

# Attitudes of higher education students to new venture creation

## The relevance of competencies and contextual factors

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**Abstract:** Higher education institutions (HEIs) play an important role in the generation of high-tech 'entrepreneurial capacity'. As entrepreneurship education gives greater attention to the creation of new ventures, there is an urgent need for a better understanding of the attitudes of students, potentially the entrepreneurs of the future. Logit estimates using 4,413 responses from students enrolled in Portuguese HEIs show that students who have business-related competences and live in an environment that fosters and encourages entrepreneurship have a stronger desire to become entrepreneurs. This supports the contention that entrepreneurship is a process that can be learned and that HE establishments, teachers and other institutions and individuals are in a position to encourage entrepreneurial behaviour.

**Keywords:** entrepreneurship education; entrepreneurship; students' attitudes; entrepreneurial intention; new venture creation

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The continuing uncertainties about national and global economies, corporate and government downsizing and a declining number of corporate recruiters in the education system have increased the appeal of self-employment and new business creation (Moore, 2002; Klapper and Léger-Jarniou, 2006). Entrepreneurship, either through the creation of new ventures or within existing firms, has been identified as one of the major engines of economic growth (Wennekers and Thurik, 1999; Carree and Thurik, 2003; Rasmussen and Sørheim, 2006). In the 1990s, Malecki (1997) pointed out that there was a close relationship between

entrepreneurship and regional and local development, while Reynolds *et al* (1994) found that high start-up rates were a necessary (although not sufficient) condition for economic growth. Entrepreneurial organizations make two critical contributions to market economies (Kuratko, 2005): first, they are an integral part of the renewal process that pervades and defines market economies, playing a crucial role with innovations that lead to technological change and productivity growth; and, second, entrepreneurial businesses are the essential mechanism by which millions of individuals (including, in particular,

disadvantaged groups such as women and minorities) seek to achieve financial success.

As a consequence of the trend towards entrepreneurial activities and widespread belief of the social and economic effectiveness of entrepreneurship, there has been a dramatic increase in the number of public and private initiatives to promote entrepreneurial activity, propelled by the expectation of accelerating the rate of growth of innovation, technology development and job creation (Reynolds *et al*, 2001). In addition, in the context of academic and scientific research, entrepreneurship has secured a higher profile, improved status and more resources (Laukkanen, 2000).

Traditionally, courses within business schools have mostly been designed on the basis that graduating students would seek employment in specialized departments in large, established organizations (Levenburg *et al*, 2006). Increasingly, however, students have been choosing, or expressing a desire, to start their own businesses both before and during their undergraduate studies, as well as at postgraduate level (Oakey *et al*, 2002). As a result, students interested in creating new businesses (that is, 'entrepreneurship') need to develop a range of skills (McMullan and Long, 1987) – for example, planning, risk-taking, market analysis, problem-solving and creativity – that will support their new ventures. In fact, the successful creation of a new venture requires a command and blend of skills different to those required to maintain an established business. Higher education courses, whilst having their limitations, can play a role in providing useful insights into the challenges involved in being an entrepreneur and in encouraging the development of skills and self-reliance (Henderson and Robertson, 2000). In this context courses – both principal and secondary – in entrepreneurship have emerged in numerous higher education institutions (HEIs) in order to encourage the entrepreneurial ambitions of students (for example, in Austria, France and Portugal: see EC, 2008).

In Portugal, education in entrepreneurship is a novelty in the curriculum of higher education institutions. The majority of the current entrepreneurship courses first appeared in 2002 and thereafter (Redford, 2006; Redford and Trigo, 2007). At the macroeconomic level, the most recent report from the Global Entrepreneurship Monitor (GEM, 2008) concluded that there had been a substantial improvement in Portugal between 2004 and 2007 with regard to access to physical infrastructures and an increasing degree of social and cultural openness to innovation and change. Data from GEM indicate that Portugal is at the top of the ranking among the 18 European Union participant countries, with 9 in 100 individuals involved in new business creation:

Portuguese 'entrepreneurial capacity' has doubled during the period 2004–2007.

Despite this apparently rapid change, some business representatives and former policy makers have raised serious doubts about the sustainability of this entrepreneurial trend. For instance, Mira Amaral, former Minister for Industry and Energy (1987–1995), member of the European Community Competitiveness Advisory Group and President of the Forum for Competitiveness, recognizes that Portugal is still behind in terms of investment in new ideas and entrepreneurial projects, identifying a lack of public policies in this area. He believes the Portuguese government needs to make bigger investments in entrepreneurship and risk capital, especially in *technological* projects that lead to exports.<sup>1</sup>

Higher education institutions (universities and polytechnics) play an important role in the generation of high-tech 'entrepreneurial capacity' – more specifically, entrepreneurial human capital: that is, the creation of skills, incentives and a cultural environment favourable for the commercialization, by researchers, teachers and students in general, of R&D outcomes (Mendonça *et al*, 2009). Since entrepreneurship in general and entrepreneurship education in particular are emerging phenomena in Portugal, there is an urgent for better understanding and development which could be achieved by analysing the supply side – that is, the courses taught in this field, as studied by Redford (Redford, 2006) – and the 'demand side', that is, the attitudes of students, the potential entrepreneurs of the future, to new venture creation.

The impact of entrepreneurship education has been recognized as one of the crucial factors that help young people understand and develop an entrepreneurial attitude (Gorman *et al*, 1997; Kourilsky and Walstad, 1998). Although other interrelated factors such as family and role models (van Auken *et al*, 2006) influence young people's attitudes towards entrepreneurship, education can be a critical enhancing factor, particularly in contexts where an increasing proportion of young(er) people is pursuing business creation, as is the case in Portugal (GEM, 2008; Mendonça, 2009). There is thus a need to understand how to develop and nurture potential entrepreneurs while they are still students. Few empirical studies have examined the entrepreneurial propensity of university students as a source of future entrepreneurs (Wang and Wong, 2004). Because the students' attitudes towards and knowledge of entrepreneurship are likely to influence their tendency to consider starting their own businesses, such a study would also help universities and other higher education institutions to develop suitable educational programmes for promoting entrepreneurship.

This paper examines the attitudes of higher education students in Portugal with regard to new venture creation and evaluates which factors (for example, individual, contextual or educational) are likely to influence the attitudes of young people towards entrepreneurship. In particular, we aim to highlight the role of education (type and level of degree, area of study, entrepreneurship competencies and type of higher education institution).

The paper is organized thus: the first two sections provide a brief review of the literature on entrepreneurship, with particular emphasis on student entrepreneurship and highlighting the main findings from existing research. Section 3 then describes the methodology used and data collection; and section 4 presents and discusses the results on the determinants of Portuguese students' entrepreneurial intentions and propensity. Finally, in our conclusions we highlight the key results of the present study and offer some policy recommendations.

## Literature review

### *Relevance of entrepreneurship and entrepreneurship education*

For developed countries, entrepreneurial activity, as represented by new venture formation, can be the means by which stagnant economies are revitalized and unemployment problems are managed by providing new job opportunities (Gürol and Atsan, 2006). Equally, it is a potential catalyst and incubator for technological progress, product and market innovation (Jack and Anderson, 1999; Mueller and Thomas, 2000). In both developed (EC, 2008) and developing countries (Gürol and Atsan, 2006), entrepreneurship has increasingly been seen as an engine of economic progress, job creation and social adjustment. Thus, both small business growth and new business formation are encouraged by national economic policies, to stimulate economic growth and the creation of financial wealth (Mendonça *et al.*, 2009).

According to official data, some 23 million small and medium-sized enterprises (SMEs) were responsible for the creation of more than two-thirds of employment in the private sector in Europe, which corresponds to 75 million jobs (EC, 2006: 3).<sup>2</sup> In Portugal, during the period 1991–2000, 93% of new firms were very small, with less than 10 workers (Baptista and Thurik, 2007).<sup>3</sup>

As interest in entrepreneurship has increased throughout the world, there has also been a corresponding greater level of interest in Portugal in entrepreneurship activities among academic scholars, government policy-makers and business leaders (GEM, 2008). Due to a lack of both qualified entrepreneurs and

accumulation of capital during the *Estado Novo* (dictatorship) period of 1932–1968, a state-initiated economic policy was implemented with state-owned enterprises playing a leading role, particularly in the industrial sector (Barreto, 1999). Since the mid-1970s, and in particular following Portugal's entry into the European Community in 1985, a major shift in the country's economic development strategy has taken place. The importance of entrepreneurship and small businesses to the economy is now widely recognized, with national incentives being offered by successive governments. The meta-narrative concerning a lack of entrepreneurs and entrepreneurial spirit has been translated into a variety of programmes and initiatives designed to raise awareness of entrepreneurship and to foster entrepreneurial activity,<sup>4</sup> an important contribution to the motivation of individuals and, especially, young people in higher education, to start their own business. Various organizations and institutions are involved in the delivery of such programmes, ranging from government agencies and local enterprise agencies to chambers of commerce and professional associations to university business schools.

A central premise of these programmes is that entrepreneurship is a learned phenomenon; that entrepreneurs are not born, but are produced by way of their experiences as they develop and learn, influenced by teachers, parents, mentors and role models (Volery, 2004). It could be argued that whilst individuals interested in entrepreneurship and current entrepreneurs cannot be taught, they can be encouraged rather than discouraged. Thus, entrepreneurship is regarded as a learning and learned process.

The idea of becoming an entrepreneur is increasingly attractive to students because it is seen as a rewarding way of entering the labour market without losing personal independence (Martínez *et al.*, 2007). The most common values amongst graduates confronted by the demands of the new labour markets are linked to those of self-employment: independence, challenge and self-fulfilment (Lüthje and Franke, 2003). Although there has been a significant amount of research on the causes of the increased inclination towards and attractiveness of entrepreneurship, (Greenberger and Sexton, 1988; Learned, 1992; Naffziger *et al.*, 1994; Brandstatter, 1997), there is only a small number of studies that concentrate on entrepreneurial intentions among students. Those that do exist (for example, Autio *et al.*, 2001; Collins *et al.*, 2004; Franke and Lüthje, 2004) tend to focus on experience in the USA and UK and are mainly restricted to samples of small numbers of students with business, or directly related topics as their principal subject of study.

Despite the heterogeneity of sampling methods and target population, existing studies report that, on average, a quarter of the students surveyed claimed that after graduating they would like to become entrepreneurs (that is, to start their own business or be self-employed). There are nevertheless noticeable differences between US and non-US students: in general, there is a higher entrepreneurial intent among US students. For instance, Franke and Lüthje (2004), analysing 1,313 business undergraduates from Austria, Germany and the USA found that entrepreneurial intentions of those in the USA was double that of Germany's (50% against 25%) and substantially above Austria's (36%). In Portugal, for a range (60) of courses in the largest Portuguese university, Teixeira and Forte (2009) found that around 26% of final year students envisaged starting a new venture as their career choice. This percentage varied considerably among disciplines and courses, from the lowest (11%) in psychology to the highest (47%) in veterinary medicine.

Although new venture opportunities exist within nearly all academic disciplines, the majority of entrepreneurship initiatives at universities are offered by business schools (Ede *et al*, 1998; Hisrich, 1988) and for business students (for example, Roebuck and Brawley, 1996). In fact, most studies exploring entrepreneurial intent among university students have focused on business students (see, for example, DeMartino and Barbato, 2002; Ede *et al*, 1998; Hills and Barnaby, 1977; Hills and Welsch, 1986; Krueger *et al*, 2000; Lissy, 2000; Sagie and Elizur, 1999; Sexton and Bowman, 1983). However, Hynes advocated that entrepreneurship education can and should also be promoted and fostered among non-business students (Hynes, 1996).

Picker *et al* (2005) mention that entrepreneurial-led measures have been recently implemented, through the establishment of new graduate programmes, at MIT, the Stockholm School of Entrepreneurship and the International Graduate School of Chemistry (Muenster, Germany). Thus, if one of the goals of designing entrepreneurial programmes is to help all students, it is important to understand the intentions of students enrolled in disciplines other than business.

#### *Determinants of the entrepreneurial intents of students*

We share Krueger's view that intentions are in fact constructed, even when they appear to arise spontaneously (Krueger, 1996). Entrepreneurial intentions, in which key initial characteristics are rooted, are crucial to an understanding of the overall process of entrepreneurship. They are the driving force behind the establishment of a new venture or creation of new values in an existing venture (Bird, 1988).

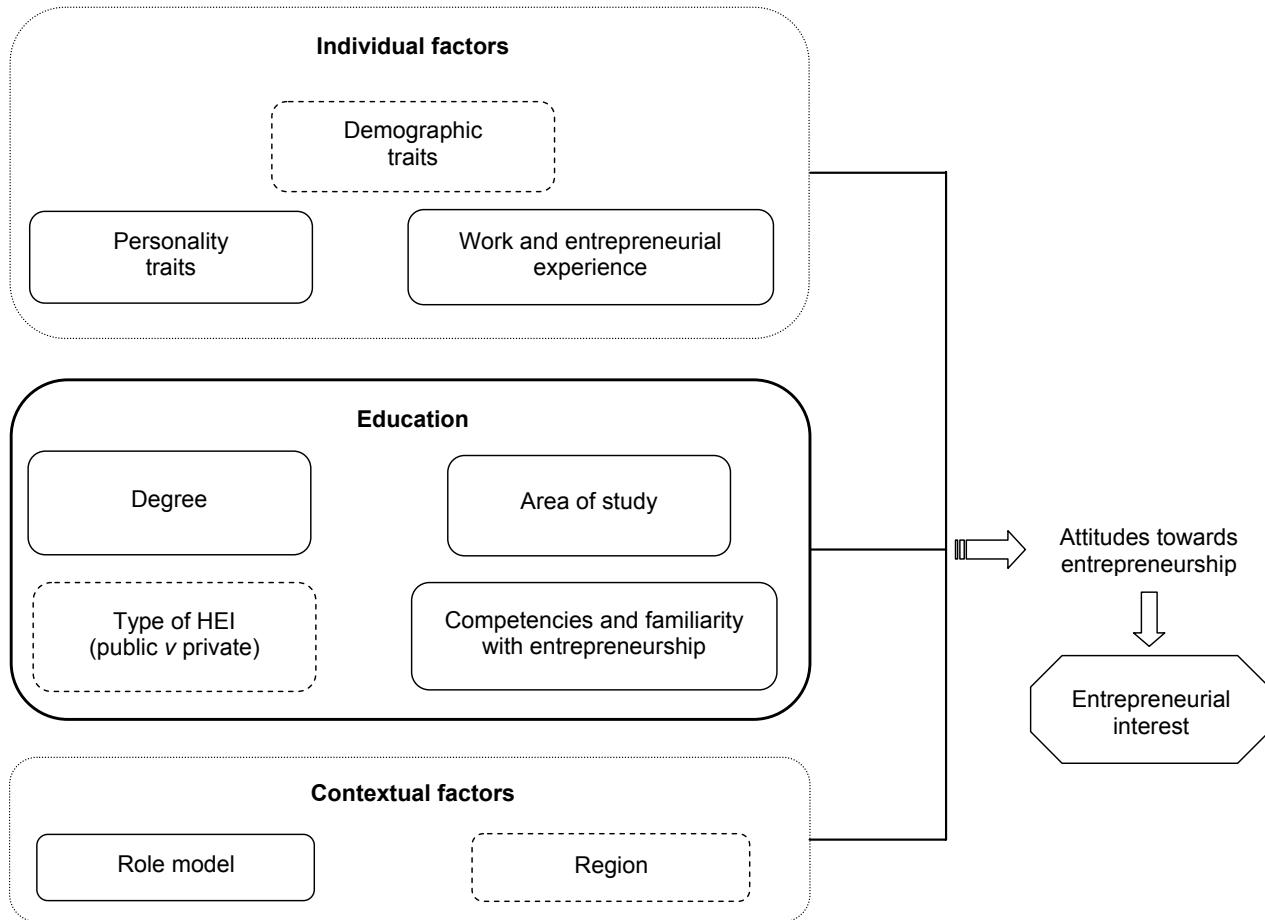
The relevant literature on entrepreneurial activities reveals that there is consistent interest in identifying the factors that lead an individual to become an entrepreneur (Martínez *et al*, 2007). These studies reveal that there are several, similar factors, the most frequent of which are age, gender, professional background, work experience and educational and psychological profiles (Delmar and Davidsson, 2000). Broadly speaking, three factors have been used to measure entrepreneurial intentions: demographic data, personality traits (Robinson, 1987) and contextual factors (Naffziger *et al*, 1994). Demographic data (for instance, gender and age) can be used to describe entrepreneurs, but consideration of most of these characteristics does not enhance the ability to predict whether or not a person is likely to start a business (Hatten and Ruhland, 1995). The second method used to assess entrepreneurial intentions involves examination of personality traits such as risk taking, creativity and motivation to achieve (Teixeira, 2008a). However, several authors (for example, Naffziger *et al*, 1994) argue that the decision to behave entrepreneurially is based on more than personal characteristics and individual differences. Thus the interaction of personal characteristics (risk, creativity and need for achievement) with other important perceptions of contextual factors (work and professional experience, region and role model), competencies and familiarity with entrepreneurship (entrepreneurial experience, knowledge, awareness and interest), formal education (schooling year, degree, type of higher education institution), and type of course and areas of study, may be critical for assessing the entrepreneurial potential of students. Figure 1 shows the 'structural model' of the entrepreneurial intentions of students that was used in this study.

The analysis underlying this study extends existing research in the area of students' entrepreneurial intentions in several ways: it includes both undergraduate and postgraduate students from all scientific areas, enrolled in every academic year (that is, at all stages of the courses) at all Portuguese higher education institutions (universities and polytechnics, public and private). Using such an extensive sample enabled us to obtain a reasonable, nationwide view of the extent of the entrepreneurship culture in Portugal. Further details of our sample are given in the next section.

## **Methodology and data gathering**

### *Target population and sample*

The research described in this paper is an extension of an international survey of first-year business students



**Figure 1.** Structural model of entrepreneurial intent

Note: discontinuous lines (demographic traits; type of institution, region) identify the 'control' variables.

involving eight universities from eight countries, including the University of Porto.<sup>5</sup> Several different aspects were considered in the present study which targeted all students in Portugal enrolled in higher education institutions and included both undergraduate and postgraduate students, irrespective of the stage of the course, from public and private polytechnic and university HEIs, from all scientific disciplines and subjects.

This empirical study was therefore designed as part of a wider, international research project having the aim of advancing the understanding, in comparative terms, of the attitudes of students to new venture creation. In particular, the research seeks to answer the question: 'what are the determinants of students' entrepreneurial intentions?'.

A descriptive and quantitative method was used: whilst exploratory and causal research explores circumstances, descriptive research portrays specific details of a situation, social setting or relationship. In order to meet the challenge of illustrating the status quo

of student attitudes to new venture creation, a quantitative design was therefore chosen. An online survey was selected as the most appropriate research method on the basis of the nature of the research questions and the multi-establishment, multi-course approach employed.

#### *Data collection*

In June 2008, the Rectors and Directors of all Portuguese higher education institutions were contacted and asked to collaborate by sending an email to all their students (undergraduate and postgraduate) with a message describing the project and asking the students to participate in the survey. Some HEIs also publicized the research and the link to the survey on their Website home page. By the end of September 2008, 4,413 valid responses had been received, representing 1.2% of the total number of students enrolled in higher education in Portugal. Although the sample obtained is reasonably representative of the whole population of Portuguese higher education students with regard to degree subject

**Table 1. Definition of the proxies for the relevant variables.**

<b>Variable</b>	<b>Definition of the proxy</b>
Effective entrepreneurial propensity – created firms	Dummy variable takes the value 1 if the student had already created a firm (effective entrepreneurial propensity <i>stricto sensu</i> ) and 0 otherwise.
Effective entrepreneurial propensity – taken steps to start a business/created a firm	Dummy variable took the value 1, if the student had created a firm or had taken some steps to create a firm (effective entrepreneurial propensity <i>lato sensu</i> ) and 0 otherwise.
Potential entrepreneurial propensity	The entrepreneurial intent variable was directly assessed by asking students, on a scale of 1 (employee) to 5 (having my own business), which was the most likely option for their future career. If the student answered 4 or 5, the entrepreneurial intent variable took the value 1 and 0 otherwise.
Gender (female= 1; male=0)	Dummy variable takes the value 1 if the student is female, 0 otherwise.
Age (ln)	Numerical variable, in logarithm, of students' age.
Risky (dummy=1)	The 'risky' variable is the sum of three dummy variables computed based on answers given by students in the questionnaire. A first dummy took the value 1 when the student answered 1 (strongly disagree) or 2 (disagree) to the statement 'One should not start a business when there is a risk it might fail', and 0 otherwise. The second dummy took the value 1 when the student answered 1 (strongly disagree) or 2 (disagree) to the statement 'Job security/stability of employment/stable income' when asked 'Why would you prefer to be an employee rather than self-employed?'. The third dummy took the value 1 when the student answered 1 (strongly disagree) or 2 (disagree) to the statement 'It is not as risky as being self-employed' when asked 'Why would you prefer to be an employee rather than self-employed?'. Then we summed up the three dummy variables and re-computed a new dummy variable, which took the value 1 when the sum variable resulted in values 2 and 3, and 0 otherwise.
Creativity (dummy=1)	The 'creativity' variable is a dummy variable that took the value 1 when the student answered 4 (agree) or 5 (strongly agree) to the statement 'I have an idea that could be a business opportunity'.
Need for achievement (dummy=1)	The 'need for achievement' variable is the sum of two dummy variables computed based on answers given by students in the questionnaire. A first dummy took the value 1 when the student answered 4 (agree) or 5 (strongly agree) to the statement 'Personal achievement', and 0 otherwise when asked 'Why would you prefer to be self-employed rather than an employee?'. The second dummy took the value 1 when the student answered 4 (agree) or 5 (strongly agree) to the statement 'Personal independence/Managing own time' when asked 'Why would you prefer to be self-employed rather than an employee?'. Then we summed up the two dummy variables and re-computed a new dummy variable that took the value 1 when the sum variable resulted in values 2 and 0 otherwise.
Work experience (ln)	Numerical variable, in logarithm, of students' work experience (1: no experience; 2: internship; 3: part-time job; 4: full-time less than 1 year; 5: full-time over a year).
Entrepreneurial experience (ln)	Entrepreneurship experience is a numeric variable, computed in logarithm, that resulted from the sum of the scores (1...5) obtained from the answers to the following statements: 'I worked for myself as a teenager, eg delivering papers, babysitting, mowing lawns, etc'; 'I have been a freelancer or self-employed'; 'I have closely followed or assisted family members who have started companies'; 'I have closely followed or assisted friends or acquaintances who have started companies'.

**Table 1. Continued.**

Variable	Definition of the proxy
Entrepreneurial knowledge (ln)	Entrepreneurship knowledge is a numeric variable, computed in logarithm, that resulted from the sum of the scores (1...5) obtained from the answers to the following statements: 'I know techniques for finding out what the market wants'; 'I understand the type of issues that face entrepreneurs in taking an idea to market'; 'I can create a business plan and a business concept'; 'I know how to legally finance a new business concept'.
Entrepreneurial awareness (ln)	Entrepreneurship awareness is a numeric variable, computed in logarithm, that resulted from the sum of the scores (1...5) obtained from the answers to the following statements: 'I regularly read books/articles about entrepreneurship/innovation'; 'I participate regularly in conferences/lectures/workshops on entrepreneurship and/or innovation'.
Entrepreneurial interest (ln)	Entrepreneurship interest is a numeric variable, computed in logarithm, that resulted from the sum of the scores (1...5) obtained from the following statements: 'Starting a new business from an idea'; 'Entrepreneurship using research'; 'Entrepreneurship within an existing company', in response to the following question: 'How interested are you in one of the following topics during your studies?'
Schooling year (ln)	Numerical variable in logarithm of students' schooling year (undergraduate degree and Integrated Master's: 1st to 6th year of schooling; MBA: 7th year of schooling; Master's: 8th–9th year of schooling ; PhD: 10th–13th year of schooling).
Master's + MBA	Dummy variable taking the value 1 if the student was enrolled in a Master's or MBA degree, 0 otherwise.
PhD	Dummy variable taking the value 1 if the student was enrolled in a PhD degree, 0 otherwise.
Public versus private (public=1; private=0)	Dummy variable taking the value 1 if the student was enrolled in a public higher education institution, 0 if the student was enrolled in a private institution.
University versus polytechnic (uni=1; poly=0)	Dummy variable taking the value 1 if the student was enrolled in a university, 0 if the student was enrolled in a polytechnic or other tertiary-level school.
Role model (family and friends)	Dummy variable taking the value 1 when the student chose 4 (agree) or 5 (totally agree) in response to the statement 'My relatives and close friends work as self-employed/are employers', when questioned 'Why would you prefer to be self-employed rather than an employee?'.

and gender, it does show a clear bias towards students enrolled in schools located in the North and Central Regions, at the expense of those located in the Lisbon area. Additionally, technology-related areas (that is, engineering, manufacturing and construction) are over-represented: health-related, scientific areas are underrepresented.

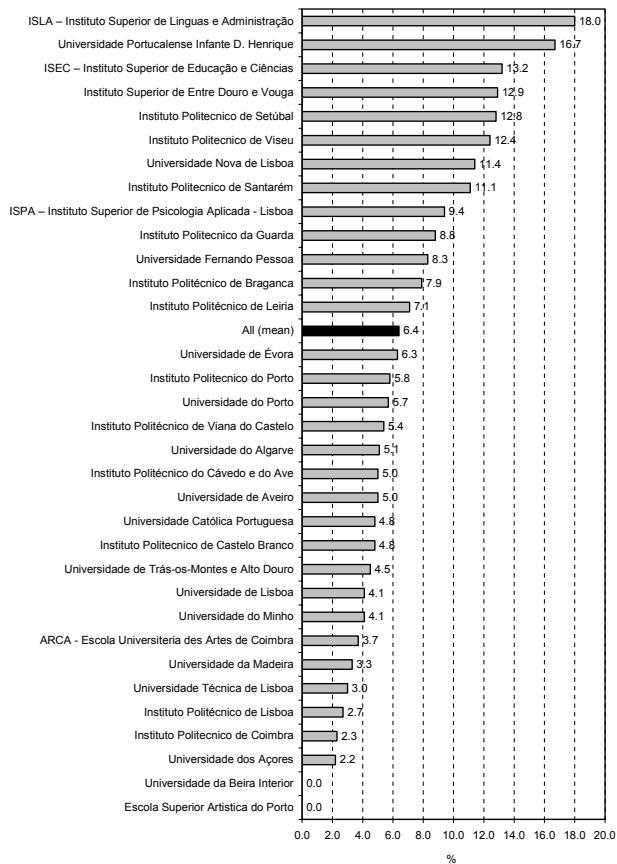
#### Proxies for the variables

Three measures of the entrepreneurial potential of students were produced in this study: two that may be considered as measures of *effective entrepreneurial propensity*, and one of entrepreneurial *intent*. The two measures of effective entrepreneurial propensity were calculated as dummy variables which, in one case, took the value 1 if the student had already created a business

(effective entrepreneurial propensity *stricto sensu*) and 0 (zero) otherwise; in the other case, it took the value 1 if the student had already created a business or taken some steps towards doing so (effective entrepreneurial propensity *lato sensu*) and 0 (zero) otherwise. The variable of entrepreneurial *intent* was directly assessed by asking students, on a scale of 1 ('employee') to 5 ('having my own business'), which was the most likely option for their future career. If the student answered 4 or 5, the entrepreneurial intent variable took the value 1; and 0 (zero) otherwise.

Measuring entrepreneurial potential of students in these different ways enabled an assessment to be made of the extent to which some factors – for instance, education-related – could 'determine' the entrepreneurial attitudes of students in a significant, distinct manner.

## Student attitudes to entrepreneurship in Portugal



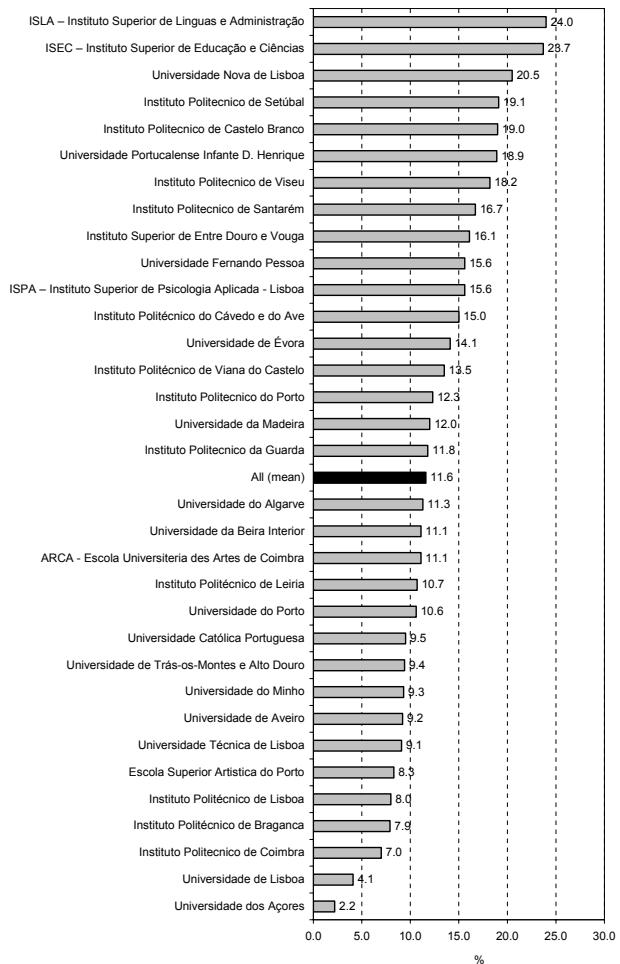
**Figure 2.** Effective entrepreneurship (*stricto sensu*) of Portuguese higher education students, by school.

According to our structural model of entrepreneurial intents (Figure 1), students' attitudes may be influenced by three sets of determinants: individual (personality, competencies, demographic traits), education (degree, area of study, public v private institution), and contextual (role model, professional experience, region). Table 1 gives details of how the different proxies were constructed.

## Results

### Descriptive statistics

Considering only the higher education institutions that are ranked in the top 30 (Figure 2), ISLA (*Instituto Superior de Línguas e Administração*), Universidade Portucalense Infante D. Henrique, and ISEC (*Instituto Superior de Educação e Ciências*) are the best positioned as far as the effective entrepreneurial propensity is concerned. For example, of the total number of students surveyed, 6.4% stated that they had created at least one business (effective entrepreneurship *stricto sensu*): the corresponding percentage for students enrolled at ISLA is almost three times higher (18.0%)

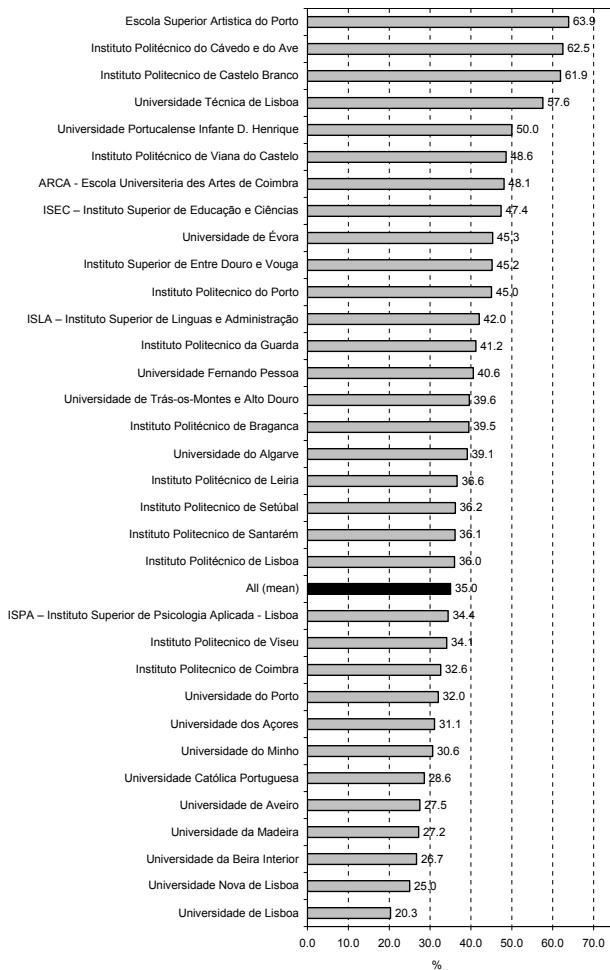


**Figure 3.** Effective entrepreneurship (*lato sensu*) of Portuguese higher education students, by school.

and for the *Universidade Portucalense* it is more than double (16.7%). At *Instituto Superior de Educação e Ciências*, *Instituto Politécnico de Setúbal* and *Instituto Superior de Entre Douro e Vouga*, the effective entrepreneurial rate, around 13%, is twice the overall mean value of 6.4%. Thus, at first sight, we are inclined to conclude that students enrolled in non-university institutions are more entrepreneurially-oriented.

When the concept of effective entrepreneurship is widened to include not only the creation of firms *stricto sensu* but also action taken to create new ventures (entrepreneurship *lato sensu*), *Universidade Nova de Lisboa* enters the top 3 highest ranked institutions (Figure 3), with 21% of its students claiming that they had already taken some steps towards creating a new business (well above the overall average value of 11.6%).

ISLA and *Instituto Superior de Educação e Ciências* are in the top rankings with 25% of students having created, or taken some steps towards creating, a



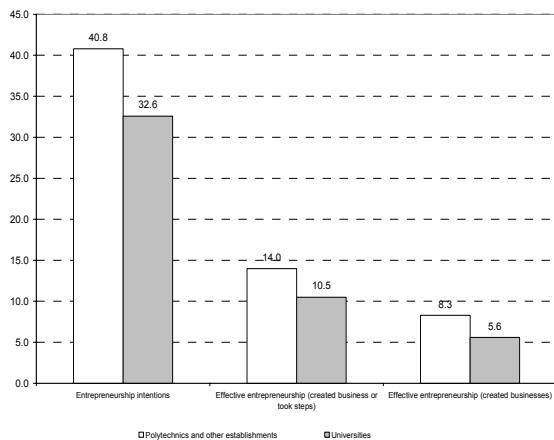
**Figure 4.** Entrepreneurship intent of Portuguese higher education students, by school.

business. When analysing the entrepreneurial intentions of students (Figure 4), that is, the extent to which

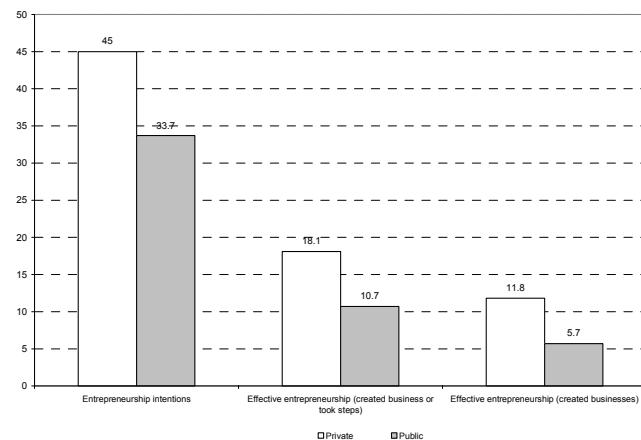
students think that their future will include having their own business rather than working for an employer, the ranking changes significantly. Although the worst ranked in terms of effective entrepreneurship (as represented by the number of businesses created), the *Escola Superior Artística do Porto* ranks first in terms of entrepreneurial intentions; similar findings were reported for the *Universidade Técnica de Lisboa*, *Instituto Politécnico do Cávado e Ave*, *Instituto Politécnico de Castelo Branco*, and *Universidade Portucalense*, these forming the top five with regard to entrepreneurial intentions.

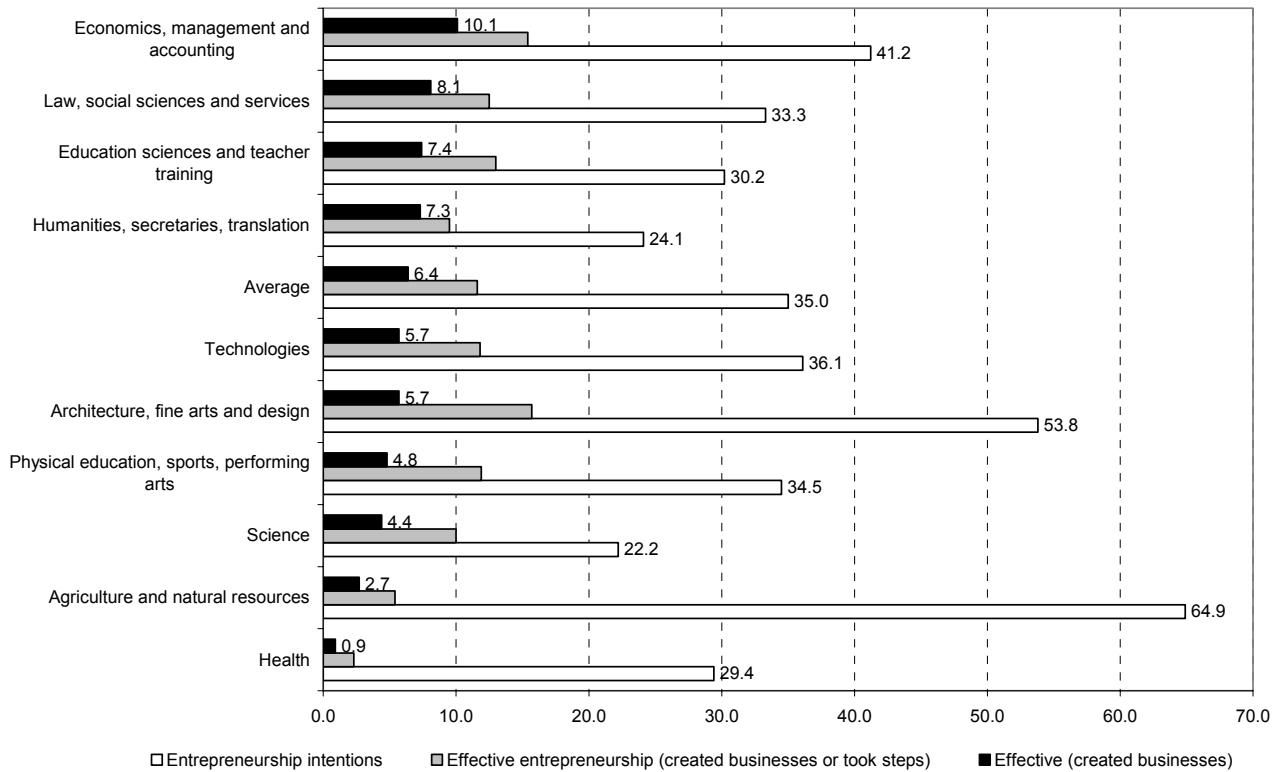
Upon first inspection the above analysis seems to reveal that public and private HE establishments, as well as universities and non-universities, show quite distinct trends as far as effective entrepreneurship and entrepreneurship intentions are concerned: this is clearly illustrated in Figure 5. Polytechnics, other establishments and private HEIs systematically had higher average values for potential and effective entrepreneurship than universities and public HEIs.

Analysis of whether entrepreneurial attitudes vary between different scientific areas also proved interesting. As can be seen in Figure 6, on average 10% of students enrolled in courses in economics, management and accounting had already created businesses; and a further 5% had already taken steps towards doing so. A somewhat surprising result, at first sight, is that students enrolled in courses from education sciences, humanities and law exhibited a quite high effective entrepreneurial propensity, certainly higher than their counterparts enrolled in technologies, who had below-average effective entrepreneurship. These results corroborate the evidence gathered by Teixeira (2008b), and Teixeira and Forte (2009) regarding final year students at the University of Porto.



**Figure 5.** Entrepreneurship potential of Portuguese higher education students, by type of school (polytechnics v university; private v public).





**Figure 6.** Entrepreneurship potential of Portuguese higher education students, by scientific area.

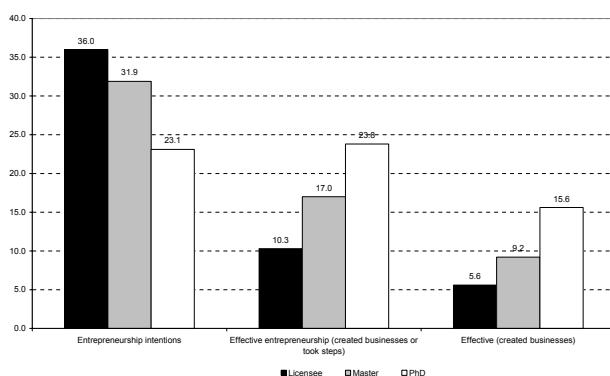
Although presenting a noticeable potential entrepreneurship propensity, where almost 60% of the students envisaged starting a business as a possible career choice, the disciplines of architecture, fine arts and design and agriculture and natural resources presented a noticeably low effective entrepreneurial propensity.

A curious result is that PhD and Master's students showed the highest average effective entrepreneurship propensities (see Figure 7) – double and almost treble that of the *stricto* and *lato* effective entrepreneurship of

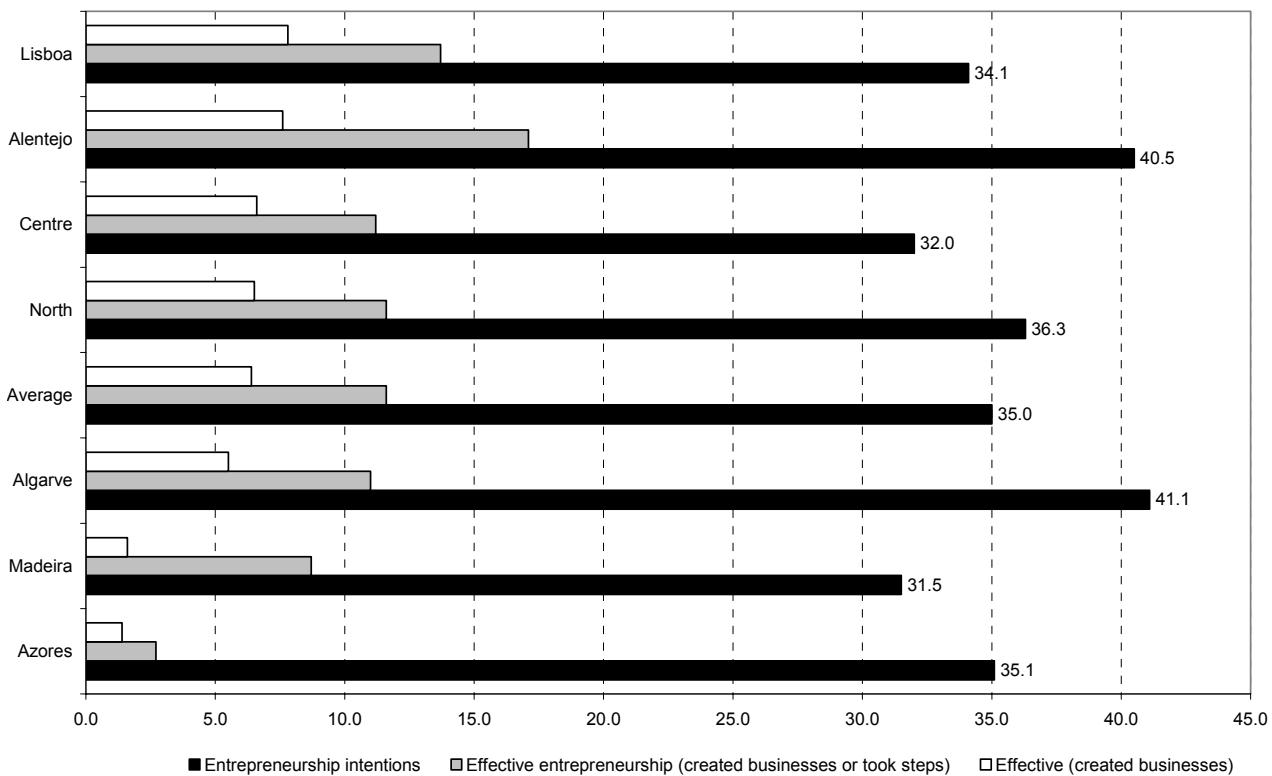
undergraduates, respectively – whereas entrepreneurship intentions were considerably higher for graduates (36%) than for those having obtained a PhD (23%).

The effective entrepreneurial propensity is higher among students whose permanent address was in Lisbon, Alentejo and, to a lesser extent, the Central Region (Figure 8). Indeed, students from Alentejo showed the highest effective entrepreneurship *lato sensu* and the second highest potential entrepreneurship propensity, immediately below that of the Algarve.<sup>6</sup>

Concentrating on the demographic characteristics of students, the gender gap – extensively observed in other studies within the entrepreneurship literature – is again apparent (Strom, 2007). As can be seen in Figure 9, the effective entrepreneurial propensity among male students is roughly double that of their female counterparts. Stephan and El-Ganainy (2007), also focusing on academia, found that women were less likely to engage in an entrepreneurial activity or start a company. They put forward several explanations to account for such a gender gap, mentioning that women were generally more risk-averse than men, they disliked competition and were less likely to pursue enquiries than men; women chose to work in ‘small’ areas, with less commercial possibilities and, finally, women traditionally have more responsibilities outside the workplace than men (Stephan and El-Ganainy, 2007).



**Figure 7.** Entrepreneurship potential of Portuguese higher education students, by degree.



**Figure 8.** Entrepreneurship potential of Portuguese higher education students, by region.

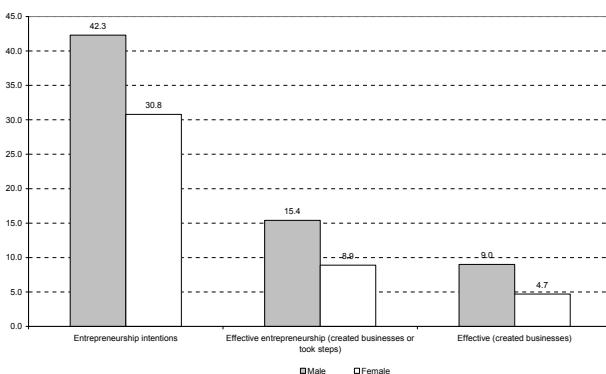
We suggest that given the lack of entrepreneurship experience and awareness and the fact that business skills and competencies appear to be in short supply, HEIs could usefully take a number of measures to provide non-business students with appropriate business and entrepreneurship-related courses, information and networks: this could transform the status of entrepreneurship propensity from 'potential' to 'effective'.

#### Econometric estimations

All the variables analysed above could explain (in part) the effective and potential entrepreneurship potential of

higher education students. However, in order to account for their net effect with greater rigour, we used a multivariate econometric model. This type of model enabled the individual sign and statistical significance of a given determinant of entrepreneurial attitudes (for example, risk), controlling for all the other determinants (for instance, gender), to be assessed. The empirical assessment of the entrepreneurial propensity of students is based on the estimation of the following general logistic regression, which in turn is derived from the existing literature on the determinants of the propensity of students to embark on entrepreneurial ventures, as presented above.

In order to obtain a more straightforward interpretation of the logistic coefficients, it is convenient to consider a rearrangement of the equation for the logistic model, in which it is rewritten in terms of the odds of an event occurring. Writing the logistic model in terms of the odds, we obtain the logit model as shown in Figure 10. The logistic coefficient can be interpreted as the change in the (log)odds associated with a one-unit change in the independent variable. Then,  $e$  raised to the power  $\beta_i$  is the factor by which the odds change when the  $i^{\text{th}}$  independent variable increases by one unit. If  $\beta_i$  is positive, this factor will be greater than 1, which means that the odds are increased; if  $\beta_i$  is negative, the factor will be less than one, which means that the odds



**Figure 9.** Entrepreneurship potential of Portuguese higher education students, by gender.

$$\log\left(\frac{\text{Prob}(entrepreneur)}{\text{Prob}(Non-entrepreneur)}\right) = \beta_0 + \underbrace{\beta_1 \text{Risk} + \beta_2 \text{Creativity} + \beta_3 \text{Need for Achievement} + \beta_4 \text{Work Experience}}_{\text{Personality and individual traits}} + \underbrace{\beta_5 \text{Gender} + \beta_6 \text{Age}}_{\text{Demographic traits}} + \underbrace{\beta_7 \text{Experience} + \beta_8 \text{Knowledge} + \beta_9 \text{Awareness} + \beta_{10} \text{Interest}}_{\text{Competencies / Familiarity with entrepreneurship}} + \underbrace{\beta_{11} \text{Degree}}_{\text{Formal Education}} + \underbrace{\beta_{12} \text{Course}}_{\text{Type of tertiary institution}} + \underbrace{\beta_{13} \text{Public} + \beta_{14} \text{Private} + \beta_{15} \text{University} + \beta_{16} \text{Polytechnic}}_{\text{Type of tertiary institution}} + \underbrace{\beta_{15} \text{Role Model} + \beta_{16} \text{Region}}_{\text{Contextual factors}} + \varepsilon_i$$

**Figure 10.** Logit model used.

are decreased. When  $\beta_i$  is zero, the factor equals 1, which leaves the odds unchanged. In the case where the estimate of  $\beta_5$  emerges as positive and significant for the conventional levels of statistical significance (that is, 1%, 5% or 10%) this means that, on average, all other factors remaining constant, female students would have higher (log)odds of entrepreneurial potential.

The descriptive statistics of the variables model and the matrix of correlations is presented in Table A1 in the Appendix: the estimates of the  $\beta$ s are given in Table A2 which presents three different models:

- Model 1: effective entrepreneurship *stricto sensu* (having created a business);
- Model 2: effective entrepreneurship *lato sensu* (having created a business or taken steps to do so); and
- Model 3: entrepreneurial intentions (seeing self-employment or starting a business as the most likely future career option).

The results, schematically documented in Table 2, show that the determinants of effective entrepreneurship and entrepreneurship intentions do not match completely. In comparison with their counterparts, higher education students in Portugal having already created a (or some) business(es) not surprisingly tended on average to possess greater entrepreneurial experience and knowledge. All other factors remaining constant, male and older students tended to be more likely to create new ventures than female and younger students respectively. Controlling for all the potential determinants of effective entrepreneurship propensity, the results also reveal that students permanently resident in Lisbon and the Islands (Azores and Madeira) created, on average, fewer new business than their colleagues living (permanently) in the North Region. With regard to the area of studies, we found that students enrolled in economics and business courses tended to be more entrepreneurial than those enrolled in technologies: health students were less entrepreneurially-oriented.

In considering a more inclusive indicator of effective entrepreneurship – described as ‘created businesses’ or ‘took steps to start a business’ – similar results to those above (effective entrepreneurship propensity *stricto sensu*) were obtained with regard to entrepreneurial experience, entrepreneurial knowledge, gender, age, work experience and health as an area of study. In contrast, personal characteristics – attitudes to risk and creativity – emerged as positive influences, related significantly to entrepreneurial propensity. This indicates that students who have a higher risk behaviour – in other words, those who argue that they do not agree with the statement, ‘one should not start a business when there is a risk it might fail’, as well as those who tend to underrate job security and stability of employment and stable income to new venture creation, and do not fear the risk associated with new ventures – are, all other factors remaining constant, much more likely to have created or taken steps to create new businesses. This corroborates the view that entrepreneurial ventures and risk propensity are closely related. These students also revealed higher levels of creativity – having ideas likely to become business opportunities.

Personality traits (risk, creativity, need for achievement), competencies and familiarity with entrepreneurship (experience, knowledge, awareness and interest), formal education, demographic traits (gender and age), and contextual influences (work experience and role models in family and friends) are all factors that explain the entrepreneurial intentions of students. Furthermore, students who anticipated to a greater extent that their career would involve owning a business were, on average, more susceptible to risk, showing higher levels of creativity and familiarity with entrepreneurship issues. As in the case of effective entrepreneurship, male, older and more professionally experienced students tended to reveal (all else remaining constant) higher entrepreneurial intentions. In contrast to effective entrepreneurship, the role model emerges as

**Table 2. Determinants of students' entrepreneurial propensity/intent.**

	<b>Effective entrepreneurial propensity</b>		<b>Entrepreneurial intent</b>
	<b>Created a business</b>	<b>Created a business or took steps to do so</b>	
<b>Individual</b>			
<i>Demographic traits:</i>			
Gender (female=1; male=0)	--	--	---
Age	+++	+++	+++
<i>Personality traits:</i>			
Risky		++	+++
Creativity		+++	+++
Need for achievement			+++
<i>Work experience</i>	+++	+++	+
<i>Entrepreneurial experience</i>	+++	+++	+++
<b>Education</b>			
<i>Entrepreneurial competencies and view of entrepreneurship:</i>			
Entrepreneurial knowledge	+++	+++	+++
Entrepreneurial awareness			+++
Entrepreneurial interest			+++
<i>Degree:</i>			
Master's + MBA			---
PhD			---
<i>Area of study (default area – technology):</i>			
Sciences			-
Health	--	---	
Agriculture and natural resources			+++
Architecture, arts and design			+++
Education			
Law and social sciences			
Economics and business	++		
Humanities			-
Sports and performing arts			
<i>Type of higher education:</i>			
Public versus private (public=1; private=0)			
University versus polytechnic (uni=1; poly=0)			
<b>Contextual</b>			
<i>Role model (family &amp; friends)</i>			
<i>Region (default region – North):</i>			
Centre			+++
Lisbon			---
Alentjo			
Algarve			
Islands (Azores and Madeira)	--	—	—

Notes: +++ (---) Statistically significant at 1%; ++ (--) 5%; + (-) 10%. A blank cell indicates that the relationship is not statistically significant. In the Appendix, Table A2 details the estimates for each model.

an important factor influencing the entrepreneurial intentions of students. Thus, students living in an environment which encourages interest in entrepreneurship – for instance, where family members or friends are entrepreneurs – tended, on average, to have a stronger desire to become entrepreneurs. This is encouraging in the sense that it aligns with the central premise of entrepreneurship programmes, that entrepreneurship is a learned phenomenon. Entrepreneurs can therefore be shaped by their experience as they grow and learn, being influenced by

teachers, parents, mentors and role models (Volery, 2004; Van Auken *et al*, 2006). Extending these arguments suggests that even when individuals interested in entrepreneurship and current entrepreneurs cannot be taught *stricto sensu*, they can be encouraged and influenced.

Although students enrolled in private institutions and polytechnics showed, in the descriptive analysis, greater entrepreneurship propensities than their colleagues in public institutions and universities respectively, when controlling for a large number of

factors likely to influence entrepreneurial propensity (both effective and intention) the type of higher education fails to constitute a statistically significant determinant. Students enrolled in agriculture and natural resources and architecture, arts and design exhibited stronger entrepreneurial intentions than those enrolled in technologies; and the opposite applies for students enrolled in humanities.

It is important to reflect on why risk and creativity emerge as important personality traits for effective entrepreneurship *lato sensu* (that is, having created businesses or taken steps to do so) and entrepreneurial intentions (students seeing themselves as entrepreneurs at the end of their studies), but failed to determine effective entrepreneurship *stricto sensu* ('created businesses'). In a comprehensive and data-rich report on micro-entrepreneurship in Portugal, Portela and co-authors (Portela, 2008) point out several situations that are likely to be particularly noteworthy and which may shed some light on the seeming mystery of the non-significance of risk and creativity for effective entrepreneurship propensity. It will be recalled that students who created businesses (effective entrepreneurship *stricto sensu*) were generally postgraduates and/or relatively senior individuals. As such, 'entrepreneurial' ventures associated with these individuals are likely to suffer from the weaknesses pointed out by Portela (2008), namely lack of innovation or creativity and risk aversion.

## Conclusions

Regardless of how directly supportive universities are of the commercialization of research, they offer access to a number of unique resources that can be particularly helpful to budding entrepreneurs. First, universities provide access to a large body of talented and skilled individuals gathered in one location, and so building a team within the university 'ecosystem' may be much easier than anywhere else. Indeed, the diversity of talents available is very important for start-ups. Moreover, bringing new ideas to market requires a wide range of skills, including a mix of business and technical expertise. Teams with members who possess a number of different skills are therefore very valuable.

Portuguese higher education students who responded to the survey recognized that their interest in new venture creation would be improved if their HE establishment brought them into contact with the networks needed to start new businesses and put entrepreneurial students in contact with each other. A significantly large percentage of these students claimed that arranging conferences or workshops on entrepreneurship and raising their awareness of

entrepreneurship as a possible career choice would be important incentives. Additionally, the estimates from our model revealed that students who live in an environment that breeds entrepreneurship tended on average to have a stronger desire to become entrepreneurs. This supports the proposal that entrepreneurship is a learned phenomenon and, as such, entrepreneurs can be shaped by their experience as they grow and learn, being influenced by teachers, parents, mentors and role models throughout their process of growth (Volery, 2004; Van Auken *et al*, 2006).

The (strong statistical) importance of 'entrepreneurial knowledge' for effective and potential entrepreneurship is quite apparent. Indeed, students who claimed to know techniques for finding out what the market wants, who said they understood the type of issues that face entrepreneurs in taking an idea to market, who stated that they could create a business concept and a business plan, and knew how to finance a new business concept, were much more likely to become entrepreneurs than those with poor entrepreneurial knowledge.

Combining the above results with the fact that most of the students responding had a relatively low level of understanding of the entrepreneurship process – indicated by a failure to understand the type of issues entrepreneurs face when taking an idea to the market, not possessing enough knowledge on the creation of business concepts and plans, or on techniques for finding out market needs and wants, or how to finance legally a new business – we conclude that there is an urgent and critical requirement for higher education institutions in Portugal to offer relevant training on entrepreneurship subjects.

Portuguese higher education can also foster the entrepreneurial intentions of students by raising 'entrepreneurial awareness and interest' – that is, IHEs in general and course curricula in particular should encourage students to read books and articles about entrepreneurship and innovation regularly and, equally, to participate regularly in conferences, lectures and workshops on entrepreneurship and/or innovation. Highly committed and motivated teachers and appropriate and interesting syllabuses are likely to enhance the interest of students in entrepreneurship, with regard to starting new businesses arising from new ideas or as an outcome of research, as the strong statistical coefficient associated to 'entrepreneurial awareness' and 'entrepreneurial interest' revealed (see Table 2).

Although the type of degree (PhD, Master's or undergraduate) did not emerge as a significant determinant of effective entrepreneurship, our results indicated that Portuguese undergraduates, regardless of the area of study and other attributes, on average

exhibited stronger entrepreneurial intentions than their colleagues at higher levels of training.

There was some degree of heterogeneity with regard to effective and potential entrepreneurial intentions in specific areas of study. Indeed, all other factors being held constant, students of economics and business tended to reveal higher effective entrepreneurial propensity (*stricto sensu*) than their colleagues from technological subjects. On average, students enrolled in health-related areas were much less likely to start a new business or even take steps to do so. With regard to entrepreneurial intentions, students enrolled for courses in agricultural and natural resources and architecture, arts and design revealed a stronger desire to become entrepreneurs, whereas students of humanities showed the opposite.

Given that labour markets and economic conditions were not controlled for (both in general and by field of study) in this study, the heterogeneity of the entrepreneurial intentions of students and propensities by area of study would suggest that customized solutions for entrepreneurial education will be preferable.

Although contextual factors, most notably role models, did not emerge as particularly relevant in explaining the entrepreneurial propensity of Portuguese students, the relevance of individual factors is noticeable, namely entrepreneurial and work experience; and personality traits, particularly risk propensity and creativity. In fact, students who worked as teenagers (for example, delivering newspapers, babysitting, mowing lawns, and so on), who continued working as freelancers or self-employed and closely followed, or assisted, family members, friends or acquaintances who had started companies, showed higher effective and potential entrepreneurial attitudes. Creativity and risk propensity emerged as a significant factor for explaining the effective and potential entrepreneurial propensity *lato sensu* of students, but not for effective entrepreneurial propensity *stricto sensu*; and this raises some concerns about the true ‘entrepreneurial’ nature of students’ existing businesses ventures.

This paper is an exploratory attempt to uncover patterns regarding the attitudes of higher education students in Portugal to entrepreneurship. A useful and valuable avenue for future research would be an analysis of the measures that each HE establishment has developed to foster entrepreneurship in its students and staff. Such a study could provide additional and revealing evidence about the importance and quality of the context in promoting entrepreneurship.

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## Notes

<sup>1</sup>Source: Lusa, 18 June 2008.

<sup>2</sup>According to the Recommendation 96/280 of the European Commission, from 3 April 1996, medium-sized firms are regarded as those that employ between 50 and 250 workers and register a turnover that is lower than 40 million Euros; small firms employ between 10 and 49 workers and have a turnover lower than 7 million Euros; very small/micro firms employ less than 10 workers. The European Recommendation is followed in Portugal. In the USA, the concepts are different, which makes it difficult to establish comparisons. There, firms characterized as small may employ a maximum of 40 workers, whereas medium-sized firms may employ a maximum of 500 workers (Storey, 2003, p 474).

<sup>3</sup>It is important to recall here that although often entrepreneurship and small business creation are often used as synonymous terms, there are quite significant differences between an entrepreneurial venture and small businesses with regard to the amount and speed of wealth creation, risk and innovation (Drucker, 1985).

<sup>4</sup>At the European level, one can mention the Competitiveness and Innovation Framework Programme (CIP) ([http://ec.europa.eu/cip/index\\_en.htm](http://ec.europa.eu/cip/index_en.htm)); at the National level, it is worth mentioning the set of programmes managed by IAPMEI, for instance, the FIVE Programme – Fostering Innovation and Entrepreneurial Value promoted by IAPMEI during the period 2002–2005, and the set of programmes currently in progress described in <http://www.iapmei.pt/iapmei-bimindex.php>.

<sup>5</sup>The other seven universities are: Muenster University of Applied Sciences (Germany); University of Adelaide (Australia); Lahti University of Applied Sciences (Finland); University of Maribor (Slovenia); Coventry University (UK); Cracow University of Economics (Poland); Dubai Women’s College (UAE).

<sup>6</sup>It is important to be cautious in this regard as our sample is not statically representative at the regional level.

## References

- Autio, E., Keeley, R., Klofsten, M., Parker, G., and Hay, M. (2001), ‘Entrepreneurial intent among students in Scandinavia and in the USA’, *Enterprise and Innovation Management Studies*, Vol 2, No 2, pp 145–160.
- Baptista, R., and Thurik, A.R. (2007), ‘The relationship between entrepreneurship and unemployment: is Portugal an outlier?’, *Technological Forecasting and Social Change*, Vol 74, No 1, pp 75–89.
- Barreto, A. (organizer), (1999), *A Situação Social em Portugal, 1960–1995*, Vol 1, ICS-UL, Lisbon.
- Baucus, D., and Human, S. (1995), ‘Second-career entrepreneurs: a multiple case study analysis of entrepreneurial processes and antecedent variables’, *Entrepreneurship Theory and Practice*, Vol 19, No 4, pp 41–72.
- Bird, B. (1988), ‘Implementing entrepreneurial ideas: the case for intentions’, *Academy of Management Review*, Vol 13, pp 442–554.
- Brandstätter, H. (1997), ‘Becoming an entrepreneur – a question of personality structure?’, *Journal of Economic Psychology*, Vol 18, pp 157–177.
- Carree, M.A., and Thurik, A.R. (2003), ‘The impact of entrepreneurship on economic growth’, in Acs, Z.J., and Audretsch, D.B., eds, *Handbook of Entrepreneurship Research*, pp 437–471, Kluwer, Dordrecht.

- Carroll, G., and Mosakowski, E. (1987), 'The career dynamics of self-employment', *Administrative Science Quarterly*, Vol 32, pp 570–589.
- Collins, L., Hannon, P., and Smith, A. (2004), 'Enacting entrepreneurial intent: the gaps between student needs and higher education capability', *Education and Training*, Vol 46, No 8–9, pp 454–463.
- Delmar, F., and Davidsson, P. (2000), 'Where do they come from? Prevalence and characteristics of nascent entrepreneurs', *Entrepreneurship and Regional Development*, Vol 12, pp 1–23.
- DeMartino, R., and Barbato, R. (2002), 'An analysis of the motivational factors of intending entrepreneurs', *Journal of Small Business Strategy*, Vol 13, pp 26–36.
- Dyer, W.G. (1994), 'Toward a theory of entrepreneurial careers', *Entrepreneurship, Theory and Practice*, Vol 19, No 2, pp 7–21.
- Drucker, P. (1985), *Innovation and Entrepreneurship*, Harper Collins, New York.
- EC (2006), *Report on the Implementation of the Entrepreneurship Action Plan*, European Commission Staff Working Paper, Brussels.
- EC (2008), 'Entrepreneurship in higher education, especially in non-business studies', *Best Procedure Project: Final Report of the Expert Group*, European Commission, Brussels.
- Ede, F.O., Panigrahi, B., and Calcich, S.E. (1998), 'African American students' attitudes toward entrepreneurship', *Journal of Education for Business*, Vol 73, No 5, pp 291–96.
- Farinha, L. (2005), 'The survival of new firms: impact of idiosyncratic and environmental factors', *Financial Stability Report 2005, Boletim do Banco de Portugal*, pp 101–113.
- Franke, N., and Lüthje, C. (2004), 'Entrepreneurial intentions of business students: a benchmarking study', *International Journal of Innovation and Technology Management*, Vol 1, No 3, pp 269–288.
- GEM (2008), *Projecto GEM Portugal 2007*, Global Entrepreneurship Monitor, <http://www.gemconsortium.org/>.
- Gorman, G., Hanlon, D., and King, W., (1997), 'Some research perspectives on entrepreneurship education and education for small business management: a ten-year literature review', *International Small Business Journal*, Vol 15, No 3, pp 56–77.
- Greenberger, D.B., and Sexton, D.L. (1988), 'An interactive model of new venture creation', *Journal of Small Business Management*, Vol 26, No 3, pp 1–7.
- Gürol, Y., and Atsan, N. (2006), 'Entrepreneurial characteristics amongst university students: some insights for enterprise education and training in Turkey', *Education and Training*, Vol 48, No 1, pp 25–39.
- Hatten, T.S., and Ruhland, S.K. (1995), 'Student attitude toward entrepreneurship as affected by participation in an SBI program', *Journal of Education for Business*, Vol 70, No 4, pp 224–227.
- Henderson, R., and Robertson, M. (1999), 'Who wants to be an entrepreneur? Young adult attitudes to entrepreneurship as a career', *Education and Training*, Vol 41, pp 236–245.
- Hills, G.E., and Barnaby, D.J. (1977), 'Future entrepreneurs from the business schools: innovation is not dead', in *Proceedings of the 22nd International Council for Small Business*, pp 27–30, International Council for Small Business, Washington, DC.
- Hills, G.E., and Welsch, H. (1986), 'Entrepreneurship behavioral intentions and student independence, characteristics and experiences', in *Frontiers of Entrepreneurship Research: Proceedings of the Sixth Annual Babson College Entrepreneurship Research Conference*, pp 173–186, Babson College, Babson Park, MA.
- Hisrich, R.D. (1988) 'Entrepreneurship: past, present, and future', *Journal of Small Business Management*, Vol 26, No 4, pp 1–4.
- Hynes, B. (1996), 'Entrepreneurship education and training: introducing entrepreneurship into non-business disciplines', *Journal of European Industrial Training*, Vol 20, No 8, pp 10–17.
- IAPMEI (2007), *Observatório da Criação de Empresas. Resultados do inquérito 2006*, Institute for the Support of Small and Medium-sized Enterprises (IAPMEI), Lisbon.
- IN+ (2008), 'Inovação, Empreendedorismo e Desenvolvimento', *Preparar Portugal para um Novo Ciclo de Fundos Estruturais*, pp 2007–2013, (in Portuguese).
- Jack, S.L., and Anderson, A.R. (1999), 'Entrepreneurship education within the enterprise culture: producing reflective practitioners', *International Journal of Entrepreneurial Behaviour and Research*, Vol 5, No 3, pp 11–12.
- Klapper, R., and Léger-Jarniou, C. (2006), 'Entrepreneurial intention among French Grande École and university students: an application of Shapero's model', *Industry and Higher Education*, Vol 20, No 2, pp 97–110.
- Kolvereid, L., and Moen, Ø. (1997), 'Entrepreneurship among business graduates: does a major in entrepreneurship make a difference?', *Journal of European Industrial Training*, Vol 21, No 4, pp 154–160.
- Kourilsky, M.L., and Walstad, W.B. (1998), 'Entrepreneurship and female youth: knowledge, attitudes, gender differences and educational practices', *Journal of Business Venturing*, Vol 13, pp 77–88.
- Krueger Jr, N.F. (2000), 'The cognitive infrastructure of opportunity emergence', *Entrepreneurship Theory and Practice*, Vol 24, No 3, pp 5–24.
- Krueger, N., Reilly, M., and Carsrud, A. (2000), 'Competing models of entrepreneurial intentions', *Journal of Business Venturing*, Vol 15, pp 411–432.
- Kuratko, D. (2005), 'The emergence of entrepreneurship education: development, trends and challenges', *Entrepreneurship Theory and Practice*, Vol 29, pp 577–597.
- Kuratko, D.F., and Hodgetts, R.M. (2004), *Entrepreneurship: Theory, Process, Practice*, South-Western College Publishers, Mason, OH.
- Laukkonen, M., (2000), 'Exploring alternative approaches in high-level entrepreneurship education: creating micro-mechanisms for endogenous regional growth', *Entrepreneurship and Regional Development*, Vol 12, pp 25–47.
- Learned, K.E. (1992), 'What happened before the organization? A model of organization formation', *Entrepreneurship Theory and Practice*, Vol 17, No 1, pp 39–48.
- Lena, L., and Wong, P.K. (2003), 'Attitude towards entrepreneurship education and new venture creation', *Journal of Enterprising Culture*, Vol 11, No 4, pp 339–357.
- Levenburg, N., Lane, P., and Schwarz, T. (2006), 'Interdisciplinary dimensions in entrepreneurship', *Journal of Education for Business*, Vol 81, No 5, pp 275–281.
- Lissy, D. (2000), 'Goodbye b-school', *Harvard Business Review*, Vol 78, No 2, pp 16–17.
- Lüthje, C., and Franke, N. (2003), 'The 'making' of an entrepreneur: testing a model of entrepreneurial intent among engineering students at MIT', *R&D Management*, Vol 33, pp 135–147.
- Malecki, E.J. (1997), 'Entrepreneurs, networks, and economic development: a review of recent research', in: Katz, J.A., and Borckhaus, R., eds, *Advances in Entrepreneurship, Firm Emergence and Growth*. JAI Press, Greenwich, CT.
- Martínez, D., Mora J.-G., and Vila, L. (2007), 'Entrepreneurs, the self-employed and employees amongst young European higher education graduates', *European Journal of Education*, Vol 42, No 1, pp 92–117.
- McMullan, W.E., and Long, W.A. (1987), 'Entrepreneurship education in the nineties', *Journal of Business Venturing*, Vol 2, No 3, pp 261–275.
- Mendonça, J. (2009), *The Impact of Knowledge Creation and Accessibility on Entrepreneurial Activities*, PhD Thesis, Instituto Superior Técnico (IST), Universidade Técnica de Lisboa (in Portuguese).

- Mendonça, J., Baptista, R., and Lima, F (2009), 'The creation of higher education institutions and firm entry' in Smallbone, D., Landström, H., and Jones-Evans, D., *Entrepreneurship and Growth in Local, Regional and National Economies*, Chapter 10, Edward Elgar, Cheltenham.
- Moore, B.L. (2002), 'Changing classes: the entrepreneurial spirit hasn't died on business-school campuses; but it has changed', *Wall Street Journal*, p R8.
- Mueller, S.L., and Thomas, A.S. (2000), 'Culture and entrepreneurial potential: a nine country study of locus of control and innovativeness', *Journal of Business Venturing*, Vol 16, pp 51–75.
- Naffziger, D.W., Hornsby, J.S., and Kurtako, D.F. (1994), 'A proposed research model of entrepreneurial motivation', *Entrepreneurship Theory and Practice*, Vol 18, No 3, pp 29–42.
- Oakey, R., Mukhtar, S-M. and Kipling, M. (2002), 'Student perspectives on entrepreneurship: observations on their propensity for entrepreneurial behaviour', *International Journal of Entrepreneurship and Innovation Management* Vol 2, No 4/5, pp 308–322.
- Picker, V.H., and Vala, L. (2005) 'Why are scientists not managers!?', *Journal of Business Chemistry*, Vol 2, No1, pp 1–3.
- Portela, J., (coordinator), (2008), *Microempreendedorismo em Portugal. Experiências e perspectivas*, 'POEFDs – Medida 4.2.2.1. – Estudos e Investigação Projecto No 87/2006', INSCOOP – Instituto António Sérgio do Sector Cooperativo, Lisbon, (in Portuguese).
- Rasmussen, E., and Sørheim, R. (2006), 'Action-based entrepreneurship education', *Technovation*, Vol 26, pp 185–194.
- Redford, D., and Trigo, V. (2007), *The State of Portuguese Entrepreneurship Education: A National Study of 2005/2006*, Instituto Universitário de Lisboa, Lisbon.
- Redford, D.T. (2006), 'Entrepreneurship education in Portugal: 2004/2005 national survey', *Comport Organ Gestao*, Vol 12, No 1, pp 19–41.
- Reynolds, P., Camp, S.M., Bygrave, W.D., Autio, E., and Hay, M. (2001), *Global Entrepreneurship Monitor: 2001, Executive Report*, Kauffman Center for Entrepreneurial Leadership, Kansas City, MO.
- Reynolds, P., Storey, D.J., and Westhead, P. (1994), 'Cross national comparisons of the variation in new firm formation rates', *Regional Studies* Vol 28, pp 443–456.
- Robinson, P.B. (1987), *Prediction of Entrepreneurship Based on Attitude Consistency Model*, unpublished doctoral dissertation, Brigham Young University, in *Dissertation Abstracts International*, Vol 48, 2807B.
- Roebuck, D.B., and Brawley, D.E. (1996), 'Forging links between the academic and business communities', *Journal of Education for Business*, Vol 71, pp 125–128.
- Sagie, A., and Elizur, D. (1999), 'Achievement motive and entrepreneurial orientation: a structural analysis', *Journal of Organizational Behavior*, Vol 20, No 3, pp 375–87.
- Scott, A.J. (1988), *New Industrial Spaces*, Pion, London.
- Sexton, D.L., and Bowman, N.B. (1983), 'Comparative entrepreneurship characteristics of students: preliminary results', in Hornaday, J., Timmons, J., and Vesper, K., eds, *Frontiers of Entrepreneurship Research*, pp 213–232, Babson College, Wellesley, MA.
- Stephan, P.E., and El-Ganainy, A. (2007), 'The entrepreneurial puzzle: explaining the gender gap', *Journal of Technology Transfer*, Vol 32, pp 475–487.
- Strom, R.D. (2007), 'Fostering research on minority entrepreneurship', *Annals of the American Academy of Political and Social Science*, Vol 613, pp 6–9.
- Teixeira, A.A.C., and Forte, R. (2009), 'Unbounding entrepreneurial intents of university students: a multidisciplinary perspective', *FEP Working Paper* No 322, April.
- Teixeira, A.A.C. (2008a), 'Entrepreneurial potential in chemistry and pharmacy courses: results from a large survey', *Journal of Business Chemistry*, Vol 5, No 2, pp 48–63.
- Teixeira, A.A.C. (2008b), 'Entrepreneurial potential in engineering and business courses: why worry now?', in *Innovation in Manufacturing Networks*, Vol 266, pp 325–336, IFIP (International Federation for Information Processing), <http://www.ifip.or.at>.
- Van Auken, H., Stephens, P., Fry F., and Silva J. (2006), 'Role model influences on entrepreneurial intentions: a comparison between USA and Mexico', *Entrepreneurship Management*, Vol 2, pp 325–336.
- Volery, T. (2004), 'Entrepreneurship and enterprise education in Europe: what must be learnt and what can be taught', *EntreNews*, Issue 2/2004, p 2.
- Wang, C., and Wong, P-K. (2004), 'Entrepreneurial interest of university students in Singapore', *Technovation*, Vol 24 pp 163–172.
- Wennekers, A.R.M., and Thurik, A.R. (1999), 'Linking entrepreneurship and economic growth', *Small Business Economics*, Vol 13, pp 27–55.

# Appendix

## Descriptive statistics of the variables model and the correlations matrix

**Table A1. Descriptive statistics and correlation matrix.**

	Mean	St. Deviation	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1) Effective entrepreneurial propensity – created a business	0.064	0.244	0.723***	0.137***	0.039***	0.093***	0.023	0.234***	0.201***	0.116***	0.067***	0.026*	0.045***	0.074***	-0.082***	0.348***	0.184***	0.015	-0.081***	-0.051***
(2) Effective entrepreneurial propensity – taken steps to start a business/create firm	0.115	0.319	1.000	0.187***	0.059***	0.144***	0.045***	0.268***	0.238***	0.169***	0.090***	0.048***	0.063***	0.075***	-0.096***	0.358***	0.202***	0.022	-0.072***	-0.048***
(3) Potential entrepreneurial propensity	0.350	0.477		1.000	0.126***	0.282***	0.147***	0.219***	0.237***	0.214***	0.233*	-0.027*	-0.026***	-0.048***	-0.116***	0.084***	0.100***	0.131***	-0.074***	-0.077***
(4) Risky (dummy=1)	0.178	0.383			1.000	0.039***	-0.021	0.038**	0.070***	0.076***	0.042***	-0.024	-0.002	-0.005	-0.025	0.020	0.017	0.040***	-0.025*	-0.020
(5) Creativity (dummy=1)	0.494	0.500				1.000	0.147***	0.237***	0.276**	0.233***	0.317***	0.012	0.023	-0.005	-0.111***	0.049***	0.078***	0.092***	-0.044***	-0.038**
(6) Need for achievement (dummy=1)	0.677	0.468					1.000	0.095***	0.123***	0.083***	0.194***	0.032**	0.027*	-0.009	0.001	0.006	0.024	0.088***	-0.029*	0.000
(7) Entrepreneurial experience (ln)	0.534	0.536						1.000	0.298***	0.227***	0.212***	0.014	0.030**	0.007	-0.046***	0.136***	0.240***	0.207***	-0.095***	-0.063***
(8) Entrepreneurial knowledge (ln)	0.551	0.588							1.000	0.375***	0.298***	0.067***	0.056***	0.020	-0.097***	0.143***	0.128***	0.079***	-0.043***	-0.050***
(9) Entrepreneurial awareness (ln)	0.159	0.330								1.000	0.238***	0.035**	0.030**	0.059***	-0.096***	0.082***	0.096***	0.067***	-0.033**	-0.046***
(10) Entrepreneurial interest (ln)	0.911	0.482									1.000	0.017	0.021	-0.009	-0.085***	0.030**	0.093***	0.070***	-0.026*	-0.017
(11) Schooling year (ln)	1.103	0.692										1.000	0.549***	0.367***	0.052***	0.280***	0.113***	-0.022	-0.004	0.226***
(12) Master's + MBA	0.122	0.328											1.000	-0.073***	0.058***	0.213***	0.160***	-0.021	-0.040***	0.142***
(13) PhD	0.036	0.187												1.000	0.034**	0.196***	0.128***	-0.021	0.046***	0.119***
(14) Gender (female=1; male=0)	0.525	0.499													1.000	-0.110***	-0.077***	0.034**	-0.034**	0.056***
(15) Age (ln)	3.193	0.226														1.000	0.465***	-0.056***	-0.165***	-0.128***
(16) Work experience (ln)	0.900	0.573															1.000	-0.011	-0.129***	-0.147***
(17) Role model (family & friends)	0.145	0.352																1.000	-0.033**	-0.007
(18) Public versus private (public=1; private=0)	0.887	0.317																	1.000	0.223***
(19) University versus polytechnic (uni=1; poly=0)	0.717	0.451																		1.000

**Note:** statistically significant at \*\*\*1%; \*\* 5%; \* 10%.

**Table A2.** Determinants of students' entrepreneurial propensity/intent.

	Effective entrepreneurial propensity		Entrepreneurial intent
	Created a firm ( <i>stricto sensu</i> )	Created a firm or took steps to start a business ( <i>Lato sensu</i> )	
<b>Individual</b>			
<i>Demographic traits:</i>			
Gender (female=1; male=0)	-0.342**	-0.236**	-0.304***
Age (ln)	4.107***	3.675***	0.458**
<i>Personality traits:</i>			
Risky (dummy=1)	0.163	0.304**	0.625***
Creativity (dummy=1)	0.256	0.466***	0.752***
Need for achievement (dummy=1)	0.071	0.194	0.443***
<i>Work experience (ln)</i>	0.646***	0.358***	0.125*
<i>Entrepreneurial experience (ln)</i>	1.560***	1.216***	0.338***
<b>Education</b>			
<i>Entrepreneurial competencies and view of entrepreneurship:</i>			
Entrepreneurial knowledge	0.845***	0.688***	0.310***
Entrepreneurial awareness	-0.290	0.179	0.510***
Entrepreneurial interest	-0.013	-0.062	0.568***
<i>Schooling year (ln)</i>	-0.252*	-0.155	0.025
<i>Degree:</i>			
Master's + MBA	0.068	0.088	-0.430***
PhD	0.699*	0.351	-0.868***
<i>Area of study (default area – technology):</i>			
Sciences	0.331	0.307	-0.302*
Health	-1.118**	-1.127***	0.031
Agriculture and natural resources	-0.154	-0.640	1.371***
Architecture, arts and design	-0.136	0.265	0.858***
Education	0.058	-0.078	0.096
Law and social sciences	0.224	-0.130	-0.056
Economics and business	0.384**	0.019	0.147
Humanities	0.213	-0.418	-0.380*
Sports and performing arts	-0.422	-0.106	0.011
<i>Type of higher education:</i>			
Public versus private (public=1; private=0)	-0.422	-0.106	0.011
University versus polytechnic (uni=1; poly=0)	0.086	0.125	-0.125
<b>Contextual factors</b>			
<i>Role model (family &amp; friends)</i>	-0.168	-0.142	0.476***
<i>Region (default region – North):</i>			
Centre	-0.084	-0.160	-0.273***
Lisbon	-0.439*	-0.258	-0.182
Alentjo	-0.337	0.136	0.090
Algarve	-0.516	-0.433*	-0.016
Islands (Azores and Madeira)	-1.262**	-0.457	-0.301*
Constant	-18.517***	-15.887***	-3.675***
N (total)	4.400	4.400	4.400
Entrepreneurs	4.120	3.894	2.862
Others	280	506	1538
<i>Goodness-of-fit statistics :</i>			
% corrected	94.1	90.0	72.2
Hosmer and Lameshow test ( <i>p</i> -value)	13.003 (0.111)	5.394 (0.715)	2.540 (0.960)

\*\*\* Significant at 1%; \*\* Significant at 5%; \* Significant at 10%.