A quasi-experimental difference-in-differences study to disentangle entrepreneurial competencies from entrepreneurial intention in an undergraduate entrepreneurship program[1]

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Type of study: Pre-test post-test quasi-experimental design using difference-in-differences and structural equations models for the identification strategy and empirical estimations.

[1] This project was developed as part of the Entrepreneurship Research Workshop, a training space for undergraduate management students interested in developing their research skills by carrying out projects under faculty supervision. The students involved in this project were: Mateo Uprimny, Andrés Martín, Víctor Guativa, Daniel Norato, Manuela Nava, María Fernanda Cuartín, and Laura Vélez.

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Motivation

Entrepreneurship is widely understood as one of the main drivers of economic development and social change. Hence, in the last decades, the increased interest of social planners and private individuals in entrepreneurship has led to an unprecedented growth among entrepreneurship education programs. Just in the realm of higher education, already a decade and a half ago, Katz (2003) estimated that over 2000 entrepreneurship courses were being offered in more than 1600 institutions in the U.S. Undoubtedly, this figure is expected to grow by many orders of magnitude when considering a global perspective, going beyond the confines of business schools and the U.S. This expansion is based on the agreement that entrepreneurship can be taught. From Gorman, Hanlon and King's (1997) seminal survey of the field to the most recent works on entrepreneurship education, research has shown that formal training has some effect on entrepreneurial skills, attitudes and intentions (Morris et al. 2013; Sánchez 2013; Bae et al. 2014; Walter & Block 2016). However, most efforts trying to provide evidence on the efficacy of entrepreneurship programs face an external validity limitation: a large number of subjects self-select into the program. In this study we use a Difference-in-Differences design that exploits a feature of the undergraduate curricula in our institution, which allows us to include in the treatment group subjects who a priori are not interested in becoming entrepreneurs. Namely, the pool of entrepreneurship students involves both some who voluntarily enroll in the program and others who must take the course as a graduation requirement, irrespective of their entrepreneurial intention. This identification strategy lets us separate entrepreneurial intent from the treatment, potentially leading to more robust evidence on the effect of entrepreneurship education.

Most studies on the effect of entrepreneurship education (EE) are quasi-experimental in nature, since formal education programs do not allow for the random allocation of subjects. Souitaris, Zerbinati, and Al-Laham (2007) conducted one of the first pre-test post-test quasi-experimental analyses of EE in the university setting, finding a positive effect of training on the entrepreneurship attitudes and intentions of science and engineering students. Subsequent studies have followed their methodological outline, proposing variations on the pre-test post-test design to measure the effect of EE on entrepreneurial traits, competencies, intention or motivation. However, these were often unable to randomize subjects or acknowledge the biases induced by the curricular components of the design, leading to inconclusive results (Von Graevenitz, Harhoff & Weber, 2010; Martin, McNally & Kay, 2013; Bae et al. 2014). Another limitation these studies face is their focus on traits, attitudes, intentions or motivations, which might not be affected by training in immediately transparent ways, presenting lags or measurement challenges. A need for further research in these lines is evident.

In this study we focus on the effect of EE on entrepreneurial competencies. We choose competencies because the literature has shown that entrepreneurial competencies can be developed through training (Morris et al. 2013). Moreover, competencies in general can be assessed in relation to past performance or based on scripts, which makes them ideal for pre-test post-test comparisons. In that sense, we align with Sánchez (2013), who studies the effect of EE on the entrepreneurial competencies of Spanish secondary education students. However, while he is limited to a treatment group where students enroll voluntarily in an entrepreneurship program, and compares it to a control group of students who stay outside of the program, our design allows us to clearly identify the students who self-select into the treatment, while still providing the same entrepreneurial training to those who must compulsorily take the entrepreneurship course. Hence, we can compare not only the treatment and control groups in terms of the competencies they develop and their entrepreneurial intention. We can also discuss the way the treatment affects

subjects who could have self-selected into the treatment given their background characteristics (interest in entrepreneurship, entrepreneurial intention, propensity for self-employment) but are not given that choice. Furthermore, in an interesting feature of our design, we have a subset of subjects in the treatment group that lets us analyze the way the course affects those who undergo the treatment despite not being explicitly interested in entrepreneurship before taking the course. Through this design we can also study the effect of EE on entrepreneurial intention by the way of a path analysis, focusing on the role of entrepreneurial competencies on such construct.

Design of the study proposed

In a nutshell, the set-up for our quasi-experimental design is the following:

The treatment consists of a semester long entrepreneurship course, offered by the university's business department to all undergraduate students. The entrepreneurship course is open. That is, it has no academic pre-requirements and any student from any major in the university can take the course in any semester during their undergraduate education. The course is offered in several sections and schedules every semester, following a standard learning plan. The course is structured as a venture-creation simulation and, by and large, comparable to most entrepreneurship courses offered at the undergraduate level in the world.[3]

The entrepreneurship course is compulsory for management students, who make up from 60 to 67% of the enrolled students depending on the semester. The second largest group of students who take the entrepreneurship course come from Industrial Engineering, counting for 25 to 28% of the cohort. The remaining students come from minors as diverse as medicine, arts, journalism, design, etc. None of these groups make up more than 1% of the student cohort. The number of students who take the course each semester fluctuates from 220 to 250.

We choose to focus on management and industrial engineering students for the comparison in this study because they are the closest in number, their study plans are the most comparable (as opposed to other majors who also take the course), and because entrepreneurship is explicitly offered as a minor alternative in the industrial engineering study plan.

Thus, the treatment group is composed by management and industrial engineering students who take the entrepreneurship course in a given semester. The treatment group has a size of approximately 200 students. The control group is composed by industrial engineering students who do not take the entrepreneurship course. The entrepreneurship course is offered in the fifth semester for management students. For this reason, we include in the control group industrial engineering students from the fifth semester onward. We randomly choose industrial engineering students to form the control group until it has a size similar to the treatment group (about 200 students).[4]

[3] Roughly speaking, during the semester the students must form a team and develop an entrepreneurial project, going from identifying a business opportunity to generating the business model to capitalize on it.

[4] We are aware of the value and need of including in the study a control group comprised of management students. For that we consider two alternatives: First, using the pre-test measurements of management students in a given period (t) as the control for post-test measurements of management students in a later period (t+1). Second, taking a sample of management students from a semester before they take the entrepreneurship course, and offering them a voluntary set of workshops, activities and lectures equivalent to the EE treatment. Hence, among the sample we would have control and treatment groups entirely comprised of management students, upon which we can apply the same pre-test post-test instrument and perform comparisons. Both options have their limitations but could help make our design and conclusions more robust.

We will develop an instrument to measure the students' entrepreneurial intention, and the following entrepreneurial competencies, before and after they have taken the course: self-efficacy, creativity, risk management, and resourcefulness.

These competencies were chosen because they are the most prevalent in the EE literature, being present in most of the studies on entrepreneurial competencies in one form or another, with standard measurements available for their assessment, but also because the four comprise the main categories in which one can classify the various competency taxonomies available.[5] Furthermore, there is evidence on the relation between these competencies and the intention of self-employment, often understood as a proxy for entrepreneurship intention.

The instrument being developed includes measurements for each of the four competencies and is based on Hodgkinson (1992) for self-efficacy, Politis, Winborg and Dahlstrand (2012) for resourcefulness, Hmieleski and Corbett (2006) for creativity, Morris et al. (2013) for risk management, and Kolvereid (1996) for entrepreneurial intention. All these are questionnaires with Likert-type response scales.[6]

The instrument will be applied to both the control and treatment groups the first and the last week of class. The instrument for entrepreneurial intention will be run on a different day from the one for the competencies, to avoid experimental demand biases.

The students will be asked to complete an online form while a teaching assistant provides them the link and waits until everyone is done, answering any question that might arise regarding the form or the questionnaire.

We will control for background characteristics of the students by including questions on: courses taken, work experience, parental employment, socioeconomic status, previous entrepreneurship training and experience, etc. All answers will be anonymized and identifiable only by a code assigned to each register.

Other characteristics will be controlled by sampling the control and treatment groups and running tests on the subsets sampled to measure their: IQ, Risk-taking attitudes, Self-confidence, Memory, etc. We will also obtain data on the university admission grade and GPA of the samples. This in order to isolate and control other potential sources of differences between the groups.

In order to analyze the effect of the program on entrepreneurial competencies and intentions, we propose a two-phase study:

First, we look at the effect of EE on each of the competencies. For that, we propose a classical DID design, where we compare the pre-test and post-test measurement levels for each of the competencies and observe whether the latter is significantly different between the treatment and control groups.

Second, we analyze the effect of entrepreneurial competencies on the entrepreneurial intention construct. For this we use a Structural Equations Model (SEM) to analyze if the entrepreneurial competencies studied play a role in entrepreneurial intent, and whether that effect is influenced, transformed or modified by the treatment.

[5] Cf. Morris et al. (2013).

[6] These instruments were chosen because they are of widespread use in the literature, to the point of being considered canonical. All the instruments used to measure the competencies were developed and applied in the context of EE. A relevant extension of the study would involve trying alternative instruments and measurement techniques, closer to capturing the actual performance of a competency and not simply a belief or perception.

Our hypotheses are:

1. Students who complete the entrepreneurship program will have higher measurement levels for the self-efficacy, resourcefulness, creativity and risk-management entrepreneurial competencies than before taking the course.
2. A higher level of entrepreneurial competencies will lead to a higher entrepreneurial intention.

Contribution and expected results

Regarding our expected results, on a first level our contribution would be to prove or disprove the effect of EE on the competencies and intentions of undergraduate students, a matter still subject to debate. In that sense, we contribute to the EE literature by devising and developing a quantitative study on the relation of entrepreneurship programs and outcomes relevant to future entrepreneurial activities. Moreover, we are able to extend studies on the effect of EE by limiting the self-selection bias thanks to an identification strategy that allows us to separate students who are interested in entrepreneurship, and take the treatment, from those who are subject to the treatment irrespective of their interest in becoming entrepreneurs. This might help us shed some light on the effect of the treatment and its interaction with background or baseline characteristics, a limitation of preceding quasi-experimental pre-test post-test studies.

To be precise, our design splits the population in four groups: We have a pool with students who want to become entrepreneurs and receive the treatment without opting into it, students who do not want to become entrepreneurs before taking the course and receive the treatment without opting into it, students who opt into the treatment (and can thus be assumed to be interested in becoming entrepreneurs), and a control group formed by the students who do not enroll in the entrepreneurship course and hence do not receive the treatment. If entrepreneurial intention is a proxy for entrepreneurial competencies (that is, there is endogeneity between the two variables since those more apt to become entrepreneurs naturally manifest a higher propensity to self-employment), on average, one can expect different levels of competencies and intention among the students who take the course voluntarily and those who take it compulsorily. This could even lead to a comparison with students who are interested in becoming entrepreneurs but do not take the course (likely a small subset of the control group). Thus, our results might let us argue whether the treatment, defined as fostering the development of the students' entrepreneurial competencies, is effective or not. This potentially allows us to disentangle entrepreneurial intentions from the treatment. In simpler words, we may be able to observe the effect of the treatment on subjects irrespective of their interest, desire or plans to become entrepreneurs. Ultimately, we expect the result of our study to bring more robustness to our conclusions on the effect of EE: if the treatment is effective, the entrepreneurial competencies of all students in the treatment group should be positively affected regardless of their entrepreneurial intention before taking the course. This is why we believe these results can enrich the analysis of educators, policymakers and institutions considering the role, goals and scope of entrepreneurial education in a society.