



Entrepreneurship: What matters most

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ABSTRACT

This paper presents the results of a study about particular personality traits that entrepreneurs display. Supported by a survey involving 1,135 responses from students enrolled in master's degree programmes taught across five cities in Spain, we identified the relevant characteristics that determine the personality traits of a likely entrepreneur. We found some key aspects such as previous knowledge of the business, high level of initiative, open-mindedness and coming from an entrepreneurial family environment, with no other distinctions made for other factors.

In a second analysis, we compared students enrolled in entrepreneur-related courses (EMBA and MBA) with students enrolled in other disciplines and found significant differences between groups. Finally, we compared all results based on gender to obtain more relevant conclusions.

1. Introduction

Scholars have acknowledged the relevance of a psychological perspective since entrepreneurship has proven fundamentally personal (Baron, 2007). Previous research on entrepreneurship has pointed out that there are certain psychological characteristics that motivate people to become entrepreneurs. Successful entrepreneurs act effectively by transmitting enthusiasm to the people around them and creating a favourable environment for achieving goals (D. Audretsch, 2012).

The key personality items linked with the entrepreneurship process are a need for achievement, the locus of control, risk-propensity, self-efficacy (Bygrave & Hofer, 1992; Caliendo et al., 2014), autonomy and independence (Rauch & Frese, 2000), optimism (Ivanova & Gibcus, 2003), passion, entrepreneurial self-efficacy and risk perception (Stroe et al., 2018). Entrepreneurs who display some of these psychological characteristics are more likely to start an enterprise. It is commonly accepted that entrepreneurs are people who take action and engage in vigorous, persistent efforts to convert their ideas and visions into profitable, operating companies (Gieure et al., 2020). This proclivity for action is, in a sense, crucial to the entrepreneurial process (Baum & Frese, 2007; Frese & Gielnik, 2014).

Meta-analytic studies have highlighted significant associations between personality and entrepreneurship (Brandstätter, 2011). Start-up intention could be characterised as opportunity recognition, opportunity exploitation, innovation and value creation (Leutner et al., 2014).

The Battery for the Assessment of the Enterprising Personality (BEPE) (Postigo et al., 2021) is one modern method that aided in realising the aims of our personality search; the most relevant items in their study included self-efficacy, autonomy, innovativeness, internal locus of control, achievement motivation, optimism, stress tolerance and risk-taking. For instance, happy people were deemed highly social, and strong social skills help entrepreneurs build broad and informative social networks (Diener & Seligman, 2002). Such networks in turn act as an important source of many valuable resources (Baron, 2007).

In Spain, one traditional source of information about entrepreneurship is the GEM-Spain (Global Entrepreneurship Monitor) (Neira Gómez et al., 2021). This 2020–2021 report classified the Spanish entrepreneurship in the long run 2005–2020 by age, educational level, income level and sex. The most recent GEM also suggested that identification of personal characteristics that encourage enterprising activity is important for the modern economy. To improve the knowledge of this phenomenon in our country, this paper seeks to fill the gap between the GEM-Spain (Neira Gómez et al., 2021) and the GEM recommendations (Bosma et al., 2021). Moreover, in 2018 the GEM introduced the National Entrepreneurship Context Index (NECI), which summarises, in one number, the average state of an economy's environment for entrepreneurship. In Spain in 2020, the NECI was 4.7 on a Likert scale from 0 to 10.

This assessment makes clear that improvements are critical.

In line with the notion that personal characteristics are important,

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our previous findings indicate education and training are key aspects to entrepreneurship. This aligns with another crucial point—that is, a graduate person is more likely to be starting or running a new business (Bosma et al., 2021). According to (Chye Koh, 1996) MBA students who have similar characteristics as entrepreneurs are more likely to fit in as an entrepreneur than students who lack such characteristics. To test this evidence, we raise a hypothesis concerning the importance of education and training in business as one key aspect of entrepreneurship. The ability to spot opportunities is also an important characteristic of the successful entrepreneur, as are prior entrepreneurial experience and self-perceived skills with the new business formation (Bosma et al., 2021). All of this matches our item Q8: being able to detect new market opportunities. This precise item allows us to contrast hypothesis 1.

We intent to contribute to this new stream by focusing on complementary settings, so this article presents an in-depth analysis using new statistical tools to shed light on the key personality traits of young entrepreneurs. We focus on “who” becomes an entrepreneur rather than “how” to guide students on their way to starting up a company. Entrepreneurial research might explore the personality traits which lead a person to become an entrepreneur, and knowledge of the factors connected to entrepreneurial intentions have practical significance. We explore family environment and the student’s self-perceptions of creativity, initiative, risk-taking and efficiency via a cluster of survey items. We also pose one direct question about how open-minded students perceive themselves to be.

In the present paper, we discriminate items to define the entrepreneurial profile across the entire survey, then we make a gender analysis following a former study that posited that creativity for women has been considered a relevant item (Hmieleski & Sheppard, 2019) or women whose motive is risk-taking are more likely to succeed (Rey-Martí et al., 2015). The results show that the relevance of items defining personality is almost the same: Males have 10 items and females have 11 items. Q4: *skills to manage teams* and Q19: *be traditional and uncreative* are not relevant for women, while Q10: *continuing education*, Q11: *be the sum of their skills and knowledge* and Q16: *be reliable and self-disciplined* all proved relevant for women, while for men these were not significant items. To conclude, our results predict a superior tendency of entrepreneurship amongst men—that is 70.1%—while 76.4% is our estimation for women.

We focused our research on ESIC master’s programmes, since the questionnaire has been filled out by ESIC’s students (for all questions and master’s programmes analysed, see (Rosado-Cubero et al., 2021). Master’s of Business Administration (MBA) and Executive Master’s of Business Administration (EMBA) degrees were selected as key to identifying the entrepreneurial tendency of ESIC’s students. Finally, we compared these results with other ESIC master’s programmes. Preliminary results show that MBA and EMBA students have a higher entrepreneurial profile than students from other master’s programmes. We were able to detect a few items that are linked to entrepreneurs, and we confirmed the theory that Q3: *high level of initiative*; Q8: *being able to detect new market opportunities*; Q17: *open-minded person*; and Q19 (negative): *being traditional and uncreative* altogether define properly an entrepreneur personality. Finally, we estimated the entrepreneurial tendency with 62.8% reliability.

Compared to other ESIC master’s programmes, we can confirm that Q1: *previous knowledge of the business*; Q3: *high level of initiative*; and Q17: *open-minded person* are the appropriate items to define the entrepreneurial personality. To conclude, we estimated with a reliability of 73.7% the tendency of this group to start a new company.

The paper is organised as follows: section two reviews the related research essential for the study and background of association between personality dimension and entrepreneurship process. Section three proposes a theoretical framework based on the discriminant analysis of data. Section four contains findings, implications and limitations of the study, and lastly, we offer the main conclusions of the study. Additional research opportunities are discussed to help policy-makers and scholars

conduct future studies based on these findings.

2. Key aspects to be an entrepreneur backdrop

Former studies have shown that creativity, innovation and controlled risk-taking are the traits that define every entrepreneurial profile “per se” according to business entrepreneur critics (Caliendo et al., 2014; D. B. Audretsch, 2014; Carsrud & Brännback, 2011; Larson et al., 2002). Ambiguity tolerance, emotional intelligence and coping and problem solving are also noted (López-Núñez et al., 2020). We name another set of attributes that are to a greater or lesser extent commonly associated with an entrepreneurial profile, although these features, trained or developed, are also present in non-entrepreneurs, which impact the level of success of the venture. Research in this area, combined with practical knowledge, leads us to conclude that entrepreneurs have effective behaviour associated with four key characteristics: a good education, a particular family environment, a cluster of creativity, initiative, risk-taking and efficiency management and open mindedness.

Traditional research on entrepreneurship has revealed a positive relationship between human capital variables and success; uncertainty remains about the magnitude of this relationship as well as about the circumstances under which human capital is more or less strongly associated with success (Unger et al., 2011). Several studies have focused on education as a component of human capital, considering learning as a remarkable variable in the process of starting a new company (Rosado-Cubero et al., 2021; Freire-Rubio & Rosado-Cubero, 2015; Astebro & Bazzazian, 2010), alongside active methods such as project-based learning or active-learning based on attitudes (Varamäki et al., 2015)

To be a successful entrepreneur, graduate and post-graduate programmes must prepare the student well. Support of the development of social skills is a bonus. The entrepreneur needs certain knowledge and skills to implement these social skills in an effective way. The concept of entrepreneurial intention, defined as the commitment to start a new business after graduation, has been analysed by several authors (D. B. Audretsch, 2014; Bosma et al., 2012; Krueger & Carsrud, 1993), and it is recognised that people in China with more education are generally less likely to become entrepreneurs (Huang et al., 2021). In Spain, however, there exists evidence that higher education is indeed a precursor for entrepreneurship attitudes, intentions and actions (Lanero et al., 2011). In previous research, we noticed how relevant this item is when it comes to identifying the intention to be an entrepreneur (Rosado-Cubero et al., 2021). In fact, this was the first question on our survey: Q1: *The knowledge acquired in my education, both undergraduate and graduate, has helped me set up a business*. We thus put forth the following hypothesis to more thoroughly analyse this item.

Hypothesis 1. *Education and training in business are key aspects of entrepreneurship.*

Academics agree about the relevance of family environment for the entrepreneur; one main contribution in this field has been made to a better understanding this phenomenon, showing the importance of the interplay between family generations for a successful start-up a new company (Basco et al., 2019; Neubaum, 2018) Also, when students’ families themselves are already running a business, graduates tend to be more optimistic (Puri & Robinson, 2013). Another argument is the relevance of family involvement in executive management and generational transfer (Marín et al., 2016) as well as the parental influence on entrepreneurial interests (Luis-Rico et al., 2020). In our line of thinking, personal characteristics of successors within a business family combine to produce motivated successors (Porfirio et al., 2020). Research has also been conducted to identify and model potential relationships between previous experience and consequences associated with the “family” and “business” components of family businesses (Payne, 2018). Collateral analyses suggest that there are emerging paths where family businesses can be considered alongside community-based enterprises

(Woodfield et al., 2017). In the case of Poland, no significant correlations have been found between entrepreneurial success and parental attitudes (Staniewski & Awruk, 2021). In Spain we found evidence that the family environment does influence the intention to establish a business, and in this study, we thoroughly analysed this evidence. To better measure the impact of the family context on entrepreneurship, we asked students Q9: *The entrepreneurial family environment has been a facilitating factor when undertaking new business initiatives*. We linked this question with Q8: *easily visualised or detected new market opportunities that can turn into entrepreneurship*, for the reason described above. Thus, we propose the following hypothesis:

Hypothesis 2. *Family environment positively influences entrepreneurship. This is more so in females than in males.*

There is a commonly accepted notion that initiative and entrepreneurship refer to an individual's capacity to turn ideas into action. This action requires creativity, innovation and risk-taking, as well as the ability to plan and manage projects toward achieving objectives. Creativity in business is a manner of thinking that inspires people to find innovative solutions. Innovation is characterised by a tendency to support new ideas, experimentation and the use of creative processes (Chandra et al., 2009). We found evidence about the highest (positive) impact associated with Q3 in our former analysis. We asked our students about creativity and innovations in Q3: *I have enough personal initiative to undertake projects*. To assess the risk-aversion tendencies in our students, we asked Q5: *I have no problem with leading in risk situations at work (skill conflict management)* and Q7: *When taking risks, I value the probabilities of success and failure before making a decision to undertake a project*. Risk associated with embarking on a business venture is related to the skills of the decision-maker (Shapira, 1995). We further explored this with Q13: *I am clear in defining the objectives and planning and designing consistent plans for achieving them*. Finally, in pursuing one question to measure how inspiring people motivate others, and likewise the skills and competence of our students to solve problems in groups (Morselli & Ajello, 2016) since entrepreneurship could indeed be a collaborative process (Karami & Read, 2021), we asked Q15: *I efficiently manage and coordinate the resources*, including time, money and human resources used to achieve the objectives.

Hypothesis 3. *Creativity, initiative, risk-taking and efficiency management are crucial factors to becoming an entrepreneur.*

Seeing oneself as an open-minded person could be considered a relevant item to understanding the entrepreneurial personality (Rosado-Cubero et al., 2021); thus, our final personality trait of entrepreneurs is that they must be open-minded towards new experiences. Specifically, let us sketch a definition including a variety of characteristics: entrepreneurs should be open-minded enough to see all possible changes in the environment before they happen. At the same time, they are always seeking opportunities and new approaches to solving problems in advance. To be open-minded also means to be tolerant, fair-minded and receptive, expressing fair attitudes and actions. In some courses about entrepreneurship, instructors prompt students to open their minds in any sense described above, since it is commonly accepted that this is a specific characteristic any entrepreneur must recognise and possess. Measuring open-mindedness is challenging, but we asked students directly, in: Q17: *I see myself as someone who is open to new experiences and multifaceted*. To follow, we propose the following hypothesis:

Hypothesis 4. *Considering oneself as open-minded is one key to being/becoming an entrepreneur.*

3. Method

We aimed to assess the relationship between entrepreneurship and some key personalities and environment. For this purpose, we selected master's programmes where potential entrepreneurial students enrol.

Then, we designed a questionnaire to identify the common entrepreneurship personalities amongst students. The data were analysed using different statistical techniques to establish students' entrepreneurial determination.

The methodology and techniques used to achieve this goal will be discussed below.

3.1. Questionnaire design and sample selection

The questionnaire was designed following a way of characterising items and enabled us to identify the differences between master's degrees, gender and qualitative items.

The objective of this survey and its results were to detect whether students enrolled in postgraduate programmes and master's degrees have particular psychological characteristics. To achieve the objective of the survey questions, we sought to identify students' profiles for the different training programmes. Thus, the results should reveal the profiles of potential entrepreneurs. The relationship of variables or items used in the design of the survey can be found in (Rosado-Cubero et al., 2021).

The questionnaire items were evaluated using a 7-point Likert scale (Likert, 1932). The degree of agreement or disagreement that subjects had for each item ranged from 1, *Strongly disagree* to 7, *Strongly agree*. The participants who completed the survey provided their general demographic data, including age, gender, nationality and level of education.

3.2. Sampling process

A final sample of 1135 questionnaires were collected from the ESIC Business & Marketing School master's degree programme and from the Madrid, Valencia, Barcelona, Bilbao, Granada, Zaragoza, Málaga and Navarra campuses on a face-to-face basis from December 13–22, 2019. The authors gave instructions to the teachers in charge of each class who were responsible for the distribution and collection of the data. There was no second opportunity for any students who did not attend that particular session. The questionnaire was administered to all ESIC master's degree students who attended class; we estimated attendance to be over 90%, so the results are highly representative. Furthermore, all the collected questionnaires were valid due to the high level of engagement of all teachers. The Excel file with all responses was read by IBM SPSS, and neither missing data nor outliers were detected. This means that no cleaning process was needed, since the quality of this primary data was excellent.

The goal was to obtain indicative results on the skills and knowledge of participants studying in a master's programme to promote and categorise the profile.

3.3. Statistical tools

The statistical techniques used for the analysis of the questionnaire belong to what is known as classification problems or discriminant analysis, one of the most popular Machine Learning Methods. These methods have been widely used in almost every field of knowledge since their inception. Typical applications in Business and Economics include fraud detections (Adewumi & Akinyelu, 2017) or credit scoring systems (Dastile et al., 2020). More specifically, they have been used to understand entrepreneurship in (Vossen & Ihl, 2020). The students' intention to start an entrepreneurial project in the coming months (or the fact that he/she has already done so) was taken as the variable to define the groups (i.e., the dependent variable). This technique enabled us to study the impact of each variable on entrepreneurial intention.

More specifically, Linear Discriminant Analysis (LDA) and Decision Trees (DT) have been used. LDA Linear Discriminant Analysis is one of the most commonly used rules in practical research. It originates from the proposal by (Fisher, 1936) for the case of $K = 2$ groups in pioneering

Table 1
Descriptive Statistics of the 19 items, distinguishing between the entrepreneurs and the non-entrepreneurs.

	No			Yes			Total		
	Mean	N	Std. Deviation	Mean	N	Std. Deviation	Mean	N	Std. Deviation
Q1	4.37	748	1.586	5.07	371	1.468	4.60	1119	1.583
Q2	5.12	761	1.410	5.52	370	1.254	5.25	1131	1.373
Q3	5.52	761	1.281	6.24	371	0.938	5.76	1132	1.226
Q4	5.72	757	1.040	5.96	367	0.942	5.80	1124	1.015
Q5	5.67	757	1.089	5.97	368	0.959	5.77	1125	1.057
Q6	5.80	752	1.052	5.98	366	1.013	5.86	1118	1.042
Q7	5.77	752	1.015	5.93	366	0.941	5.82	1118	0.993
Q8	4.62	757	1.228	5.15	363	1.206	4.79	1120	1.245
Q9	3.82	746	1.843	4.43	361	1.981	4.02	1107	1.910
Q10	6.13	753	1.037	6.21	365	1.067	6.16	1118	1.047
Q11	5.69	755	1.266	5.91	366	1.219	5.76	1121	1.255
Q12	6.03	755	0.963	6.21	367	0.831	6.09	1122	0.925
Q13	5.47	755	1.017	5.56	367	1.064	5.50	1122	1.033
Q14	5.92	755	0.973	5.99	365	0.949	5.94	1120	0.965
Q15	5.43	752	0.984	5.62	365	0.989	5.49	1117	0.989
Q16	6.05	753	1.004	6.34	366	3.198	6.15	1119	2.009
Q17	6.01	755	0.973	6.42	365	0.813	6.14	1120	0.943
Q18	2.56	756	1.520	2.71	366	1.636	2.61	1122	1.560
Q19	2.91	754	1.536	2.58	366	1.476	2.80	1120	1.524

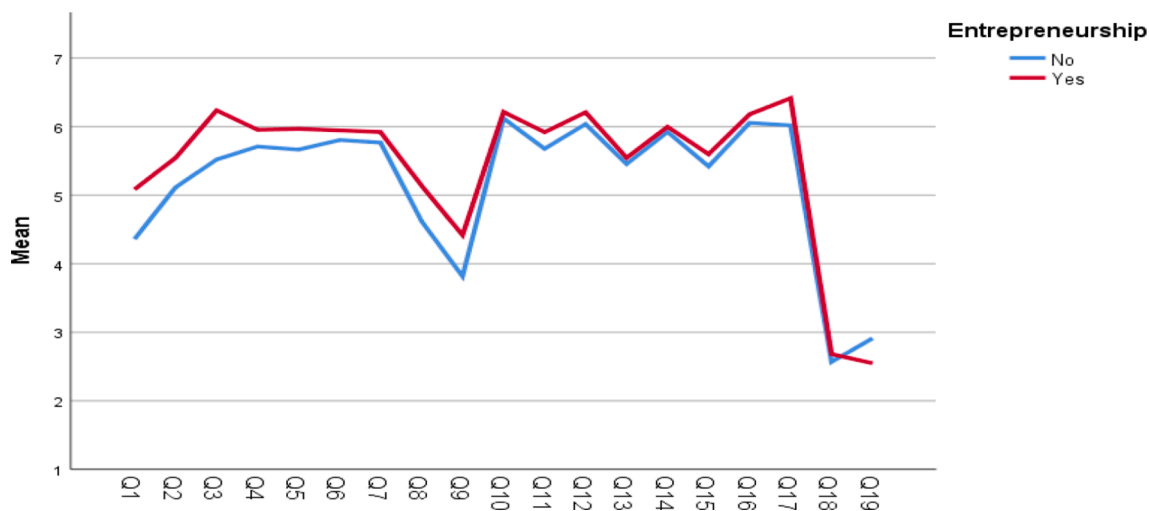


Fig. 1. Means of the items in both groups.

work in the field of discriminant analysis. We can assume it is the optimal rule when the distributions determined by the groups follow the normal distribution with different mean vectors but with a common matrix of variance–covariance. As a starting point, this may seem restrictive; however, the study of the behaviour of this rule, mainly in the case of $K = 2$ groups, both in simulations and with real data (McLachlan, 1992; Krzanowski, 1995) shows that this rule is robust when dealing with deviations from the normal, as well as with a moderate magnitude of heteroscedasticity. This explains why this rule is appropriate for application to real data sets. For example, (Lim et al., 2000) compared 33 classification algorithms with 32 sets of data and, organising them according to the average error margin, the lineal rule came in fifth place.

The process starts with tests of equality of group means (Wilks’ Lambda F) to detect possible differences in behaviour of the variables in the two groups—that is, entrepreneurs and non-entrepreneurs. Variables that do not result in differences in the mean when applied to both groups, and consequently do not help discriminate, will not be included in the analysis.

The next stage is to obtain the Standardized Canonical Discriminant Function Coefficients, which allow consideration of which variables used pose a bigger impact when it comes to determining entrepreneurial

behaviours.

Finally, the quality of the predictions can be evaluated with the so-called confusion matrix (or classification table), which is a tabular representation of actual (observed) vs. predicted (by the model) values. From the elements of this table, we can obtain the unbiased cross-validation estimate of the overall error rate or accuracy of the model.

Along with these techniques, we used DT, which was introduced by (Breiman et al., 2017) as a statistical technique that generates a classification model, based on flux diagrams, to identify groups and make inferences. A decision tree helps make a more accurate decision from a probability perspective when faced with a range of possible decisions (Hastie, Tibshirani, Friedman, 2017). It allows us to examine the results and determine visually how the model flows. We chose the division model CHAID (*Chi-squared Automatic Interaction Detection*). At each step, CHAID chooses the independent (predictor) variable that has the strongest interaction with the dependent variable. Categories of each predictor are merged if they are not significantly different from the dependent variable. A great advantage stemming from this method is the graphical representation that allows us to distinguish the combination of predictive variables that produces the highest (and also the lowest) values of entrepreneurial behaviours.

All analyses were run using IBM SPSS Statistics for Windows, Version

Table 2
Tests of equality of group means.

	Wilks' Lambda	F	df1	df2	Sig.
Q1	,954	50,745	1	1049	,000
Q2	,978	23,459	1	1049	,000
Q3	,925	85,295	1	1049	,000
Q4	,987	13,542	1	1049	,000
Q5	,982	19,443	1	1049	,000
Q6	,996	4,185	1	1049	,041
Q7	,995	5,563	1	1049	,019
Q8	,962	41,466	1	1049	,000
Q9	,978	23,247	1	1049	,000
Q10	,998	1,845	1	1049	,175
Q11	,992	8,571	1	1049	,003
Q12	,992	8,105	1	1049	,005
Q13	,998	1,742	1	1049	,187
Q14	,999	1,359	1	1049	,244
Q15	,993	7,458	1	1049	,006
Q16	,996	3,912	1	1049	,048
Q17	,961	42,447	1	1049	,000
Q18	,999	1,236	1	1049	,266
Q19	,987	13,617	1	1049	,000

25.0.

4. Results

4.1. General results

We analysed the different hypotheses described in section two. The statistical data processing described above allowed us to arrive at the following results.

First, **Table 1** shows the main descriptive statistics (mean and standard deviation) for the 19 items included in the questionnaire, distinguishing between entrepreneurs and non-entrepreneurs. **Fig. 1** represents, in graphical form, the mean of the items for the two groups. Inspection of those results made apparent the importance of some items in explaining entrepreneurial behaviour (those exhibiting different behaviours across groups; see, for instance, Q1 or Q9).

Results of the first statistical treatment were used to discriminate and detect entrepreneurship among the 19 survey items. **Table 2** shows the results of Wilks' Lambda Tests of Equality of Group Means. Items Q10, Q13, Q14 and Q18, with p-values higher than 0.05, will be ignored in the analysis.

We conducted an LDA with the other items, using proportional sample sizes belonging to each group as probabilities "a priori".

Fig. 2 shows the Standardized Canonical Discriminant Function Coefficients. They support the view that Q3, with a coefficient of 0.602, Q1,

with a coefficient of 0.441, and Q17, with a coefficient of 0.324, should be considered the most relevant. This result matches our previous findings and confirms **Hypothesis 3** regarding how important creativity, initiative, risk-taking and efficiency management are to becoming an entrepreneur; **Hypothesis 1** regarding education and training in business as key aspects of entrepreneurship; and **Hypothesis 4** regarding considering oneself as open-minded is key to being/becoming an entrepreneur.

Table 3 includes the results of the classification. According to these results, we estimate with 71.0% accuracy the entrepreneurial tendency for all elements in the sample.

Figure 3 shows the analysis made using a Decision Tree model to discriminate the most relevant items used to identify entrepreneurs. The boxes include frequencies regarding reasons why a student would be characterised as an entrepreneur. The variables (with their values) that further separate the yeses from the no's are searched for, focussing especially on extreme cases. The top box shows the results from the whole sample, and using these data we maintain that Q3: *high level of initiative* is a relevant item, with a p-value = 0.00, which is statistically significant because it indicates compelling evidence against the null hypothesis. Moreover, chi-square statistic = 102.030 determines that the relationship exists.

We are looking for more refined characteristics for entrepreneurship. Once we determine Q3 as relevant, we can select only students who scored 7 on this particular item, and we searched for the second item to combine them. In this case, the selected item was Q1: *previous knowledge of business*, p-value = 0.00 and chi-square statistic = 22.767. The

Table 3
Classification results.^{a,c}

		Entrepreneurship		Total	
		Predicted group membership			
		No	Yes		
Original	Count	No	649	62	711
		Yes	233	115	348
	%	No	91,3	8,7	100,0
Cross validation ^b	Count	No	644	67	711
		Yes	240	108	348
	%	No	90,6	9,4	100,0
		Yes	69,0	31,0	100,0

^a 72,1% of original grouped cases correctly classified.

^b Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

^c 71, 0% of cross-validated grouped cases correctly classified.

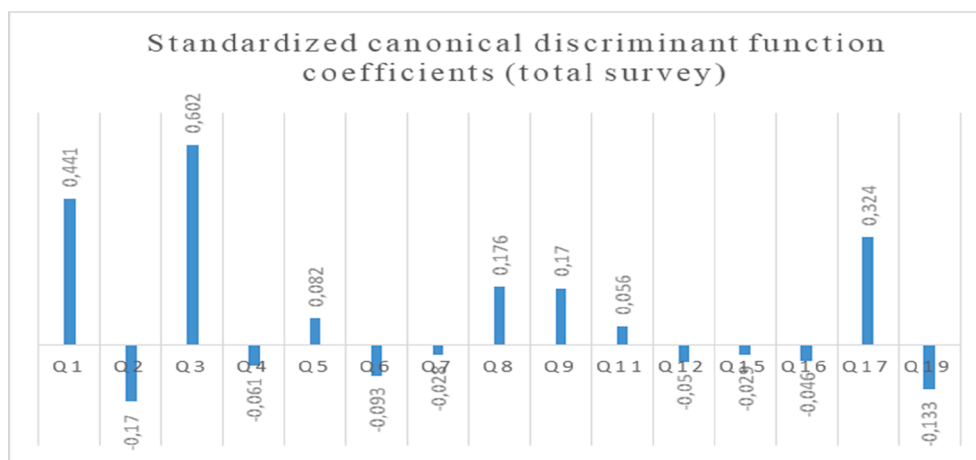


Fig. 2. Standardized Canonical Discriminant Function Coefficients (total survey).

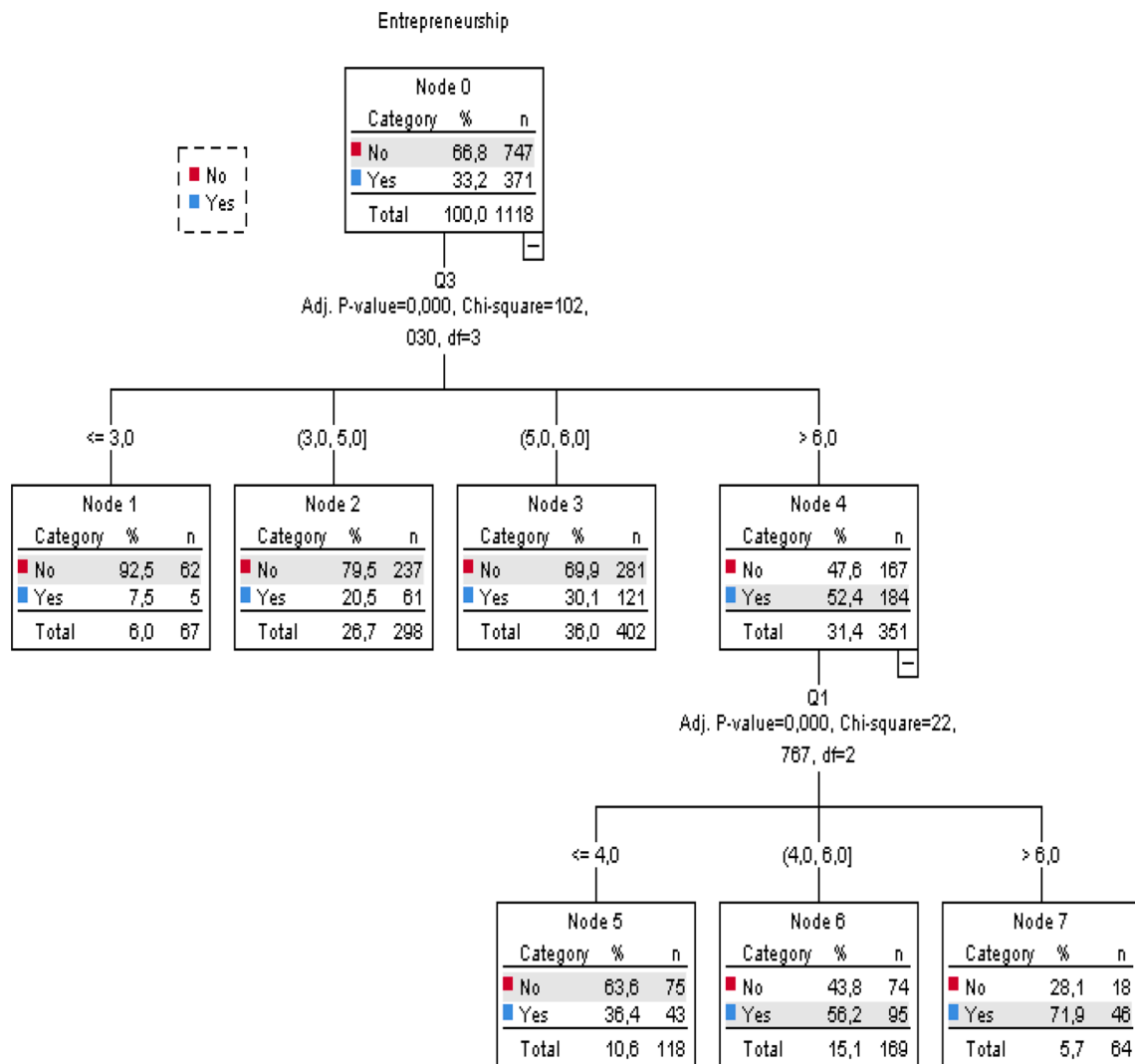


Fig. 3. Entrepreneurship Tree. Total survey.

Table 4
Tests of Equality of Group Means (male).

	Wilks' Lambda	F	df1	df2	Sig.
Q1	,948	29,100	1	526	,000
Q2	,986	7,225	1	526	,007
Q3	,918	46,841	1	526	,000
Q4	,980	10,677	1	526	,001
Q5	,991	4,966	1	526	,026
Q8	,966	18,452	1	526	,000
Q9	,991	4,560	1	526	,033
Q12	,991	4,565	1	526	,033
Q17	,961	21,369	1	526	,000
Q19	,973	14,691	1	526	,000

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	,854	82,430	10	,000

combination of both items allows us to confirm that one student who scores 7 on both items Q3 and Q1 is an entrepreneur with 71.9% probability.

4.2. Gender analysis: Male

After identifying the most relevant items for the complete sample, we

Table 5
Classification results.^{a,c}

	Entrepreneurship	Predicted Group Membership men		Total
		No	Yes	
Original	Count	No 262	Yes 56	318
	%	No 82,4	Yes 17,6	100,0
Cross-validation ^b	Count	No 259	Yes 59	318
	%	No 81,4	Yes 18,6	100,0

^a 72,2% of original grouped cases correctly classified.

^b Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

^c 70,1% of cross-validated grouped cases correctly classified.

decided to compare the results for the male group and the female group. Preliminary results show that both items Q4: *I have skills to manage teams* and Q19: *I see myself as someone who is traditional and uncreative* deserve to be considered in the male group, but not in the female group; on the other hand, items Q10: *Continuing education is key when taking on new professional challenges*, Q11: *An entrepreneur is the sum of their skills* and

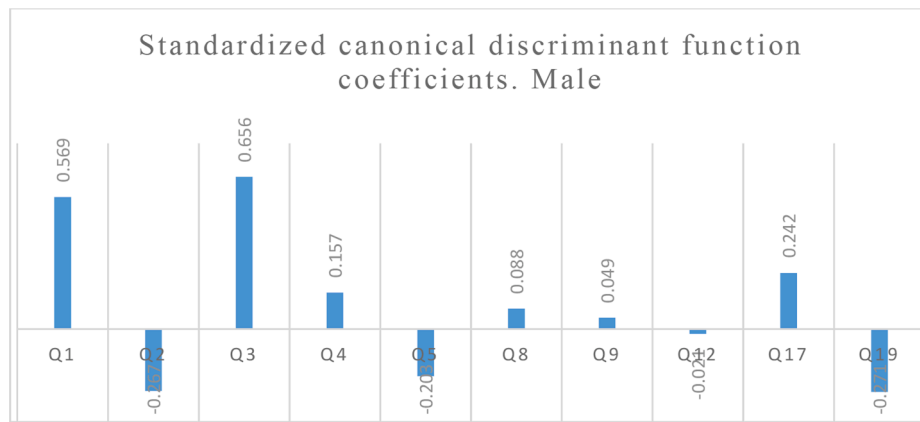


Fig. 4. Standardized Canonical Discriminant Function Coefficients (male).

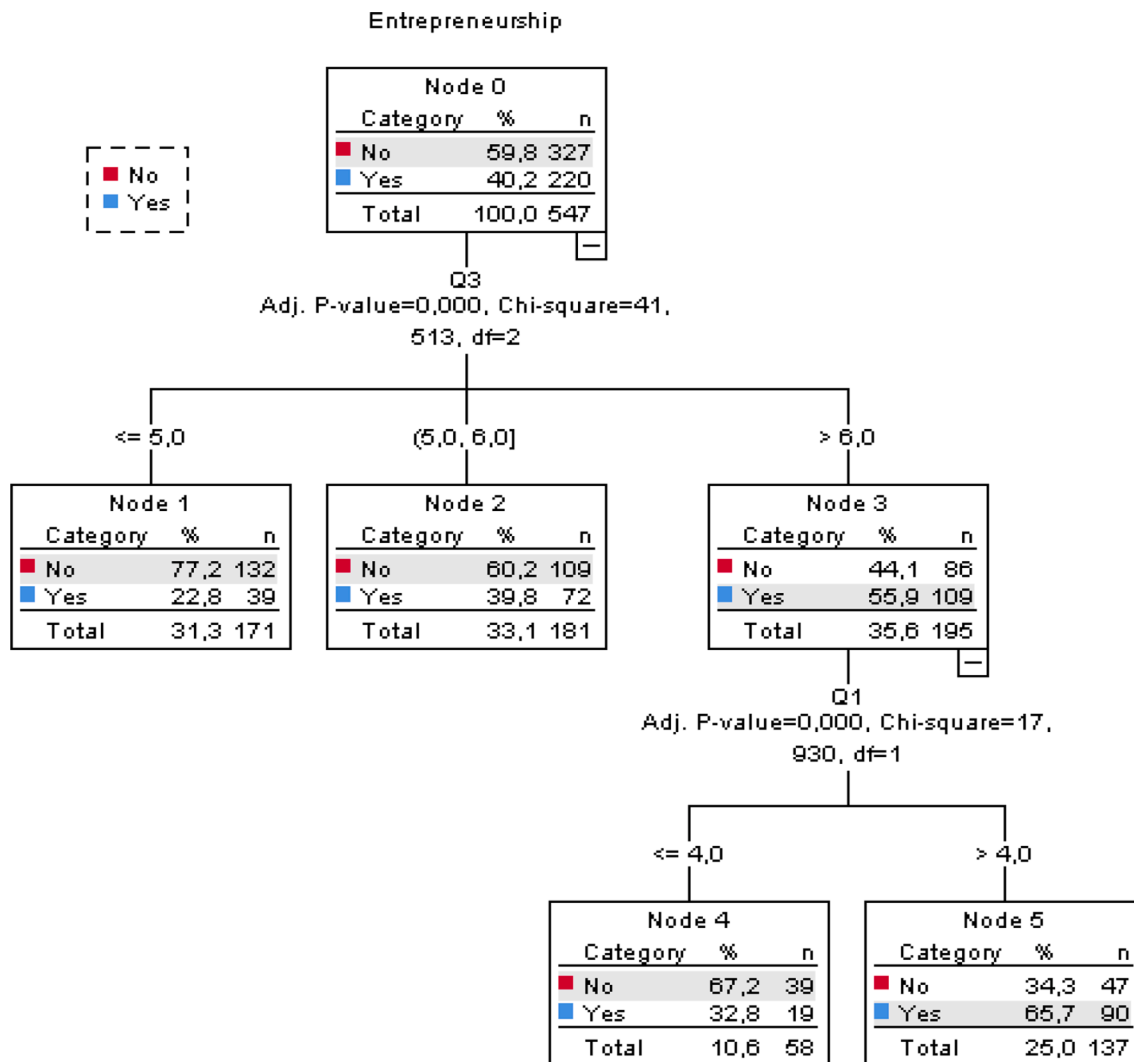


Fig. 5. Entrepreneurship Tree. Male.

knowledge and Q16: I see myself as someone who is reliable and self-disciplined must be taken into account in the female group, but are not significant in the male group. This point does not significantly affect our analysis; later we explain the ponderation of all relevant items, and we note that other items should be considered.

The results for entrepreneurship intention in men are included in

Table 4 and Table 5. The first table shows the discriminating analysis made for select items to indicate only the most relevant items for males; only 10 items have been selected. The next table shows the classification results for the group of males (see Fig. 4).

Once we discriminated the relevant items of our questionnaire for males, we applied the Wilks' Lambda test showing the significance of the

Table 6
Tests of equality of group means (female).

	Wilks' Lambda	F	df1	df2	Sig.
Q1	,967	18,778	1	544	,000
Q2	,976	13,323	1	544	,000
Q3	,938	36,260	1	544	,000
Q5	,978	12,168	1	544	,001
Q8	,962	21,679	1	544	,000
Q9	,943	33,181	1	544	,000
Q10	,988	6,406	1	544	,012
Q11	,983	9,554	1	544	,002
Q12	,990	5,372	1	544	,021
Q16	,989	5,898	1	544	,015
Q17	,958	23,984	1	544	,000

Table 7
Classification results.^{a,c}

		Entrepreneurship		Predicted Group Membership female	Total
		No	Yes		
		No	Yes	No	Yes
Original	Count	No	395	9	404
		Yes	117	25	142
	%	No	97,8	2,2	100,0
		Yes	82,4	17,6	100,0
Cross-validation ^b	Count	No	394	10	404
		Yes	119	23	142
	%	No	97,5	2,5	100,0
		Yes	83,8	16,2	100,0

^a 76,9% of original grouped cases correctly classified.

^b Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

^c 76,4% of cross-validated grouped cases correctly classified.

analysis; as a consequence, we have the Standardized Canonical Discriminant Function Coefficients (Fig. 2), then we have proof that Q3: *I have enough personal initiative to undertake projects*, with a coefficient of 0.656, and Q1: *The knowledge acquired in my education, both undergraduate and graduate, has helped me to set up a business*, with a coefficient of 0.569; both are relevant items for males becoming entrepreneurs. Family environment, our item Q9: *The entrepreneurial family environment has been a facilitating factor when undertaking new business initiatives*, could not be considered a relevant variable. We do not want to miss the

opportunity to point out that Q19: *I see myself as someone who is traditional and uncreative*, with a coefficient of -0.271 , shows how negatively this item is considered by our students thinking about becoming entrepreneurs. These results confirmed Hypothesis 1. Education and training in business are key aspects of entrepreneurship and Hypothesis 3. How important creativity, initiative, risk-taking and efficiency management are to becoming an entrepreneur. In this case, we cannot maintain Hypothesis 2. Family environment positively influences entrepreneurship. This is consistent with our previous findings, where in both MBA and EMBA, the family context was identified as relevant. We will return to this point.

Table 5 shows we estimate with 70.1% accuracy entrepreneurial tendency in the male group.

This case follows the analytical methodology already described for the interpretation of trees, as described in Fig. 5. The top box shows the results of the gender analysis: for males, and using obtained data, we maintain that Q3: *high level of initiative* is a relevant item, with a p-value = 0.00 and chi-square statistic = 41.513. Seeking more refined characteristics for entrepreneurship, the second selected item was Q1: *previous knowledge of business*, with a p-value = 0.00 and chi-square statistic = 17.913.

Up to this point and based on the data for the entire student cohort, we can validate our hypothesis that items Q3 and Q1, in that order, are the ones that determine the entrepreneurial skills amongst males.

The combination of both items allows us to confirm that one male student who scores 7 on item Q3 and scores more than 4 on item Q1 is an entrepreneur with 65.7% probability.

4.3. Gender analysis: Female

The next analysis is similar to the calculations made above, but in this case the predicted group dummy has been built for females. The results for entrepreneurial intentions of women are included in Table 6 and Table 7. The first table shows the discriminating analysis, made to select items that point out just the most relevant ones; 11 items have been discriminated. The next table shows the classification results for the female group.

Once we discriminated the relevant items of our questionnaire for women, we applied the Wilks' Lambda test showing the significance of the analysis (Table 6); as a consequence, we have the Standardized Canonical Discriminant Function Coefficients (Fig. 6) then we report the evidence that Q3: *I have enough personal initiative to undertake projects*, with a coefficient of 0.517, is lower than men, but first in the ranking

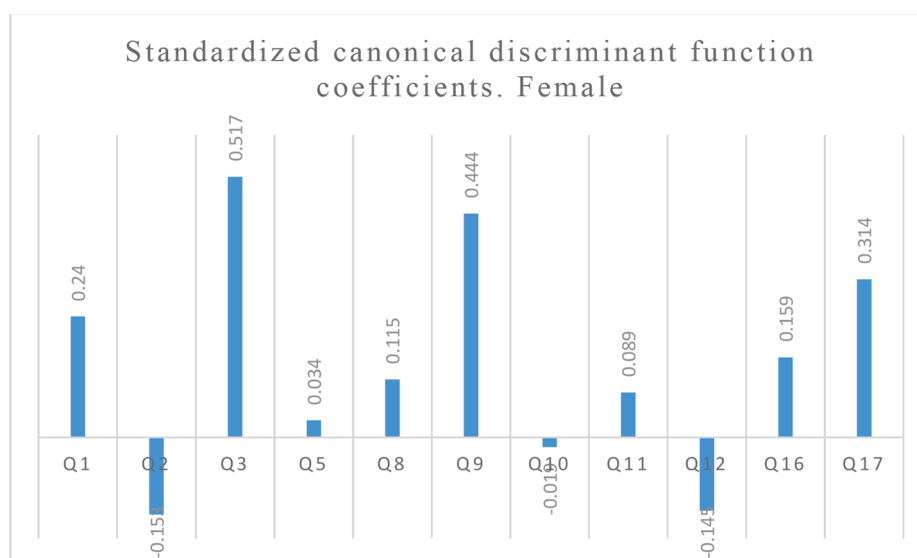


Fig. 6. Standardized Canonical Discriminant Function Coefficients (female).

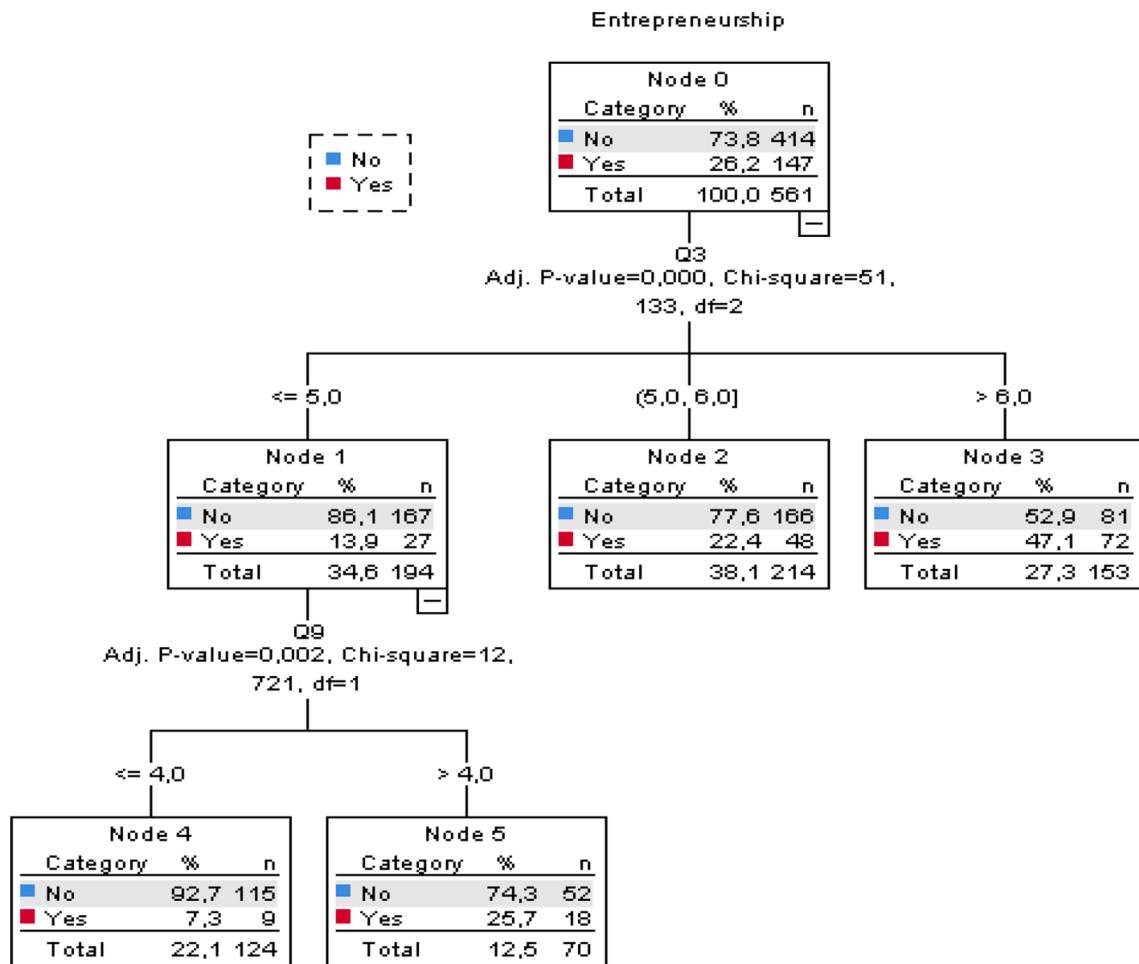


Fig. 7. Entrepreneurship Tree. Female.

Table 8
Tests of Equality of Group Means (MBA and EMBA).

	Wilks' Lambda	F	df1	df2	Sig.
Q3	,933	21,398	1	299	,000
Q8	,956	13,637	1	299	,000
Q17	,961	12,209	1	299	,001
Q19	,966	10,511	1	299	,001

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	,894	33,155	4	,000

nonetheless. Confirming our previous research, Q9: *The entrepreneurial family environment* is a facilitating factor when undertaking new business initiatives ranks second for women; the coefficient is 0.444. Finally, item Q17: *I see myself as someone who is open to new experiences and multi-faceted*, with a coefficient of 0.314, confirms Hypothesis 4. Considering oneself as open-minded is key to being/becoming an entrepreneur.

Table 6 shows we estimate with 76.4% accuracy the entrepreneurial tendency in the female group.

As described in Fig. 7, we maintain that Q3: *high level of initiative* is a relevant item, with a p-value = 0.00 and chi-square statistic = 51.133, determining that relationship exists. The second selected item was Q9: *Entrepreneurial family environment*, with a p-value = 0.002 and chi-square statistic = 12.721. The combination of items allows us to conclude that one student who scores lower than 5 on item Q3 and scores lower than 4 on item Q9 has only a 7.3% probability of becoming

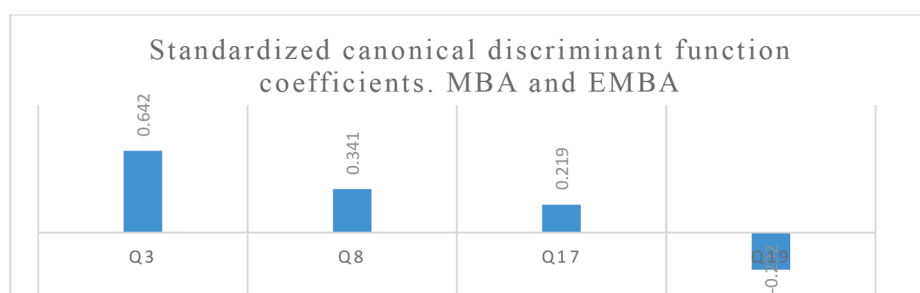


Fig. 8. Standardized Canonical Discriminant Function Coefficients (MBA and EMBA).

Table 9
Classification results.^{a,c}

		Entrepreneurship		Predicted Group Membership MBA and EMBA		Total
		No	Yes	No	Yes	
Original	Count	No	109	53	162	
		Yes	54	85	139	
	%	No	67,3	32,7	100,0	
		Yes	38,8	61,2	100,0	
Cross-validation ^b	Count	No	104	58	162	
		Yes	54	85	139	
	%	No	64,2	35,8	100,0	
		Yes	38,8	61,2	100,0	

^a 64,5% of original grouped cases correctly classified.

^b Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

^c 62,8% of cross-validated grouped cases correctly classified.

an entrepreneur.

As seen previously for the entire student cohort, again we see the relevance of item Q3 in determining the entrepreneurial skills in the female group. If we add the results from item Q9, we can confirm Hypothesis 2. Family environment positively influences the development of entrepreneurial skills. This is more so in the female than in the male group.

4.4. MBA and EMBA analysis

ESIC has been interested in expanding their knowledge about the master’s programmes as well and in how students decide to enrol in one of them; whether or not entrepreneurship is part of the programme. In

our previous research, we found that the students most predisposed to setting up new businesses were those who chose the EMBA, the Executive Master’s in Business Administration degree programme, and the MBA, the Master’s in Business Administration degree programme. EMBA is an unusual programme because it requires experience to even enrol, and it is more suitable for those with an entrepreneurial spirit. To shed light on this issue, we decided to compare the relevant items in our questionnaire for MBA and EMBA students with other ESIC master programmes.

The discriminant analysis applied across the quiz’s answers shows that only four items are relevant (see Table 8 and Fig. 8). As expected, Q3: *I have enough personal initiative to undertake projects*, with a coefficient 0.642, and Q8: *Easily visualised or detected new market opportunities that can turn into entrepreneurship*, with a coefficient 0.341, confirm Hypothesis 3. How important creativity, initiative, risk-taking and efficiency management are to becoming an entrepreneur. On the other side, Q17: *I see myself as someone who is open to new experiences and multi-faceted*, with a coefficient 0.219, confirms Hypothesis 4. Considering oneself as open-minded is key to being/becoming an entrepreneur. Finally, Q19: *I see myself as someone who is traditional and uncreative*, with a negative coefficient of -0.292, shows how important it is for entrepreneurial activity that one is not a traditional but rather a creative person. These results allow us to trust in our analytical methods.

Table 9 shows the classification results. We estimate with 62.8% accuracy the entrepreneurial tendency for MBA and MBA students.

In the case of MBA and EMBA students, notice that these particular master’s programmes enrol students with high entrepreneurial intention. The top box shows the results of these master’s programmes (see Fig. 9). Using these data, we maintain that Q3: *high level of initiative* is a relevant item, with a p-value = 0.00 and chi-square statistic = 20.875. We also show Q8 as relevant, *being able to detect new market opportunities*, with a p-value = 0.014 and chi-square statistic = 8.966. The

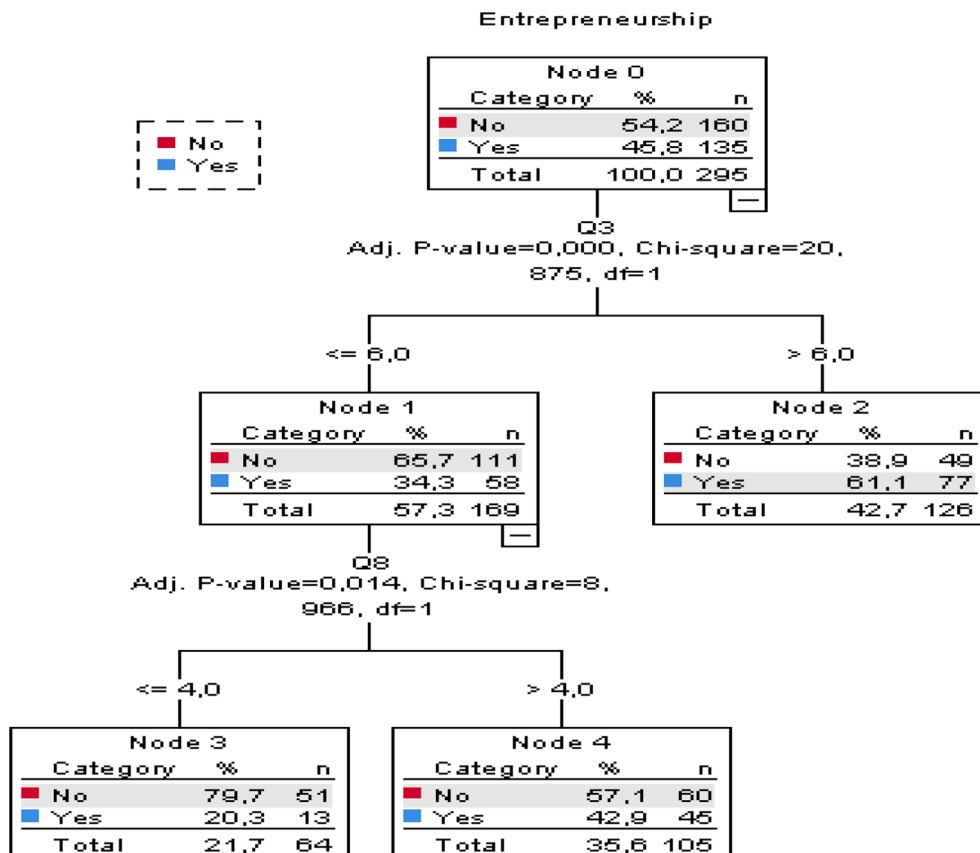


Fig. 9. Entrepreneurship Tree. MBA and EMBA.

Table 10
Tests of Equality of Group Means (other master programs).

	Wilks' Lambda	F	df1	df2	Sig.
Q1	,942	47,706	1	780	,000
Q2	,972	22,747	1	780	,000
Q3	,937	52,544	1	780	,000
Q4	,985	12,046	1	780	,001
Q5	,985	11,506	1	780	,001
Q7	,993	5,785	1	780	,016
Q8	,967	26,492	1	780	,000
Q9	,968	26,007	1	780	,000
Q11	,991	6,757	1	780	,010
Q12	,992	6,536	1	780	,011
Q15	,989	8,644	1	780	,003
Q17	,961	31,363	1	780	,000
Q19	,989	8,797	1	780	,003

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	,882	97,090	13	,000

combination of both items confirms that one student who scores lower than 6 on item Q3 and scores lower than 4 on item 8 is an entrepreneur with 20.3% probability.

4.5. Other master's programmes

We conclude this paper with the estimation of entrepreneurship amongst students enrolled in other ESIC master's programmes. Repeating the method developed to understand the entrepreneurial behaviour among ESIC's master's students, we confirm the same relevant items.

As Table 10 and Fig. 10 once again show, Q1: education, with a coefficient of 0.479, Q3: personal initiative, with a coefficient of 0.504 and Q17: open minded person, with a coefficient of 0.335, confirm our hypothesis about the entrepreneurial intention of ESIC students, even in the case that they have been enrolled in a master's programme not particularly specialised in developing entrepreneurial skills.

Finally, Table 11 shows the classification results. We estimate with 73.7% accuracy the entrepreneurial tendency for ESIC other master's students becoming entrepreneurs once they conclude the programme.

Fig. 11 shows the key items to becoming an entrepreneur in the case of ESIC other master's students, that is, not MBA or EMBA students. The top box shows that Q3: high level of initiative is a relevant item, with a p-value = 0.00 and chi-square statistic = 58.790. Once we show Q3 as remarkable, we select only students who scored 7 on this particular item, and we searched for the second item to combine then. In this case, the

selected item was Q1: previous knowledge of business, with a p-value = 0.00 and chi-square statistic = 22.806. The combination of items confirms that one student who scores 7 on item Q3 and scores more than 5 on item Q1 is an entrepreneur with 64.8% probability.

5. Discussion of results

Our findings have been supported by a questionnaire filled out by students who have chosen ESIC, some of whom have a predisposition to start a new company or follow in their parents' footsteps when they finish higher education. One limitation of our study is that was conducted on a relatively small group of people in one precise business school and only in Spain. It would be wise to run an analogous or similar study on a larger population, and we have considered widening the findings to other business schools in different countries.

In terms of gender, students found 10 and 11 items relevant for males and females, respectively, two items important for men but not for women and three other different items relevant for females more than males. This leads us to re-think future research. It was a surprise that MBA and EMBA students could determine precisely which items they considered as relevant and then hone in on just four. These particular characteristics lead us to maintain that these students have a marked tendency for entrepreneurship. Confirming this idea, students in other master's programmes show 13 items as relevant. The study examines personality as one key to entrepreneurship. It would also prove worthwhile to analyse the intention to start a new firm by other means.

Table 11
Classification results.^{a,c}

		Entrepreneurship		Predicted Group Membership other master programs		Total
		No	Yes	No	Yes	
Original	Count	No	540	25	565	
		Yes	175	42	217	
	%	No	95,6	4,4	100,0	
		Yes	80,6	19,4	100,0	
Cross-validation ^b	Count	No	537	28	565	
		Yes	178	39	217	
	%	No	95,0	5,0	100,0	
		Yes	82,0	18,0	100,0	

^a 74,4% of original grouped cases correctly classified.

^b Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

^c 73,7% of cross-validated grouped cases correctly classified.

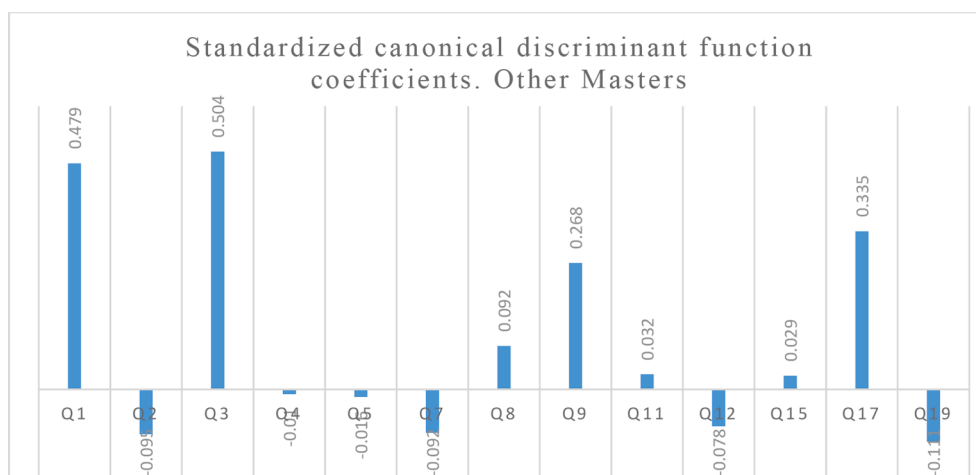


Fig. 10. Standardized Canonical Discriminant Function Coefficients (other masters).

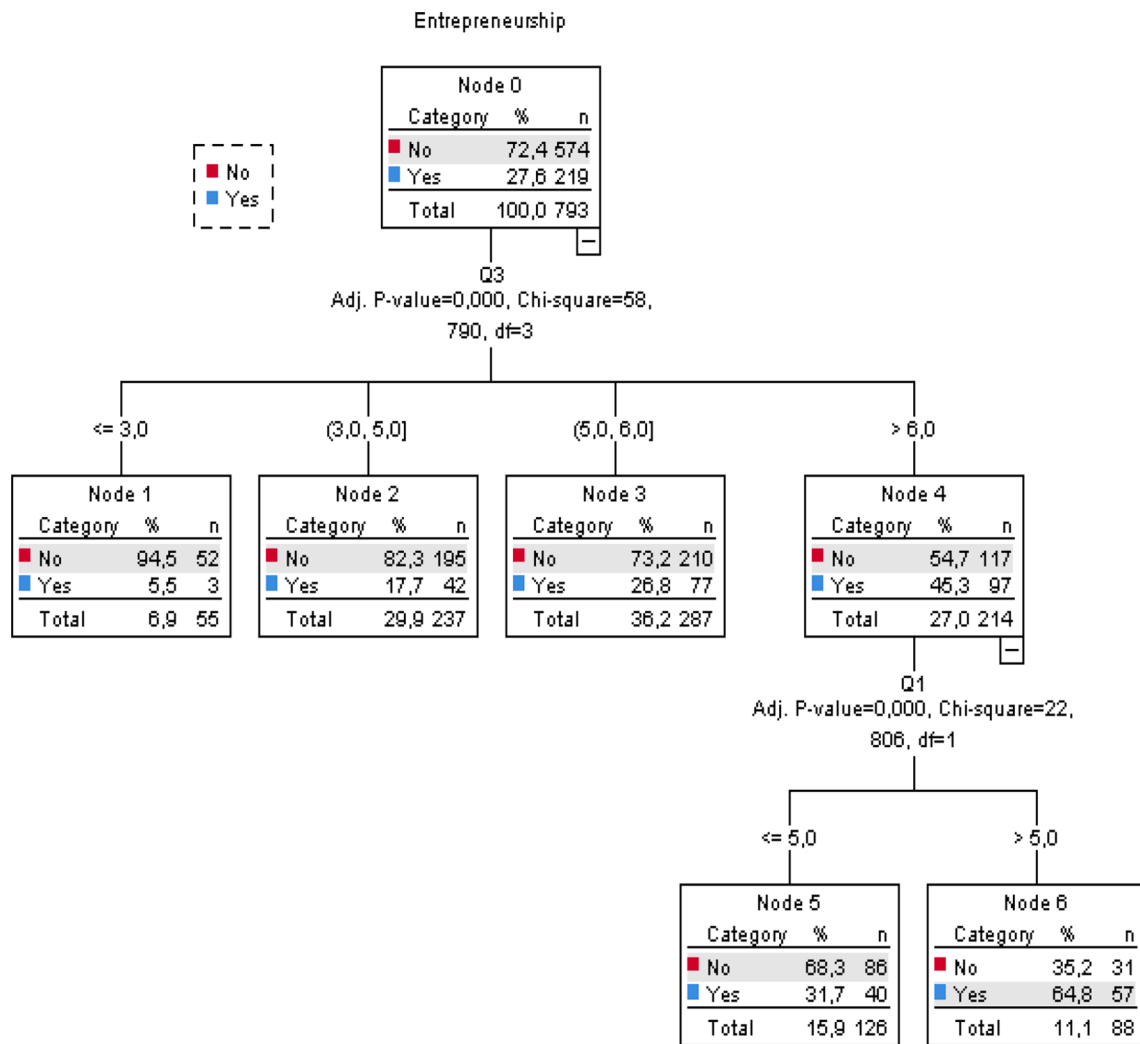


Fig. 11. Entrepreneurial Tree. Other masters.

In all cases, a Box’s M test was conducted and led us to reject the null hypothesis of equality of variance–covariance matrixes for the entrepreneurs (yes/no) groups. In such situations, Quadratic Discriminant Analysis (QDA) could be interpreted as the optimal rule. We have performed this analysis as well, although the outputs are not included in this paper since LDA has always obtained similar or better results. This confirms that LDA behaves better as a tool in practice, as previously stated by Hastie et al. (2017).

6. Conclusions

After the analysis of the variables collected in the survey and knowing all the statistical conclusions on statistics, we analyse in-depth the relevant variables that illustrated a special personality among entrepreneurs in Spain and for a sample of ESIC’s master’s students. Fig. 10 illustrates with a bar chart, and we confirm that the next most relevant items that characterise the personality of a young entrepreneur are Q1, Q3 and Q17. Starting with Q1: *The knowledge acquired in my education, both undergraduate and graduate, has helped me to set up a business*; in Spain it has been anticipated that higher education is a precursor of entrepreneurial attitudes (Lanero et al., 2011; Rosado-Cubero et al., 2021). We conclude that Q1, defined above, and item Q3 together shaped an entrepreneur personality with 71.9% probability. The second item is Q3: *I have enough personal initiative to undertake projects*, previously analysed as the capacity to solve problems in groups (Morselli &

Ajello, 2016), or considering that entrepreneurship could be a collaborative process (Karami & Read, 2021). We conclude that it is a relevant item, with a p-value = 0.00, which is statistically significant because it indicates strong evidence against the null hypothesis. Finally, Q17: *I see myself as someone who is open to new experiences and multifaceted*, which has been analysed by academics as risk-propensity, self-efficacy (Bygrave & Hofer, 1992; Caliendo et al., 2014) autonomy and independence (Rauch & Frese, 2000) or passion, entrepreneurial self-efficacy and risk perception (Stroe et al., 2018) is shown in our study as the third remarkable item, with a coefficient of 0.314 in the Standardized Canonical Discriminant Function Coefficients. This function allows us to assert that the variables used have a larger impact when it comes to determining entrepreneurial behaviours.

Both together are the appropriate items to defining the entrepreneurial personality, repeatedly showing relevancy. We can conclude that an entrepreneurial personality is a blend of education, personal initiative and an open-minded personality, with the family environment as the most determining factor for young enterprising attitudes. Variables such as gender had a positive impact on the probability of becoming an entrepreneur, but not significantly.

As we have found regarding the type of programme students attended for identifying an entrepreneurial spirit, EMBA and MBA programmes are most commonly chosen, before other more specific training programmes. After reconsidering these findings, we confirm our previous conclusions: our model allows us to predict the students who

have a high intention to becoming entrepreneurs.

These conclusions are, from our point of view, the most significant since the study includes many important variables marking aspects of an entrepreneur, including a cluster of creativity, initiative, risk-taking and efficiency management, plus education and an open-minded personality. Moreover, ESIC master's programmes like the EMBA and MBA are chosen by future businessmen to complete their education.

7. Practical implications

The most practical implication on policy in Spain would be that the knowledge that can be derived from this study can contribute to developing a favourable environment for young entrepreneurs. Once the key personality traits are described, public administration figures interested in developing a programme for young entrepreneurs could define personal features following that research; then public policy should be implemented with more accuracy, minimising losses and wasted resources. At the same time, any educational institution, mainly business schools, could adapt their training programmes according to the characterisation described here. Finally, this research could have managerial and human resources implications as well, since intra-entrepreneurship of employees is growing in corporations, where new proposals by current employees are always welcome.

CRedit authorship contribution statement

Ana Rosado-Cubero: Methodology, Investigation, Formal analysis.
Teresa Freire-Rubio: . **Adolfo Hernández:** Visualization, Methodology, Data curation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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