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# The role of entrepreneurship education as a predictor of university students' entrepreneurial intention

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**Abstract** Using Ajzen's theory of planned behavior and Shapero's entrepreneurial event model as well as entrepreneurial cognition theory, we attempt to identify the relationship between entrepreneurship education, prior entrepreneurial exposure, perceived desirability and feasibility, and entrepreneurial intentions (EI) for university students. The data were collected from a survey of ten universities; we received 494 effective responses. We used probit estimation to show that perceived desirability significantly impacts EI whereas there is no significant impact from perceived feasibility. There is a significant negative impact from exposure (which is surprising) and a significant positive impact from entrepreneurship education. Males and people from technological universities and/or backgrounds have higher EI than females and people from other universities and backgrounds. There are also significant positive interactive effects by gender, university type, and study major on the relationship between entrepreneurship education and EI.

**Keywords** Entrepreneurship · Entrepreneurial intention · Entrepreneurship education · Prior entrepreneurial exposure

## Introduction

Entrepreneurship plays an important role in economic development by incubating technological innovations, increasing economic efficiency, and creating new jobs

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(Shane and Venkataraman 2000). Therefore, tremendous research attention has been devoted to entrepreneurship in recent decades. One of the most widely studied questions is: *What makes an entrepreneur?* Specifically, *what are the basic factors that lead an individual to be willing to become an entrepreneur?* (i.e., that determine his or her Entrepreneurial Intention (EI); see Bird (1988) and Boyd and Vozikis (1994)). Bird (1988) defines intentionality as a state of mind directing personal attention, experience, and action toward a specific goal. This can be an intentional behavior (Bird 1988) or a predictor of planned entrepreneurial behavior (Krueger 1993). More in particular, EI can be defined as the commitment to start a new business (Krueger 1993) and in most career choice models it is considered the antecedent of entrepreneurial behavior. EI is in its turn determined by attitudes, and attitudes are affected by “exogenous influences” such as traits and situational variables (Ajzen 1991; Krueger et al. 2000).

To date, scholars have recognized several determinants of individuals’ EI, including their traits and personalities e.g., the big five (Ciavarella et al. 2004), risk-taking propensity (Zhao et al. 2005), self-efficacy (Zhao et al. 2005), exposure to entrepreneurial activity (e.g., Krueger 1993; Matthews and Moser 1996), and gender (e.g., Eccles 1994; Wilson et al. 2007; Marlow and McAdam 2011). Amongst these determinants of EI, entrepreneurship education appears to be an important antecedent as well, as evidence in previous studies shows that there is clear a linkage between entrepreneurship education and entrepreneurial activities (Galloway and Brown 2002; Gorman et al. 1997; Henderson and Robertson 2000). In general, entrepreneurship education is defined as the process of providing individuals with the concepts and skills to recognize opportunities that others have overlooked and to have the insight and self-esteem to act where others have hesitated (McIntyre and Roche 1999, p. 33).

Although entrepreneurship education is recognized to be important (e.g., Donckels 1991; Crant 1996; Robinson and Sexton 1994; Gorman et al. 1997; Zhao et al. 2005), there have been relatively few empirical studies of its impact, distinct from that of general education, on perceptions of entrepreneurship and EI (Krueger and Brazeal 1994; Peterman and Kennedy 2003). As mentioned by Byabashaija and Katono (2011, page 129): “The effect of general education has been explored but only a few studies have looked at entrepreneurial education, particularly at university and tertiary institution level”. In other words, the effect of entrepreneurship education on entrepreneurial intention is limited and still undergoing empirical testing (Byabashaija and Katono 2011). To address this limitation in current research, the purpose of this paper is to develop an understanding of *how entrepreneurship education influences entrepreneurial intention*.

In addition, in the emerging literature most studies have focused primarily on the *indirect effect* of exogenous influences such as education on entrepreneurial intentions through attitude changes (Ajzen 1991). For example, Wu and Wu (2008), conclude that educational background has a significant indirect impact on EI through the antecedents of EI. However, when they specifically focus on *entrepreneurship* education, they find no significant difference for the three antecedents of entrepreneurial intentions between students who had entrepreneurship education and who did not have. But surprisingly, students who followed entrepreneurship education did show a greater intention to start-up. These findings imply that

entrepreneurship education potentially does not have an indirect effect on EI, but instead has a direct effect.

Unfortunately, most approaches have tended to ignore the question whether exogenous influences in general and entrepreneurship education in particular can also have a direct effect on EI, thereby representing a major void in the literature so far. This is an important conclusion and echoes the results expressed by Crant (1996), who provided evidence for a direct effect of educational level on EI (instead of the indirect effect found by others). To address this void, we go beyond the dominant perspective taken and argue that entrepreneurship education will have a direct effect on EI. Furthermore, comparable to Byabashaija and Katono (2011), who studied the impact of college entrepreneurial education on entrepreneurial intention in Uganda, we also expect that in a developing country like China there are some important moderating factors that combine with entrepreneurial education to influence entrepreneurial intention. More in particular, we will include gender and students’ background in terms of university and major as moderating factors. A final contribution of our paper lies in the fact that most of the studies examining the effect of entrepreneurship education on entrepreneurial intention are focused on developed economies. Very limited empirical research has focused on developing countries (Byabashaija and Katono 2011), such as China.

In sum, we have developed a comprehensive framework to address the impact of entrepreneurship education on EI (see Fig. 1). We applied this model in China and collected data from ten leading universities including Tsinghua University, Renmin University, Beijing University of Aeronautics and Astronautics, Nanjing University, Xián Jiaotong University, and Wuhan University. By collecting data from both universities that offer entrepreneurship education and those that do not, we analyzed

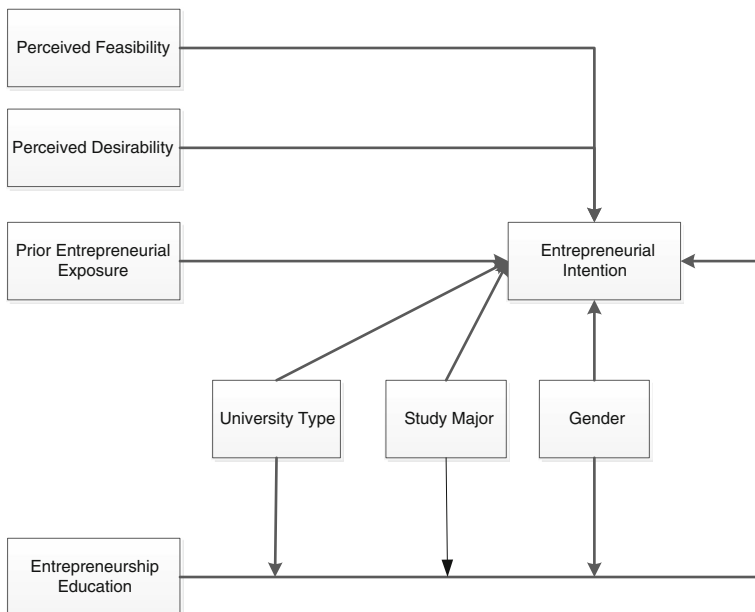


Fig. 1 Conceptual framework

the impact of such education. We conclude that entrepreneurship education has a significant positive effect on Chinese students' EI. It also has significant positive interactive effects especially for technological universities, technological majors, and males.

This paper is organized as follows. Section “[Theoretical framework and hypotheses](#)” describes the theoretical background, the conceptual framework and the hypotheses. Section “[Data and methods](#)” discusses the data and methods. Section “[Results](#)” presents the results, and Section “[Conclusion](#)” provides concluding remarks.

## Theoretical framework and hypotheses

### Theoretical framework

To explore the relationship between EI and its antecedents, scholars have introduced several theoretical models. After an elaborated literature review, we decided to base our investigation on the models of Shapero (1984) and Ajzen (1991), because firstly these two models present the basic cognitive linkage from the antecedents of EI to EI itself and to entrepreneurial action. Secondly, these two models have been robustly tested and validated by existing literature (see for example Peterman and Kennedy 2003; Guerrero et al. 2008; Krueger et al. 2000; Kolvereid 1996; Tkachev and Kolvereid 1999).

In general, the Shapero model (Shapero and Sokol 1982) is called the *entrepreneurial event model (EEM)* and is used to describe an *entrepreneurial process* where intentionality is central (Bird 1988). This model considers business creation as an event that can be explained by the interaction between initiative, ability, management, relative autonomy, and risk. The model indicates that EI stems from the *perception of feasibility and desirability*, and this path is affected by the cultural and social context. This perception of personal choice-making in cultural and social environments has been adopted empirically by Krueger et al. (2000), Peterman and Kennedy (2003), Wilson et al. (2007), and others. Under the assumption that human behavior has an inertia that can be interrupted or replaced by *something*, Shapero argued that perceived desirability and feasibility determine the relative credibility of alternative behaviors, and EI arises *partially* from exposure to entrepreneurial activity (Shapero and Sokol 1982).

The second model is the *theory of planned behavior (TPB)*, introduced by Ajzen (1991). Briefly stated, TPB consists of three components that predict the formation of intention, namely (1) the attitude toward the behavior, (2) subjective norms and (3) the degree of perceived behavioral control (self-efficacy). It claims that any behavior requires a certain amount of planning and can be predicted by the intention to adopt that behavior.

The *attitude toward the act* is the attractiveness of the behavior or the degree to which the individual holds a positive or negative personal valuation of entrepreneurship (Ajzen 1991). It is equivalent to the perception of the personal desirability of the behavior in Shapero's model. *Subjective norms* measure the perceived social pressure from family, friends, or significant others (Ajzen 1991), referring to people's

perceptions of a particular behavior. This includes the family's expectation for an individual's behavior and the expected support from other significant people. However, this factor is difficult to capture and has less predictive impact for subjects with a highly internal locus of control (Ajzen 1987) or a strong orientation toward taking action (Bagozzi et al. 1992). Besides the less predictive impact for particular subjects, several studies also have found no significant direct relationship between subjective norms and EI (Krueger et al. 2000; Autio et al. 2001). Consequently, we will not include subjective norms in our model but rather follow the suggestion of Krueger et al. (2000, page 430) to examine the effect of entrepreneurial exposure on intentions. *Perceived behavioral control* refers to the perception of situational competence and reflects the perceived ability to become self-employed. It is called self-efficacy by Bandura (1997) and is equivalent to perceived feasibility in Shapero's model.

To study the relationship between EI and its antecedents, Krueger et al. (2000) compared Shapero's EEM and Ajzen's TPB using a sample of 97 senior university business students in the USA. They concluded that EEM is slightly superior for assessing EI. Audet (2002) used EEM and TPB to analyze the longitudinal EI of Canadian undergraduate business students and found that the temporal stability of an intention is a requirement for an intention-based model to accurately predict behavior. Therefore, the link between EI and venture creation may prove difficult to establish. Paço et al. (2011) found that TPB is an appropriate tool for modeling the development of EI through pedagogical processes. However, in all of the above mentioned studies the contribution of exogenous factors such as entrepreneurship education and exposure to entrepreneurial experience were not comprehensively investigated. This again motivates our study.

As such, we propose an intention-based model as presented in Fig. 1. First, we investigate the influence of the unobserved credibility construct (illustrated by two observed critical constructs: desirability and feasibility) on entrepreneurial intention. Following Shapero-Sokol's lead we concentrate on the influence of perceived desirability and feasibility on entrepreneurial intentions and assume that self-efficacy elaborated by TPB is embedded in perceived feasibility and attitude is embedded in perceived desirability.

Second, we investigate an additional set of variables that have the potential to account for part of the variation in entrepreneurial intention, namely the exogenous influences of prior entrepreneurial exposure and entrepreneurship education. Our attempt to include both determinants in the intention-based model (Fig. 1) derives from empirical as well as theoretical reasons. Empirically, Krueger (1993) has investigated the impact of prior entrepreneurial exposure on entrepreneurial intention. He concluded that this factor can be added to Shapero's intention-based model and found that there exists correlation between prior entrepreneurial exposure and perceived desirability & feasibility. To analyze the direct impact of the exogenous factor prior entrepreneurial exposure on EI, we extend Krueger's study (1993) in the Chinese context. Concerning the second exogenous factor, entrepreneurship education, several studies show that particular entrepreneurship support programs are successful in encouraging entrepreneurial intentions (see for example Gorman et al. 1997; McMullan et al. 2002; Peterman and Kennedy 2003). In addition, Peterman and

Kennedy (2003) argue that the results of their study show that additional exposure variables (i.e. exposure to entrepreneurship education) should be included in the traditional intentions models.

The theoretical argumentation for adding the two exogenous factors into the intention-based model is based on the entrepreneurial cognition theory. The central question in this theory focuses on value creation-driven opportunity identification (Mitchell et al. 2007). According to Elfving et al. (2009) we can only understand entrepreneurial intentions when we develop a theoretical framework in which opportunity identification (amongst other variables) is included. More in particular, they argue that the traditional EI model offers a limited framework since it does not include the variable opportunity evaluation, which is according to Elfving et al. (2009) and Shane and Venkataraman (2000) an important variable in the intentional process.

Inspired by the entrepreneurial cognition theory, we develop the following reasoning to include prior entrepreneurial exposure and entrepreneurship education in our model, based on two entrepreneurial cognition approaches. First the *heuristics-based logic* (Busenitz and Barney 1997) in the entrepreneurial cognition theory argues that heuristics-based logic is influenced by beliefs that originate in specific methods which are based on informal processes and exposure to entrepreneurial experience for solving problems for which no formula exists (Busenitz and Barney 1997; Busenitz and Lau 1996).

In addition, our attempt to add these two exogenous factors can also be theoretically explained by another aspect of cognition theory—the *entrepreneurial expertise* approach. This approach argues that entrepreneurs develop unique knowledge structures and process information differently because of their “entrepreneurial expertise” (Mitchell 1994). We argue that this different “unique entrepreneurial expertise” can be derived from entrepreneurs’ formal entrepreneurship education and exposure to entrepreneurial activities.

Accordingly, the conceptual framework is formalized and presented in Fig. 1

## Hypotheses

The effect of perceived desirability and perceived feasibility on EI builds upon the prior work of a broad range of researchers studying entrepreneurial intention (e.g. Shapero 1984; Ajzen 1991; Gatewood et al. 1995; Krueger 1993; Guerrero et al. 2008). This work has shown that perceived desirability and perceived feasibility are both significant antecedents of intentions. Shapero and Sokol (1982) argue that perceptions of desirability and feasibility lead to the formation of the entrepreneurial event (although they do not explicitly use the concept of intention). In addition, the theory of planned behavior (Ajzen 1991) shows that the attitude toward the act (perceived desirability), subjective norms and perceived behavioral control (perceived feasibility) are important antecedents of entrepreneurial intention (EI). Moreover, results by Krueger (1993) show that perceived feasibility and perceived desirability explain more than half of the variance in entrepreneurship intention. In addition, both models (EEM and TPB) have been compared with each other and repeatedly empirically tested (see Krueger et al. 2000), providing scholars with a rich and validated



argumentation on the relationship between perceived desirability, perceived feasibility and EI (Fayolle et al. 2006). Following this argumentation we expect that:

Hypothesis 1a: Perceived desirability is positively related to EI.

Hypothesis 1b: Perceived feasibility is positively related to EI.

A third important factor in entrepreneurial intention models, next to perceived desirability and feasibility, is prior exposure to entrepreneurial experience. By examining prior exposure to experience we may explain additional variance in intentions (Ajzen 1987; Krueger et al. 2000). In previous studies, prior entrepreneurial exposure such as having self-employed parents is considered to be a key predictor of self-employment (Dunn and Holtz-Eakin 2000; Hout and Rosen 2000; Krueger 1993; Shapero and Sokol 1982). This is confirmed by others who show that prior exposure to entrepreneurship and experience in the family business (e.g. Dyer and Handler 1994) will affect the family members' intentions towards entrepreneurial action. Children raised up in a family business environment are spontaneously exposed to entrepreneurial circumstance by listening, seeing, feeling, knowing, and understanding real entrepreneurial events. This kind of exposure is according to Carr and Sequeira (2007) an important factor in the development of informational requirements and behavioral skills necessary for self-employment. Consequently, they find support for a positive relationship between prior family business exposure and entrepreneurial intent. In a similar vein, Hundley (2006) argues that a positive effect is established by the acquisition of entrepreneurial capital (skills, values and other attributes conducive to success in self-employment) from exposure to a self-employed parent. In a family business, parents often teach their children relevant skills, values and confidence that is needed to establish their own business (Carr and Sequeira 2007).

We expect that this positive impact also occurs when a person is exposed to an entrepreneurial setting of his/her friends, relatives, employers, or selves. Besides the parents, these people may serve as a role model as well and positively diffuse their entrepreneurial knowledge. Scott and Twomey (1988) confirm that exposure to entrepreneurial experience can vary, either by tapping into the experience of others or one's own. Consequently, as a result of exposure to various role models, we expect that prior entrepreneurial exposure is likely to have a positive effect on an individual's entrepreneurial intention. Therefore, we propose hypothesis 2a as following:

Hypothesis 2a: Prior entrepreneurial exposure is positively related to EI.

A fourth important factor in the evaluation of entrepreneurial intention is the effect of entrepreneurship education. Empirical research has shown that both the presence of education in general and entrepreneurship programs in particular have a positive effect on students' entrepreneurial intention. For example, Cho (1998) suggested that education promotes EI because entrepreneurship-related knowledge and skills stimulate an individual's motivation to create a new venture. Donckels (1991) addressed the promotion of education to encourage entrepreneurial behavior. Gorman et al. (1997) and Kuratko (2003) argued that



entrepreneurship can be learned or at least encouraged via education. Gorman et al. (1997), McMullan et al. (2002) and Peterman and Kennedy (2003) showed that particular entrepreneurship support programs were successful in encouraging entrepreneurs to start a business or to improve their business performance. Wu and Wu (2008) confirm that student who follow entrepreneurship education indeed show a greater intention to start-up.

Since university education has a clear impact on personal career choice, entrepreneurship education at universities is important as well. A study by Peterman and Kennedy (2003) found that exposure to such education affects EI, but it surveyed high-school students. Souitaris et al. (2007) used a pretest/post-test experimental design to show that entrepreneurship programs improve the attitudes and the EI of science and engineering students. We therefore form the following hypothesis on the impact of entrepreneurship education on EI:

**Hypothesis 2b:** Entrepreneurship education is positively related to EI.

Along with their growing influx into the workforce over the last half century, women have become more active in entrepreneurial activities (Bowen and Hisrich 1986). This has led to studies of the relationship between gender and EI (Bowen and Hisrich 1986). Several studies indicate that the preference for self-employment is an important indicator of actual involvement in self-employment, and that women have a lower preference for self-employment vis-à-vis wage employment than men do (Blanchflower et al. 2001; Grilo and Irigoyen 2006). Hsu et al. (2007) provide evidence that women alumna lag their male counterparts in the rate at which they become entrepreneurs. Verheul et al. (2005) found that women tend to select different activities, choosing less frequently those activities that both genders view as entrepreneurial. Zhao et al. (2005) show that gender is not related to entrepreneurial self-efficacy but is directly related to EI: women reported lower EI than men did. Wang and Wong (2004) show that gender affects the EI of Singaporean students.

Women may feel as capable of performing entrepreneurial tasks as men do but may perceive the environment as more difficult and less rewarding. The under-representation of women in entrepreneurship, called the “pipeline” effect (Wilson 2002), may arise from gender-related constraints. Such constraints impede career progression, which in turn encourages premature departure from related fields of employment (Marlow and McAdam 2011) and limits women’s ability to accrue appropriate entrepreneurial capital (Crump et al. 2007). Many studies show that males have higher EI than females do, but this result may not be valid in China. By 2011 25 % of Chinese entrepreneurs were female, and 80 % of these women state that the motivation fuelling their entrepreneurial spirit is self-realization<sup>1</sup>. Moreover, the literature is not conclusive on the effect of gender on the relationship between entrepreneurship education and the willingness to engage in start-up activities. We argue that although entrepreneurship education would facilitate the formation of entrepreneurial intention as elaborated in hypothesis 2b, the rewarding effect of entrepreneurship education

<sup>1</sup> Source: People’s Daily Online (Sept. 17, 2011), <http://english.peopledaily.com.cn/90778/90862/7598064.html>

for female to perceive the entrepreneurial opportunity and environment would be less than that for male due to the “pipeline” effect (Wilson 2002) existed in women group. Therefore, we hypothesize:

Hypothesis 3a: Females have lower EI than males do.

Hypothesis 3b: Gender has a positive interactive impact on the relationship between entrepreneurship education and EI.

We also explore the EI differences for students from different types of universities and different study majors. With respect to the latter, Wu and Wu (2008) argue that educational background is an important factor influencing entrepreneurial intention. More in particular, results of their study show that academic major plays a significant role as engineering students have a higher entrepreneurial intention than students from other majors. Hassan and Wafa (2012) also show that there are significant differences in entrepreneurial intentions between a diverse set of degree programs. They find that students who follow the science program have significantly higher entrepreneurial intentions than business or arts students. We will follow the results of these studies and argue that students with a technological major have a higher entrepreneurial intention than students following a non-technological major. For understanding the importance of university type, we will follow a similar logic as with the different study majors and argue that students from technological universities have a higher entrepreneurial intention than students from other universities. Thus, we hypothesize that students from technological universities and/or technological majors have higher EI than those without this background (see hypotheses 4a and 5a below).

Besides a higher EI, science students also have a higher risk taking propensity than other students (Hassan and Wafa 2012). This is explained by the fact that the possession of technical skills potentially will lead to a higher sense of self-efficacy. We also know that subjects with a higher sense of self-efficacy see more opportunities in a risky choice and take more risks (Krueger and Dickson 1994). Previously, we mentioned that entrepreneurship education provides individuals with the concepts and skills to recognize opportunities that others have overlooked (McIntyre and Roche 1999, p. 33), which has a positive effect on entrepreneurial intention. When we combine this finding with the fact that science students also recognize more opportunities in a risky choice, we expect that technological universities and/or technological majors will have a positive interactive effect on the relationship between entrepreneurship education and EI (see hypotheses 4b and 5b below).

Hypothesis 4a: Students from technological universities have higher EI than those from other universities.

Hypothesis 4b: Technological universities have a positive interactive impact on the relationship between entrepreneurship education and EI.

Hypothesis 5a: Students with technological majors have higher EI than those with other majors.

Hypothesis 5b: Technological majors have a positive interactive impact on the relationship between entrepreneurship education and EI.

## Data and methods

### Sample

The data were collected from a questionnaire-based survey in 10 Chinese universities from May to August 2010. The questionnaire consisted mainly of structured questions. To reduce the selection bias, these ten universities include both technological and other universities<sup>2</sup>: the Chinese Academy of Science, Tsinghua University (technological), Beihang University (technological), Renmin University, Beijing Institute of Technology (technological), Beijing University of Technology (technological), the Central University of Finance and Economics, Shanghai University, Wuhan University of Technology (technological), and Zhejiang University. Of these ten universities, five universities are in the list of entrepreneurship-education models and five are not. The geographical bias was reduced by selecting universities from international metropolises such as Beijing and Shanghai and provincial capitals such as Hangzhou and Wuhan. In order to reduce the selection bias, we chose students from *university-wide common elective courses* as the surveyed targets, for the reason that respondents from different study subjects and education level can be randomly accessed. To explain, in most of the Chinese universities, university-wide common elective courses are provided for all the population of students in the university, disregard of education level, gender, and study background. Normally, the class size of this type of common elective course is averagely 60 (some of the popular courses can receive up to 100 attendants). In our survey, we prepared 100 questionnaires for each targeted class (one targeted class in one university). Our contacts helped us to distribute the questionnaires randomly in a number of common elective courses in the same semester. In the end, 510 questionnaires were returned (a 72.86 % response rate; 700 questionnaires were distributed), of which 494 were fully completed.

In the 494 effective responses, 72 % of the respondents were younger than 26 years old; 64 % were undergraduate students, 27 % masters students, and 9 % Ph.D. students. The gender distribution was almost equal: 51 % male and 49 % female. There were 176 responses (35 %) from engineering-oriented majors including electronic engineering, industrial electronic automation, mechanical engineering, information systems, optical engineering, chemical engineering, nuclear engineering, construction engineering, and biomedical engineering. Only 171 surveys (35 %) came from engineering-oriented universities.

### Measures

The questions were designed based on our model and related to desirability, feasibility, and prior entrepreneurial exposure. They were derived from robust pretested sources: an unpublished questionnaire used in Shapero and Sokol (1982), Shapero (1984), and the published studies of Cooper et al. (1988), Krueger (1993) and Krueger et al. (2000).

<sup>2</sup> A technological university is a university specializing in engineering science and technology.

### *Dependent variables*

*Entrepreneurship intention* is a dummy variable (yes=1 and no=0). It is set based on the responses to questions such as: Do you think you will start a business in the future?

### *Independent variables*

*Perceived desirability* was based on three subquestions: d(1) To what extent do you desire to have a new business?; d(2) How tense would you be?; and d(3) How enthusiastic are you? Each response was given on a Likert scale from 1 (lowest) to 5 (highest). The final score is calculated by averaging the scores for the three questions.

*Perceived feasibility* was measured in the same way, based on three subquestions: f(1) How hard would it be to run a new business?; f(2) How certain are you of success?; and f(3) How sure of yourself are you?

*Prior entrepreneurial exposure* According to Krueger (1993), Krueger et al. (2000), breadth of prior entrepreneurial experience is a better predictor of attitudes toward starting a new venture than any individual experience, and good experiences have more impact than bad experiences. However, heuristically, the career-choice decision involves various factors considered *integratively*. Therefore, we measured prior entrepreneurial experience in terms of prior entrepreneurial exposure in an integrated index *PE'*. We formed this index by multiplying the *weighted experience breadth (EB)* (sourced from parents and relatives, friends, self, and ex-employers) and the self-evaluated consequences of this *PE'*, called the *experience quality*. We gave each source of *EB* a weight of 0.25; the weight of a positive influence was 1 and that of a negative influence was  $-1$ . The advantage of this integrated index is its reflection of the self-evaluated prior entrepreneurial exposure in terms of both quantity and quality. As an example, the *PE'* index for a respondent who reported a positive influence from parents, a negative influence from friends, no personal experience, and a positive influence from ex-employers is  $0.25(=0.25*1+0.25*(-1)+0.25*0+0.25*1)^3$ .

*Entrepreneurship education* is another independent variable. Its value was based on a scaled question. It was set to 2 for students with entrepreneurship education, to 1 for students who plan to acquire such education, and to 0 for students with no such education and no plans to acquire it.

Other independent variables include *gender* (female=0, male=1), *type of university* (technological=1, other=0), and *type of study major* (technological=1, other=0). A technological university is a university authorized by the Bureau of Chinese Education as a teaching and research institute specializing in engineering science and technology. A non-technological university may teach these subjects but does not specialize in them.

<sup>3</sup> A confirmed factor analysis showed that these four categories represent exposure to entrepreneurial activity.

### Control variables

The control variables in this study are *age* and *education level* (PhD level=3; Master level=2; Bachelor level=1)

### Method

As the dependent variable EI takes two values, having intention (labeled as 1) and having no intention (labeled as 0), we applied Probit Maximum Likelihood Regression to investigate the impact of all the independent variables on the probability of having entrepreneurial intention. The structured equation is presented in Eq. (1), including independent variables, moderated variables, and control variables.

$$Pr.(EI = 1) = \beta_0 + \beta_1 \text{ desirability} + \beta_2 \text{ feasibility} + \beta_3 \text{ entrepreneurship education} + \beta_4 \text{ prior entrepreneurial exposure} + \beta_5 \text{ gender} + \beta_6 \text{ university type} + \beta_7 \text{ study major} + \beta_8 \text{ entrepreneurship education} * \text{university orientation} + \beta_9 \text{ entrepreneurship education} * \text{study major} + \beta_{10} \text{ entrepreneurship education} * \text{gender} + u \quad (1)$$

### Results

Table 1 presents the descriptive statistics and the variable correlations. The results in Table 2 show that Hypothesis 1a, predicting perceived desirability has a significant positive effect on EI, is significantly supported. In a different cultural context, this result is consistent with the conclusion of Luthje and Franke (2003) that students (from MIT) who have a favorable attitude are more likely to become self-employed. However, the estimated results in our study do not support hypothesis 1b that states that the effect of perceived feasibility on EI is positive. We attribute this unexpected result to the negative environmental components of perceived behavioral control. These include (1) *administrative complexities* that consume time and money and may discourage people from starting a business (World Bank 2008), (2) *access to finance*, which is often identified as an important barrier to entry to self-employment (Bates 1995), and (3) the *general economic climate*, which determines the opportunities available and the risks and rewards of setting up shop (Verheul et al. 2002). Moreover, our respondents were students who mostly had no personal entrepreneurial experience, so they may feel uncertain about their inner locus of control and about environmental controls. Thus, although Hypothesis 1b is not supported, this is consistent with Guerrero et al.'s conclusion (Guerrero et al. 2008) that feasibility does not have a positive impact on students' EI.

The positive impact of prior entrepreneurial exposure on EI (Hypothesis 2a) is not supported. In contrast, this variable has a *significant negative* impact on EI. We are surprised but very excited to see this result. Our finding partially confirms the argument put forward by Carr and Sequeira (2007, page 1090) who argue the following: "...individuals with prior family business experience may incorporate their experiences, such that their attitudes and behaviors towards entrepreneurial action are shaped *positively or negatively* towards business ownership". A possible explanation for the negative impact of entrepreneurial exposure on EI that we find in our study

**Table 1** Descriptive statistics and variable correlations

Variable	Observations	Mean	Std. Dev.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12
(1) EI	494	.7186235	.4501266	0	1	1.00											
(2) Perceived Desirability	494	3.632.928	.9947959	0	5	0.57*	1.00										
(3) Perceived Feasibility	494	331.444	.8935212	0	5	0.45*	0.79*	1.00									
(4) Entrepreneurship Education	494	.8137652	.7161799	0	2	0.32	0.30*	0.27*	1.00								
(5) Prior Entrepreneurial Exposure	494	.2368421	.2534327	-0.5	1	-0.04	0.02	-0.01	-0.02	1.00							
(6) University Type	494	.6315789	.4828654	0	1	0.18*	0.03	-0.03	0.09*	0.06	1.00						
(7) Study Major	494	.2894737	.4539778	0	1	0.12*	0.06	0.04	-0.01	-0.02	0.30*	1.00					
(8) Gender	494	.51417	.5003058	0	1	0.17*	0.06	0.12*	0.06	0.05	0.19*	0.14*	1.00				
(9) Age	494	23.79	4.27	17	56	0.10*	0.09	0.09*	0.16*	0.07	0.19*	0.23*	0.12*	1.00			
(10) Entrepreneurship Education*Gender	494	.4392713	.682553	0	2	0.32*	0.20*	0.20*	0.62*	-0.02	0.15*	0.07	0.63*	0.20*	1.00		
(11) Entrepreneurship Education*University Type	494	.5465587	.7240145	0	2	0.34*	0.25*	0.20*	0.73*	0.05	0.58*	0.11*	0.12*	0.24*	0.52*	1.00	
(12) Entrepreneurship Education*Study Major	494	.2327935	.5099989	0	2	0.16*	0.16*	0.09*	0.34*	-0.04	0.20*	0.72*	0.11*	-0.17*	0.26*	0.35*	1.00

Sig: \* (<=0.10), two tails

**Table 2** Probit Regression on EI

Independent variables	Model 1 (Probit)	Model 2 (Probit)	Model 3 (Probit)	Model 4 (Probit)	Model 5 (Probit)
Perceived desirability	1.02*** 0.13	1.06 *** 0.14	1.05*** 0.13	1.08 *** 0.14	1.08*** 0.14
Perceived feasibility	0.14	0.08	0.09	0.05	0.13
Prior entrepreneurial exposure	-0.48 ** 0.3	-0.60** 0.31	-0.67** 0.32	-0.62** 0.31	-0.56** 0.31
Entrepreneurship education (E-education)	0.45 *** 0.11	0.46 *** 0.11	0.15 0.17	0.56 *** 0.13	0.13 0.15
University type (technological=1)		0.30* 0.17	-0.04 0.22	0.34** 0.17	0.32** 0.17
Gender (male=1)		0.47*** 0.16	0.48*** 0.16	0.48 *** 0.16	-0.02 0.22
Study major (technological=1)		0.29* 0.2	0.27* 0.19	0.53** 0.26	0.36** 0.16
Cross effects					
Entrepreneurship education * University type			0.54*** 0.23		
Entrepreneurship education * Study major				-0.37* 0.26	
Entrepreneurship education * Gender (male=1)					0.82*** 0.25
Control variables					
Education level (Bachelor=1, Master=2, PhD=3)		-0.04 0.16	0.02 0.16	-0.04 0.15	-0.05 0.16
Age		0.015 0.03	0.01 0.28	0.01 0.02	0.01 0.03
Constant	-3.72*** 0.45	-4.40 *** 0.67	-4.12*** 0.69	-4.42*** 0.67	-4.29*** 0.7
Log likelihood LRChi2 (Probit)	-192.42 202.29	-180.4 226.31	-177.67 231.77	-179.37 228.37	-174.61 237.89
Pseudo R2	0.34	0.39	0.39	0.39	0.41
Number of Observations	494	494	494	494	494

Sig: \*\*\* ( $\leq 0.01$ ), \*\* ( $\leq 0.05$ ) \* ( $\leq 0.10$ ), two tails

could be that the respondents in our sample are mainly exposed to negative entrepreneurial experiences. Prior exposure to negative entrepreneurial experiences (e.g. bankruptcy) from other role models may strengthen the perceived fears and risks of self-employment and as such may have a negative impact on students' entrepreneurial intention. For instance, if students have a self-employed family from which they gain negative information due to failure or setback, students might be de-motivated to



undertake entrepreneurial activities leading towards a diminished entrepreneurial intention. In addition, the failure rate (98 %) of Chinese students' entrepreneurial activities is extremely high<sup>4</sup>. This exposure to high failure rates and corresponding risks of self-employment, when the alternative is a comparatively stable income from wage employment, might negatively affect students' view of entrepreneurial activities as well.

Hypothesis 2b is supported, proving that entrepreneurship education does have a significant impact on entrepreneurial intention. In other words, taking entrepreneurship education can stimulate entrepreneurial intention and improve the probability of this intention-making.

Hypotheses 3a and 3b suggest an (interactive) impact of gender on EI. Both hypotheses are significantly supported. So females have lower EI than males do. In addition, model 5 offers evidence that if all students receive entrepreneurship education, males have a higher ( $0.82 - 0.02 = 0.80$ ) log-chance of EI than females do.

Hypotheses 4a and 4b suggest an (interactive) positive impact from technological universities on EI. The results supported both hypotheses. The results of model 3 indicate that if all students receive entrepreneurship education (where those who have received such education will have a 0.15 higher log-chance of EI than those who have not), students from technological universities have a higher ( $0.54 - 0.04 = 0.5$ ) log-chance of EI than those from other universities.

Similarly, Hypotheses 5a and 5b, on the (interactive) impact of study major on EI, were significantly supported. In particular, model 4 shows that if all students receive entrepreneurship education, those from technological majors have a higher ( $0.56 - 0.37 = 0.19$ ) log-chance of EI than those from other majors.

## Conclusion

The importance of entrepreneurship cannot be downplayed given its impact on jobs, economic efficiency and innovation (Shane and Venkataraman 2000). Despite its importance it is striking to see that there are only very few studies on the impact of entrepreneurial education. In particular the effect of entrepreneurial education on entrepreneurial intention has been rather neglected in the existing literature. In particular very limited research has been undertaken to address these issues from a developing countries perspective.

In an attempt to fill this void we studied the impact of EE on EI in the context of China. This paper empirically not only demonstrates the effect of EE on EI but also goes beyond the dominant perspective, which assumes that EE has an indirect effect on EI. Deviating from this existing view we were able to show that EE has a direct effect on EI.

The significance of this study lies in our attempt to explain the philosophy that "*entrepreneurship can be increased through education, especially entrepreneurship education*" (European Commission 2006) by estimating the impact of entrepreneurship

<sup>4</sup> Source: Chinese University Students' Career Guide, Nov. 21, 2011.

education on EI<sup>5</sup>. We contribute to one of the key questions in entrepreneurship research, which deals with the issue of why some people become entrepreneurs and others don't (Baron 2004). We show that entrepreneurship education explains a significant amount of additional variance in EI even after other antecedents are entered into the model.

Our findings provide some important theoretical and practical implications. We are one of the first to establish a relationship between university orientation (study major) and EI. This provides a new pathway for researchers in the field of educational studies and entrepreneurship. We also found empirical support for Shane's argument on the relationship between prior knowledge and the discovery of entrepreneurial opportunities (Shane 2000). This is an important finding given the current debate on this issue among academics and practitioners.

The findings on gender are not very surprising but strengthen the need for the current public debate on the need for more female role models. It is important for policy-makers and educators to realize that entrepreneurship is generally associated with masculine characteristics. The lack of female role models seems to reinforce these stereotypes. Therefore there is the need to break away from the traditional entrepreneurial stereotypes and to foster new thinking about entrepreneurship in a more female appealing way.

For educators, policy makers and university management we would like to point at our finding on the interactive effects indicating that entrepreneurship education has a greater effect on EI for males than females, for students from technological universities than from other universities, and for students from technological majors than from other majors. These findings provide empirical evidence to support entrepreneurship education in technological universities and majors. The traditional focus of entrepreneurship educational programs on business students should therefore be accompanied by more focus on entrepreneurship programs for engineering students. In these programs more focus could be placed on technology entrepreneurship, thereby making these programs even more interesting for this specific target group.

Whereas entrepreneurship education seems to facilitate entrepreneurial intention, prior entrepreneurial exposure generates a negative and even stronger effect. Although this effect of entrepreneurial exposure is surprising and warrants more research it is in line with recent work of Carr and Sequeira (2007) who argue that prior exposure to entrepreneurship can be either positive or negative. When students have witnessed the negative consequences of entrepreneurship (bankruptcy, long hours of working, stress etc.), this might decrease their entrepreneurial intention in the future. The fact that this effect appears to be even stronger than the effect of entrepreneurship education indicates that this factor can no longer be ignored by entrepreneurship research. The study of entrepreneurial exposure therefore seems to be an interesting and relatively unexplored field of future research.

Our findings have implications for educators, potential entrepreneurs, and policy-makers. Educators should try to strengthen entrepreneurship education, especially for undergraduate students and those with technological majors. With appropriate education, potential entrepreneurs can recognize opportunities, search for resources

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<sup>5</sup> EI can have a positive impact on entrepreneurial behavior.

economically, and organize efficient teams. Such education stimulates EI and improves entrepreneurs' ability to manage and grow new ventures.

This study has three main limitations. First, we studied university students, which might limit the applicability of our results to other groups. Secondly, we did not track the respondents' entrepreneurial behavior after the survey. Thirdly, we did not analyze the results at the provincial level. We recommend that future studies be based on a larger dataset so that students' EI before and after entrepreneurship education can be compared. Other groups could be studied, such as middle-school students, those who are carrying out entrepreneurial activities in incubators, and those who undertake entrepreneurship education. Scholars could use path analysis or multilevel analysis to further explore the interactive effects of entrepreneurship education on EI.

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