (details in Table 1 below), and in total, 1,064 individuals took part in them. The second type of intervention comprises shorter interventions, which we label *limited training interventions* (details in Table 2), and a total of 827 individuals took part in them. We have data on the exact time of participation for 1,420 out of the 1,891 participants. While we know the time of participation for as many as 97% (1,028/1,064) of students in university courses[3], the corresponding number is only 47% (392/827) for participants in the limited training interventions.[4]

Table 1. Examples of university course interventions

Course name	Location	Course credits	Level	Requirement	Mandatory
Textile project and business development (TPA012)	University of Borås	15 ECTS	BSc	Registered in textile product development and entrepreneurship program (180 ECTS)	Yes
Entrepreneurship and business development (SEA01B)	University of Borås	15 ECTS	BSc	Registered in textile product development and entrepreneurship program (180 ECTS)	Yes
Entrepreneurship focused on health promotion (2IV120)	Linnaeus University	15 ECTS	BSc	120 ECTS in Idrotts-vetenskapligt program (180 ECTS)	Yes
Entrepreneurship focused on health sciences (2XN002)	Linnaeus University	7.5 ECTS	BSc	Basic eligibility and 60 ECTS credits in biomedical science	No
Business development and personal entrepreneurship (1FE620)	Linnaeus University	7.5 ECTS	BSc	15 prior ECTS credits in business administration	No
Entrepreneurship and business development (1FE807)	Linnaeus University	7.5 ECTS	BSc	30 prior ECTS in business administration	No

Note: A total of 38 students attended both TA012 and SEA01B. ECTS = European Credit Transfer and Accumulation System.

[2] In all, 84 individuals took part in more than one intervention; 71 individuals took part in two interventions, and 13 individuals took part in three or more interventions. Including/excluding these individuals from the sample does not affect the results.
[3] There were 56 individuals in 2011, 280 in 2012, 237 in 2013, 276 in 2014, and 179 in 2015. The last 179 participants in 2015 were excluded from analysis since register data on entrepreneurial outcomes only provides information on outcome variables until 2014, and we want to avoid any simultaneity bias in the analysis.
[4] A total of 106 individuals participated in an intervention in 2012 and 286 individuals in 2013. Exactly when between 2011 and 2014 the remaining 435 individuals in this group received their intervention is unknown.

The university course interventions are displayed in Table 1. They differed in both length and curricula. Half of the courses were equivalent to 10 weeks of studying, whereas the other half required only five weeks of fulltime study. The courses all contained a mix of theoretical and practical elements. All university course interventions, however, introduced the students to basic concepts and theories about entrepreneurship. All courses in the Swedish higher education system require that theoretical knowledge is part of the examination process.[5]

The courses on entrepreneurship in health promotion and entrepreneurship in health science focused on the specificities of the health sector throughout the course. One of the courses targeting business administration students (i.e., business development and personal entrepreneurship) focused on social and cultural entrepreneurship in addition to for-profit entrepreneurship. The three remaining courses were quite general in character and focused on opportunity identification, business planning, market analysis, etc. (Katz, 2003). There were some differences when it came to the practical elements of the courses. Textile project and business development went furthest in letting students develop a business idea and then start and run a company as part of the syllabus. The other five courses all required students to be able to apply theories and tools in practice, but they had different course components (e.g., workshops, case studies, or essay writing) to facilitate the development of such skills.

Table 2. Examples of limited training interventions

Activity	Type	Mandatory
Motivational talk	Extracurricular activity	No
Creativity workshop and exercise	Extracurricular activity or part of university program	No
Introductory lecture and seminar	Part of university course	No
Idea and business model contest	Extracurricular activity	No

The limited training interventions were less comprehensive than the university courses and comprised a more diverse set of activities. Some were advertised to all students on campus, whereas others targeted a select group, taking the form, for example, of a voluntary

[5] University courses need to fulfill a set of common criteria and adhere to the overall goals of academic education according to the Swedish Higher Education Authority. Specifically, they need to be based on academic research and test students on academic knowledge and critical reflection. Before approval, new courses at Swedish universities are reviewed by an educational board in the university's faculties of science, medicine, or social science and humanities.

module available to students in a particular university program. Examples of both intervention types can be found within the four categories listed in Table 2. The duration of the limited interventions differed greatly: motivational talks typically lasted a couple of hours, creativity workshops and exercises lasted about a half a day, and introductory lectures and seminars lasted between two and four hours.

The duration of the idea and business model contests were difficult to establish, but in general, those responsible for the program described them as being more extensive than the introductory lectures and seminars. Among the limited training interventions, only the introductory lectures and seminars included any type of introduction to concepts and theories about entrepreneurship. The lectures were given to students studying to work in education, media and communication, human resource management, pharmacology, etc. The topics of the motivational talks ranged from "being entrepreneurship oriented" to "attitude training."

As can be seen, the educational "treatment" differs between these two groups in that the university courses provided a qualitatively different and more extensive treatment than the limited training interventions. Since we wish to gauge the relative impact of different type of entrepreneurship interventions (similar to Hahn et al., 2017), separating the effects of the two types of interventions is of interest. As a first step in the analysis, we assumed that all interventions were equal in order to gauge the overall impact of the program. In further steps, we then examined the effect of these two types of interventions separately.

RESEARCH DESIGN

We conducted two sub-studies to investigate the effects of the program: one based on comprehensive register data of all Swedish citizens and one based on a survey employing validated psychometrics.

The first study used detailed register data from the individual-level LISA database.[6] The database includes all individuals age 16 years and over registered in Sweden as of December 31 each year and includes annually updated data on income, education, and demographics. Individuals are the primary objects of interest in LISA, but it is possible to link individuals to the schools they attended and the firms they started. We identified all program participants and matched them to the database and subsequently used students at the same university in the same age cohort with the same gender as the basis for constructing control groups (see below).

[6] LISA is the acronym for "Longitudinell integrationsdatabas för Sjukförsäkringsoch Arbetsmarknadsstudier."

To study the program under review in a reliable manner, we had to address several challenges. First, a reliable dating of the program intervention was necessary for the analysis to be meaningful. Unfortunately, as mentioned, 471 participants—primarily those participating in limited training interventions—did not have a date of intervention noted, so our final sample of participants was reduced from 1,891 to 1,420. For participants in the university course interventions, however, date of participation was comprehensively noted for close to 97% of individuals. This problem is hence mainly an issue for the limited training interventions.

An additional challenge was that we could only observe participants and non-participants prior to the program using register data. Thus, we could only assess individuals' likelihood of starting a business but none of the intermediary outcome variables of interest (i.e., entrepreneurial self-efficacy and entrepreneurial intentions) before the intervention took place. This poses challenges for handling non-observable heterogeneity that affects program selection, which we attend to below.

A common feature of programs like this is that at some point, the individual has chosen to participate in them. This self-selection comes in different forms depending on the type of program and the university, ranging from the choice to enlist in a many-year-long university education that includes an element of entrepreneurship to attending a creativity workshop or business model contest. Nevertheless, a general problem remains: the choice to participate in the program may correlate with the outcome variables assessed. Simply comparing outcomes between participants and non-participants would result in a biased estimation, with an error term resulting from the self-selection. Any such comparison thus risks becoming erroneous if one cannot account for differences between individuals participating in the program and those who do not (Rosenbaum & Rubin, 1983; Angrist, 1998).

The two studies addressed this self-selection challenge slightly differently. In both cases, we overcame this issue through a form of matching—that is, by pairing each participant with a "twin" (e.g., someone who is also a woman of a similar age attending the same university who has a similar education, a similar socioeconomic background, and so forth). By taking such factors into account, we limited the potential bias of self-selection.

In the first study, based on the register data, we handled the self-selection problem using propensity score matching (PSM), matching individuals who took part in a program intervention to individuals who did not but who presumably had the same probability of participating in the intervention. This matching approach relies on a set of assumptions that

should hold for the method to be reliable. First, the common support assumption demands—in its strictest form—that there are some participants and some non-participants for each value that a specific background variable takes (Rosenbaum & Rubin, 1983). Since we had access to such a large pool of potential recruits to the control group, this problem was negligible. Second, according to the conditional independence assumption, participants and individuals in the control group should, *on average*, be comparable after conditioning on observable variables (Caliendo & Kopeinig, 2008). Fortunately, the register data contained a host of variables with potential relevance for entrepreneurship, such as ethnicity and family background. Nonetheless, it is possible that our results were affected by non-observable heterogeneity since we were unable to observe factors like different psychological characteristics (Dehejia & Wahba 1999; Patel & Fiet, 2010). As long as the error is random—namely, occurring with the same probability among participants and individuals in the control group—this should not bias our results. We will return to a discussion of these assumptions in relation to the results.

In the second study, which used survey data, we took a different route to handle self-selection. In addition to participants, the survey questionnaire was distributed to individuals who did not participate but were known to have had a similar educational experience. In practice, this meant that the control group consisted of students who attended the same educational program as the participants but either chose not to take the course (if the course was not mandatory) or took the program prior to the course being included (if the course was mandatory).

STUDY 1: REGISTER DATA ANALYSIS

We gather the register data for Study 1 from Statistics Sweden with additional information collected from SAERG and the project owners themselves, who were obliged to report who participated in the program and when. As the sampling frame for the control group, we used the full population of individuals born in 1970 or later who were registered at any of the Swedish universities participating in the program between 2011 and 2014 (n = 685,022). Together with the 1,891 participants in the program, the total sample sums up to 686,913.

Dependent variables: Entrepreneurial entry and entrepreneurial income

Our first dependent variable is *entrepreneurial entry*, which we defined as being full-time engaged in entrepreneurship in 2014 (subsequent to the program) in a firm that is majority owned and managed by the individual. Entrepreneurship is measured in LISA based on tax

records, for which an individual's occupation and primary source of earnings is calculated at the end of each calendar year based on taxable business or salary income during the year. By using this definition and not self-reported measures of entrepreneurship, we excluded part-time or miniscule firms that could be run on the side (Folta, Delmar & Wennberg, 2010). Using data based on public registers can thus be considered a stricter test of whether program participants are more likely than non-participants to enter into entrepreneurship compared to relying on self-reported measures of entrepreneurial activities.

Entrepreneurial income is our second dependent variable, which we defined as the income from running a business whether as a sole proprietorship or an incorporated firm. We created this variable by taking the logarithm of the income of active business operations, measured in hundreds of Swedish kronor (SEK), while exempting zeros from the logarithmic transformation.

Independent variable: Intervention type

University course intervention/limited training intervention. University-level programs in entrepreneurship tend to focus on multiple goals, such as facilitating entrepreneurial skills, learning about academic theories, and preparing aspiring entrepreneurs for entrepreneurial careers (Garavan & O'Cinnede, 1994; cf. Weber, 2011). Shorter interventions often focus on a less comprehensive set of goals, such as highlighting alternative career paths or increasing participants' entrepreneurial intentions. Following these broad distinctions, our main independent variable seeks to test whether the effectiveness of an EET intervention is contingent on whether the intervention in question comes in the form of a university course or in the form of a limited training intervention. While for the first step in our analysis, we created a treatment variable equal to 1 if the student took part in any type of intervention and 0 otherwise, we subsequently considered university course interventions and limited training interventions separately.

Participant-specific control variables

We introduced a set of control variables that earlier research has shown to possibly affect both the likelihood of participating in EET and the potential impact of EET interventions.

Gender. We included gender since it has been found to influence entrepreneurial behavior and learning at different stages of the process (Van Der Zwan, Verheul, Thurik, & Grilo, 2013). While men in several studies report higher entrepreneurial intentions and a higher probability of engaging in entrepreneurship than women (Chen et al., 1998; Scherer,

Brodzinski & Wiebe, 1990; Grilo & Thurik, 2008), this does not imply that they are as likely to perceive the need for or benefit from entrepreneurial interventions. We controlled for gender with a dummy variable taking the value 1 for women and 0 for men.

Age. We control for the age of students in 2011, measured in years, because researchers have suggested that age influences an individual's predisposition to learn (Minola et al 2014).

Mother/father entrepreneur. Individuals whose parents have been involved in entrepreneurial endeavors may exhibit entrepreneurial intentions or have inherited entrepreneurship-specific human capital (Sørensen, 2007; Walter & Dohse, 2012; Fayolle & Gailly, 2015). To account for this, we included a dummy variable taking the value 1 if either of a focal person's parents ran a business at some point from 1986 onward and 0 otherwise.

Non-Nordic background. Immigrants are known to be more likely to enter entrepreneurship (Arum & Muller, 2004). Therefore, we included a control variable taking the value 1 if the student was born outside the Scandinavian countries (Sweden, Norway, Finland and Denmark) and 0 otherwise.

Family education. Parental education is known to facilitate the formation of human capital in children (Coleman, 1988). Thus, we introduced two control variables in dummy format—one for "mother higher education" and one for "father higher education"—both of which took the value 1 if the parent had a three-year or longer college degree and 0 otherwise.

High school grade. We used high school grade to account for the potential selection of students with high general ability into the program (Elfenbein, Hamilteon, & Zenger 2010). This variable proxies for individuals' existing cognitive capabilities, which are important for their ability to accumulate human capital assets from investments like an education intervention (Martin et al., 2013, Unger et al., et al 2011) and transform experiences into entrepreneurial knowledge (Marvel et al., 2016; Politis, 2005). To guard against grade inflation and to make comparisons across changing grade scales, we divided students in each graduation cohort into percentiles based on their grades. The variable was thus measured on a scale from 0 to 100.

Faculty. Dummy variables denoting their faculty affiliation in 2010 were used to control for students' field of study. This is an important factor to control for since business students generally place more emphasis on learning about entrepreneurship (Shinnar et al., 2009), although entrepreneurship education is growing in importance in the social sciences and science/engineering (Souitaris et al., 2007; Walter et al., 2013).

Descriptives

Table 3 shows the descriptive statistics for the participant group and the overall population of students regarding the characteristics deemed to be relevant in the theory section. We used t-tests to determine differences in background variables between the two groups.

Table 3. Descriptive statistics for participants and the overall population

	Population	Participants	t-value
Gender	0.59	0.66	-6.05
Age (2011)	23.32	22.69	18.34
Non-Nordic background	0.15	0.07	9.81
Mother entrepreneur	0.14	0.14	-0.19
Father entrepreneur	0.26	0.28	-1.94
Mother higher education	0.27	0.25	1.64
Father higher education	0.22	0.20	1.84
High school grade	50.18	50.42	-0.34
Observations	685,022	1,891	

Note: N = 686,913. Participants and individuals in the control group born in 1970 or later who were enrolled at a university at some point between 2011 and 2014. Missing data for the variable high school grade means that the t-test was calculated on 1,678 participants and 496,025 control group individuals.

Table 3 reveals significant differences in several background variables between the participating group and the rest of the university population. Program participants were more often women, generally younger, and less often of a non-Nordic background. By contrast, they did not seem to differ from other students in terms of high school grades nor parental background. Only for the variable *father entrepreneur* is there a small statistically significant difference between the two groups. However, this difference may be relevant since, as mentioned, research considers parental background in entrepreneurship as one of the strongest predictors of whether an individual will engage in entrepreneurship (Lindquist et al., 2015).

Table 4 shows rates of entrepreneurship for all participants, for participants in university course interventions only, and for the general population. We report entrepreneurship statistics for these groups both in 2010 (the year before the program was initiated) and in 2014 (the last year we have data for). Since these statistics represent average numbers for a population of young individuals (most are in their mid- to late 20s) who were still tied to the university or were beginning their working career, comparatively low rates of

entrepreneurship are to be expected for this demographic group (Delmar & Davidsson, 2000). Indeed, this is what we find.

For 2010, the difference in likelihood of being full-time engaged in entrepreneurship between participants and the overall population is not statistically significant. Furthermore, participants in university course interventions stand out as being less than half as likely to be engaged in entrepreneurship compared to the rest of the population. While their level of entrepreneurship increased somewhat in 2014, it is still substantially lower than for the overall population. This issue will be considered in more detail in the coming analysis.

Table 4. Rates of entrepreneurship 2010 and 2014 for participants and the control group

	Non-participants (control group)	All participants	t-value	University course participants	t-value
Entrepreneurs in 2010	0.02	0.02	-0.24	0.01	1.81
Observations	661,348	1,871		1,058	
Entrepreneurs in 2014	0.02	0.03	-0.72	0.01	2.54
Observations	669,444	1,881		1,060	

Note: N (2010) = 663,219, N (2014) = 671,325. The t-value for participants in university course interventions is computed against all non-participants and participants in other interventions.

We used PSM as the matching method for this study. The purpose of the first step in PSM is to estimate a propensity score, which, in this case, is the probability that an individual received a (particular) program intervention. This step was modelled as a logit regression with program participation (1 = participation, 0 = no participation) as the dependent variable and the independent variables were those presented in Table 3, which, as demonstrated in the theory section, were chosen because previous literature has shown their relevance either for entrepreneurship education or for entrepreneurship. The matching was conducted based on the logarithm of the odds ratios produced by the logit model since a growing empirical literature suggests this approach to work well in practice (Angrist & Pischke, 2008: 61). The results are presented in Table 5, which shows the results for selection equations with respect to entrepreneurial entry and entrepreneurial income.

Table 5. Propensity score estimation: Logit model for the probability of program participation

	Entrepreneurial entry						Entrepreneurial income					
	(I) All interventions		(II) University courses		(III) Limited interventions		(I) All interventions		(II) University courses		(III) Limited interventions	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Mother entrepreneur	-0.06	0.08	-0.02	0.10	-0.12	0.12	-0.07	0.07	-0.06	0.09	-0.08	0.11
Father entrepreneur	0.05	0.06	0.03	0.08	0.07	0.09	0.011	0.06	-0.03	0.07	0.07	0.09
Higher education mother	-0.23***	0.06	-0.23***	0.08	-0.23**	0.10	-0.21***	0.06	-0.23***	0.08	-0.18*	0.09
Higher education father	-0.20***	0.07	-0.19**	0.09	-0.21*	0.11	-0.20***	0.06	-0.25***	0.08	-0.13	0.10
Age	-0.06***	0.01	-0.08***	0.01	-0.05***	0.01	-0.07***	0.01	-0.11***	0.01	-0.03***	0.01
Non-Nordic background	-0.23***	0.12	-0.25	0.16	-0.20	0.17	-0.27**	0.11	-0.32**	0.15	-0.20	0.16
Gender	0.00	0.00	0.01***	0.00	-0.01***	0.00	0.28***	0.05	-0.07	0.06	0.86***	0.09
High school grade (inflation adjusted)	0.29***	0.06	-0.02	0.07	0.74***	0.09	0.00	0.00	0.01***	0.00	-0.00***	0.00
Faculty unknown	-1.01	1.01		(omitted)	-0.81	1.01	-0.59	-0.71		(omitted)	-0.51	0.71
Humanities and theology	-0.77***	0.18	-1.55***	0.43	-0.48**	0.21	-0.57***	0.16	-1.39***	0.39	-0.32*	0.18
Law and social sciences	-0.66***	0.15	-1.13***	0.30	-0.42**	0.19	-0.67***	0.14	-1.14***	0.30	-0.52***	0.17
Arts	0.67**	0.26	0.15	0.59	0.82***	0.30	0.49*	0.25	0.11	0.59	0.55*	0.28
Medicine and odontology	-0.68	0.47		(omitted)	0.01	0.48	-0.51	0.38		(omitted)	-0.00	0.39
Physical sciences	-0.51**	0.22	-2.02***	0.75	-0.13	0.25	-0.33*	0.19	-1.84***	0.63	-0.20	0.21
Technology	-0.35	0.27	-1.06	0.75	0.00	0.29	-0.36	0.24	-0.45	0.55	-0.12	0.26
Health care	-1.68***	0.53	1.05	0.71	-2.17***	0.75	-1.31***	0.41	-0.95	0.71	-1.52***	0.49
Other faculty	0.80***	0.29	0.45	0.73	0.76**	0.33	0.77***	0.27	0.46	0.72	0.65**	0.30
Constant	-4.23***	0.19	-4.49***	0.27	-5.56***	0.27	-3.91***	0.18	-3.46***	0.26	-6.03***	0.25
Observations	551,91		527,714		551,079		563,169		538,276		562,152	
Likelihood ratio chi-2	583.94		433.79		228.81		682.56		614.30		229.13	
Prob > chi2	0.00		0.00		0.00		0.00		0.00		0.00	
Pseudo R2	0.029		0.035		0.024		0.029		0.042		0.021	

In order to distinguish between university courses and limited interventions, we undertook three estimations for each outcome variable: first, an estimation for which the dependent variable takes the value 1 if an individual participated in any program intervention between 2011 and 2014 (Column I); second, one where the dependent variable takes the value 1 if an individual participated in any program university course between 2011 and 2014 (Column II); lastly, one in which the dependent variable takes the value 1 if an individual participated in any limited training intervention between 2011 and 2014 (Column III).

As can be seen in Table 5, the estimations are fairly similar in terms of which variables affect selection. Age and parents with a higher education affect the probability of participating in the program negatively in virtually all estimations. The effects of high school grades and gender appear more ambiguous, whereas parental entrepreneurial history seems to have little effect whatsoever. Pseudo R2 is low in all estimations, but it is considered a poor measurement for assessing the efficiency of PSM in creating groups that are balanced over covariates (Ho, Imai, King & Stuart, 2007). A more relevant heuristic is that no significant difference remains on included variables between participants and the control group identified with the help of the propensity score, and t-tests subsequent to matching demonstrate that this is the case, supporting the conditional independence assumption (Caliendo & Kopeinig, 2008). The population that could potentially be used in the control group consisted of more than 600,000 individuals. Possibly as a consequence, the common support assumption is fulfilled in all estimations presented.

In a second step, we matched participants according to the nearest-neighbor principle using individuals who did not participate but had a similar of participating according to their estimated propensity score.[7] This approach enables a reasonable comparison when considering the outcome variables—entrepreneurial entry and income—which we do in Tables 6a–c below. (In Tables A2a–c in the appendix, we replicate the results when only considering the female sample. These results are very similar to those presented here).

In Table 6a, we compare the outcome for participants (regardless of intervention type and year of participation) with the general population and, more importantly, with the control group matched on the propensity score that we obtained from the estimation in Column I of Table 5. Entry rates into entrepreneurship amount to 1.6% for the participation group and 1.8% for the matched control group, with overlapping confidence intervals. This first,

[7] In cases when an observation has several nearest neighbors, a chance algorithm determined which one of them should be included in the control group. For robustness, we also matched using three other methods: kernel matching, radius matching, and local linear regression matching. However, these methods scarcely affected the results concerning program effects (the exception is that local linear regression matching led to completely insignificant differences in regard to the university course interventions).

admittedly broad, analysis suggests that the program as a whole did not increase participants' likelihood of engaging in entrepreneurship. This is also the case when we consider entrepreneurial income, which is not significantly different between participants and the matched control group.

Table 6a. Average treatment effect on the treated for all program interventions
Dependent variable: Entrepreneurial entry 2010–2014

Population: 1,453 participants, 550,457 in the control group					
Comparison	Participants	Control group	Difference	S.E.	t-stat.
Unmatched (n = 551,910)	0.016	0.017	-0.001	0.003	-0.25
Matched (n = 2,906)	0.016	0.018	-0.002	0.005	-0.43
Dependent variable: Ln(entrepreneurial income) 2014					
Population: 1,734 participants, 561,435 in the control group					
Comparison	Participants	Control group	Difference	S.E.	t-stat.
Unmatched (n = 563,169)	0.390	0.374	0.015	0.047	0.33
Matched (n = 3,468)	0.390	0.297	0.092	0.062	1.48

Table 6b. Average treatment effect on the treated for all university courses
Dependent variable: Entrepreneurial entry 2010–2014

Population: 831 participants, 526,883 control group individuals					
Comparison	Participants	Control group	Difference	S.E.	t-stat.
Unmatched (n = 527,714)	0.008	0.017	-0.008	0.004	-1.84
Matched (n = 1,662)	0.008	0.022	-0.013	0.006	-2.22
Dependent variable: Ln(entrepreneurial income) 2014					
Population: 1,017 participants, 537,259 in the control group					
Comparison	Participants	Control group	Difference	S.E.	t-stat.
Unmatched (n = 538,276)	0.260	0.367	-0.107	0.061	-1.77
Matched (n = 2,034)	0.260	0.275	-0.015	0.071	-0.21

Table 6c. Average treatment effect on the treated for all limited training interventions
Dependent variable: Entrepreneurial entry 2010–2014

Population: 622 participants, 550,457 in the control group					
Comparison	Participants	Control group	Difference	S.E.	t-stat.
Unmatched (n = 551,079)	0.026	0.017	0.009	0.005	1.76
Matched (n=1,244)	0.026	0.014	0.011	0.008	1.41
Dependent variable: Ln(entrepreneurial income) 2014					
Population: 717 participants, 561,435 in the control group					
Comparison	Participants	Control group	Difference	S.E.	t-stat.
Unmatched (n = 562,152)	0.574	0.374	0.200	0.073	2.74
Matched (n = 1,434)	0.574	0.315	0.259	0.110	2.36

We proceeded to a finer-grained analysis distinguishing between university course interventions and limited training interventions. In Table 6b, only university course interventions are considered as the treatment, and the matched control group is identified on the basis of the propensity scores obtained in Column II of Table 5. As can be seen, participants in the university course interventions were substantially less likely to enter entrepreneurship between 2010 and 2014 than the general population, which is in line with the descriptives in Table 4. Entry rates into entrepreneurship amount to 0.8% for participants in the university course interventions and 2.2% for the matched control group. The results thus suggest that interventions taking the form of university courses had, if anything, a negative effect on individuals' entrepreneurship in terms of new business creation. As for entrepreneurial income, differences between participants and the matched control group appear to be miniscule.

Table 6c presents the comparison when only limited training interventions are considered as treatment, and the matched control group is identified on the basis of the propensity scores obtained in Column III of Table 5. We now see that participants have a considerably greater probability of starting a firm than non-participants (2.6% compared to 1.4% but not statistically significant) and also have a significantly higher entrepreneurial income at the 1% level: on average, it is almost 30% higher (100 * (exp(0.259) − 1) = 29.563). These results suggest that the more limited interventions may have had a weak positive effect on participants' likelihood of entering entrepreneurship.

Robustness tests

To ensure the veracity of the results obtained, we conducted a number of robustness tests. We first considered two alternative dependent variables: (1) entrepreneurship in 2014, a dummy variable taking the value 1 if an individual is full-time engaged in entrepreneurship in this year or 0 otherwise, and (2) change in employment status between 2010 and 2014, an ordinal variable taking the value 1 if an individual was not engaged in entrepreneurship in 2010 but was in 2014, 0 if an individual's employment status remained unchanged between 2010 and 2014, and -1 if an individual was full-time engaged in entrepreneurship in 2010 but not in 2014. The results for these alternative outcome variables were qualitatively very similar to those presented above.

Second, we considered the fact that we pooled individuals over the 2011–2014 period in the results presented above. As such, the time since exposure differed by as much as three years; however, it may take a few years for recent university graduates to reach the age at

which they are most likely to enter into entrepreneurship (Delmar & Davidsson, 2000; Elert et al., 2015). Therefore, we repeated the estimations for entrepreneurial entry while only including individuals who participated in the program in a specific year. In none of the annual estimations assessing the overall effect of the program were participants more likely to enter entrepreneurship by 2014 than the matched control group. In fact, in 2012, the overall effect of the program is negative and statistically significant. As before, the coefficients in the estimations considering limited training interventions separately are positive (but insignificant), whereas the coefficients for the university courses are negative but only significant for the matched sample in 2012.

Third, we employed three other matching methods: kernel matching, radius matching, and local linear regression matching. Overall, the results from these alternative matching methods are highly similar to those presented above; the exception is that local linear regression matching resulted in non-significant differences between treated and untreated individuals with regard to the university course interventions. The results from these specifications are available upon request.

Conclusions from Study 1

The results from Study 1 suggest that participants in the university course interventions were not more likely to enter entrepreneurship subsequent to the program. However, the more limited interventions may have had a positive effect on participants' likelihood of entering entrepreneurship and had a small positive effect on participants' entrepreneurial income.

STUDY 2: SURVEY OF STUDENTS' ENTREPRENEURIAL SELF-EFFICACY AND ENTREPRENEURIAL INTENTIONS

The survey questionnaire

As mentioned, a strong research tradition has theorized that entrepreneurship is an intentionally planned behavior (Krueger et al., 2000; Schlaegel & Koenig, 2014; Shapero & Sokol, 1982), and studies of EET have frequently evaluated outcomes in terms of higher intentions or self-efficacy. Significant effort has gone into developing and testing scales of entrepreneurial self-efficacy, which have been shown to have good predictive value in singling out individuals with entrepreneurial intentions (e.g., Chen et al., 1998, Moberg, 2013; McGee et al., 2009).

The survey questionnaire in this study was based on Moberg's (2013) compilation and synthesis of questions from three previous studies of entrepreneurial self-efficacy (Chen et al., 1998; DeNoble, Jung & Ehrlich, 1999; McGee et al., 2009). The questions aimed at defining

entrepreneurship according to a process model related to entrepreneurial entry by setting up a new venture, which was first proposed by Stevenson and Gumpert (1985). In all, the questionnaire consisted of 29 questions related to entrepreneurial self-efficacy divided into five areas by Moberg (2013): (1) searching/creativity, (2) planning/management, (3) marshaling, (4) managing ambiguity, and (5) financial knowledge. Respondents were asked to answer questions like "How certain are you of your ability to . . .?" by assigning a number on a Likert scale from 1 (not at all certain) to 7 (very certain).

In addition to the self-efficacy questions, the survey also included three attitudinal questions from McGee et al. (2009) asking respondents to state their attitudes about different entrepreneurial activities (Questions 30–32) as well as five questions to determine whether individuals are nascent entrepreneurs (Questions 33–37 [c.f. Alsos & Kolvereid 1998]). These questions were also measured on a scale from 1 to 7.

As mentioned, we proceeded differently when constructing the control group compared to the register data analysis. In total, the questionnaire was distributed by mail to 1,991 people, 1,092 of which (55%) had taken part in one of the six university course interventions described in Table 1. The remaining 899 people (45%) formed the control group and consisted of students who attended the same educational program as the participants but who either chose not to take the courses (if the course was not mandatory) or took the program prior to the course being included (if the course was mandatory).

While the invitation was sent by regular mail, the respondents filled it out online. After two reminders, the response frequency reached 21.7% in the participant group and 22.4% in the control group. In total, 19.4% of the men asked to take the survey responded compared to 24.0% of women. Respondents were somewhat younger (26.4 years on average) than non-respondents (27.4 years), a difference that is statistically significant at the 1% level. We could not find any difference in geographical distribution between respondents and non-respondents, nor did a response time examination show any differences based on whether responses were given before the first reminder, before the second reminder, or after the second reminder.

Table 7 below summarizes the responses to the questionnaire, with means for respondents in the participant group and the control group. A t-test reveals whether differences are large enough to be statistically significant. The mean values indicate that program participants score slightly higher, on average, on 25 out of 29 questions. However, only for six questions are differences between the two groups statistically significant. In all these cases, participants have higher scores than the control group, but these differences are

never greater than 0.31 on a 7-point scale. The significant differences occur with regards to the individuals' confidence in their ability to improvise (Question 18), to combine new resources (Question 1), to find creative ways of getting things done (Question 5), to lead and manage a team (Question 10), to conduct analysis for a project that aims to solve a problem (Question 7), and to identify opportunities for new ways to conduct activities (Question 4). None of these questions concern the last area of entrepreneurial self-efficacy, financial knowledge.

Table 7. Survey questionnaire

A. Efficacy. How much confidence do you have in your ability to . . . ? (Low [1]– High [7])	**Control group**	**Participant group**	**t-value**
(1) Searching/creativity			
1. Identify ways to combine resources in new ways to achieve goals	4.58	4.88	-2.34
2. Brainstorm (come up with) new ideas	4.88	5.02	-1.03
3. Think outside the box	4.79	4.97	-1.43
4. Identify opportunities for new ways to conduct activities	4.66	4.89	-1.82
5. Identify creative ways to get things done with limited resources	4.82	5.11	-2.30
(2) Planning/management			
6. Manage time in projects	5.1	5.19	-0.72
7. Conduct analysis for a project that aims to solve a problem	5.01	5.25	-1.85
8. Set and achieve project goals	5.2	5.38	-1.50
9. Design an effective project plan to achieve goals	4.8	4.94	-1.13
(3) Marshalling resources			
10. Lead and manage a team	4.79	5.07	-1.92
11. Put together the right group/team in order to solve a specific problem	4.56	4.65	-0.65
12. Form partnerships in order to achieve goals	4.53	4.56	-0.18
13. Identify potential sources of resources	4.49	4.54	-0.40
14. Network (i.e., make contact and exchange information with others)	4.43	4.48	-0.34
15. Get others to identify with and believe in my visions and plans	4.52	4.5	0.19
16. Clearly and concisely explain verbally/in writing my ideas in everyday terms	5.17	5.05	0.93
17. Proactively take action and practically apply my knowledge	5.02	5.15	-1.10
(4) Managing ambiguity			
18. Improvise when I do not know what the right action/decision might be in a problematic situation	4.68	5	-2.34
19. Tolerate unexpected change	4.86	4.95	-0.72

20. Persist in face of setbacks	4.95	5.05	-0.75
21. Learn from failure	5.59	5.76	-1.54
22. Manage uncertainty in projects and processes	4.38	4.52	-1.06
23. Exercise flexibility in complicated situations when both means and goals are hard to establish	4.76	4.8	-0.35
24. Work productively under continuous stress, pressure, and conflict	5.18	5.12	0.48
25. Make decisions in uncertain situations when the outcomes are hard to predict	4.47	4.51	-0.27
(5) Financial knowledge			
26. Read and interpret financial statements	4.89	4.91	-0.10
27. Perform financial analysis	4.76	4.73	0.15
28. Control costs for projects	4.7	4.74	-0.25
29. Estimate a budget for a new project	4.49	4.59	-0.61
B. Entrepreneurial attitudes			
30. In general, starting a business is… Worthless (1)–Worthwhile (7)	5.05	5.18	-0.94
31. In general, starting a business is… Disappointing (1) –Rewarding (7)	5.37	5.52	-1.18
32. In general, starting a business is… Negative (1)–Positive (7)	5.6	5.62	-0.11
C. Entrepreneurial intentions			
33. I strongly consider setting up my own business	3.59	3.77	-0.90
34. I am willing to work hard to set up my own business	4.07	4.43	-1.78
35. I have been preparing to set up my own business	2.34	2.48	-0.74
36. I am going to try hard to set up my own company	3.23	3.40	-0.79
37. I would rather be employed than running my own company	4.67	4.44	1.29

Regarding the questions about entrepreneurial attitudes (Questions 30–32) and the extent of individuals' entrepreneurial intentions (Questions 33–37), program participants are shown to have slightly higher attitudes and intentions than the control group regarding all questions. However, only one question reveals a statistically significant difference between the two groups: whether the individual "is willing to work hard to set up his or her own business" (Question 34).

Creating entrepreneurial constructs

The 29 questions regarding entrepreneurial self-efficacy were used to create scaled constructs for each of the five self-efficacy areas. Table 8 presents the scales, both aggregated for all the 434 students in our sample and separately for the control and the participant groups. In the full sample, Cronbach's alpha values range from 0.78 to 0.93. Alpha values are similar

between the participant and control groups, indicating that all respondents understood the questions in a similar manner. A possible exception is the planning construct, for which the Cronbach's alpha is 0.78 for the participants and 0.86 for the controls. The table also shows the mean differences for participants and the control group. As can be seen, only for the creativity construct is there a weak difference between participants and non-participants, significant at the 10% level.

Table 8. The five constructs: Convergent construct validity and mean values

Construct	Participant group (n = 236)		Control group (n = 200)			All (n = 436)
	Alpha	Mean	Alpha	Mean	t-test	Alpha
Creativity	0.83	4.96	0.84	4.77	-1,84	0.84
Planning	0.78	5.19	0.86	5.03	-1,50	0.83
Marshalling	0.86	4.74	0.88	4.7	-0,39	0.87
Ambiguity	0.86	4.96	0.90	4.87	-1,00	0.88
Financial literacy	0.93	4.75	0.93	4.7	-0,35	0.93

To represent program participation, we considered two different variables: first, the dichotomous treatment variable from before and second, a "course length" variable that took the length of the course into consideration to explicitly test whether more is more. This variable took the value 0 for respondents in the control group, 1 if the individual attended a course worth 7.5 ECTS points, 2 if the individual received 15 ECTS points, and 4 if the individual received 30 ECTS points (no individuals received 22.5 ECTS points, which would have resulted in the value 3). Among participants, the value 1 was given to 201 individuals; only 26 individuals had a double course length, and only nine had the quadruple course length.

Table 9 shows the correlations between the two participation variables, the five efficacy constructs, and similar constructs regarding entrepreneurial intentions and entrepreneurial attitudes. As can be seen, the correlations between all constructs are fairly high, whereas the dichotomous treatment variable exhibits a positive but insignificant correlation to all constructs. In contrast, the course length variable has a significant positive correlation with creativity as well as intentions.

Table 9. Correlation matrix

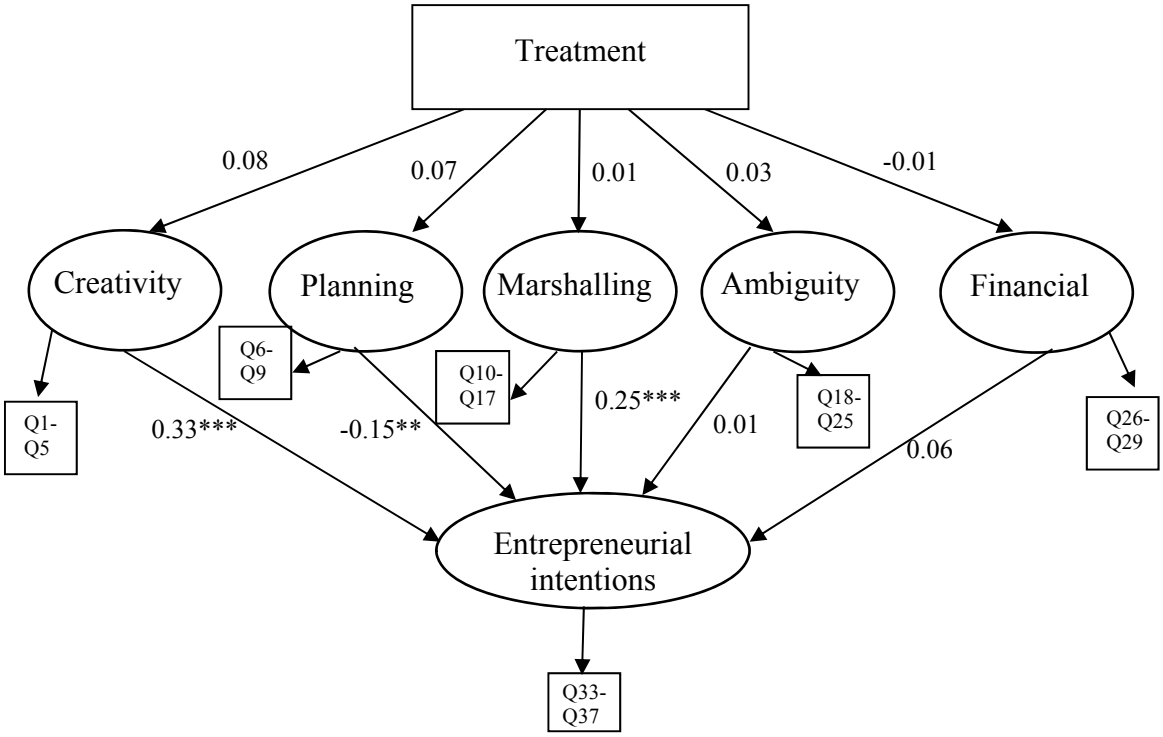
	Treatment	Course length	Creativity	Planning	Marshalling	Ambiguity	Financial	Attitudes
Treatment								
Course length	0.801*							
Creativity	0.088	0.144*						
Planning	0.072	0.036	0.514*					
Marshalling	0.019	0.037	0.669*	0.637*				
Ambiguity	0.048	0.083	0.595*	0.646*	0.719*			
Financial	0.017	-0.086	0.321*	0.535*	0.478*	0.433*		
Attitudes	0.033	0.065	0.355*	0.274*	0.399*	0.330*	0.249*	
Intentions	0.043	0.125*	0.374*	0.181*	0.356*	0.273*	0.192*	0.577*

Note: * indicates significance at the 5% level or better.

Structural equation modeling

We used SEM to examine the relationship between the self-efficacy and attitude variables and the theorized outcome (entrepreneurial intentions) and the ways these may differ between the participant and control groups. The actual questions in the questionnaire were used as measurements in order to capture the latent concepts (analogous to the constructs that we observed above; we thus assume that Questions 1–5 in Table 7 are manifestations of creativity, Questions 6–9 of planning, Questions 10–17 of marshalling, Questions 18–25 of ambiguity, Questions 26–29 of financial knowledge, and Questions 33–37 of entrepreneurial intentions). The treatment variable was included as an exogenous variable. If the program exhibits the intended effect, the treatment variable should affect the five latent efficacy constructs directly. These, in turn, are assumed to affect the outcome variable (i.e., entrepreneurial intentions). The results from a maximum likelihood estimation are summarized in a simplified path diagram in Figure 1 (see Table A3 in the appendix for the structural part of the regression output), where we focused on the relationships between constructs and outcomes but did not report relationships between measured variables or covariances between the variables.

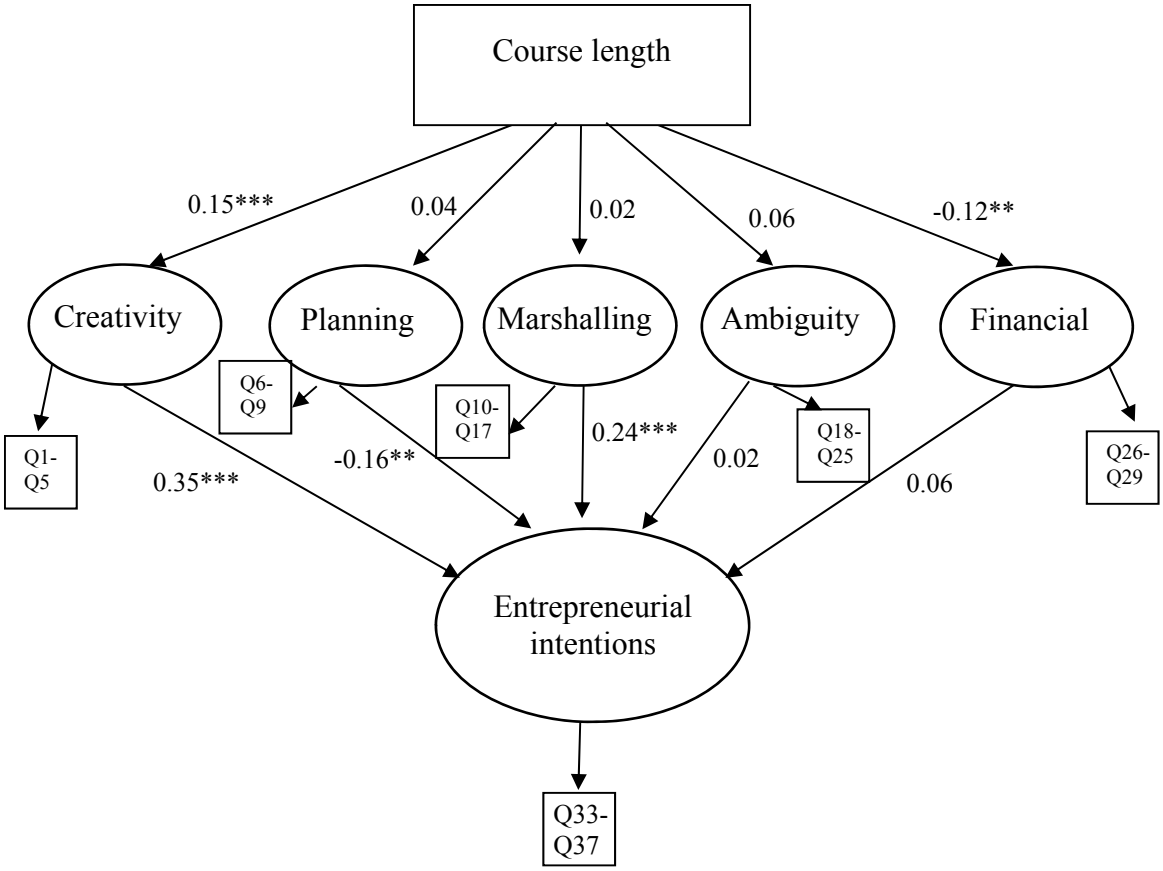
Figure 1. Path diagram from SEM maximum likelihood estimations



Endogenous variables. Measurement: Questions 1–29, Questions 33–37. Latent: creativity, planning, marshalling, ambiguity, financial, intentions. *Exogenous variables*. Observed: treatment. Log likelihood: -21580.62, Chi-2: 2522.32, RMSEA: 0.094, CFI: 0.774, TLI: 0.756, SRMR: 0.262, Observations: 403. Note: *, **, and *** reveal significance at the 10%, 5%, and 1% level, respectively.

The figure reveals that program participation does not have a significant effect on any of the five latent efficacy constructs. Furthermore, while the creativity and marshalling constructs are positively associated with entrepreneurial intentions (0.33 0.25, respectively; both $p > 0.05$), ambiguity and financial literacy are not statistically significant. Meanwhile, the planning construct exhibits a negative and statistically significant association with entrepreneurial intentions (-0.15, $p > 0.05$). In summary, the results indicate a weak effect from treatment on the development of entrepreneurial self-efficacy as well as on realized entrepreneurial intentions. That being said, the model fit is quite weak; for example, the comparative fit index (CFI) is far below 0.95, which is generally recognized as a threshold indicative of a good fit (Hu and Bentler, 1999). Things look differently if we instead consider course length as the exogenous variable, as shown in the path diagram in Figure 2.

Figure 2. Path diagram from SEM maximum likelihood estimations

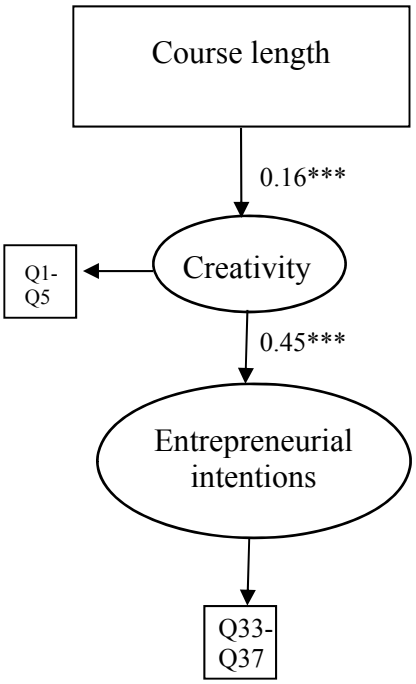


Endogenous variables. Measurement: Questions 1–29, Questions 33–37. Latent: creativity, planning, marshalling, ambiguity, financial, intentions. *Exogenous variables*. Observed: course length. Log likelihood: -21697.45, Chi-2: 2534.56, RMSEA: 0.095, CFI: 0.773, TLI: 0.755, SRMR: 0.263, Observations: 402. Note: *, **, and *** reveal significance at the 10%-, 5%, and 1%-level.

As shown in Figure 2, where course length is considered the exogenous variable, course length has a significant positive correlation with the creativity construct but a significant negative correlation with financial knowledge. These results suggest that increased exposure may in fact lead to more self-efficacy in terms of creativity, whereas the opposite relationship seems to hold with respect to financial knowledge. As before, however, the latter construct has no significant association with entrepreneurial intentions. While this model lends some support to the notion that more is more, its fit remains poor.

A plausible reason for the lack of good model fit is that we may have included too many variables with irrelevant relationships. In an attempt to improve the fit, we estimated a simplified model including only the creativity construct since this was the only construct to exhibit significant associations with both course length and entrepreneurial intentions. As can be seen in Figure 3, the associations remain the same, but the model fit improves considerably with CFI $\geq$ 0.95 and a RMSEA at a more acceptable 0.074.

Figure 3. Path diagram from SEM maximum likelihood estimations



Endogenous variables. Measurement: Questions 1–5, Questions 33–37. Latent: creativity, intentions. *Exogenous variables*. Observed: course length. Log likelihood: -7477.74, Chi-2: 142.88, RMSEA: 0.074, CFI: 0.959, TLI: 0.948, SRMR: 0.038, Observations: 426. Note: *, **, and *** reveal significance at the 10% , 5%, and 1% level.

Conclusions from Study 2

In summary, our results from Study 2 give some support to the notion that increased exposure to EET increases entrepreneurial intentions. However, this mechanism seems to operate solely through the effect of EET on creativity-related self-efficacy. In contrast, the effect of increased exposure on self-efficacy in financial knowledge appears to be negative, but this type of self-efficacy does not appear to have any effect on entrepreneurial intentions.

DISCUSSION

In this paper, we studied the effects of an EET program funded by the Swedish government, which was administered as either longer interventions in the form of university courses or shorter interventions delivered without university course credits. While much research in entrepreneurship education sees EET as causally related to entrepreneurial self-efficacy, entrepreneurial intentions, and the likelihood of engaging in entrepreneurship, we provided theoretical arguments problematizing whether increased exposure to EET improves outcomes.

To examine this question empirically, we conducted two studies examining the effectiveness of (1) university courses and (2) limited training interventions for entrepreneurial outcomes in terms of entrepreneurial self-efficacy, entrepreneurial intentions, and entrepreneurial entry and income.

The first study was based on a comparison of 1,420 participants to a control group of more than 600,000 Swedish university students. We showed that while in general, program participants were no more likely than comparable individuals to start a business one to three years after participation, students who had partaken in limited training interventions were more likely than comparable individuals to engage in entrepreneurship. In contrast, those who had participated in longer university course interventions were less likely than the matched control group to engage in entrepreneurship.

The second study was based on a survey sent out to participants in university courses and a control group of similar students with questions relating to entrepreneurial efficacy, entrepreneurial perceptions, and entrepreneurial intentions. Results from structural equation models provide some support to the notion that increased exposure to EET enhances entrepreneurial intentions, which contrasts the results from Study 1. The mechanism by which exposure to EET enhances entrepreneurial intentions seems to operate solely through the effect of EET on creativity-based self-efficacy. In contrast, the effect of increased exposure on self-efficacy in financial knowledge appears to be negative, but this type of self-efficacy does not appear to have any effect on entrepreneurial intentions.

Contributions to research on entrepreneurship education

Our study adds a missing piece to the puzzle laid by previous work on EET (Bae et al., 2014; Marin et al., 2014; Piperoulos & Dimov 2015) in that it suggests that government-sponsored EET efforts targeting large groups of students may indeed be beneficial but that the effectiveness of these efforts may hinge on the duration of the EET interventions as well as their pedagogical structure.

In line with experiential learning theory, our results suggests that entrepreneurship education efforts are more effective when delivered as shorter—often practice-based—interventions whereby knowledge is created through the transformation of experience rather than through theoretically oriented education in a classroom setting. Furthermore, our study highlights the importance of investigating both proximal outcomes from EET in terms of entrepreneurial self-efficacy and intentions as well as long-term outcomes in terms of entrepreneurial action, such as entering into entrepreneurship.

Limitations and future research

Our study comes with limitations, several of which constitute interesting avenues for future research. First, while our register data gave us access to measures of entrepreneurial entry before *and* after participation, we had to collect our measures of self-efficacy and entrepreneurial intentions after program participation. Therefore, we lack pre-post measures regarding these intermediate outcomes, which means that interpretations of Study 2 are correlational rather than causal, the matched participant and control group notwithstanding. As a result, there is a possibility that our results are affected by non-observable heterogeneity. In future studies, researchers could handle this problem by convincing organizers of EET interventions to collect psychometric data both before and after interventions are conducted as this would yield an enhanced understanding of how EET efforts are related to intermediate and long-term outcomes (e.g. Moberg, 2014; Astebro & Hoos, 2016; DeTienne & Chandler, 2004).

A second limitation is the relative short time that has passed since the interventions ended—between one and three years—and the time at which outcome measures were observed. This affected the potential to study outcomes in terms of realized entrepreneurial behavior. It is well-known that most entrepreneurs, especially successful ones, start their firms after being active in an industry for some time (Klepper, 2001), and the probability of starting a firm is highest among individuals in their 30s and 40s (Delmar & Davidsson, 2000). The long-term effects of these programs are therefore difficult to examine so soon after individuals' participation in entrepreneurship education efforts at the university level. This problem is by no means unique to this study. For example, the comprehensive GATE study in the United States followed individuals for a maximum of five years after program participation (Michaelides & Benus 2010; Fairlie, Karlan & Zinman 2015), whereas Karlan and Valdivias' (2011) study followed subjects for two years after participation in a Peruvian lending program. As time passes, follow-up studies can follow individuals in the Swedish program to better understand the long-term outcomes of EET.

Third, our evidence regarding more proximal outcomes from EET, such as entrepreneurial self-efficacy, attitudes, and intentions, were limited to participants in the university course interventions investigated using survey data in Study 2. Since these interventions did not materialize into enhanced likelihood of entrepreneurial entry or higher income among participants in Study 1, our test regarding proximal outcomes should be seen as conservative. If the same proximal outcomes could have been measured among participants

in the limited training interventions, it is possible that we would have found stronger results regarding the effects of short EET interventions on entrepreneurial self-efficacy, attitudes, and intentions.

Conclusion

In this study of an extensive government-sponsored EET initiative in higher education, we found that longer interventions (in the form of university courses) only modestly increase self-efficacy and entrepreneurial intentions but have no effect on entrepreneurial entry or income. Shorter intervention, however, increase both entrepreneurial entry and income. In sum, it seems that under the right circumstances, small interventions can be more beneficial than large initiatives for promoting entrepreneurship.

APPENDIX

Table A1. All projects in the program *Entrepreneurship in Higher Education*

University	Project name	Awarded amount (SEK)	Evaluated
Halmstad University	SISTERS 2—Support and inspiration for girls in entrepreneurship	772,548	Yes
University of Borås	Women's entrepreneurship in textile and fashion	1,050,000	Yes
Malmö University	Entrepreneurship in service innovation and service business	709,894	Yes
Södertörns University	Entré Q Flemingsberg: creativity, innovation, and business development	690,000	No**
Mid Sweden University	MIUN Innovation—For entrepreneurship in education	681,689	Yes
University of Gothenburg	Entrepreneurship in health care education at Sahlgrenska Akademin	639,996	Yes
Upgrades Education Sweden AB	Entrepreneurship theory	616,359	No**
Municipality of Varberg	EMBRYO: Entrepreneurship and business development	519,714	Yes
University of Borås	Facilitating entrepreneurship knowledge among university teachers	516,863	No*
University of Skövde	Care entrepreneurs	501,232	No**
Linnæus University	Entrepreneurial women at Linnæus University	497,199	Yes
SLU Holding AB	Trampolin Generation 2—Entrepreneurial developmental program for students at SLU	446,271	Yes
Lund University	Believe in your ideas	419,797	Yes
University of Borås	Entrepreneurship in textile and fashion	300,000	Yes
Swedish University of Agricultural Sciences	Lian: Women's entrepreneurship in green sectors	227,840	No*

Notes: *The project consisted of activities targeted at teachers. **Participants social security numbers could not be retrieved. Source: SAERG.

Table A2a. Average treatment effect on the treated for program interventions
Dependent variable: Entrepreneurial entry 2010–2014

Population: Women; 1,022 treated, 328,575 untreated

Comparison	Treated	Control group	Difference	S.E.	t-stat.
Unmatched (n = 329,597)	0.018	0.012	0.005	0.003	1.50
Matched (n = 2,044)	0.018	0.013	0.005	0.006	0.86

Table A2b. Average treatment effect on the Treated for university courses
Dependent variable: Entrepreneurial entry 2010–2014

Population: Women; 489 treated, 311,278 untreated

Comparison	Treated	Control group	Difference	S.E.	t-stat.
Unmatched (n = 311,767)	0.006	0.012	-0.006	0.005	-1.24
Matched (n = 978)	0.006	0.016	-0.010	0.008	-1.36

Table A2c. Average treatment effect on the treated for limited training interventions
Dependent variable: Entrepreneurial entry 2010–2014

Population: Women; 533 treated, 328,575 untreated

Comparison	Treated	Control group	Difference	S.E.	t-stat.
Unmatched (n = 329,108)	0.028	0.012	0.016	0.005	3.27
Matched (n = 1,066)	0.028	0.011	0.017	0.009	1.94

Table A3. SEM maximum likelihood estimation

Endogenous variables
Measurement: Questions 1–29, Questions 33–37
Latent: creativity, planning, marshalling, ambiguity, financial, intentions
Exogenous variables
Observed: treatment

		Coefficient	OIM Std. Err.	z-value
creativity <-				
	treatment	0.080	0.054	1.49
planning <-				
	treatment	0.071	0.053	1.34
marshalling <-				
	treatment	0.009	0.053	0.18
ambiguity <-				
	treatment	0.034	0.053	0.64
financial <-				
	treatment	-.012	0.051	-0.23
intentions <-				
	creativity	0.333	0.068	4.88
	planning	-0.148	0.068	-2.17
	marshalling	0.249	0.083	3.00
	ambiguity	0.014	0.078	0.18
	financial	0.058	0.056	1.06
Log likelihood:		-21580.62		
Chi-2:		2522.32		
RMSEA		0.094		
CFI		0.774		
TLI		0.756		
SRMR		0.262		
Observations		403		

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