The effect of proximal personality traits on entrepreneurial intention among higher education students

Abstract

Purpose - According to the literature, general personality traits are less strongly related to the creation of new ventures than specific/proximal personality traits. Therefore, this study aims to understand the different proximal personalities that influence the entrepreneurial intention to start a new venture, and the relationship between them.

Design/methodology/approach - Data were gathered through a self-administered questionnaire filled in by students of entrepreneurship or related courses at the end of the second semester (2019/2020 academic year) and the research option is based on covariance-based structural equation modelling.

Findings - The results show that entrepreneurial intentions can be predicted by specific individual traits, namely risk-taking, entrepreneurial alertness, creativity, proactivity and self-efficacy. Moreover, it was found that risk-taking mediates the relationship between entrepreneurial alertness and proactivity. On the other hand, students' creativity mediates the relationship between risk-taking and proactivity. Finally, students' self-efficacy mediates the relationship between proactiveness and entrepreneurial intention.

Practical implications - The results have implications for entrepreneurship education given that a better understanding of the personality traits that influence entrepreneurial intentions can lead to the development of new approaches and pedagogical tools.

Originality/Value - Our model can be used as a diagnostic tool for designing an effective and efficient entrepreneurship curriculum and pedagogy, acting as an (ongoing) audit of students' entrepreneurial intentions to get a scientific basis in case of further course/module adjustments.

Keywords Entrepreneurial behaviour, Proximal traits, Entrepreneurial process, Students' entrepreneurial intentions, Entrepreneurship education, Structural equation modelling.

Introduction

Entrepreneurship is acknowledged as one of the main drivers of economic growth (Badri and Hachicha, 2019, De Vita *et al.*, 2014, Welsh *et al.*, 2016) due to its impact on sustainable wealth creation and employment development (Kim *et al.*, 2018).From a macro perspective, Teixeira *et al.* (2018) identified major determinants of the entrepreneurial intention in European countries. Therefore, it has become increasingly relevant to understand how individuals, especially young people, might develop into entrepreneurs. Based on the diversity in contexts and motivations, this has also driven the advance in entrepreneurship research in recent decades, which has incorporated valuable contributions from different fields of research such as economics, management, psychology, and sociology, allowing the understanding of the various facets of this complex phenomenon.

The personality approach to entrepreneurship is grounded in psychology and has a long tradition in entrepreneurship research since it is generally agreed that the entrepreneur is at the core of the entrepreneurial process. Although this research stream has been criticised by various authors due to the absence of behavioural and ontological contingencies (Ramoglou *et al.*, 2020, Gartner, 1989), empirical research has found that personality factors have a much greater impact on entrepreneurial intent than any contextual factors (Rauch and Frese, 2007b). In this case, it is frequently assumed that personality characteristics correlate with each other, while at the same time being influenced and shaped by environmental forces such as industry dynamics (Kerr *et al.*, 2018) and entrepreneurial ecosystems in higher education (Ferrandiz *et al.*, 2018). This is in line with the recent personality models in personality psychology which posit that a person's personality should be considered as a system in order to understand how traits affect behaviour (Obschonka *et al.*, 2015, Neneh, 2019).

According to Rauch and Frese (2007a), personality characteristics can be divided into general (broad) personality traits, such as the Big Five (extraversion, conscientiousness, openness, agreeableness, and neuroticism), which are considered relatively stable characteristics and behavioural tendencies across various situations; and the specific/proximal traits[1], such as the need for achievement, risk-taking, and self-efficacy, that can affect entrepreneurial intention and behaviour. Schlaegel *et al.* (2021) argue that whereas broad personality traits play a highly contextual role in entrepreneurial outcomes, the role of proximal traits is less influenced by context. Thus, broad traits are found to be less strongly related to new venture creation than specific/proximal personality traits (Rauch and Frese, 2007a), despite their positive influence on characteristic entrepreneurial adaptations or proximal traits (Obschonka and Stuetzer, 2017). Similar results were obtained by Postigo *et al.* (2021) who observed that eight specific traits were better at predicting and discerning entrepreneurial activity than the general traits.

Nevertheless, specific/proximal traits are seen as a "heterogeneous and unspecified category that lumps together very different psychological factors" (Obschonka and Stuetzer, 2017, p. 208), as in the study conducted by Botha and Morallane (2019). As mentioned by Obschonka and Stuetzer (2017, p. 208), "such lumping together is simplistic and reductionistic since such framework does not specify any dynamics within the characteristic adaptation level". The current study addresses this gap by promoting a better understanding of the relationship between the different specific/proximal personality traits and how they influence the entrepreneurial intention to start a new venture. By doing so, the study aims to make three contributions to the existing literature on the role of personality traits in the entrepreneurial process.

This study brings three main contributions. First, this study contributes to theory about personality traits that can impact entrepreneurial behaviour. Previous studies have focused on using these traits to examine entrepreneurial intention and consequent entrepreneurial activity (Ferrandiz *et al.*, 2018, Botha and Morallane, 2019). In contrast, in this study we performed an analysis of these personality traits that impact behaviour entrepreneur, at an early stage of the entrepreneurial process Second, we add to previous studies that the relationship between specific/proximal traits can reveal that they have different levels of proximal/distal behaviour for entrepreneurship Third, by revealing significant relationships between the traits of personality, the study provides a better understanding of the formation of entrepreneurial intention.

The remainder of this article is organised as it follows. Section 2 presents a review of the relevant literature on entrepreneurial traits. Section 3 outlines the research methodology and section 4 presents the main results. Based on the results, the following sections provide the discussion and raise

[1] According to (McCrae and Costa, 2008), the term 'trait' is usually applied to a person's relatively stable personality characteristics, such as the Big Five. On the other hand, more changeable personality characteristics, such as risk-taking, self-efficacy, etc., should be labelled as 'characteristic adaptations'.

practical implications. Finally, section 7 sets out the main conclusions, highlighting some key limitations in our analysis and pointing out fruitful avenues for further research.

Literature review and research hypotheses

Despite being considered a fuzzy concept, personality traits are defined as "complex, genetically co-determined psycho-physiological structures which originate and regulate the individual ways of experience and action" (Brandstätter, 2011, p. 223). Therefore, the intention to start a venture is a consequence of personality traits. It remains to be known which personality traits influence the entrepreneurial intention and the actual behaviour of starting a new business.

Entrepreneurial intention is defined as a person's self-acknowledged conviction to establish a new business venture in the future (Thompson, 2009). This includes conscious planning and the effort a person is expecting to exert to perform the behaviour (Ajzen, 1991). Therefore, the greater the commitment to start a new business, the greater the intention to perform subsequent entrepreneurial behaviour (Krueger *et al.*, 2000). Several studies have listed different predictors of entrepreneurial intentions. For instance, Ozaralli and Rivenburgh (2016) have grouped the different factors into social (experience and education), societal (economic and political climate), and personality factors (optimism, risk-taking propensity, self-efficacy, etc.). Despite the lack of consensus regarding the determinant personality traits for entrepreneurship, some are considered more relevant than others. According to the meta-analysis conducted by Rauch and Frese (2007b), the traits that significantly matched the entrepreneurial behaviour were the need for achievement, generalised self-efficacy, innovativeness, stress tolerance, need for autonomy, and proactive personality. These data were corroborated by Kerr *et al.* (2018) who also found self-efficacy, proactivity, and risk attitude as relevant traits in entrepreneurial behaviour. In turn, several studies found that creativity was also relevant to promote entrepreneurial intention (Bellò *et al.*, 2018, Zampetakis *et al.*, 2011).

More recently, Chavoushi *et al.* (2021) and Daniel *et al.* (2021) highlighted the role of entrepreneurial alertness in identifying entrepreneurial opportunities, which is a critical function of the entrepreneur in the entrepreneurial process. These studies are in line with the EntreComp Framework proposed by Bacigalupo *et al.* (2016), which identifies three main competency areas that the entrepreneur must master: 'Ideas and opportunities', 'Resources' and 'In action', which together are the building blocks of entrepreneurship as a competency.

Relationship between Entrepreneurial Alertness, Risk-taking, and Proactivity

According to Uy *et al.* (2015, p. 116), "the value of examining entrepreneurial alertness is that it concerns the individual's awareness, assessment and orientation toward uncertainties and changes in the external environment and context – beyond the within-person, internal issue of identity". Several authors have highlighted the role of entrepreneurial alertness in the process of opportunity recognition (Baron, 2006, Sharma, 2019, Ardichvili *et al.*, 2003, Tang *et al.*, 2012), which is considered the first step of the entrepreneurial process. In addition, entrepreneurial alertness is also considered a meta-ability for a variety of entrepreneurial behaviours (Obschonka and Stuetzer, 2017). Yet there is still no consensus regarding the relationship between entrepreneurial alertness and entrepreneurial capabilities and behaviours.

On the one hand, Cui *et al.* (2016) found that alertness to business ideas has a significant positive effect on entrepreneurial capabilities, such as innovativeness, risk-taking, and proactivity. In this case, the effectiveness of alertness to business ideas varies according to the different levels of risk propensity, which refers to the ability to cope with uncertainty about the surrounding world. Greater alertness leads to a significantly higher level of autonomy, innovativeness, and proactivity mediated by the risk-taking dimension. On the other hand, Obschonka and Stuetzer (2017) studied the role of personality characteristics and age-appropriate entrepreneurial competencies (leadership, self-esteem,

creativity, and proactivity motivation) in the prediction of entrepreneurial alertness and career intention. This study concluded that the effects of personality on alertness were mediated by leadership and proactivity. On the other hand, Uy *et al.* (2015) and Hu *et al.* (2018) argue that entrepreneurial alertness mediates the impact of proactive personality on a boundaryless mindset and entrepreneurial intention, respectively. These contradictory results highlight the need to further study the relationship between entrepreneurial alertness and entrepreneurial competencies, such as risk-taking propensity and proactivity.

According to Kirzner (1985, p. 56), alertness is "a motivated propensity of man to formulate an image of the future". Similarly, Gaglio and Katz (2001) argue that a high level of entrepreneurial alertness leads to an acute sensitivity to one's surroundings. Thus, entrepreneurs are more likely to act proactively to opportunities when they have more knowledge about customer needs and market demands, useful technologies, and greater managerial capabilities (Choi and Shepherd, 2004). In addition, the entrepreneur's initiative to explore an opportunity should not be opposed to the idea of the uncertainty related to the outcome in this process. In the same vein, Antoncic (2003) argues that an entrepreneurial endeavour is considered risky due to the frequent failure of new firms. Therefore, although there are studies that show contradictory results regarding an entrepreneur's propensity to risk (Macko and Tyszka, 2009, Tan *et al.*, 2021), there is always a risk associated with the outcome of the entrepreneurial process. Thus, when an entrepreneur identifies a business opportunity, his/her decision to act on that opportunity is affected by his/her propensity to take risks. Based on these arguments we draw the following hypotheses:

H_1: Entrepreneurial alertness has a positive and significant impact on students' proactivity.

H_2: Entrepreneurial alertness has a positive and significant impact on students' risk-taking propensity.

H_3: Risk-taking propensity has a positive and significant impact on students' proactivity.

$H_{3'}$: Risk-taking mediates the path between entrepreneurial alertness and proactivity.

Relationship between Risk-taking, Creativity, and Proactivity

Creativity has been defined as "the interaction among aptitude, process, and the environment by which an individual produces a perceptible product that is both novel and useful as defined within a social context" (Plucker *et al.*, 2004, p. 90). In this case, the development of new products often involves the proposal of new ideas by creative individuals who usually share them with others for approval, adaptation, or criticism. According to Bonetto *et al.* (2020), creative individuals display stronger levels of social risk-taking (i.e. willingness to challenge norms), since presenting ideas to others involves an amount of social risk due to potential negative peer evaluations (Tyagi *et al.*, 2017). Several studies have provided evidence of the relationship between risk-taking and creativity (Amabile and Gryskiewicz, 1987, Dewett, 2006, Perry and Karpova, 2017). In this case, willingness to take risks is considered a strong positive predictor of employees' (Dewett, 2006) and undergraduate students' creativity (Wan *et al.*, 2021).

Past studies have also established a link between a proactive personality and creativity. In this case, the generation of novel and potentially useful ideas is related not only to a person's risk-taking propensity, but also to his/her proactivity to present and implement those ideas (Li *et al.*, 2020). Proactive individuals show a behavioural tendency to change their environment, persevering until significant change occurs through engaging in the proactive behaviour of identifying and seizing opportunities; non-proactive individuals are passive and reactive, and prefer to adapt rather than change circumstances (Bateman and Crant, 1993). Several studies have proposed that proactive personality is an important dispositional antecedent of employees' creativity (Bateman and Crant, 1993, Li *et al.*, 2020, Naz *et al.*, 2020, Crant, 1996), since proactive individuals are active agents who continuously initiate changes to the *status quo*. In this case, the outcomes of employees' creativity were related, for example, to career satisfaction and perceived insider status (Kim *et al.*, 2009).

In the specific case of entrepreneurial behaviour, there is no clear understanding of how creativity and proactivity influence each other. For instance, Tan *et al.* (2021) found that both creativity and proactivity are antecedents of the perceived feasibility which will then have an impact on social entrepreneurial intention. On the other hand, Hu *et al.* (2018) observed that entrepreneurial alertness has a full mediation effect on the relationship between creativity, a proactive personality, and entrepreneurial intention. Neither of the studies assesses the relationship between creativity and proactivity. Moreover, according to Parker and Collins (2010) different proactive behaviours may be considered distinct constructs, such as proactive work behaviour, proactive strategic behaviour, and proactive person-environment behaviour. This can lead to the assumption that proactivity related to entrepreneurial behaviour may be a different construct from the proactivity related to the work environment. In this case, if creativity involves a future-oriented vision, since it consists of "coming up with new and better ways of doing things" (Zhou and George, 2001, p. 682), it must lead to proactive action to implement this vision of the future. As a consequence, greater creativity should promote proactive behaviour towards the intention to create a new venture.

Moreover, Danish *et al.* (2019) found that creativity plays a mediating role in the relationship between openness to change and self-efficacy on entrepreneurial culture. Similarly, Altahat and Alsafadi (2021) concluded that creativity mediates the relationship between the entrepreneurial mindset and corporate entrepreneurship. Thus, creativity may play a mediating role between entrepreneurs' risk-taking propensity and their proactive behaviour toward the creation of a new venture.

Based on these arguments, we draw the following hypotheses:

H_4: Risk-taking propensity has a positive and significant impact on students' creativity.

H_5: Creativity has a positive and significant impact on students' proactivity.

$H_{5'}$: Creativity mediates the path between risk-taking and proactivity.

Relationship between Proactivity, Self-efficacy and Entrepreneurial Intention

Proactive behaviour refers to the tendency to initiate and maintain actions that directly alter the surrounding context (Bateman and Crant, 1993). Therefore, proactive individuals can identify opportunities and act on them, as well as persist until they have caused a significant change. Different studies have stressed the relationship between a proactive personality and entrepreneurial development and intentions (Shapero and Sokol, 1982, Crant, 1996). According to Naz *et al.* (2020), a proactive personality is positively associated with three broader forms of self-efficacy that determine specific self-efficacy. In this case, the broader forms of self-efficacy (Entrepreneurial self-efficacy) and specific self-efficacy (Creative self-efficacy, learning self-efficacy, and leadership self-efficacy) play the role of serial mediators in the relationship between proactive personality and entrepreneurial intentions.

Together with locus of control (controllability), self-efficacy is part of a superordinate construct called perceived behavioural control (Ajzen, 2002). Self-efficacy is related to one's feeling of control and the perceived likelihood of success in executing the proactive behaviour (Bandura, 2006). In this case, individuals perceive that they have the expertise and capabilities to perform a specific task. Empirically, Farrukh *et al.* (2017) confirmed the positive impact of self-efficacy on entrepreneurial intentions of business students, while Şahin *et al.* (2019) show that entrepreneurial intention can be realised through multiple configurations of (entrepreneurial) self-efficacy. In the case of entrepreneurship, Hu and Ye (2017) found that entrepreneurial self-efficacy is a key cognitive predictor of three different manifestations of entrepreneurial intention, namely general, high growth and lifestyle entrepreneurial intention. According to Prabhu *et al.* (2012), proactive personality not only mediated the relationship between proactivity and all three forms of entrepreneurial intention, but also moderated the relationship between proactive personality and high growth entrepreneurial intention as well as proactive personality and lifestyle entrepreneurial intention. Moreover, other studies have been confirmed the mediation role of self-efficacy (Wang *et al.*, 2016) or by the perceived behaviour control

(that tacitly captures effects of self-efficacy) to gain a better understanding of entrepreneurial intention (Farrukh *et al.*, 2019).

Nevertheless, Carsrud *et al.* (2017) argue that the entrepreneurial activity is motivated by higher self-efficacy, but the effect can be different, in that it may not always affect performance positively. Taking into consideration these arguments, the following hypotheses are proposed:

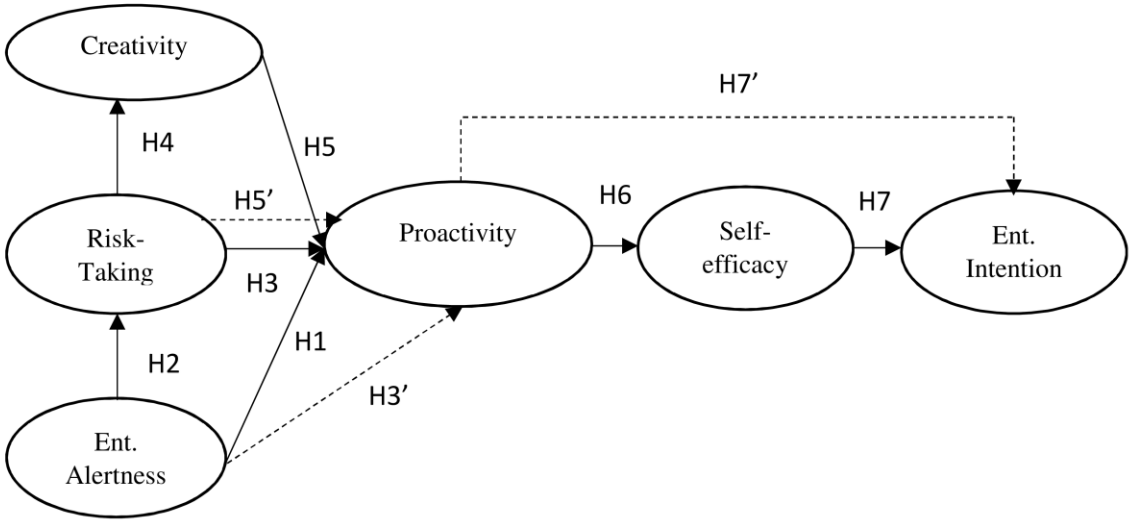
H_6: Proactivity has a positive and significant impact on students' self-efficacy.

H_7: Self-efficacy has a positive and significant impact on students' entrepreneurial intentions.

$H_{7'}$: Students' self-efficacy mediates the relationship between proactiveness and entrepreneurial intention.

To sum, according to the sequence of evidence-information presented in the full chapter, the research model presented in Figure 1 proposes that students' entrepreneurial alertness, risk-taking, and creativity have a direct impact on proactiveness. Moreover, proactiveness exerts a positive effect on self-efficacy which, in turn, is positively related to entrepreneurial intention. This model has two innovative features. On the one hand, it explores the role of specific/proximal traits, and how they impact students' entrepreneurial intention. On the other hand, it highlights the influence of the inter-relations among the different variables, expanding our current understanding of how personality traits influence entrepreneurial behaviour. Finally, due to the growing similarities between universities and polytechnic institutes in Portugal (Brás, 2021), our model is focused on higher education system as a whole.

Figure 1. Research Model



Notes: ⟶ direct effects; – – – ▸ indirect effects

Methods

Survey and data collection

Data were gathered through a self-administered questionnaire filled in by students of entrepreneurship or related modules (entrepreneurship and innovation, entrepreneurship and project management,

(Health Sciences and Exact Sciences) enrolled in master or bachelor degree programmes at the end of the second semester of the 2019/2020 academic year.

Adopting the nomenclature for territorial units (NUTSII), this study was conducted in the Centre of Portugal, one of the seven statistical regions. The region has eight Higher Education Institutes (HEIs) (University of Coimbra, University of Aveiro, University of Beira Interior, Polytechnic Institute of Tomar, Polytechnic Institute of Castelo Branco, Polytechnic Institute of Viseu, Polytechnic Institute of Leiria, Polytechnic Institute of Coimbra) only one of which did not agree to participate in this study (Polytechnic Institute of Coimbra); however, the Coimbra region is covered by the University of Coimbra. The number of entrepreneurship students in these HEIs is unknown but a total of 213 students participated in the survey. After analysing the responses, questionnaires with missing values or that repeatedly had identical responses (on at least 20 consecutive items) were eliminated, yielding a final sample of 190 participants: i) 77 of these were men (40.5%) and 113 women (59.5%), ii) 77 % of whom were studying for a bachelor's degree while 23% were attending master courses, and ii) 71% of whom were enrolled at a university while 29% were enrolled at a polytechnic institute. Additionally, it should be noted that the largest participation rate (92%) was among students aged up to 24 years.

Regarding sample size requirements for covariance-based structural equation modelling (CB-SEM), various rules-of-thumb have been advanced: 5-10 observations for each estimated parameter (Bentler and Chou, 1987), a minimum sample size of 100 or 200 observations (Boomsma, 1982, Boomsma, 1985), or at least a sample size of 100 observations (Awang *et al.*, 2015). It is hard to say if our sample is "large enough" with 190 observations, but we are relatively comfortable because Kline (1998) considers 100 to 200 observations a medium sample size for CB-SEM; in addition, through the Monte Carlo simulations and under nonnormality conditions, CB-SEM outperforms PLS-SEM for sample sizes of 150-200 observations (Jannoo *et al.*, 2014) and presents similar results for 100 observations (Awang *et al.*, 2015).

Measures

The questionnaire described a six-factor structure: 'entrepreneurial intention', 'risk taking', 'self-efficacy', 'proactivity', 'creativity', and 'entrepreneurial alertness'. The dimensions 'scanning and search', 'association and connection', and 'evaluation and judgment' are all attached to the second-order latent variable, 'entrepreneurial alertness'. Taking into account these eight scales previously tested in other studies, the questionnaire was composed of prepositional phrases rated on 5-point Likert scales (1 = "I strongly disagree"; 5 = "I strongly agree"). Table I shows all measurement scales used in this study.

[Please insert Table I here]

Procedures and data analysis

Primarily, briefly analysed descriptive statistics assess both univariate and multivariate normality of data. Moreover, we conducted a first-order confirmatory factor analysis (CFA) based on the abovementioned eight scales to assure their reliability and validity. Thereafter, and maintaining the assessment of reliability and validity, a second-order CFA was performed to test if entrepreneurial alertness reflects 'scanning and search', 'association and connection', 'evaluation and judgment' factors. Based on the studies of several researchers (Fornell and Larcker, 1981, Hair *et al.*, 2005, Henseler *et al.*, 2015, Kline, 2015), Table II provides some rules of thumb when appraising validity and reliability data.

[Please insert Table II here]

Next and following our main purpose, the research option relies on the covariance-based structural equation modelling (CB-SEM) instead of variance-based SEM - also known by partial least squares SEM (PLS-SEM) - due to the confirmatory nature of this study, which is usually a rule of thumb to justify CB-SEM (Hair *et al.*, 2017). However, according to Awang *et al.* (2015, p. 58) "the result of CB-SEM with bootstrapping is almost similar to that of PLS-SEM (bootstrapping as usual) through bootstrapping". We use the maximum likelihood estimation (ML) as it has been the commonly used method for SEM estimation (Yuan and Bentler, 2007, Allen *et al.*, 2020) and provides appropriate estimates (Ringle *et al.*, 2009), even considering violations of its underlying distributional assumptions (Reinartz *et al.*, 2009, Jannoo *et al.*, 2014).

Regarding the descriptive statistics (Appendix I), in short and consistent with the reference values defined by George and Mallery (2010) — | Sk | > 2 (marked asymmetry) or | Ku | values > 2 (marked kurtosis), we note that none of the variables seriously violated the univariate normal distribution, excluding the item 33 in the two statistical metrics. For the multivariate normal distribution, Appendix 1 shows a coefficient of 21.89, also known as Mardias' multivariate coefficient (Mardia, 1970). This critical ratio is indicative of nonnormally distributed data as it is above the threshold (5) proposed by Bentler (2005). As suggested by several authors (Purwaningsih *et al.*, 2021, Awang *et al.*, 2015, Yung and Bentler, 1996, Enders, 2001, Nevitt and Hancock, 2001), we performed a bootstrap resampling due to the (usual) violation of multivariate normality, considering the percentile bootstrap approach with 1000 replications as defended by Cheung and Lau (2008) for mediation studies. Moreover, Yung and Bentler (1996) considered bootstrap methods as a reliable alternative to normal theory methods for obtaining robust results.

Taking into account the factor loadings, only one item out of a total of 42 items is below the acceptable cut-off of 0.4 (Wülferth, 2013). In other words, item 33 "I browse the Internet every day" is potentially more distant from the latent variable 'scanning and search' resulting in a lower loading (0.132); excluding this item, the loadings indicate that all items are moderate/strongly related with latent variables. This item shows the lowest explained variance (0.018) within all latent factors and is eligible to be removed as it does not achieve the most liberal rules of thumb concerning the squared multiple correlations: minimum value of 0.15 (Clark and Watson, 1995). The lack of this individual item reliability forced us to drop this nonsignificant variable, as suggested by some authors (Chin, 1998; Hair, Black, Babin, & Anderson, 2013; Wülferth, 2013). In fact, this was the only item from the 'scanning and search' scale without a sentence containing the word "information", which we strongly recommend introducing. As we are dealing with an item from a multidimensional scale composed of three factors and another 12 items to measure Entrepreneurial Alertness (through a second-order CFA), the impact on the conceptual foundations of CB-SEM is expected to be smooth. Despite this procedure and totally respecting the theoretical framework of CB-SEM, no single outlier was removed and modification indexes were ignored based on the disadvantages of post hoc modifications reported by Hermida (2015).

Results

Reliability and validity assessment

Table III highlights some trends related to the reliability and validity of factors. Cronbach's alpha scores show that all factors revealed an adequate internal consistency. The sample adequacy is assured by KMO measure and the appropriateness of data is confirmed by Bartlett's test of sphericity.

[Please insert Table III here]

In addition, the average variance extracted (AVE) and the composite reliability (CR) measures confirm both convergent validity and construct reliability (Hair *et al.*, 2005). Therefore, it can be

concluded that items are highly correlated within one and the same underlying factor (convergent validity) and that the set of variables is consistent to measure each factor (construct reliability). Cumulatively, as all factor loadings are higher than 0.5, and the majority are higher than the ideal cut-off value of 0.7, we can conclude for factorial validity, which means that items are strongly related to latent variables or factors. Simultaneously, as squared multiple correlations of all items are above the 0.25 threshold, we can also conclude that the variance of appropriate items is explained by the latent variables or factors. Furthermore, instead of the widely used Fornell–Larcker criterion (1981), we present the Heterotrait-Monotrait Ratio of Correlations (HTMT) in assessing the discriminant validity due to its higher sensitivity, specificity (Hamid *et al.*, 2017) and superior performance (Henseler *et al.*, 2015) – Table IV.

[Please insert Table IV here]

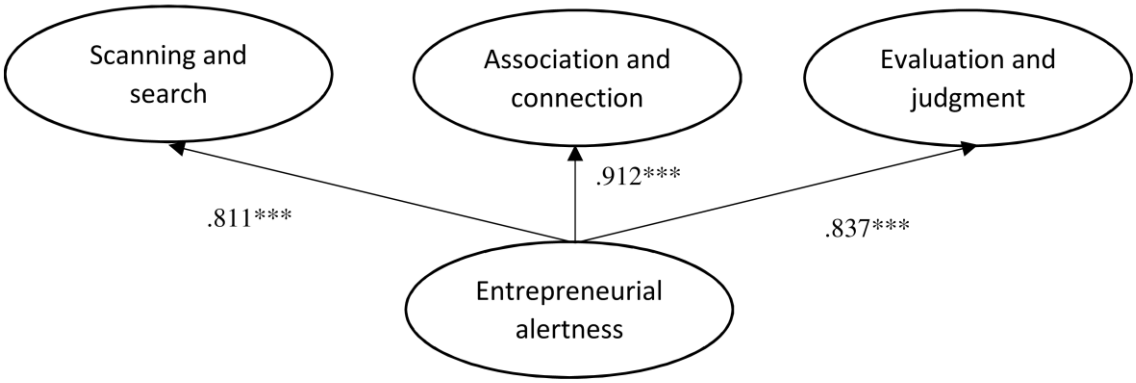
None of the ratio correlations presented in the HTMT matrix are above the 0.90 (liberal) or 0.85 (strict) thresholds suggested by Teo *et al.* (2008) or by Kline (2015), respectively. Therefore, the discriminant validity of factors is demonstrated in Table IV; i.e. dissimilar constructs are not correlated and could be easily differentiated.

Finally, the following indexes can be reported when assessing the fit of the measurement model: $\frac{\chi^2}{df} = 1.706$; RMSEA = .061; CFI = .905; PCFI = 0.818; SRMR = .0712. To sum up, the proposed measures result in satisfactory model fit.

Second-order CFA

The results of CFA confirmed the presence of a second-order factor structure of entrepreneurial alertness. Graphically, this can be confirmed through Figure 2.

Figure 2. CFA results of the entrepreneurial alertness construct



Notes: ***: p-value <0.01; **: p-value <0.05; *:p-value <0.10

Therefore ‘scanning and search’, ‘association and connection’, and ‘evaluation and judgment’ were confirmed as reflective factors of ‘entrepreneurial alertness’.

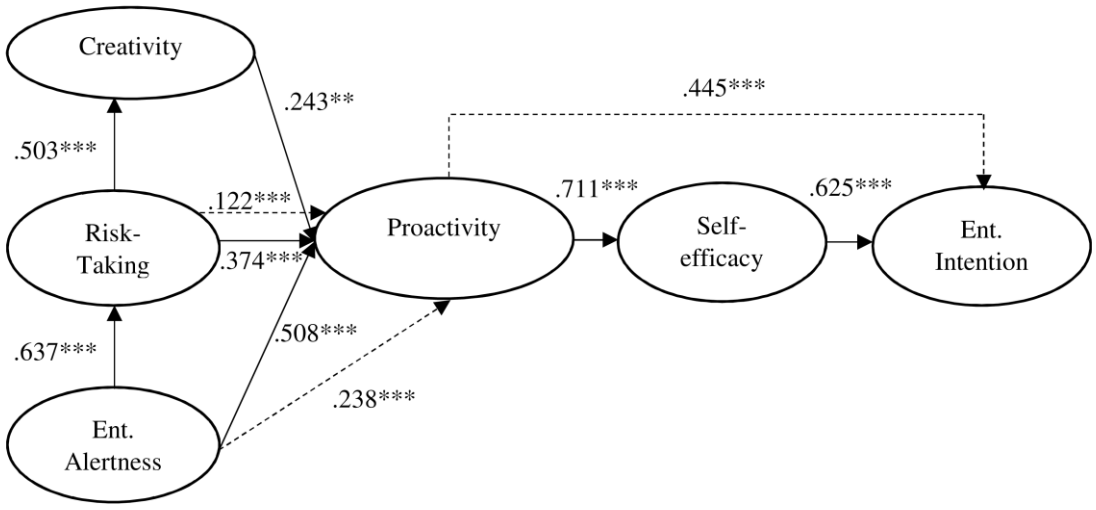
Testing of hypotheses

Table V summarises the main results for the structural model (base), achieved through the bootstrap resampling method supporting evidence for the research hypotheses.

[Please insert Table V here]

Graphically, Figure 3 depicts the structural model, the standardised coefficients and significance levels of the relationships established between the latent variables.

Figure 3. Estimation results (CB-SEM)



Notes: ***: p-value <0.01; **: p-value <0.05; *:p-value <0.10
⟶ direct effects; – – –► indirect effects

The abovementioned results (Table V and Figure 3) show the standardised direct effects in which it is possible to conclude there is evidence to support all the research hypotheses. Additionally, some indirect effects should be addressed. Therefore, there is evidence to support hypotheses 3', 5', and 7' concluding by multiple mediators that factors make a positive indirect contribution to the students' EI. Additionally, despite these significant indirect effects through mediation paths, SE shows the highest impact on EI. Finally, the structural model was evaluated on the basis of the adjustment indexes/parameters, which showed a satisfactory fit to the data ($\frac{\chi^2}{df} = 1.730$; RMSEA = .062; CFI = .901; PCFI = 0.819; SRMR = .0789).

Discussion

These results supported our *H1: Entrepreneurial alertness has a positive and significant impact on students 'proactivity, H2: Entrepreneurial alertness has a positive and significant impact on students' risk-taking propensity,* and *H3: Risk-taking propensity has a positive and significant impact on students' proactivity*. Several authors find that alertness is a fundamental characteristic of entrepreneurs in the entrepreneurial process (Obschonka and Stuetzer, 2017, Baron, 2006, Sharma, 2019, Tang *et al.*, 2012). This is due to the fact that individuals with this ability (alertness) are able to better identify opportunities in the environment, thus allowing them to innovate and take risks in a more or less calculated way (Cui *et al.*, 2016). Above all, it allows entrepreneurs to be proactive (Obschonka and Stuetzer, 2017).

Our results also support hypotheses *H4: Students 'risk-taking has a positive and significant impact on students' creativity* and *H5: Students 'creativity has a positive and significant impact on students' proactivity*. Li *et al.* (2020) found that the creation of new potentially useful ideas is related to two characteristics: risk-taking and proactivity. Proactive individuals opt for risk-taking essentially because they not only know the environment in which they are acting but they want to change it in some way through the creation of new ideas (Bateman and Crant, 1993). Individuals with these characteristics are also willing to share their creative ideas with their peers in order to obtain approval or inputs that improve them. This leads them to take risks (Tyagi *et al.*, 2017, Bonetto *et al.*, 2020).

Our results also allow us to support *H6: Students 'proactivity has a positive and significant impact on students' self-efficacy* and *H7: Students 'self-efficacy has a positive and significant impact on students' entrepreneurial intentions*. Thus, it appears that the greater the commitment at the beginning of a new business, the greater the entrepreneurial behaviour observed (Ajzen, 1991, Krueger *et al.*, 2000). For Rauch and Frese (2007b), generalised self-efficacy and tolerance to stress, as well as proactive personality, are characteristics of entrepreneurial behaviour (Kerr *et al.*, 2018). Hence, entrepreneurial self-efficacy is a key cognitive predictor of three different expressions of entrepreneurial intention, namely general, high growth and lifestyle entrepreneurial intention (Bandura, 2006, Hu and Ye, 2017). Despite these arguments, we should be aware of the desirable steps to follow from the idea basic principles until its market inception, in which technology readiness levels provide a reliable guidance.

Regarding the indirect effects, *H3'* is confirmed*: Risk-taking mediates the path between entrepreneurial alertness and proactivity*. Obschonka and Stuetzer (2017) concluded that the greater the alert level, the greater the innovation and proactivity, thus performing a moderating effect on risk propensity. Thus, the more alert the entrepreneur is, the more attentive he/she will be to the environment and this will lead him/her to be more proactive in circumventing threats from the environment and result in a more calculated choice when taking risks (Uy *et al.*, 2015, Obschonka and Stuetzer, 2017, Hu *et al.*, 2018).

Our results also supported *H5': Students' creativity mediates the relationship between risk-taking and proactivity,* as in Hu *et al.* (2018). Different types of proactive behaviours (proactive work behaviour, proactive strategic behaviour and proactive person-environment behaviour) can be considered different constructs. Thus, we can infer that proactivity related to entrepreneurial behaviour can be a different construct from proactivity related to the work environment (Parker and Collins, 2010). Thus, the generation of new and potentially useful ideas is related not only to a person's propensity to take risks but also to his proactivity to present and implement those ideas (Li *et al.*, 2020).

Finally, the results also support our *H7': Students' self-efficacy mediates the relationship between proactiveness and entrepreneurial intention*. This is consistent with some findings provided by Kumar and Shukla (2019), where the authors confirmed that self-efficacy mediates the proactive personality impacts on the entrepreneurial intention of management students. Hence, self-efficacy acts as a very important link between the proactive personality and the entrepreneurial intention (Prabhu *et al.*, 2012).

Implications

Theoretical Implications

Nowadays entrepreneurship has a crucial role in society in many domains. In European context, the problem of unemployment is effectively an issue that must be addressed and to realize how entrepreneurship education can, in a way, contribute to this scourge. It is therefore necessary that more academic research emerge in the future around this issue and thus contribute to providing insights useful for the proposal and development of innovative entrepreneurship programs for postgraduate

and/or graduates students that allow them to develop their transversal skills and provide them a new professional way.

Our research aimed to fill in the contextual and methodological gaps in the existing literature. Thus, it has implications for entrepreneurship education to become practical and recommends at least involving students in a single entrepreneurship start-up project (Krueger *et al.*, 2000). Furthermore, the research and practical implication of this study is to further strengthen the development of young people's attitude towards entrepreneurship based on the entrepreneurial experiences specified in this study. Additionally, this study will contribute to entrepreneurial intent, which can be influenced by personality attributes, including determination, consistency, and risk-taking, to support your educational needs and expenditures. These personality attributes must be considered by policymakers when designing strategies to increase entrepreneurial intent and student behaviours. It is recommended that focus be placed on developing these characteristics in students. According to some researchers, characteristics such as need for achievement and propensity to take risks can develop and change to some extent over a period of time. Entrepreneurship education can increase the locus of control and the need for achievement (Bellò *et al.*, 2018, Zampetakis *et al.*, 2011)

The results of this study can also be used as a reference to design a framework for young people to become educational entrepreneurs and policymakers to develop a contextual framework for entrepreneurs based on different youth personality traits and other related contexts in the region.

Managerial Implications

Entrepreneurship teachers can take advantage of the model presented in this study as a quantitative tool to identify the extent to which the model's variables stimulate the causes. Managers and educators can gain a better understanding of the essential factors that influence entrepreneurial intent. Our model can be a diagnostic tool for the formulation of an effective and efficient entrepreneurship curriculum and pedagogy, possibly based on technology to cultivate entrepreneurial activities among students. In addition, improving the image of entrepreneurship as a plausible career option can affect students' intentions vis-a-vis entrepreneurship (Krueger *et al.*, 2000).

Higher education institutions must promote entrepreneurship through more attractive business models in order to create a positive image of entrepreneurship and thus motivate students to pursue their careers as entrepreneurs. It is vital to facilitate interaction between experienced entrepreneurs and students in the higher education system to strengthen their entrepreneurial intent. Our results not only contribute to the development of behavioural theories of entrepreneurship, but also provide valuable inspiration for students so that they may choose entrepreneurship as a future career (Uy *et al.*, 2015).

Concerning management practices, teachers and institutions must realize that the attitude towards education for entrepreneurship and the entrepreneurial environment is a vehicle that can inspire the entrepreneurial intention of HEIs students. Entrepreneurship is an activity that requires the right mindset and an education for it. Through proper training, HEIs students can acquire the knowledge, skills and practical experience necessary for the entrepreneurial process, which can further improve their entrepreneurial intention (Chavoushi *et al.*, 2021). Students' innate entrepreneurial skills can be strengthened through entrepreneurship education can exercise, enhancing their entrepreneurial potential and inspiring their entrepreneurial confidence and passion. HEIs should therefore pay more attention to creating an enabling environment for entrepreneurship in order to enrich entrepreneurship education and improve its effectiveness. Although we know that academic context matters (state universities vs private universities) on students' entrepreneurial intention (Yurtkoru *et al.*, 2014), it is fundamental to change mentalities regarding risk-taking on the part of entrepreneurs. Reluctance to take risks is often linked to the stigma of entrepreneurial failures. However, it is also argued that it is with failures that entrepreneurs improve (Ferreira *et al.*, 2020). In this sense, it is essential to create policies that somehow create a "safety net" for entrepreneurs when such mishaps occur.

Conclusions, limitations, and future research

The creation of companies is essential to the development of countries, contributing to the dissemination of innovation, job creation, improving competitiveness, greater social cohesion, and well-being; moreover, entrepreneurial behaviour is a necessary condition for the creation of companies. Thus, it is essential to study the context variables, personal and social variables that influence the entrepreneurial intention, particularly among university students, given the importance of the university in knowledge creation and the need to transfer this knowledge to society in general. This study examines the explanatory variables of the entrepreneurial intention based on the psychological traits, motivations and individual and collective values of university students.

For this purpose, a sample of higher education students at Portuguese universities and polytechnics was selected. Our results show the influence of the different explanatory variables used to predict and explain the entrepreneurial intention among higher education students. Alertness, risk-taking, proactivity and creativity not only have an effect on the entrepreneurial intention, but also on each other.

Our research is not without limitations. First, place and circumstances (i.e. distinct effects of the training in each different HEI) were not controlled or taking into account in our analysis thus resulting in a quasi-experimental research project without a control sample to assess these different effects. We do not compare the changes resulting from differences between institutions. We study only the entrepreneurial intention in the short term. We do not know how many of these entrepreneurial intentions will be fulfilled in the future. Research on these long-term effects and on constructs such as perceived behavioural control and the attitude towards entrepreneurship may shed more light on the role of entrepreneurship courses and programmes in HEIs.

Many research opportunities have not yet been discovered in the field of entrepreneurship education, especially regarding new teaching methods. Not only is it important to evaluate the psychological characteristics of the entrepreneurial intention, but also to conduct research on the best way to transform these intentions into entrepreneurial actions. Finally, we add, as a future line of investigation, the application of this study in other contexts. Our investigation was applied to Portugal, a country that despite belonging to the European Union, does not have the same culture or customs as the other member states. A future investigation could be precisely to understand the behaviour of these variables in other EU countries. It is also important to study these variables in developing countries and compare them with the results obtained. These countries face challenges that are not posed to developed countries. In this sense, studies are needed to understand which policies can most foster entrepreneurial intention and activity.

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Table 1. Measurement scales.

Variables	**Source**
Entrepreneurial intention	(Liñán *et al.*, 2011)
Risk-taking	(European Commission, 2012)
Self-efficacy	(Liñán *et al.*, 2011)
Proactivity	(Trifiletti *et al.*, 2009)
Creativity	(Biraglia and Kadile, 2017)
Entrepreneurial alertness	(Tang *et al.*, 2012)

Table 2. Subcategories of construct validity and reliability.

Statistic	**Reference values**
Factorial Validity	SFL ≥ 0.5, ideally ≥ 0.7
Individual item reliability	SMC > 0.25
Convergent Validity	$AVE_j \geq 0.5$
Discriminant validity	Coefficients of the HTMT < 0.85
Composite Reliability	CR ≥ 0.7
Cronbach's Alpha	$\alpha \geq 0.6$

Notes: SFC – standardized factor loadings; AVE - average variance extracted; CR - Composite Reliability; HTMT - Heterotrait-Monotrait ratio of correlations; SMC - Squared Multiple Correlations

Table 3. Reliability and validity.

Factors and measurement variables	α[2]	KMO[3]	BT[4] sig.	AVE[5]	CR[6]	SFL[7]	SMC[8]
Entrepreneurial Intention (EI)							
It1 - I'm ready to make anything to be an entrepreneur						0.647	0.419
It2 - My professional goal is to become an entrepreneur						0.78	0.608
It3 - I will make every effort to start and run my own firm	.943	.889	.000	0.725	0.94	0.839	0.704
It4 - I'm determined to create a firm in the future						0.964	0.929
It5 - I have very seriously thought about starting a firm						0.905	0.819
It6 - I've got the firm intention to start a firm someday						0.935	0.874
Risk-Taking (RT)							
It7 - I am willing to take risks						0.854	0.728
It8 - I tend to take my chances, even when I run the risk of bearing a considerable loss	.787	.748	.000	0.501	0.796	0.741	0.549
It9 - I realise new things deliberately						0.520	0.270
It10 - When I discover opportunities. I bring them to fruition						0.675	0.456
Self-Efficacy (SE)							
It11 - Start a firm and keep it working would be easy for me						0.711	0.506
It12 - I'm prepared to start a viable firm						0.885	0.783
It13 - I can control the creation process of a new firm	.875	.848	.000	0.529	0.868	0.819	0.672
It14 - I know the necessary practical details to start a firm						0.574	0.329
It15 - I know how to develop an entrepreneurial project						0.603	0.363
It16 - If I tried to start a firm, I would have a high probability of succeeding						0.723	0.522
Proactivity (P)							
It17 - Wherever I have been, I have been a powerful force for constructive change	.866	.885	.000	0.501	0.875	0.635	0.404
It18 - No matter what the odds. if I believe in something I will make it happen						0.738	0.550
It19 - I love being a champion for my ideas, even against others' opposition						0.602	0.359

[2] Cronbach's Alpha
[3] Kaiser-Meyer-Olkin test
[4] Bartlett's test of sphericity (significance value)
[5] Average Variance Extracted
[6] Composite Reliability
[7] Standardized Factor loadings
[8] Squared Multiple Correlations

It20 - I excel at identifying opportunities						0.752	0.569
It21 - I am always looking for better ways to do things						0.672	0.454
It22 - If I believe in an idea, no obstacle will prevent me from making it happen						0.738	0.543
It23 - I can spot a good opportunity long before others can						0.798	0.631
Creativity (C)							
It24 - I often come up with creative solutions to problems						0.690	0.476
It25 - I am good at providing a fresh approach to problems						0.770	0.593
It26 - I often come up with new and practical ideas	.900	.868	.000	0.605	0.901	0.837	0.701
It27 - I often have new and innovative ideas						0.864	0.747
It28 - I am good at generating creative ideas						0.835	0.696
It29 - I often promote and champion ideas to others						0.648	0.419
Scanning and search (SS)							
It30 - I have frequent interactions with others to acquire new information						0.696	0.487
It31 - I always keep an eye out for new business ideas when looking for information	.834	.773	.000	0.520	0.842	0.627	0.394
It32 - I read news, magazines, or trade publications regularly to acquire new information						0.616	0.377
It34 - I am an avid information seeker						0.801	0.642
It35 - I am always actively looking for new information						0.837	0.699
Association and connection (AC)							
It36 - I see links between seemingly unrelated pieces of information	.872	.740	.000	0.692	0.871	0.848	0.726
It37 - I am good at “connecting dots”						0.797	0.637
It38 - I often see connections between previously unconnected domains of information						0.851	0.714
Evaluation and judgment (EJ)							
It 39 - I have a gut feeling for potential opportunities						0.800	0.640
It 40 - I can distinguish between profitable opportunities and not-so-profitable opportunities	.878	.834	.000	0.645	0.879	0.774	0.599
It 41 - I have a knack for telling high-value opportunities apart from low-value opportunities						0.807	0.652
It 42 - When facing multiple opportunities. I am able to select the good ones						0.830	0.689

Table 4. HTMT matrix.

Factors / Factors	**EI**	**RT**	**SE**	**P**	**C**	**SS**	**AC**	**EJ**
EI								
RT	0.624							
SE	0.585	0.596						
P	0.491	0.736	0.699					
C	0.450	0.437	0.550	0.718				
SS	0.447	0.493	0.551	0.670	0.694			
AC	0.259	0.440	0.462	0.741	0.668	0.699		
EJ	0.531	0.570	0.632	0.765	0.627	0.653	0.731	

Table 5. Estimation results (CB-SEM).

Paths			Estimate	Standard Errors	Significance	Hypotheses
EA	→	P	0.508	0.102	0.005***	H1) Supported
EA	→	RT	0.637	0.113	0.002***	H2) Supported
RT	→	P	0.374	0.095	0.003***	H3) Supported
EA →	RT→	P	0.238	0.095	0.001***	H3') Supported
RT	→	C	0.503	0.109	0.002***	H4) Supported
C	→	P	0.243	0.080	0.011**	H5) Supported
RT →	C →	P	0.122	0.045	0.006***	H5') Supported
P	→	SE	0.711	0.068	0.002***	H6) Supported
SE	→	EI	0.625	0.055	0.002***	H7) Supported
P →	SE→	EI	0.445	0.068	0.002***	H7') Supported

Notes: *** p-value <0.01; ** p-value <0.05

Appendix I. Descriptive statistics.

Items	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
It1	190	1	5	3.26	1.066	-.305	.176	-.383	.351
It2	190	1	5	2.98	1.101	.031	.176	-.677	.351
It3	190	1	5	2.98	1.177	.277	.176	-.783	.351
It4	190	1	5	3.11	1.217	.135	.176	-1.035	.351
It5	190	1	5	2.86	1.187	.383	.176	-.757	.351
It6	190	1	5	2.97	.975	-.040	.176	-.453	.351
It7	190	1	5	3.09	1.225	.107	.176	-1.023	.351
It8	190	1	5	3.53	.963	-.557	.176	.041	.351
It9	190	1	5	4.28	.737	-.987	.176	1.525	.351
It10	190	2	5	4.01	.738	-.487	.176	.184	.351
It11	190	1	5	2.84	.836	-.125	.176	.571	.351
It12	190	1	5	3.01	1.021	-.161	.176	-.426	.351
It13	190	1	5	3.27	.953	-.314	.176	-.142	.351
It14	190	1	5	3.52	.930	-.884	.176	.793	.351
It15	190	1	5	3.60	.809	-.905	.176	1.489	.351
It16	190	1	5	3.12	.804	-.100	.176	.699	.351
It17	190	1	5	3.73	.854	-.524	.176	.511	.351
It18	190	1	5	3.64	.775	-.244	.176	.110	.351
It19	190	1	5	3.90	.963	-.769	.176	.357	.351
It20	190	1	5	3.39	.834	-.187	.176	-.138	.351
It21	190	1	5	4.00	.763	-.723	.176	1.047	.351
It22	190	1	5	3.39	.883	-.211	.176	.019	.351
It23	190	1	5	3.06	.814	-.117	.176	.310	.351
It24	190	1	5	3.62	.900	-.528	.176	.278	.351
It25	190	1	5	3.51	.821	-.324	.176	.088	.351
It26	190	1	5	3.56	.887	-.492	.176	-.160	.351
It27	190	1	5	3.40	.896	-.254	.176	-.280	.351
It28	190	1	5	3.27	.829	-.211	.176	-.115	.351
It29	190	1	5	3.32	.995	-.539	.176	-.096	.351
It30	190	1	5	3.68	.923	-.798	.176	.783	.351
It31	190	1	5	3.05	.988	-.129	.176	-.397	.351
It32	190	1	5	3.21	1.057	-.365	.176	-.456	.351
It33	190	2	5	4.78	.508	-2.519	.176	6.879	.351
It34	190	1	5	3.75	.810	-.716	.176	1.122	.351
It35	190	1	5	3.63	.926	-.613	.176	.170	.351
It36	190	1	5	3.48	.821	-.338	.176	.035	.351

It37	190	1	5	3.71	.821	-.622	.176	.555	.351
It38	190	1	5	3.40	.795	-.082	.176	.152	.351
It39	190	1	5	3.44	.851	-.400	.176	.269	.351
It40	190	1	5	3.51	.828	-.288	.176	.048	.351
It41	190	1	5	3.40	.822	-.398	.176	.411	.351
It42	190	1	5	3.62	.773	-.602	.176	1.063	.351
Mardias' coeff.		21.89							