

Prior education and entrepreneurial intentions: the differential impact of a wide range of fields of study

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Abstract Studies on entrepreneurial intentions often neglect the heterogeneity of individuals' education background. This paper develops an integrated intention-based framework and analyzes the impact of fields of study on entrepreneurial intentions. Based on a sample of 2423 final-year students, enrolled in 32 fields of study, and resorting to logistic estimations, we find that, beside the attitude towards starting a business, fields of study, considered at a highly detailed level, are relevant (direct and indirect) predictors of entrepreneurial intention. We unambiguously show that there is a huge hidden potential for new venture creation in fields of study related to creative and leisure activities (e.g., Arts and humanities, or, more specifically, Literature and linguistics, History and archaeology, Audio-visual techniques and media production, Sports, and Architecture and town planning), Law, and Health (most notably, Pharmacy and Veterinary). Significant differences in the level of intention between students of different fields of study indicate that universities should more extensively focus entrepreneurship education on students in other subject area than business or engineering/technology sciences.

Keywords Entrepreneurial intentions · Entrepreneurial motivation · Prior educational background of entrepreneurs · Antecedents of entrepreneurial intentions

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1 Introduction

The economic importance of entrepreneurship is well established in the literature (van Praag and Versloot 2007; Landström et al. 2012). Entrepreneurship has been considered a means of boosting economic growth and job creation (Shane and Venkataraman 2000; Díaz-Casero et al. 2012; GEM 2014). In recent years, public policy has increasingly focused on promoting/stimulating entrepreneurial activities since they are regarded as a driving force for innovation (Farrington et al. 2012; Brancu et al. 2015). In this context, a vast range of programs and services (e.g., business plan competitions, education centers and entrepreneurship chairs) have been created in order to provide better infrastructure for new ventures (Nab et al. 2013). Part of these programs is directed at (university) students as future entrepreneurs.

Although the preference for entrepreneurship is not high among highly educated individuals (Nabi et al. 2010; van Praag 2011; GEM 2014), the economic benefits from formal education for entrepreneurs are large (and larger than for employees) (van Praag and Versloot 2007; van Praag et al. 2013). Moreover, the idea of becoming an entrepreneur is increasingly more attractive to students because it is seen as a valuable way of participating in the labor market without losing one's independence (Autio et al. 2001; Martínez et al. 2007; Barros 2015). Increasing disappointment has also been observed in traditional occupations in large companies (Kolvereid 1996; Bagheri and Pihie 2011), where restructuring processes involving major cost cutting has eroded the previous employment-related advantages of established companies, such as job security, reward for loyalty, and stability (Yemini and Yeheskel 2011). At the same time, the work values usually linked with the creation of one's own business (independence, challenge and self-realization) have become more desirable (Astebro et al. 2012).

The creation of one's own business involves careful planning and thinking on the part of the individual, making entrepreneurship a deliberate and planned *intentional* behavior (Webster 1977; Bird 1988). In fact, the "intentionality" (Katz and Gartner 1988: 431) of nascent/would-be entrepreneurs has long been stressed as an important variable in understanding the formation of new business ventures (Thompson 2009). As Krueger et al. (2000: 413) underlined, "...much of what we consider 'entrepreneurial' activity is intentionally planned behavior", and consequently applicable for intention models.

Behavioral intentions have been identified as the best predictor of actual behavior (Ajzen 1991; Zapkau et al. 2015), especially when such behavior is infrequent, difficult to observe and involves unforeseen time lags, as is the case of new business creation/entrepreneurship (Krueger et al. 2000). In this vein, entrepreneurial intentions (i.e., the intention of an individual to start a new business), as the first step in the process of discovering, creating and exploiting opportunities, are instrumental and critical to understanding entrepreneurship (Schlaegel and Koenig 2014).

There is a vast and growing body of literature that sustains the relevance of (university) students' entrepreneurial intentions in the decision to start a new

business (Bae et al. 2014; Fayolle and Liñán 2014). Such literature covers a broad range of subjects and approaches, including studies focusing on (see Liñán and Fayolle 2015): the core entrepreneurial intention models; the entrepreneurial process and the intention–behavior link; the role of personal-level variables or of context and institutions in shaping entrepreneurial intentions; and the interrelationship between (entrepreneurship) education and entrepreneurial intention. Despite the prolific research on entrepreneurial intentions, Fayolle and Liñán (2014: 663), in line with Krueger (2009), call for a “deep rethinking of research on the matter”. According to Fayolle and Gailly (2015), little is known regarding the potential link between individuals’ educational backgrounds and the antecedents of entrepreneurial intentions. Additionally, other authors (e.g., Wu and Wu 2008; Byabashaija and Katono 2011; Zhang et al. 2014) argue that research on the effect of the type of education on entrepreneurial intention is limited and still requires further empirical testing.

Studies on entrepreneurial intentions often neglect the heterogeneity of individuals’ education background. Indeed, an analysis of 87 studies in the area confirms that 18 % simply do not refer to (and thus, fail to control for) the educational background of individuals, 52 % address the entrepreneurial intentions of business students only, and 3 % compare the latter with engineering students.¹ Among the few studies that include in their samples students from diverse educational background or fields of study (17 %), the majority does not analyze the potential distinctiveness of entrepreneurial intention according to the field of study; the very few that do (6 studies), use highly aggregated categories—business versus non-business (Wu and Wu 2008; Rittippant et al. 2011); technological versus non-technological majors (Zhang et al. 2014); non-science majors (engineering, business or computer science) versus (natural) sciences (Wang et al. 2002); business, humanities versus science or technology (Schwarz et al. 2009); business administration, economics and law, natural sciences and engineering, and other social sciences (Zellweger et al. 2011). Extant research on this topic reveals some inconsistency in the findings (De Clercq et al. 2013)—some studies fail to find statistical significance for the variable field of study (e.g., Zellweger et al. 2011), others point out that engineering or technological students present the highest intentions (e.g., Wu and Wu 2008; Zhang et al. 2014), whereas in other studies, students from business or entrepreneurship-related majors (i.e., business and management) emerged as the most entrepreneurially-led (e.g., Schwarz et al. 2009; Rittippant et al. 2011). Such inconsistencies indicate that there is still a need to improve our understanding of the preconditions of entrepreneurial intent. Moreover, failing to consider the wide heterogeneity of individuals’ educational backgrounds may cause public policy-makers to improperly homogenize entrepreneurs and compromise the efficient allocation of public and private funding toward those who are more likely to start new businesses.

Our study contributes to the literature in several ways. First, we develop an integrated intention-based framework and systematically analyze the impact of field of study on entrepreneurial intentions, considering both the direct impact and the

¹ A table with the list of these studies which explicitly identifies the educational background (i.e., course/major/field of study) of the students surveyed can be available on request from the authors.

impact on entrepreneurial intentions mediated by perceived desirability/attitude toward entrepreneurship and perceived feasibility/behavior control/self-efficacy. Consequently, we link educational background (involving 32 fields of education/study)² with relevant attitude variables proposed by the two most influential models of entrepreneurial intentions, Ajzen's (1991) theory of planned behavior and Shapero's model of entrepreneurial event (Shapero and Sokol 1982). As such, we respond to calls for the integration of competing models of entrepreneurial intention which might preclude the fragmentation of the field and simultaneously lead to higher empirical precision (Schlaegel and Koenig 2014). Second, beside the type of education, we include other human capital or entrepreneurial knowledge-based variables (prior entrepreneurial exposure, e.g., professional experience and family role models, and learning orientation), which reflect the skills and knowledge acquired through investment in schooling and/or on-the-job-training, and other types of experience (Bae et al. 2014). Such an endeavor is likely to improve our understanding of the deep assumptions underpinning intentions by integrating the psychological and cognitive characteristics of the individuals (Tolentino et al. 2014). Third, we analyze students located in an underexplored setting, Portugal. Portugal shares a type of culture with a vast number of countries (Latin America as a whole and Arab countries, some Asian countries—South Korea, Thailand and Taiwan—and some European countries—Greece, Italy (south), Turkey and Russia) characterized by very high uncertainty avoidance (Wursten and Lanzer 2013). Although high uncertainty avoidance cultures are expected to be negatively associated with new business creation intentions and behavior, Wennekers et al. (2007) sustain that such a characteristic might exert a positive influence on entrepreneurial intentions and behavior by increasing psychic benefits (e.g., greater autonomy/independence). Thus, the analysis of the intentions of Portuguese might shed some light on this debate.

The paper is structured as follows: in the following section, a review of the literature on students' entrepreneurial intentions is presented. Then, in Sect. 3, we detail the methodology and describe the data. The estimation model and results are presented in Sect. 4, followed by Sect. 5 which discusses the results. Section 6 concludes the paper highlighting its main contributions and implications as well as its limitations and paths for future research.

2 Students' entrepreneurial intentions: a literature review

2.1 An integrated framework of entrepreneurial intentions

Individual entrepreneurial intention is thoughtfully defined by Thompson (2009: 676) as "a self-acknowledged conviction by a person that they intend to set up a new business venture and consciously plan to do so at some point in the future". As a conscious state of mind that precedes action and guides career decision-making

² To categorize the different education programs, we use the detailed educational field classification, ISCED 2013 (UNESCO 2014).

(Buttar 2015), entrepreneurial intention plays a pivotal role in an individual's decision to set up a new business (Bird 1988; Nabi et al. 2010) and it is considered the best predictor of that entrepreneurial future activity occurring (Shapero and Sokol 1982; Bird 1988; Kolvereid 1996; Krueger et al. 2000; Carsrud and Brännback 2011).

Considering that the literature on entrepreneurial intention is “a prime example” of interdisciplinarity in science (Fayolle and Liñán 2014: 663) by successfully integrating theories from adjacent fields (most notably cognitive and social psychology) into the study of entrepreneurship, the conceptual model proposed in the present study to serve as the theoretical framework for our analysis integrates four main contributions (see Fig. 1), namely the Theory of Planned Behavior (Ajzen 1991), Shapero's model of Entrepreneurial Event (Shapero and Sokol 1982), Bandura's (1977, 1982) cognitive approach on perceived self-efficacy, and the Theory of Cognitive Psychology, which underlies Bird's (1988) Implementing Entrepreneurial Ideas model.

The most influential theoretical frameworks that explain the formation of entrepreneurial intentions are Shapero's model of Entrepreneurial Event (SEE) (Shapero and Sokol 1982) and Azjen's (1991) Theory of Planned Behavior (TPB) (Nabi et al. 2010; Schlaegel and Koenig 2014). Both frameworks consider entrepreneurial intention as the main trigger for subsequent entrepreneurial behavior, and argue that the intentions may be predicted from attitudinal variables that influence behavior indirectly (Lanero et al. 2015).

Three attitudinal antecedents that predict the formation of intention are identified in the TPB (Ajzen 1991): the ‘attitude toward the behavior’—the degree to which the individual holds a positive or negative personal valuation of entrepreneurship; ‘subjective norms’—the perceived social pressure from family, friends, or significant others toward the behavior; and the degree of ‘perceived behavioral control’—the perception of situational competence which reflects the perceived ability to start new ventures.

The ‘attitude toward the behavior’ in the TPB is equivalent to the ‘perceived desirability’ of the behavior in the SEE model, which consists in “the personal attractiveness of starting a business” (Krueger et al. 2000: 419). The concept of ‘perceived behavioral control’ or perceived ability to engage in entrepreneurial activity overlaps Bandura's (1982: 122) perceived ‘self-efficacy’ (“... how well one can execute courses of action required to deal with prospective situations”), and it is equivalent to ‘perceived feasibility’ in the SEE model, that is, the individuals' perceived ability to successfully perform the focal behavior (Zapkau et al. 2015).

Taking the arguments above, we hypothesize that:

H1 Students with a more favorable attitude to entrepreneurship (higher ‘perceived desirability’/‘attitude toward the behavior’) tend to present stronger entrepreneurial intentions.

H2 Students with greater perceived behavior control (i.e., ‘perceived feasibility’/‘self-efficacy’) regarding entrepreneurship tend to present stronger entrepreneurial intentions.

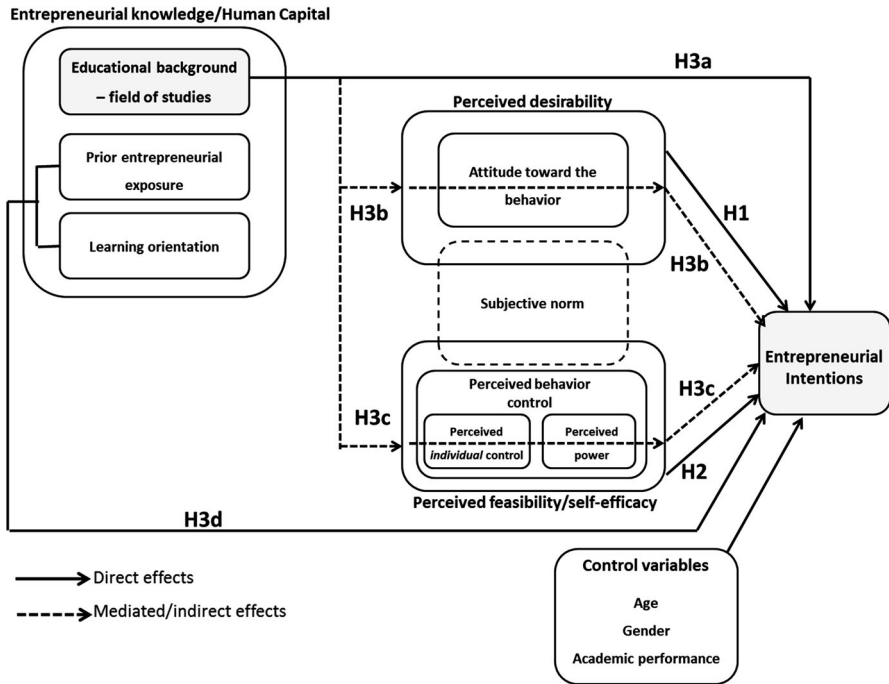


Fig. 1 The integrated conceptual framework. *Source:* Adapted from the Theory of Planned Behaviour (Ajzen 1991), Shapero’s model of Entrepreneurial Event (Shapero and Sokol 1982) and Bandura’s (1977, 1982) cognitive approach on perceived self-efficacy, and the Theory of Cognitive Psychology which underlies Bird’s (1988) model

Given that ‘subjective norms’ are difficult to capture (Bagozzi et al. 1992) and empirical studies evince discouraging predictive power on students intentions (Krueger et al. 2000; Autio et al. 2001; Zampetakis et al. 2015), some authors suggest that it might conveniently be integrated both with ‘perceived desirability’ and ‘perceived feasibility’ (Krueger et al. 2000), and/or better examined through the effect of prior entrepreneurial exposure on intentions (Reitan 1997; Krueger et al. 2000; Zhang et al. 2014). In this study, we recognize the reasonability of both approaches—in Fig. 1, ‘subjective norms’ is positioned between ‘perceived desirability’ and ‘perceived feasibility’ with the dashed line indicating that this factor is not directly impacting on entrepreneurial intentions. It is instead included in the former attitudes and is indirectly considered through the mediating impact of entrepreneurial knowledge/human capital. For instance, peer pressure intrinsic to courses/fields of study tends to act as ‘entrepreneurial socialization’ processes (Pailot 2003) by which the individual perceives that the focal behavior is not only feasible but it is desirable as it is acceptable within one’s social group (Buttar 2015).

We further recognize that entrepreneurial intentions are determined by attitudes and the latter are influenced by ‘exogenous factors’, namely situational/environmental variables (Ajzen 1991; Krueger et al. 2000; Nabi et al. 2010), which include, among others, physical surroundings (e.g., school/university), social surroundings

(e.g., friends/colleagues' social networks/fields of study) or antecedent states (e.g., prior entrepreneurial exposure or learning orientation). Thus, the impact of attitudes/perceived feasibility/desirability on entrepreneurial intentions may vary not only between individuals but across environments, groups and cultures (Schwarz et al. 2009; Engle et al. 2010).

The next sections discuss in detail the direct and indirect impact of entrepreneurial knowledge/human capital on entrepreneurial intentions (i.e., Hypotheses 3a–d).³

2.2 Educational background/field of study and entrepreneurial intentions

Several studies (e.g., Ajzen 1991; Krueger et al. 2000; Tolentino et al. 2014) show that antecedents of entrepreneurial intentions are affected by situational factors, among which educational background is one of the most important factors (Wu and Wu 2008). The influence of higher education, namely of the educational background/field of study, on students includes three main dimensions (West and Hore 1989), which are consistent with the components of our integrated model: (1) personal development, including changes in values and attitudes; (2) perceived abilities; and (3) perceived social impacts.

Each field of study has its own 'culture', that is, set of values and norms that shape individuals' perceptions about the world (Brancu et al. 2015). Values are belief systems that guide one's behavior, in which the responses that result from one's values become attitudes. Values can drive attitude and behavior (Vinson et al. 1997) and therefore interfere in the decision-making process related to field of study and career choices (Añaña and Nique 2010; Kopanidis and Shaw 2014). Distinct fields of study are underpinned by different values (Singh et al. 2011), and these values are a major influence on (perceived) attitudes and behaviors towards career aspirations, intentions and paths (Ledden et al. 2007). Focusing on (800) students in the Netherlands, van Praag (2011) finds a strong association between the perceived status of the entrepreneur, which differs among fields of study, and the willingness to become an entrepreneur. In particular, she shows that whereas students in economics and business attach similar status to the entrepreneur as students in the fields of science, technical studies and humanities, students in health and social sciences attach lower value to the status of the entrepreneur.

Fields of study represent what Fayolle and Liñán (2014) call 'communities', that is, sub-dimensions of the institutional context—in which cognitive and social capital (social networks and relationships) interact (Buttar 2015)—that play a direct role in students' entrepreneurial intentions. The social network of an individual inherent to her/his field of study might have a decisive impact on their access to knowledge that facilitates both the discovery of opportunities and the ability to exploit these opportunities (Aldrich et al. 1987; Dohse and Walter 2012). Zhang et al. (2014: 628), based on the entrepreneurial expertise approach, claim that formal entrepreneurship education, usually associated to business, management and

³ Personality factors, namely age, gender and academic performance, are included in the model as control variables in line with the extant literature in the area (see Walter and Heinrichs 2015).

economics (Wang et al. 2002; Wu and Wu 2008; Schwarz et al. 2009; Nabi et al. 2010), endows students in these majors with different “unique entrepreneurial expertise” that directly impacts on their entrepreneurial intentions.

It is further argued (see Bae et al. 2014) that distinct educational backgrounds are related with perceived entrepreneurial self-efficacy, which may increase entrepreneurial intentions. Indeed, some contend that ‘technical’ related courses/majors provide specific know-how that increases students’ perceived feasibility or behavior control. For instance, Wu and Wu (2008) found that engineering students present a higher entrepreneurial intention than students from other majors. The study of Hassan and Wafa (2012) evinces that students enrolled in a science program (at the Universiti Malaysia Sabah) reveal a significantly higher level of risk-taking as well as entrepreneurial intention. They explicitly link such results to the mechanism that influences self-efficacy as noted by Bandura (1986), which includes enactive mastery (hands-on experience), vicarious learning, and physiological/emotional arousal. Accordingly, science students can be considered as having technical skills, which assumedly provide them with an advantage over arts and business students (the other majors analyzed by the authors) and may lead to a keener sense of self-efficacy, ultimately increasing their entrepreneurial intention. Earlier studies (e.g., Richardson 1993; Ewert and Baker 2001) also suggest that individuals in different major academic fields grasp different knowledge which can play a mediating role for entrepreneurship abilities. Specifically, Richardson (1993) shows that some academic majors, such as communication or human ecology, facilitate growth and development in personal/social skills, while others, such as engineering and science, facilitate growth and development in quantitative skills.

Fields of study might also impact on entrepreneurial intentions via perceived desirability (combining the attitude toward the behavior and subjective norms). For instance, the absence (regardless of the economic environment) of regular (acceptable) employment options in some courses makes self-employment or new business creation a ‘desirable’ and accepted ‘community’ career path (Shapero and Sokol 1982; De Clercq et al. 2013). In contrast, other courses might generate more lucrative paid wage employment under better working conditions and thus decrease entrepreneurial intentions (Wang et al. 2002; van der Sluis et al. 2005). Finally, in some courses, such as Arts and Social Sciences, students reveal distinct mind-sets compared to their business, engineering and science counterparts (Shepherd et al. 2008), and attribute more importance to self-direction values, disapproving stability and conformity (Añaña and Nique 2010). Such values affect perceived desirability attitudes and might enhance students entrepreneurial intention, seeing as one of the immaterial benefits of entrepreneurship is autonomy and independence (Wennekers et al. 2007).

H3a Students’ distinct educational backgrounds/fields of study directly influence their entrepreneurial intentions.

H3b Students’ distinct educational backgrounds/fields of study indirectly, via perceived desirability, influence their entrepreneurial intentions.

H3c Students' distinct educational backgrounds/fields of study indirectly, via perceived feasibility, influence their entrepreneurial intentions.

2.3 Other human capital/entrepreneurial knowledge variables and entrepreneurial intentions

Although previous studies suggest that exogenous factors (e.g., prior entrepreneurial exposure, learning orientation) are only weak *direct* predictors for the decision of starting a new venture, students' attitudes are influenced by them (Krueger et al. 2000).

Perceived behavior control/self-efficacy can be acquired gradually through the development of complex cognitive, social, linguistic, and/or physical skills that are obtained through experience (Boyd and Vozikis 1994), as well as through formal and informal education modes, including the level and type of education and roles models (Zapkau et al. 2015). By mastery and vicarious experiences (Bandura 1982), often associated with proficient role models and past professional experience, the individuals "are exposed to business related knowledge, necessary skills for day-to-day business operations, as well as unbiased inside information that facilitates optimism about their capabilities and resources to manage business ventures of their own" (Tolentino et al. 2014: 405).

Certain contingency factors, namely those that help to alleviate the complexity and ambiguity surrounding entrepreneurship (Saravathy 2008), might facilitate the conversion of career-specific motivations into entrepreneurial intention. This is the case of learning orientations that reflect "people's propensity to update their current knowledge set continuously" (De Clercq et al. (2013: 653), being likely to enhance self-efficacy and thus entrepreneurial intentions.

H3d Students with greater prior entrepreneurial exposure and/or learning orientation tend to present stronger entrepreneurial intentions.

3 Methodology

3.1 Data, self-selection and non-response bias procedures

Entrepreneurial intention needs to be studied prospectively (Krueger and Carsrud 1993). Thus, it requires samples of individuals who may or may not intend to start a new business (Krueger et al. 2000; Zapkau et al. 2015). Although not representative of the general population, university students are perfectly suited to the study of entrepreneurial intentions, as they are considered representative of individuals involved in career decisions and a wide variety of experiences, intentions and attitudes towards entrepreneurship that make them particularly suitable for this purpose (Lanero et al. 2015). Additionally, compared with a general adult sample, they are less likely to have concrete entrepreneurial experience, a factor which might confound the level of entrepreneurial intentions (De Clercq et al. 2013).

We tested our hypotheses on a database consisting of final-year students from the University of Porto (Portugal). The population of final-year students totaled 3761 individuals, covering 55 courses, offered at 14 schools/faculties. The survey was conducted from September 2006 to March 2007.⁴ The majority of the questionnaires were administered in a classroom setting by the first author of this paper—the target classes in each course were identified with the collaboration of the schools' deans and staff. Furthermore, in order to reduce selection bias (Zhang et al. 2014), the common elective subject/major with the highest number of enrolled student was chosen. In each class, the purpose of the research was explained, stressing also that the students' responses were voluntary and anonymous. All the students that attended classes responded. Consequently, for the classroom setting, given that the respondents' propensity to participate in the study was not correlated with the substantive topic the researchers were trying to study, there was no self-selection bias in the resulting data (Olsen 2008). However, in some courses, final-year students were involved in internship training and did not have classroom lectures. Thus, in order to increase the response rate and avoid nonresponse bias,⁵ we combined the in-class questionnaires with an online survey (publicized in an official email letter sent by each school's dean encouraging the students to respond to the questionnaire).

A total of 2423 valid responses were gathered,⁶ representing a high average response rate of 64 %. By school and course/field of study, the sample is fairly representative of the population of final-year students.⁷ In terms of broad fields of study (according to ISCED-F 2013), the fields with the highest percentage of respondents/enrolled final-year students are Engineering, manufacturing and construction (25.2 %), Social sciences, journalism and information (21.2 %), Arts and humanities (13.2 %), Business, administration and law (10.6 %), Natural sciences, mathematics and statistics (10.4 %), and Health and welfare (10.3 %). Using the detailed education fields, the most representative are Economics (14.2 %),

⁴ Although the data are rather old, they are still a valid basis for deriving current conclusions, seeing as entrepreneurial values and intentions have not changed much since 2007, neither in the education system nor in the start-up behavior. Even though the Bologna Process was formally implemented in Portugal in 2006 (by Decree-Law no 74/2006), according to Leite and Ramos (2014: 81), "...the implementation of the new teaching/learning framework represents a challenge not fully overcome within HEI". Moreover, a recent study by Barros (2015) shows that the financial crises did not have a major impact on students' values and attitudes towards entrepreneurship: no significant statistical differences were found between the students of the 2012 cohort and students of the 2006 cohort in terms of achievement, risk, authority or autonomy.

⁵ Nonresponse bias might occur when (Yu and Cooper 1983: 36) "a researcher (1) fails to obtain information from a sizable portion of the sample members and (2) the missing members' responses affect conclusions about the variables of interest. Sample members may become nonrespondents because they refuse to respond, lack the ability to respond, or are inaccessible to the researcher."

⁶ From the total responses gathered (2430), 7 responses were discarded as no valid information on the field of study was provided by the respondents.

⁷ The school of Economics, namely the economics and management courses (representing 20 % in the sample versus 13 % in the population), was overrepresented in the sample, whereas the two schools of medicine, and the corresponding medicine courses, were underrepresented (4 % in the sample versus 10 % in the population). All the remaining schools and courses presented similar weights in the sample and in the population.

Electronics and Automation (incl. Electronics and Computing Systems Engineering) (8.1 %), Mechanics and Metal Trades (incl. Mechanics, Metals, Mines and Industrial Engineering) (6.9 %), Business and Administration (6.3 %), Architecture and Town Planning (4.6 %), Literature and Linguistics (4.3 %), Law (4.3 %), and History and Archaeology (4.1 %).

We tested for potential self-selection (in the online survey) and nonresponse bias in a two-step procedure. First we compared, by course, the students' control/demographic variables (age, gender, and academic performance/Grade Point Average), and the entrepreneurial intentions of students that responded in class with those who responded online. For the online survey, and following the usual procedures to assess nonresponse bias (Lahaut et al. 2003), we compared the means of the relevant variables for 'earlier' and 'late' respondents.

In the respondent sample, about 44 % of students are male, are, on average, 24 years old, present a Grade Point Average of 13.4 (out of 20), and 26.5 % claim they intended to start a new business after graduation (i.e., within 1–2 years). No significant differences existed, overall and in each of the 32 detailed fields of study considered, in the age and Grade Point Average profile of classroom and online participants and, regarding the latter, between earlier and late respondents. In terms of gender, the weight of male students is higher for the online survey compared to the classroom (49 vs. 40 %) and, by field of study, the weight of males is higher in the online survey (compared to the classroom one) in Pharmacy and Architecture and Town Planning and lower in Veterinary and Chemical Engineering. Economics and Business and Administration present a higher percentage of male students in the late respondent category (compared to that of earlier respondents). In general, no noticeable differences exist in entrepreneurial intentions for the classroom-online and earlier-late respondent categories by field of study. The few exceptions regarding the classroom-online categories are Veterinary and Architecture and Town Planning, where the entrepreneurial intentions of online respondents are higher than those of classroom respondents, and Earth Sciences and Audio-visual techniques and media production, where the entrepreneurial intentions of online respondents are lower; regarding the earlier-late categories, late respondents from Economics and Business and Administration reveal higher entrepreneurial intentions than earlier respondents (note that males predominated in the late respondents from these field of studies).⁸

Summing up, although some self-selection and non-response bias exist in a few fields of study, we contend that this problem is not severe and, thus, does not undermine the analysis.

3.2 Measures

3.2.1 Entrepreneurial intention

Intention is a prediction of one's behavior at some point in the future (Prabhu et al. 2012). The link between intention and behavior needs to be clear and significant to

⁸ Data analysis is available from the authors upon request.

individuals (Sheppard et al. 1988); in other words, intention measures should precisely correspond to the central behavior ('starting a new business') and must include a conceivable time span during which such behavior should occur (Thompson 2009; Zapkau et al. 2015).

In line with other studies (e.g., Krueger 1993; Krueger et al. 2000; Zhang et al. 2014), we measured entrepreneurial intention as one single item scale. Adapted from Zellweger et al. (2011), our dependent variable captures the intention of an individual to start a business as opposed to pursuing a career in the form of employment in organizations (or combining the two options). Entrepreneurial intention is a dummy variable which assumes the value 1 if the student answers "Solely entrepreneur (start my own business/being self-employed)" to the question: "What is your intended career choice *after graduation*?" [Possible responses: (1) Solely employee; (2) Solely entrepreneur (start your own business/being self-employed); (3) Combining employee and entrepreneur]. In terms of the relevant time span during which such behavior should occur, we opted for "after graduation", that is, 1–2 years for final-year students, instead of 5 years as in Krueger et al. (2000) or Dohse and Walter (2012), because "a shorter time frame will result in a more accurate measurement of intent." (Prabhu et al. 2012: 566) and reveal higher intention intensity (Wang et al. 2002).

Almost 27 % of the respondent final-year students intend to become entrepreneurs after graduation. Intentions vary greatly with the fields of study (see Fig. 2), both in broad and detailed categories. The most entrepreneurial (broad) fields are 'Veterinary/Agriculture/Forestry/Fisheries', 'Arts & Humanities' and 'Services (Sports)', with 37.1, 32.2, and 32.1 % of the corresponding total students, respectively, who intend to become entrepreneurs after finishing their courses; the least entrepreneurially-led are 'Social sciences (incl. Economics), Journalism and Information' (22.5 %) and 'Engineering, Manufacturing and Construction' (24.2 %). Regarding more detailed fields of study, over one-third of the students enrolled in Physics, Chemistry, Veterinary (incl. Fisheries and Agriculture), Pharmacy, and Law intend to start their own business after graduation, whereas in Psychology, Nutrition (Therapy and rehabilitation), or Chemical Engineering and Processes, less than 15 % of students intend to do so. Business, Economics and Engineering, often considered the traditional focus of entrepreneurship educational programs (Zhang et al. 2014), stand below the average in terms of entrepreneurial intentions.

3.2.2 Attitudes toward behavior/perceived desirability

Attitudes towards starting a new business or perceived desirability refer to the degree to which an individual evaluates a specific behavior ('to start a new business') as favorable or unfavorable (Ajzen 1988). In other words, and according to Douglas (2013: 635), it refers to "... the personal appeal of entrepreneurial action and depends on the individual's attitudes to five salient outcomes of entrepreneurship, namely income, autonomy, risk, work effort, and other intrinsic costs and benefits". In this line of reasoning, to obtain the latent construct of 'attitudes/perceived desirability', we employ a six-item measurement encompassing 5 Likert-

scale items (each ranging from “1”: no fear, to “5”: extreme fear), asking respondents to indicate the issues [reflecting the individual’s attitudes to the five salient outcomes of entrepreneurship referred to by Douglas (2013)] that produce the *highest fears* when they think about starting their own business: PD1) Uncertainty in remuneration; PD2) Employment instability; PD3) Need to invest a lot of time and energy in the project; PD4) Possibility of failing personally; and PD5) Possibility of bankruptcy –, plus one Likert-scale item (ranging from “1”: strongly disagree, to “5”: strongly agree), asking respondents to indicate their level



Fig. 2 Entrepreneurial intentions (%) by courses. *Note* Dark (light) grey bars represent above (below) the average entrepreneurial intentions. The average entrepreneurial intentions is 26.5%. *Source:* Authors’ computations based on data gathered from September 2006–March 2007

of agreement with a statement reflecting the context desirability to create a new business: “The present business climate is not favorable to the creation of your own business” (PD6).

The construct ‘Perceived Desirability’ (PD) would involve the above 6 items (PD1 to PD6) in a reverse scale in order to get higher values, meaning that the individual evaluates the start of a new business as more favorable.

Considering the 6 items, the internal reliability is rather low with a Cronbach’s alpha of 0.56. Upon closer inspection, we find that the scale includes two items (PD3 and PD4) with low correlations. After excluding these items, Cronbach’s alpha increases to 0.63, indicating an internal reliability sufficient for further exploratory research (Hair et al. 2009). Thus, the latent construct for ‘Perceived Desirability’ (PD) is computed as the average of the four remaining items PD1, PD2, PD5 and PD6. Regarding the validity of the scale, factor analysis on these four items shows that the scale is unidimensional.⁹

3.2.3 Perceived feasibility/perceived behavior control/self-efficacy

Perceived behavioral control (Ajzen 1991) describes the perceived feasibility (Shapiro and Sokol 1982) or ease or difficulty/self-efficacy (Bandura 1982) of performing the action as evaluated by the actor himself. It is assumed to reflect past experience and anticipated impediments and obstacles (Karpainen and Berghäll 2015). Perceived behavioral control can thus be divided into two components, control beliefs and the perceived power of the particular control factor to facilitate or inhibit behavior (Ajzen and Madden 1986).

We measure perceived feasibility (PF) as an overall measure containing efficacy as well as controllability perceptions, including the ‘perceived power’, that is, perceived presence of factors that may facilitate or impede performance of a behavior, contributing to an individual’s perceived behavioral control over each of those factors. To this end, we used nine Likert-scale items (each ranging from “1” to “5”) asking respondents to indicate the degree of agreement with perceived abilities possessed and difficulties faced in starting a business (i.e., to successfully address the focal behavior): PF1) I feel that I lack managerial knowledge to start a business; PF2) I feel that I lack technical knowledge to start a business; PF3) It will be difficult to start a new business due to lack of management competencies; PF4) My course provides me with the required tools and knowledge to start a business. Then, the items regarding perceived power included: “It will be difficult to start a new business due to... PF5) ... lack of financial support; PF6) ... complex

⁹ Internal reliability or consistency refers to the overall degree to which the items that make up a scale are intercorrelated, whereas homogeneity and unidimensionality indicate whether the scale items assess a single underlying factor or construct (Clark and Watson 1995). Internal consistency is a necessary but not sufficient condition for homogeneity or unidimensionality. In other words, a scale cannot be homogeneous unless all of its items are interrelated, but a scale can contain many interrelated items and still not be unidimensional. Because theory-driven assessment seeks to measure a single construct systematically, the ultimate goal to pursue is that of homogeneity or unidimensionality rather than internal consistency per se.

bureaucratic process; PF7) ... lack of information available on how to do it; PF8)... lack of innovative ideas; PF9) ... lack of institutional support.

All the items, except for PF4, were included in the PF construct in a reverse scale in order to get higher values, meaning that the individual perceives the start of a new business as easier or more feasible.

The Cronbach's alpha of the nine items amounts to 0.67, showing an internal reliability sufficient for further exploratory research (Hair et al. 2009). However, the factor analysis performed on these nine items shows that the scale is not unidimensional and advises the splitting of these items into two separate scales, one measuring the latent construct of 'perceived *individual* control' (PiC) (including the items PF1,...PF4), and another measuring the construct 'perceived power' (PP) (including the items PF5,...PF9).

Regarding the first scale's internal reliability, the Cronbach's alpha amounted to 0.61. Given the low total correlation of PF3 and PF4, we excluded these items and reached a Cronbach's alpha of 0.70, which is commonly taken as the acceptable threshold (Nunnally and Bernstein 1994). Factor analysis confirms the validity of this scale evidencing that it is unidimensional. Thus, the latent construct for 'Perceived *individual* control' (PiC) is computed as the average of the two items, PF1 and PF2.

The reliability of the second scale when including the items PF5, ...PF9 produces a Cronbach's alpha of 0.59. When we exclude the item with the lowest total correlation (PF8), the Cronbach's alpha goes up to 0.68, near the acceptable threshold (Nunnally and Bernstein 1994), which, according to Hair et al. (2009), warrants an internal reliability that is sufficient for further exploratory research. The factor analysis confirms the validity of this scale showing that it is unidimensional. The construct 'Perceived Power' (PP) is computed as the average of four items, PF5, PF6, PF7 and PF9.

3.2.4 Entrepreneurial knowledge/human capital

3.2.4.1 Educational background/field of study A field of study is defined as the "broad domain or area of content covered by an education programme" (UNESCO 2014: 5), where the subject matter (factual, practical and theoretical knowledge) determines the field of study/education. Data was originally collected from students enrolled in 55 distinct courses/education programs. To categorize the distinct education programs, we employed the detailed educational field classification ISCED 2013 (UNESCO 2014), obtaining 32 detailed and 11 broad education fields of studies. We then computed 32 dummy variables (1 if the student is enrolled in a given field and 0 otherwise) for the detailed education fields and 11 for the broad education fields. For the purposes of the model's analysis, we considered the 'Business and Administration' field of study as the default category. Recall that the average entrepreneurial intention for this field of study is 24.7 %, slightly below the mean for the full sample of respondents (26.5 %).

3.2.4.2 Prior entrepreneurial exposure Individuals who possess idiosyncratic prior knowledge are more likely to discover and exploit a given business opportunity (Shane 2000; Dohse and Walter 2012). Such knowledge can be derived from several distinct sources and prior experiences (Douglas and Shepherd 2000), namely work, entrepreneurial or management experiences both in the context of firms and other settings such as students' business and associative organizations. Zapkau et al. (2015) contend that albeit important, the role model exposure (that is, having close relatives as entrepreneurs), does not convey in itself the necessary skills to would-be entrepreneurs; instead role models need to be complemented with hands-on experience, learning-by-doing, which endow individuals with the necessary confidence (perceived feasibility) and competencies to follow their intention (Tolentino et al. 2014). Additionally, recent studies (e.g., Helms et al. 2014) show that international exposure/experience enhances individuals' cultural intelligence which is positively related to students' entrepreneurial intentions.

Given the above, we measured prior entrepreneurial exposure including items related to the existence of role models but also with prior international, work and other organizational exposure/experience. Specifically, we asked students whether (1 = yes; 0 = no) they had: PEE1) close relatives who are entrepreneurs (role models); PEE2) professional work experience; PEE3) been formally involved in student organizations' activities; PEE4) participated in international student mobility programs.

The construct prior entrepreneurial exposure (PEE) was computed summing up all four dimensions referred to above.

3.2.4.3 Learning orientation We measured learning orientation following De Clercq et al.'s (2013) suggestion, by assessing the extent to which individuals are prone to developing new skills. Specifically, we asked respondents to indicate their agreement (1: strongly disagree... 5: strongly agree) with the following statements related to the extent to which they would look for opportunities to develop new skills and knowledge: I would like to attend a... LO1) ... short-term (<1 year) post-graduate course in entrepreneurship specialized in my field of studies; LO2) ... short-term (<1 year) post-graduate course in entrepreneurship with a generalist scope; LO3) ... medium-term (1–2 years) post-graduate course in entrepreneurship specialized in my field of studies; LO4) ... medium-term (1–2 years) post-graduate course in entrepreneurship with a generalist scope.

The Cronbach's alpha of the four items amounts to 0.83, showing an excellent internal reliability (Hair et al. 2009). The factor analysis confirms the validity of this scale showing that it is unidimensional. Thus, the latent construct for 'Learning Orientation' (LO) is computed as the average of the four items (LO1,..., LO4).

3.2.5 Control variables

Previous research suggests that demographic characteristics appear to influence entrepreneurial intentions (see Zampetakis et al. 2015). Thus, in order to control for alternative explanations for the variation in entrepreneurial intention, we controlled

for the respondents' gender (dummy variable, male = 1), age (measure in years), and academic performance (measured in grade point average). Extant literature usually agrees that women face attitudinal and resource barriers to enterprise, have a less positive attitude toward entrepreneurship, and a lower desire to found their own firm, thus being less likely to report entrepreneurial intentions than their male counterparts (Schwarz et al. 2009; Solesvik 2013). Regarding age, more mature individuals may have more diverse skills and experience—Shepherd et al. (2008: 165) suggest that age is positively associated with “a favourable mind-set toward independence”, with older people being more accustomed to making decisions and preferring to be in charge.

3.3 Common method variance assessment

Similarly to recent studies in this area (e.g., De Clercq et al. 2013; Tolentino et al. 2014; Buttar 2015; Zampetakis et al. 2015; Zapkau et al. 2015), we undertook some procedures first to mitigate and then evaluate the magnitude of common method bias (CMB), which is derived from common method variance, that is, variance that is attributed to the measurement method rather than the constructs of interest. Such bias is likely to exist in self-reported, cross-sectional survey research, when data is gathered from a single respondent using a single methodology (Podsakoff and Organ 1986; Podsakoff et al. 2003), as is the case of our study (data was collected through paper-based or online-questionnaires).

In a first phase, in order to mitigate the problems associated with CMB, we took some preventive steps (see Zampetakis et al. 2015): (1) all participants were informed that their participation was completely voluntary and confidential; (2) some items referring to the same construct were positioned in different locations throughout the questionnaire; and (3) several items were reverse phrased. Then, after the data was gathered, to test the presence of CMB, we conducted the Harman's one-factor test and confirmatory factor analysis. The Harman test requires loading all the measures in a study into a factor analysis, with the assumption that the presence of common method variance is indicated by the emergence of either a single factor or a general factor accounting for the majority of the covariance among measures (Podsakoff et al. 2003). Principal component factor analysis with all the variables of our model extracts three factors with eigenvalues >1 (first factor: 19.7 %, second factor: 13.5 %, third factor: 11.8 %). As no single factor emerges and none of the factors accounts for most of the variance, CMB is not a concern.

4 Results

Three groups of models were estimated for each categorization of fields of study (FS): detailed FS (in Table 1, which is the reference for the empirical analysis developed in the present section), Intermediate FS (Table 3, in the Appendix), and Broad FS (Table 4, in the Appendix). For each group of models, four specifications were estimated, one (Model I) that includes the direct effects of FS on entrepreneurial intentions and three others that account for the mediating effects

Table 1 Determinants of the entrepreneurial intentions of final year students: logistics estimates (detailed fields of study)

Variables	FS direct effects Model I	FS mediate effects via PD Model II	FS mediate effects via PiC Model III	FS mediate effects via PP Model IV
<i>Attitude toward the behavior</i>				
Perceived desirability (PD)	0.704*** (0.000)		0.631*** (0.000)	0.612*** (0.000)
<i>Perceived behavior control/perceived feasibility/self-efficacy</i>				
Perceived individual control (PiC)	0.126 (0.274)	0.132 (0.241)		0.076 (0.506)
Perceived power (PP)	-0.183 (0.248)	-0.162 (0.298)	-0.194 (0.220)	
<i>Fields of study (FS) [default category: electronics and automation (incl. Electronics and Computing Systems Engineering)]</i>				
Education science	0.809* (0.067)	0.584 (0.339)	0.517 (0.232)	0.531 (0.241)
Teacher training with subject specialisation	1.026* (0.051)	1.358** (0.030)	0.740 (0.217)	1.002 (0.145)
Audio-visual techniques and media production	0.852*** (0.008)	1.074*** (0.001)	0.668** (0.036)	0.610* (0.059)
Fine arts	0.494 (0.208)	0.736** (0.042)	0.310 (0.389)	-0.012 (0.978)
History and archaeology	0.825*** (0.005)	0.625** (0.026)	0.427* (0.097)	0.399 (0.180)
Literature and linguistics	0.939*** (0.001)	0.599* (0.051)	0.355 (0.169)	0.125 (0.707)
Economics	0.320 (0.162)	0.416** (0.017)	0.083 (0.605)	-0.111 (0.536)
Political science and civics	0.904 (0.161)	0.750 (0.285)	0.858 (0.255)	0.292 (0.659)
Psychology	-0.410 (0.313)	-0.511 (0.275)	-1.162** (0.020)	-1.030** (0.024)
Sociology and cultural studies	0.837 (0.158)	1.001* (0.075)	0.359 (0.500)	0.332 (0.609)
Journalism and reporting	0.227 (0.623)	0.409 (0.377)	0.180 (0.682)	-0.171 (0.741)
Library, information and archival studies	0.686 (0.269)	0.502 (0.514)	0.251 (0.658)	0.003 (0.997)
Business and administration	0.407 (0.131)	0.531** (0.021)	0.141 (0.484)	0.000 (0.999)
Law	0.927*** (0.001)	0.928*** (0.000)	0.335 (0.140)	0.659*** (0.008)

Table 1 continued

Variables	FS direct effects Model I	FS mediate effects via PD Model II	FS mediate effects via PiC Model III	FS mediate effects via PP Model IV
Biology and biochemistry	0.519 (0.114)	0.541* (0.079)	0.322 (0.291)	0.109 (0.743)
Environmental sciences	-0.010 (0.987)	-0.152 (0.838)	-1.010 (0.290)	-0.777 (0.337)
Chemistry	1.122*** (0.004)	1.410*** (0.001)	0.697** (0.029)	0.985** (0.016)
Earth sciences	0.154 (0.666)	0.207 (0.590)	-0.404 (0.236)	-0.300 (0.418)
Physics	1.243** (0.016)	0.979* (0.072)	0.723 (0.107)	0.805 (0.118)
Mathematics	0.451 (0.213)	0.341 (0.393)	0.136 (0.671)	0.104 (0.781)
ICTs	0.307 (0.428)	0.346 (0.357)	0.054 (0.872)	0.021 (0.953)
Chemical engineering and processes	-0.241 (0.571)	-0.116 (0.788)	-0.405 (0.287)	-0.712 (0.129)
Mechanics and metal trades	0.381 (0.131)	0.463** (0.029)	0.158 (0.384)	-0.074 (0.741)
Architecture and town planning	0.613** (0.031)	0.739*** (0.006)	0.555** (0.028)	0.305 (0.266)
Building and civil engineering	0.057 (0.860)	0.247 (0.403)	-0.547 (0.109)	-0.360 (0.263)
Veterinary + agriculture + fisheries	0.937** (0.019)	1.168*** (0.004)	0.610 (0.125)	0.597 (0.159)
Dental studies	0.671 (0.114)	0.939** (0.029)	0.367 (0.427)	0.282 (0.522)
Medicine	0.062 (0.853)	0.197 (0.511)	-0.227 (0.474)	-0.219 (0.519)
Therapy and rehabilitation	-0.061 (0.907)	-0.409 (0.557)	-0.531 (0.313)	-0.431 (0.449)
Pharmacy	1.070*** (0.000)	1.248*** (0.000)	0.776*** (0.001)	0.689** (0.012)
Sports	0.787*** (0.009)	0.776*** (0.005)	0.321 (0.257)	0.332 (0.226)
<i>Other entrepreneurial knowledge/human capital</i>				
Prior entrepreneurial exposure (PEE)	-0.195* (0.077)	-0.206* (0.060)	-0.209* (0.056)	-0.181* (0.099)
Learning orientation (LO)	-0.110 (0.380)	-0.084 (0.505)	-0.077 (0.539)	-0.095 (0.451)

Table 1 continued

Variables	FS direct effects Model I	FS mediate effects via PD Model II	FS mediate effects via PiC Model III	FS mediate effects via PP Model IV
<i>Control variables</i>				
Age (in years)	1.059*** (0.002)	1.218*** (0.000)	1.208*** (0.000)	1.247*** (0.000)
Gender (male = 1; female = 0)	0.392*** (0.000)	0.376*** (0.000)	0.325*** (0.002)	0.320*** (0.003)
Academic performance (in values)	-0.329 (0.522)	-0.152 (0.764)	-0.313 (0.529)	-0.440 (0.381)
<i>Goodness of fit</i>				
Hosmer and Lemeshow test (<i>p</i> value)	4.818 (0.777)	3.273 (0.916)	5.959 (0.652)	7.289 (0.507)
% Correct	73.3	73.7	73.6	74.0

N = 2423; all models include a constant term. *p* values in brackets

of FS on entrepreneurial intentions via perceived desirability (PD) (Model II), perceived individual control (PiC) (Model III), and perceived power (PP) (Model IV).¹⁰

In the baseline model (Model I), as none of the correlations exceeds 0.30, being below the threshold of 0.7, no serious risk of multicollinearity exists (Anderson et al. 2002). This is reinforced by the values of the variance inflation factor (VIF) for each independent variable: as the highest VIF is 1.59, well below the threshold of 2.5 (Allison 1999), severe multicollinearity among the variables is absent.¹¹ In the models with interaction/mediating effects (Models II–IV), to avoid severe multicollinearity, we excluded in each specification the corresponding variables that were part of the computation of the interaction term (PD in Model II; PiC in Model III and PP in Model IV). Such a procedure ensured that all the estimated models did not suffer from multicollinearity problems (VIF for each independent variable was well below the threshold of 2.5).

The nature of the data observed relative to the dependent variable [To be exclusively an entrepreneur after graduation? (1) Yes; (0) No] dictates the choice of

¹⁰ All models included the control variables (age, gender and academic performance) as well as the variables prior entrepreneurial exposure (PEE) and learning orientation (LO) which proxied the construct 'Other entrepreneurial knowledge/human capital'. We also estimated specifications that include the mediating effects of these latter variables via perceived individual control and perceived power but the estimates fail to be statistical significant and the signal and significance levels did not changed for the other estimates.

¹¹ This evidence is presented in Table 2, in the Appendix and corresponds to Model I considering broad FS (estimated model in Table 3, in the Appendix). For the remaining baseline models, correlation matrixes are available upon request from the authors.

Table 2 Descriptive statistics and correlations of the model's main variables

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Entrepreneurial intentions (EI)	0.265	0.4412	1	0.120**	0.053**	0.018	-0.005	-0.023	0.091**	0.090**	-0.026	0.013
2. Perceived desirability (PD)/attitude toward the behavior	2.44	0.7654	1	0.253**	0.337**	0.337**	-0.056**	0.110**	0.041*	0.275**	-0.022	-0.089**
3. Perceived individual control (PIC)	2.58	1.0435	1	1	1	0.186**	-0.074**	0.056**	0.079**	0.168**	0.022	-0.038
4. Perceived power (PP)	2.42	0.7262	1	1	1	1	-0.060**	0.041*	-0.047*	0.132**	0.016	-0.038
5. Learning orientation (LO)	3.20	0.9997	1	1	1	1	1	0.044*	0.079**	-0.041*	-0.043*	0.000
6. Prior entrepreneurial exposure (PEE)	1.53	1.0064	1	1	1	1	1	1	0.083**	0.093**	0.051*	-0.051*
7. Age (years)	23.7	4.3585	1	1	1	1	1	1	1	0.107**	-0.100**	-0.016
8. Gender (male = 1; female = 0)	0.435	0.4959	1	1	1	1	1	1	1	1	-0.007	-0.063**
9. Academic performance (value scale 10–20)	13.4	1.4317	1	1	1	1	1	1	1	1	1	0.084**
10. Education	0.022	0.1463	1	1	1	1	1	1	1	1	1	1
11. Arts and humanities	0.131	0.3373	1	1	1	1	1	1	1	1	1	1
12. Social sciences, journalism and information	0.210	0.4071	1	1	1	1	1	1	1	1	1	1
13. Business, administration and law	0.104	0.3059	1	1	1	1	1	1	1	1	1	1
14. Natural sciences, mathematics and statistics	0.115	0.3188	1	1	1	1	1	1	1	1	1	1
15. Information and communication technologies (ICTs)	0.018	0.1336	1	1	1	1	1	1	1	1	1	1
16. Veterinary, agriculture, forestry, fisheries	0.249	0.4327	1	1	1	1	1	1	1	1	1	1
17. Health and welfare	0.102	0.3026	1	1	1	1	1	1	1	1	1	1
18. Services (sports)	0.035	0.1830	1	1	1	1	1	1	1	1	1	1

Table 2 continued

	Mean	SD	11	12	13	14	15	16	17	18	VIF
1. Entrepreneurial intentions (EI)	0.265	0.4412	0.050*	-0.047*	0.022	-0.002	0.003	-0.030	-0.004	0.024	
2. Perceived desirability (PD)/attitude toward the behavior	2.44	0.7654	-0.096**	0.061**	0.035	-0.075**	0.020	0.078**	-0.019	0.016	1.275
3. Perceived individual control (PIC)	2.58	1.0435	-0.094**	-0.027	0.067**	-0.005	0.028	0.105**	-0.035	-0.038	1.144
4. Perceived power (PP)	2.42	0.7262	-0.124**	0.058**	0.045*	-0.033	0.037	0.042*	-0.030	0.041*	1.169
5. Learning orientation (LO)	3.20	0.9997	0.091**	-0.026	-0.023	0.008	0.003	-0.028	-0.039	0.020	1.024
6. Prior entrepreneurial exposure (PEE)	1.53	1.0064	-0.010	0.016	0.032	-0.068**	-0.020	0.077**	-0.088**	0.059**	1.055
7. Age (years)	23.7	4.5585	0.176**	-0.058**	-0.063**	0.008	-0.014	0.001	-0.041*	-0.031	1.112
8. Gender (male = 1; female = 0)	0.435	0.4959	-0.123**	-0.074**	-0.041*	-0.078**	0.124**	0.312**	-0.142**	0.052*	1.267
9. Academic performance (value scale 10–20)	13.4	1.4317	0.046*	-0.146**	-0.138**	0.053**	-0.047*	0.037	0.090**	0.126**	1.118
10. Education	0.022	0.1463	-0.058**	-0.077**	-0.051*	-0.054**	-0.020	-0.086**	-0.050*	-0.028	1.104
11. Arts and humanities	0.131	0.3373	1	-0.200**	-0.132**	-0.140**	-0.053**	-0.224**	-0.131**	-0.074**	1.490
12. Social sciences, journalism and information	0.210	0.4071	1	1	-0.176**	-0.185**	-0.070**	-0.297**	-0.174**	-0.098**	1.585
13. Business, administration and law	0.104	0.3059	1	1	1	-0.123**	-0.046*	-0.197**	-0.115**	-0.065**	1.353
14. Natural sciences, mathematics and statistics	0.115	0.3188	1	1	1	1	-0.049*	-0.207**	-0.121**	-0.068**	1.373
15. Information and communication technologies (ICTs)	0.018	0.1336	1	1	1	1	1	-0.078**	-0.046*	-0.026	1.062
16. Veterinary, agriculture, forestry, fisheries	0.249	0.4327	1	1	1	1	1	1	-0.194**	-0.109**	1.051
17. Health and welfare	0.102	0.3026	1	1	1	1	1	1	1	-0.064**	1.385
18. Services (sports)	0.035	0.1830	1	1	1	1	1	1	1	1	1.125

**(*) significant at 1 % (5 %), SD standard deviation, VIF variance inflation factor—as the highest VIF is 1.69, well below the threshold of 2.5 (Allison 1999), severe multicollinearity among the variables is absent

the estimation model.¹² The empirical assessment of the entrepreneurial intentions is based on the estimation of the logistic model rewritten in terms of the odds of an event occurring.

The results suggest that after controlling for age, gender, academic performance, field of study and other human capital related variables, students with a more favorable attitude regarding entrepreneurship (i.e., higher perceived desirability (PD) or attitude toward the behavior) tend to present stronger entrepreneurial intentions. Indeed, the variable PD displays highly significant ($p < 0.001$) and positive effects for all specifications (see Table 1 and Tables 3, 4 in the Appendix). This means that hypothesis 1 (H1) is strongly validated. In contrast, the variables associated to perceived behavior control, namely the perceived individual control (PiC), or control beliefs, and the perceived power (PP) of the particular control factors to facilitate or inhibit behavior failed to display statistically significant coefficient estimates. In short, for this sample of final-year students, there is not sufficient evidence to support the *direct* impact of perceived feasibility on entrepreneurial intentions. Summing up, hypothesis H2 is not corroborated by our data.

To test hypothesis H3a, that students educational backgrounds or fields of study *directly* influence entrepreneurial intentions, we estimated Model I. Evidence based on detailed (Table 1), broad (Table 3, in the Appendix) or intermediate (Table 4, in the Appendix) categorizations of FS, suggests that the field of study (FS) is indeed a critical determinant of entrepreneurial intentions. Considering 32 detailed FS, considerable rich(er) information emerges (as compared to the specifications estimated with intermediate or broad FS), with ‘Pharmacy’, ‘Law’, and ‘Literature and linguistics’ revealing significantly (p value < 0.001) higher entrepreneurial intentions.¹³ Students from other FS who are also usually not considered in entrepreneurial intention studies or, when considered, are included in a fuzzy and misleading category labelled ‘non-entrepreneurship related majors’ (Wu and Wu 2008), such as ‘Chemistry’, ‘History and Archaeology’, ‘Audio-visual techniques and media production’, and ‘Sports’, reveal distinctly higher (with p value < 0.01) entrepreneurial intentions. The same can be said of students enrolled in ‘Physics’, ‘Veterinary (and related fields)’, and ‘Architecture and Town Planning’ fields of study who are significantly (at $p < 0.05$) more likely than students from ‘Electronics and automation systems engineering’ (the default FS) to become entrepreneurs. Taking this evidence, we contend that H3a is validated.

Interestingly, the mediated/indirect impact of FS on entrepreneurial intentions via perceived desirability (PD), perceived individual control (PiC) and perceived power

¹² Conventional estimation techniques (e.g., multiple regression analysis), in the context of a discrete dependent variable, are not a valid option. First, the assumptions needed for hypothesis testing in conventional regression analysis are necessarily violated—it is unreasonable to assume, for instance, that the distribution of errors is normal. Second, in multiple regression analysis, predicted values cannot be interpreted as probabilities—they are not constrained to fall in the interval between 0 and 1.

¹³ If we considered broad FS (Table 3 in the Appendix), only ‘Arts and humanities’ emerges as significantly (p value < 0.001) and directly related to entrepreneurial intentions. ‘Business, administration and law’, ‘Services (Sports)’ and ‘Education’ are positively and significantly associated with entrepreneurial intentions at the 0.05 significance level.

Table 3 Determinants of the entrepreneurial intentions of final year students: logistics estimates (Broad fields of study)

Variables	FS direct effects	FS mediate effects through PD	FS mediate effects through PiC	FS mediate effects through PP
	Model I	Model II	Model III	Model IV
<i>Attitude toward the behavior</i>				
Perceived desirability (PD)	0.702*** (0.000)		0.669*** (0.000)	0.598*** (0.000)
<i>Perceived behavior control/perceived feasibility/self-efficacy</i>				
Perceived individual control (PiC)	0.128 (0.257)	0.163 (0.141)		0.083 (0.461)
Perceived power (PP)	-0.172 (0.275)	-0.089 (0.559)	-0.177 (0.258)	
<i>Fields of study (FS) (default category: engineering, manufacturing and construction)</i>				
Education	0.682** (0.037)	0.770* (0.072)	0.591* (0.091)	0.731* (0.053)
Arts and humanities	0.598*** (0.000)	0.566*** (0.001)	0.424*** (0.007)	0.378** (0.039)
Social sciences, journalism and information	0.037 (0.804)	0.169 (0.228)	-0.021 (0.874)	-0.127 (0.382)
Business, administration and law	0.399** (0.023)	0.489*** (0.004)	0.189 (0.218)	0.333* (0.053)
Natural sciences, mathematics and statistics	0.323* (0.063)	0.378** (0.038)	0.170 (0.276)	0.231 (0.200)
Information and communication technologies (ICTs)	0.088 (0.806)	0.128 (0.726)	0.026 (0.936)	0.068 (0.846)
Veterinary, agriculture, forestry, fisheries	0.709* (0.054)	0.977** (0.013)	0.587 (0.136)	0.653 (0.117)
Health and welfare	0.322* (0.080)	0.515*** (0.005)	0.239 (0.165)	0.275 (0.150)
Services (sports)	0.586** (0.024)	0.605** (0.024)	0.306 (0.270)	0.396 (0.133)
<i>Other entrepreneurial knowledge/human capital</i>				
Prior entrepreneurial exposure (PEE)	-0.191* (0.075)	-0.175* (0.100)	-0.195* (0.068)	-0.191* (0.074)
Learning orientation (LO)	-0.096 (0.441)	-0.093 (0.454)	-0.081 (0.511)	-0.093 (0.452)

Table 3 continued

Variables	FS direct effects Model I	FS mediate effects through PD Model II	FS mediate effects through PiC Model III	FS mediate effects through PP Model IV
<i>Control variables</i>				
Age (in years)	1.111*** (0.001)	1.172*** (0.000)	1.141*** (0.000)	1.250*** (0.000)
Gender (male = 1; female = 0)	0.365*** (0.001)	0.422*** (0.000)	0.326*** (0.001)	0.319*** (0.002)
Academic performance (in values)	-0.585 (0.215)	-0.533 (0.256)	-0.513 (0.270)	-0.578 (0.218)
<i>Goodness of fit</i>				
Hosmer and Lemeshow test (<i>p</i> value)	11.202 (0.191)	14.431 (0.071)	6.368 (0.606)	12.128 (0.146)
% Correct	74.3	73.5	73.5	73.6

$N = 2423$; all models include a constant term. *p* values in brackets

***(**)[*] significant at 1 % (5 %)[10 %]

(PP) emerged as remarkably relevant, giving strong support to hypotheses H3b and H3c.

The indirect impact of PD is most significant (p value <0.001) in 'Pharmacy', 'Law', 'Chemistry', and 'Audio-visual techniques and media production', being reasonably significant (p value <0.05) in 'Economics', 'Business and administration', 'History and Archaeology', 'Mechanics and Metal Trades (incl. Mechanics, Metals, Mines and Industrial Engineering)', 'Teacher training with subject specialization', and 'Fine Arts'. As such, the positive personal valuation of/attitude to entrepreneurship from students enrolled in these FS (as compared to the default category) tends, *ceteris paribus*, to enhance entrepreneurial intentions to a larger extent.

Although the perceived feasibility components, most notably perceived individual control (PiC) and perceived power (PP), failed to *directly* influence entrepreneurial intentions, their *indirect* impact via fields of study emerged as significantly relevant. Specifically, positive perceived self-efficacy or awareness of possessing abilities/competencies for starting a new business (i.e., perceived individual control—PiC) produces a significant and positive impact on the entrepreneurial intentions of students enrolled in 'Pharmacy' (p value <0.001) and, to a lesser extent (p value <0.05), of those enrolled in 'Architecture and Town Planning', 'Chemistry', and 'Audio-visual techniques and media production'. Additionally, the perceived power (PP) over factors that might inhibit the starting of a new business (e.g., financial, institutional and information constraints or bureaucracy), significantly (p value <0.01) and positively impacts on the

Table 4 Determinants of the entrepreneurial intentions of final year students: logistics estimates (intermediate fields of study)

Variables	FS direct effects Model I	FS mediate effects through PD Model II	FS mediate effects through PiC Model III	FS mediate effects through PP Model IV
<i>Attitude toward the behavior</i>				
Perceived desirability (PD)	0.718*** (0.000)		0.665*** (0.000)	0.608*** (0.000)
<i>Perceived behavior control/perceived feasibility/self-efficacy</i>				
Perceived individual control (PiC)	0.143 (0.212)	0.169 (0.128)		0.085 (0.453)
Perceived power (PP)	-0.161 (0.307)	-0.115 (0.453)	-0.172 (0.273)	
<i>Fields of study (FS) (default category: engineering and engineering trades)</i>				
Education	0.783** (0.019)	0.870** (0.044)	0.606* (0.084)	0.751** (0.048)
Arts	0.587** (0.016)	0.827*** (0.001)	0.503** (0.038)	0.457* (0.082)
Humanities (except languages)	0.704*** (0.007)	0.553** (0.043)	0.434* (0.087)	0.478* (0.100)
Languages	0.811*** (0.002)	0.522* (0.082)	0.362 (0.156)	0.203 (0.533)
Social and behavioral sciences	0.104 (0.541)	0.240 (0.111)	-0.035 (0.802)	-0.126 (0.418)
Journalism and information	0.241 (0.511)	0.351 (0.379)	0.201 (0.565)	-0.044 (0.919)
Business and administration	0.243 (0.290)	0.400* (0.066)	0.114 (0.562)	0.054 (0.812)
Law	0.781*** (0.001)	0.813*** (0.001)	0.319 (0.153)	0.717*** (0.003)
Biological and related sciences	0.398 (0.184)	0.468 (0.121)	0.318 (0.292)	0.188 (0.566)
Environment	-0.137 (0.833)	-0.241 (0.745)	-1.018 (0.286)	-0.699 (0.385)
Physical sciences	0.532** (0.025)	0.656** (0.011)	0.224 (0.277)	0.407* (0.093)
Mathematics and statistics	0.313 (0.352)	0.221 (0.575)	0.123 (0.698)	0.168 (0.648)
Information and communication technologies (ICTs)	0.162 (0.656)	0.215 (0.560)	0.035 (0.915)	0.080 (0.821)
Architecture and construction	0.247 (0.234)	0.407** (0.043)	0.091 (0.651)	0.078 (0.715)

Table 4 continued

Variables	FS direct effects	FS mediate effects through PD	FS mediate effects through PiC	FS mediate effects through PP
	Model I	Model II	Model III	Model IV
Veterinary + agriculture + fisheries	0.796** (0.034)	1.062*** (0.007)	0.598 (0.130)	0.666 (0.112)
Health	0.415** (0.036)	0.599*** (0.001)	0.252 (0.148)	0.290 (0.139)
Personal services (Sports)	0.669** (0.013)	0.694*** (0.010)	0.321 (0.251)	0.410 (0.126)
<i>Other entrepreneurial knowledge/human capital</i>				
Prior entrepreneurial exposure (PEE)	-0.162 (0.135)	-0.173 (0.107)	-0.192* (0.073)	-0.176 (0.103)
Learning orientation (LO)	-0.102 (0.415)	-0.082 (0.509)	-0.080 (0.520)	-0.096 (0.441)
<i>Control variables</i>				
Age (in years)	1.028*** (0.002)	1.146*** (0.000)	1.143*** (0.000)	1.218*** (0.000)
Gender (male = 1; female = 0)	0.380*** (0.000)	0.409*** (0.000)	0.326*** (0.001)	0.316*** (0.002)
Academic performance (in values)	-0.656 (0.170)	-0.587 (0.217)	-0.568 (0.228)	-0.630 (0.184)
<i>Goodness of fit</i>				
Hosmer and Lemeshow test (<i>p</i> value)	13.240 (0.104)	13.103 (0.108)	7.913 (0.442)	10.723 (0.218)
% Correct	73.2	73.6	73.5	73.6

N = 2423; all models include a constant term. *p* values in brackets

***(**)[*] Significant at 1 % (5 %)[10 %]

entrepreneurial intentions of students enrolled in 'Law', 'Pharmacy', and 'Chemistry', yet it presents a negative and significant (*p* value <0.05) effect for Psychology.

With regard to the other components of human capital or entrepreneurship knowledge base—Prior Entrepreneurial Exposure (PEE) and Learning Orientation (LO)—the results suggest a weak (*p* value <0.10) but negative effect of PEE on entrepreneurial intentions and a non-significant direct impact of LO.¹⁴

Concerning the control variables, age and gender (being male) emerged as greatly significant (*p* value <0.001) in explaining final-year students' entrepreneurial intentions, whereas their average grade point (academic performance) was not found to be statistically related to entrepreneurial intentions.

¹⁴ We also estimated the indirect impact of PEE and LO via PiC and PP (results not shown but available upon request from the authors) but again results failed to emerge as statistically significant.

5 Discussion

The main aim of this study was to disentangle the effect of educational background/field of study on entrepreneurial intention to gain a better understanding of how and by which mechanisms do fields of study influence students' intention to become entrepreneurs. As such, we analyzed how 32 FS directly impacted on students' entrepreneurial intentions, mediated by the attitudinal variables of the integrated model proposed (combining TPB and SEE models), i.e., perceived desirability (PD), perceived individual control (PiC) and perceived power (PP). The stability of the results across the distinct specifications and categorization of FS strengthened our findings.

Our findings confirm the extant literature (see Schlaegel and Koenig 2014) which supports the applicability of integrating competing theories—theory of planned behavior (TPB) and Shapero's entrepreneurial event (SEE)—to explain entrepreneurial intentions. We demonstrate, in line with Buttar (2015) or Zhang et al. (2014), the key direct impact of attitude toward behavior/perceived desirability (PD) on entrepreneurial intentions. Since the 2000s, Portuguese governments have promoted an 'entrepreneurship friendly environment' (Ferrão et al. 2005) and such an amenable institutional environment is likely to have enhanced the agreeableness of an entrepreneurial vocation in young minds (Buttar 2015). Additionally, our results clearly show that the TPB and SEE can be consistently expanded by adding the influence of situational factors, most notably the fields of study (FS), mediated through attitude and perceived behavior control [in its two main components, perceived individual control (PiC) and perceived power (PP)].

Extant literature (e.g., Wang et al. 2002; Wu and Wu 2008; Schwarz et al. 2009; Nabi et al. 2010; Solesvik 2013) often considers that students enrolled in business/economics or engineering/technological related majors/fields of study are the ones that have the most extensive possibilities of learning entrepreneurship and are "... particularly likely to create fast growing knowledge-based ventures" (Dohse and Walter 2012: 878), incentivizing the focus of entrepreneurial intention studies on those students. As the evidence gathered and analyzed in the present paper shows, this is a misleading and questionable argument which runs the potential risk of ultimately misdirecting ensuing public policy measures in the entrepreneurship education area. It worrisomely neglects an incommensurably high entrepreneurial potential outside business and engineering fields of study which are related to critical economic activities, in both developed and less developed economies, associated with creative and knowledge-intensive industries (Cruz and Teixeira 2015).

We unambiguously show that there is a huge, hidden potential for new venture creation in fields of study that are not traditionally considered, most notably those related to creative and leisure activities (e.g., Arts and humanities, or, more specifically, Literature and linguistics, History and Archaeology, Audio-visual techniques and media production, Sports, and Architecture and town planning), Law, and Health (most notably, Pharmacy and Veterinary).

Our results thus cast doubts on prior studies which, using highly aggregated categories of fields of study, fail to address the relevance of students' education background on entrepreneurial intentions (e.g., Zellweger et al. 2011) or ambiguously highlight the supremacy of business (Wang et al. 2002) or engineering/technological (Wu and Wu 2008; Zhang et al. 2014) students' entrepreneurial intentions *vis-à-vis* shadowy and residual non-business or non-technological categories.

The indirect impact of FS mainly occurs through perceived desirability and perceived power. In fact, excluding the cases of Pharmacy (p value <0001) or Architecture and town planning, Chemistry and Audio-visual techniques and media production (p value <0.05), the interaction between perceived individual control (PiC) and fields of study is generally non-significant; this might mean that, in general, students, including those enrolled in business and economics or engineering, perceive that their courses do not particularly develop or endow them with unique knowledge structures and distinct information processing that enhances their entrepreneurial intentions. Such results partially contradict existing argumentations that some given courses/majors, most notably 'technical' related courses (e.g., science; engineering), are likely to provide specific know-how that increases students' perceived feasibility or behavior control (Richardson 1993; Wu and Wu 2008; Hassan and Wafa 2012).

In contrast, desirability or attitude towards entrepreneurship significantly mediates the impact of a considerable number of fields of study on entrepreneurial intentions. Our findings seem thus to suggest that the absence of regular (acceptable) employment options in some courses—e.g., Pharmacy, Law, Chemistry, History and Archaeology, Teacher training—makes new business creation/self-employment a 'desirable' and 'community' accepted career path (De Clercq et al. 2013). In other courses (e.g., Arts and humanities as a whole or Audio-visual techniques and media production, Fine Arts, and Sociology or cultural studies, in particular), students might reveal distinct mind-sets/attitudes compared to their business, engineering and science counterparts (Shepherd et al. 2008), attributing more importance to the psychic benefits of entrepreneurship such as autonomy and independence (Wennekers et al. 2007), values positively associated with attitudes toward entrepreneurship.

Based on these findings, we encourage future research to employ indirect intention-based models which explicitly consider the relevance and distinctiveness of detailed fields of study.

Similarly to Zapkau et al. (2015), although in disagreement with several past studies (e.g., Dohse and Walter 2012; De Clercq et al. 2013; Tolentino et al. 2014), we fail to find any significant positive connection between prior entrepreneurial exposure (i.e., exposure to parents and other close relatives who previously started a business, professional work experience or involvement in student organizations and international mobility programs) and entrepreneurial intention, both direct and mediated through the attitudinal variables of the integrated model. When significant, our estimates were negative. The exposure to high failure rates and the corresponding risks of new firm creation/self-employment,¹⁵ when the alternative

¹⁵ Between 2003 and 2007, Portugal presented one of the highest firm mortality rates (13 %) among the European countries—only the rate for Lithuania (17.1 %) was higher (Source: Eurostat).

is a comparatively stable income from wage employment, might negatively affect students' view of entrepreneurial activities (Zhang et al. 2014).

Our results, albeit in line with Zhang et al.'s (2014) findings, challenge previous research which argues that exposure to family businesses provides siblings with tacit knowledge (Dohse and Walter 2012), financial, human, social, and other resources necessary to successfully start a business (see Tolentino et al. 2014), or that past professional experience provides the individuals with the required understanding and attitude towards starting a company (Carr and Sequeira 2007). It may be the case, as reasoned by Zapkau et al. (2015: 650; italic added), that “[o]nly when individuals perceive parental role model exposure as *positive*, they develop a more positive attitude towards starting a business” or “[o]nly ... work experience *in a small or newly founded firm* seems to convey the necessary tacit knowledge relevant for starting a business”.

We further show that either directly or mediate through self-efficacy dimensions (PiC and PP), learning orientation, i.e. students' propensity to update continuously their current knowledge basis, does not predict the decision of starting a new venture. This result is partially supported by De Clercq et al.'s (2013) research. In this latter study learning orientation failed to directly impact on students' entrepreneurial intentions, but its mediated influence via perceived ability and feasibility emerged as significant, indicating that learning orientation can help alleviate the complexity and ambiguity surrounding entrepreneurship and thus enhance entrepreneurial intentions.

Regarding the control variables, namely gender and age, our findings are in line with extant research which proved that male and more senior students are more enthusiastic than their female counterparts about becoming entrepreneurs (see Walter and Heinrichs 2015).

6 Conclusions

6.1 Contributions and implications

Our results confirm that, besides the attitude towards starting a business or perceived desirability, fields of study, considered at a highly detailed level, are relevant (direct and indirect) predictors of entrepreneurial intention. Fields of study represent sub-dimensions of the institutional context or 'communities' (Fayolle and Liñán 2014) in which cognitive and social capital interact. As stated by Buttar (2015), social capital of an individual impacts on her/his entrepreneurial intentions and thus it would be a mistake for educators, university managers and policy-makers to concentrate exclusively on the individual neglecting the macrosocial context (i.e., the field of study) in which she/he is embedded.

Important policy implications can be derived from our findings. For the overall sample analyzed students recognized that their courses failed to endow them with the relevant skills to start a business. Interestingly though, in FS where students reveal a higher entrepreneurial intent coincide with FS where students recognize, to a larger extent, that their course did not endow them with the relevant competencies

to start a business (e.g., Chemistry, History and Archaeology, Physics, Literature and Linguistics, Audio-visual and media production, Sports or Law), and lack the technical skills (e.g., Literature, Sports, History and Archaeology, Architecture and town planning, Audio-visual and media production) or managerial skills (Audio-visual and media production, Architecture and town planning, Veterinary, History and Archaeology, Literature and Linguistics, Sports, Pharmacy) to start and run a business.¹⁶

Significant differences in the level of intention between students from different fields of study indicate that universities should more extensively focus entrepreneurship education on students in other subject areas than business or engineering/technology sciences.

But entrepreneurship educational programs should focus not only on the technical aspects of new business creation (e.g., business plan creation) but also on aspects related to the individual and entrepreneurial drive (e.g., emotions and stress management) (Sánchez 2011; Zampetakis et al. 2015). As Schwarz et al. (2009) emphasize, besides theoretical subjects, an important component of entrepreneurial training involves a social learning process where the development of 'crucial life capacities' should be the main target of all university faculties. Accordingly, the authors recommend inviting successful entrepreneurs (role models) to lectures or enable students to undertake small business experiences via interaction with local entrepreneurs. Such a holistic entrepreneurial education would certainly endow would-be entrepreneurs with the competencies/abilities required to recognize opportunities, assemble resource and efficiently organize suitable teams.

We agree with Kolvereid and Isaksen's (2006) argument that attitudinal variables, most notably, those related with perceived feasibility, can be altered by policymakers who set the economic preconditions for entrepreneurship in general and for (entrepreneurial) education and training programs in particular. But to have an impact on entrepreneurial intentions, initiatives promoting entrepreneurial activity must be offered not only in courses related with business and engineering but also in a wider range of fields of study. Moreover, and very importantly, such initiatives must render starting a business feasible in the eyes of would-be entrepreneurs, by changing control beliefs relating to perceived behavioral control (Krueger et al. 2000; Zapkau et al. 2015).

Prior entrepreneurial exposure, which combines role models, work experience and international exposure, has only a very limited impact on the two attitudinal variables preceding entrepreneurial intention and on the entrepreneurial intention directly; when the impact is significant the relation is negative. This may imply that prior exposure entails negative feelings which undermine entrepreneurial intentions (Carr and Sequeira 2007). We therefore suggest, in line with Sánchez (2011), that entrepreneurship educators should be trained to recognize the meaning of emotions and to reason based on them, being able to influence students through charismatic enthusiasm regarding entrepreneurship to engage in new business creation, overcoming possible past/negative role models and experience.

¹⁶ See Table 5 in Appendix for the concrete figures.

Table 5 Final year students' level of agreement with statements concerning skills/competencies acquisition

Broad fields of study	Intermediate fields of study	Detailed fields of study	1: Strongly disagree... 5: strongly agree						
			My course provide me the needed tools and knowledge to start a business	I feel that I lack ... knowledge to start a business	I would like to attend a short term (<1 year) post-graduation course in entrepreneurship...	I would like to attend a medium term (1–2 years) post-graduation course in entrepreneurship	Specialized With generalist	With generalist	
			Technical	Managerial	Specialized in my field of studies	With generalist scope	Specialized in my field of studies	With generalist scope	
Education	Education	0111 Education science	2.3	3.5	3.7	3.6	3.5	3.4	2.9
		0114 Teacher training with subject specialisation	2.3	3.6	4.0	3.2	3.0	2.7	2.6
Arts and humanities	Arts	0211 <i>Audio-visual techniques and media production</i>	2.2	3.4	4.2	3.7	3.3	3.0	2.7
	Humanities (except languages)	0213 Fine arts	1.9	3.3	3.7	3.5	3.2	3.2	2.5
	Languages	0222 <i>History and archaeology</i>	2.1	3.4	3.8	3.8	3.7	3.6	3.3
		0232 <i>Literature and linguistics</i>	2.1	3.6	3.8	3.8	3.7	3.5	3.3
Social sciences, journalism and information	Social and behavioral sciences	0311 Economics	2.7	3.6	3.3	3.5	3.2	3.0	2.8
		0312 Political science and civics	1.9	4.1	3.8	3.5	3.5	3.1	3.0

Table 5 continued

Broad fields of study	Intermediate fields of study	Detailed fields of study	1: Strongly disagree... 5: strongly agree						
			My course provide me the needed tools and knowledge to start a business	I feel that I lack ... knowledge to start a business	I would like to attend a short term (<1 year) post-graduation course in entrepreneurship...	I would like to attend a medium term (1–2 years) post-graduation course in entrepreneurship			
			Technical	Managerial	Specialized in my field of studies	With generalist scope	Specialized in my field of studies	With generalist scope	
		0313 Psychology	2.4	3.5	3.9	3.6	3.3	2.9	2.6
		0314 Sociology and cultural studies	2.9	3.1	3.3	3.5	3.5	2.9	2.9
	Journalism and information	0321 Journalism and reporting	2.4	3.5	3.8	3.7	3.3	3.5	3.1
		0322 Library, information and archival studies	2.5	3.3	3.0	3.1	3.5	3.0	3.2
Business, administration and law	Business and administration	0413 Management and administration	3.0	3.5	2.8	3.5	3.1	3.2	2.9
	Law	0421 Law	2.5	3.2	3.4	3.3	3.2	2.9	2.9
Natural sciences, mathematics and statistics	Biological and related sciences	0511 + 0512 Biology and biochemistry	1.7	3.5	4.1	3.4	3.1	2.9	2.6
	Environment	0521 Environmental sciences	2.1	3.6	3.9	3.4	3.6	2.9	2.9

Table 5 continued

Broad fields of study	Intermediate fields of study	Detailed fields of study	1: Strongly disagree... 5: strongly agree					
			My course provide me the needed tools and knowledge to start a business	I feel that I lack ... knowledge to start a business	I would like to attend a short term (<1 year) post-graduation course in entrepreneurship...	I would like to attend a medium term (1-2 years) post-graduation course in entrepreneurship		
			Technical	Managerial	Specialized in my field of studies	With generalist scope	Specialized in my field of studies	With generalist scope
Physical sciences	0531 Chemistry 0532 Earth sciences	2.0	3.2	3.2	3.6	3.5	3.5	3.3
		2.2	3.1	3.6	3.6	3.3	3.4	3.1
Mathematics and statistics	0533 Physics	2.1	2.8	3.2	3.3	2.9	3.4	2.9
	0541 Mathematics	2.3	3.2	3.4	3.5	3.4	3.0	3.0
ICTs	0612 Database and network design and administration	2.3	3.0	3.4	3.6	3.4	3.0	2.9
Engineering, manufacturing and construction	0711 Chemical engineering and processes	2.8	3.3	3.3	3.7	3.4	2.9	2.8
	0714 Electronics and automation (incl. electronics and computing systems engineering)	3.1	2.7	3.2	3.3	3.2	2.8	2.7

Table 5 continued

Broad fields of study	Intermediate fields of study	Detailed fields of study	1: Strongly disagree... 5: strongly agree						
			My course provide me the needed tools and knowledge to start a business	I feel that I lack ... knowledge to start a business	I would like to attend a short term (<1 year) post-graduation course in entrepreneurship...	I would like to attend a medium term (1-2 years) post-graduation course in entrepreneurship			
			Technical	Managerial	Specialized in my field of studies	With generalist scope	Specialized in my field of studies	With generalist scope	
		0715 Mechanics and metal trades (incl. mechanics, metals, mines and industrial engineering)	3.0	3.1	3.0	3.5	3.0	3.0	3.0
		0731 Architecture and town planning	2.8	3.4	4.0	3.7	3.2	3.2	2.7
		0732 Building and civil engineering	2.5	3.5	3.7	3.5	3.3	2.9	2.7
		0841 + 0831 + 0811 Veterinary + fisheries + livestock	2.5	3.3	3.9	3.9	3.5	3.5	3.1
Veterinary + agriculture + fisheries	Veterinary + agriculture + fisheries								
Health and welfare	Health	0911 Dental studies	2.4	3.4	4.2	3.6	3.2	2.8	2.5
		0912 Medicine	2.4	3.4	3.9	3.2	2.8	2.7	2.4

Table 5 continued

Broad fields of study	Intermediate fields of study	Detailed fields of study	1: Strongly disagree... 5: strongly agree						
			My course provide me the needed tools and knowledge to start a business	I feel that I lack ... knowledge to start a business	I would like to attend a short term (<1 year) post-graduation course in entrepreneurship...	I would like to attend a medium term (1–2 years) post-graduation course in entrepreneurship			
			Technical	Managerial	Specialized in my field of studies	With generalist scope	Specialized in my field of studies	With generalist scope	
		0915 Therapy and rehabilitation	2.9	3.0	3.6	3.9	3.8	3.4	3.2
		0916 Pharmacy	3.1	3.2	3.5	3.7	3.3	3.1	2.7
Services	Personal Services	1014 Sports	2.3	3.5	3.7	3.6	3.3	3.4	2.9
Overall mean			2.6	3.3	3.5	3.5	3.3	3.1	2.8

In bold is the default FS used in the estimation models; in *italics* are the FS that reveal higher entrepreneurial intention

6.2 Limitations and future research

Our study shares a major limitation with many others (see Walter and Heinrichs 2015) which is related to the intention–action gap. Although extant literature suggests a strong association between intention and behavior in entrepreneurship, including early career intention as a good predictor of entrepreneurial behavior (Tolentino et al. 2014), it is reasonable to expect that not all individuals will act upon these intentions formed early in their career until they have acquired a sufficient level of mastery to launch a business venture (Boyd and Vozikis 1994). As Van Gelderen et al. (2015: 657) insightfully point out, “the intention–action link may be weaker in the context of new venture creation than in many other domains”. The existence of a sizeable intention–action gap (Van Gelderen et al. 2015) highlights the importance of studying supplementary influences rather than mere intentions for predicting and explaining entrepreneurial behavior (Kautonen et al. 2015). But the validity and stability of the link between intention and behavior can only be directly observed in longitudinal research (Davidsson and Honig 2003; Kautonen et al. 2015; Van Gelderen et al. 2015). Therefore, as Fayolle and Liñán (2014) recommend, additional longitudinal studies investigating the link between intention and behavior in an entrepreneurial context would be of great scientific added value.

One additional source of criticism can be associated with the measurement of our dependent variable. As is often the case in past research on entrepreneurial intentions (e.g., Krueger et al. 2000), we use a single-item measure to compute entrepreneurial intentions. A multi-item measurement would serve to assess the reliability and validity of such a latent construct (Thompson 2009; Zapkau et al. 2015). Nevertheless, prior research (Krueger 2009) and recent meta-analysis (Bae et al. 2014) reveal that intention models are remarkably robust regarding different specifications of the intention variable. Also in the measurement of the dependent variable, and in line with past literature (e.g., Luthje and Franke 2003), no distinction was made between students intending highly-innovative self-employment and those intending little or no innovation in their self-employment. However, in a recent study, Douglas (2013) found a difference in the risk attitudes of the former (what he called ‘growth-oriented’ entrepreneurs) and the latter (the ‘independence-oriented’ entrepreneurs). To include such a distinction would constitute an interesting path for future research (see Bae et al. 2014).

A further limitation regards the perceived desirability items investigated in the present study, which cover essentially respondent’s attitude to risk (fears about remuneration uncertainty, employment stability, time and energy requirements, personal failure, financial failure, and the current business climate). It therefore overlooks the attitudes to decision-making autonomy and other non-monetary benefits (e.g., job satisfaction) associated with entrepreneurship intentions. Some studies in the area (e.g., Lee and Wong 2004; Saeed et al. 2015), demonstrate that the need for autonomy does not significantly determine entrepreneurial intentions. It might be as Douglas (2013) underlines that the relevance of individual’s need for autonomy differs according to the types of (growth- or independence-oriented) entrepreneurial intention analyzed.

Despite the procedures undertaken for mitigating the problem of self-selection bias, it is important to acknowledge (as it was referred over the analysis) that the Fields of Study proxy reflects to some extent the different opportunity costs of entrepreneurial intentions (what one's giving up to become an entrepreneur). Furthermore, intending to be either an entrepreneur or an employee may reflect that some people are more team-oriented and some are more solo-oriented. If larger businesses are perceived to be a team activity whereas small and new business is more of a solo activity, students may self-select into one or the other depending on their attitudes to decision-making autonomy (independence), to risk, to incomes, etc. (Douglas and Shepherd 2000).¹⁷

In our integrated model we did not explicitly account for social norms given that some extant empirical studies highlight a discouraging predictive power on students' intentions (e.g., Krueger et al. 2000; Autio et al. 2001; Zellweger et al. 2011; Buttar 2015). Nevertheless, as mentioned in Sect. 2, perceived desirability and feasibility constructs include items related to social norms and prior entrepreneurial exposure, which are likely to appropriately reflect the effect of social norms on intentions (Reitan 1997; Krueger et al. 2000; Zhang et al. 2014). The negative (albeit weak) impact of prior entrepreneurial exposure on students' intentions parallels the negative relationship between the social norms and intentions of Greek students found by Zampetakis et al. (2015). These authors justify this negative relationship on the basis of Greece's collectivistic and high uncertainty avoidance orientation (similarly to Portugal), where individuals prefer to avoid risky situations and to conform to social norms (Wursten and Lanzer 2013).

Our sample consists of Portuguese individuals. Thus, our results are at least partly dependent on the cultural and economic conditions in Portugal and may consequently not be universally applicable. Notwithstanding, it may be applied to countries sharing a similar type of culture characterized by very high uncertainty avoidance (e.g., Latin America as a whole and Arab countries, some Asian countries—South Korea, Thailand and Taiwan—and some European countries—Greece, Italy (south), Turkey and Russia) (Wursten and Lanzer 2013). As shown high uncertainty avoidance might not be an impediment to high entrepreneurial intentions; rather its influence is critically intermediated by situational factors, most notably students' fields of study. Nonetheless, given the paucity of studies addressing explicitly the impact of students' educational background on entrepreneurial intentions, additional quantitative and qualitative empirical evidence on such issue for a wider set of countries is currently in high demand.

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¹⁷ We are indebted to one of the referees for this important insight.

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