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Personality traits and their impact on decision-making risks in auction-based market purchases

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Abstract: Understanding human behaviour is pivotal in financial services marketing, particularly in decision-making processes. Given that individual characteristics can significantly influence participation dynamics in auctions, this research delves into how personality traits shape the risk profile of auction market purchasers. Utilising a mixed-methods approach, we gathered data from 58 qualitative and 282 quantitative respondents through an online questionnaire. This sample comprised Brazilian auction participants, both buyers and sellers. The analysis employed advanced statistical methodologies, highlighting descriptive statistics, hypothesis tests, and factor and regression analyses. We scrutinised five key personality constructs: extraversion, neuroticism, pleasantness, openness to experience, and conscientiousness. This study presents five principal insights, equipping auctioneers, sellers, and buyers with a deeper understanding of auction participant profiles. These findings pave the way for optimised business strategies and demystify auction dynamics.

Keywords: financial services marketing; behavioural finance; auction; personality traits; personal finance; marketing intelligence.

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Luciano Luiz Dalazen is a distinguished scholar with a Doctorate and Master's in Administration from Pontifícia Universidade Católica do Paraná (PUCPR), specialising in Strategic Administration. He has experience in food science and technology, including industrial processes. His prime areas of study encompass behavioural finance, strategy, and quantitative methods in administration, allowing him to delve deeply into intricate aspects of administrative strategies and behavioural economics. His multifaceted experience renders him an adept evaluator of journals and events, predominantly revolving around strategy and quantitative methods themes. He continually contributes to his field through his academic journey by evaluating and enhancing the literature and understanding of strategy and quantitative methods in administration.

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1 Introduction

In 2020, the global academic community celebrated as Paul R. Milgrom and Robert B. Wilson were honoured with the Nobel Prize in Economics for their seminal work on auction theory (Milgrom, 2004, 2019). This recognition emphasised the pressing need for deeper exploration within this domain. Milgrom's studies in 2004 and 2019 have highlighted the intricate interplay of factors such as individual traits, accessibility to information, and personal nuances that shape how individuals navigate auctions. Milgrom and Weber's (1982) groundbreaking research notably elucidated the close ties between auction prices and the information buyers acquire about their competitors.

This endeavour to understand the cognitive and emotional drivers behind decision-making has catalysed rich interdisciplinary dialogues encompassing economics, psychology, management, and marketing. It is within this intersection that the emergent field of behavioural finance has taken root, with scholars such as Ricciardi and Simon (2000), Ritter (2003), Chuluun and Graham (2016), Wong (2020) and Mensah and Amenuvor (2021) contributing to its growth.

As defined by Statman (2008), behavioural finance delves into the interactions and behaviours of investors and managers in the financial world, highlighting the practices that prove to be most effective. A recurring theme in these discussions revolves around human reactions to risk, a topic that has been explored in a variety of scenarios, ranging from the role of memories of previous financial and investment decisions, including even responses to natural disasters (Silver, 2019), to the realm of digital threats and opportunities (Rodríguez-de-Dios et al., 2018) and the nuances of online shopping (Bach et al., 2020; Kaur and Arora 2022; Pitta et al., 2023; Ladrón de Guevara Cortés et al., 2023).

Central to this narrative is the observation that human behaviour undergoes shifts in the face of uncertainty. Pivotal research by Keller (2015) and Momeni and Shibaei (2019) suggests that repeated exposures to uncertain situations often render individual's passive, disrupting their cognitive systems, spawning irrational beliefs, and amplifying their sense of unpredictability.

The intricacies of human behaviour and risk perception have long intrigued scholars. Weber and Millman (1997) illuminated how the mere adjustment in risk perception could pivot an individual's behaviour. Such shifts suggest that how individuals frame their decision-making can significantly guide their information processing, consequently influencing their choice to undertake or forgo specific actions (Alam et al., 2020).

In financial markets, uncertainties are omnipresent, making them a veritable crucible for understanding risk-driven behaviours. These markets are routinely and directly swayed by a multitude of external factors, including but not limited to electoral dynamics (Goodell et al., 2020), commodity price fluctuations (Demirer et al., 2020; Reichert et al., 2021), and macro-level disruptions like government interventions during pandemics, with COVID-19 being a prime example (Ashraf, 2020). Such events amplify the potential for significant financial repercussions, exacerbating the inherent volatility of financial markets.

The auction market, in particular, stands out as a compelling case study. The heterogeneous nature of traded goods in auctions underscores their unique risk profile. Depending on the auctioned item, variables such as price, the identities of buyers and sellers, and logistical concerns like timing and location of delivery can shift in significance (Milgrom, 2019; Pourrahmani et al., 2023). While the majority of auction theory research often adopts an organisational lens – emphasising areas like energy (Teixeira et al., 2021; Tsaousoglou et al., 2021) or telecommunications (Sridhar and Prasad, 2021) – there remains a lack of studies that hone in on the individual-level behavioural nuances. This article addresses this theoretical lacuna by delving into the behaviours of individuals actively participating in auctions.

Given the pressing need to understand and predict human responses in risk-laden scenarios and discern the factors inclining them toward high-risk investments, this study is steered by a pivotal research question: how do personality traits influence the risk profile of the decision maker in the purchase of a good traded in an auction-type market in the Brazilian context?

The significance of this study emanates from the under-explored nature of its topic. By probing into new theoretical vistas and reinforcing extant literature, we aspire to demystify the intricate behavioural asymmetries of humans for subsequent integration into prevailing economic models. Within this sphere, the Nash equilibrium delineated by Yu et al. (2023) and Milgrom and Mollner (2018) offers a fascinating lens through which bidding behaviours can be dissected, echoing findings from their empirical inquiries. Thus, central to our endeavour is the exploration of how personality traits shape the risk-taking inclinations of decision-makers procuring goods in Brazil's auction-centric markets.

While auction mechanisms have steadily gained traction, a conspicuous gap persists regarding the intrinsic characteristics of its participants. Drawing parallels with analogous studies in disparate settings can fortify and challenge established theoretical postulations. In line with Milgrom's assertions, an enhanced comprehension of buyer behaviours ostensibly refines the pricing mechanics (Milgrom and Mollner, 2018; Milgrom, 2019).

The research is structured into five sections that may be summarised as follows. Section 2 presents the theoretical framework, while Section 3 is concerned with the methodological procedures. Section 4 contains a presentation and analysis of the data, and Section 5 brings the article to a close with the conclusions and limitations of the study.

2 Background

2.1 Behavioural finance

Behavioural finance delves into the non-financial behavioural intricacies that steer asset pricing, market reactions, and other market aberrations (Nigam et al., 2018; Gärling et al., 2019; Misra et al., 2019; Bennett et al., 2023). To elucidate the nuances of behavioural finance, scholar like Ritter (2003) has categorised it into two foundational pillars: cognitive psychology – capturing the essence of individual thought processes (Seligman, 2010; Beck, 2013; Marques, 2015) – and the boundaries of arbitrage, an arena focusing on the efficacy (or lack thereof) of the arbitrating forces at play (Barberis and Thaler, 2003; Abreu and Brunnermeier, 2003).

Statman (2014) aptly likened behavioural finance's perspective to recognising the 'normal investors', prone to cognitive missteps and swayed by emotions, as distinct from the dispassionate, logical 'rational investors' prevalent in traditional finance narratives. Arbitrage, in its essence, pertains to the strategic manoeuvring of buying or selling commodities to exploit price discrepancies across markets (Hirshleifer, 2015).

Sara et al. (2023) pointed out that the behaviour of individuals regarding decisions is a function of their attitude, which in turn is a function of belief, with these aspects affecting the financial behaviour of individuals. Statman (2014) aptly compared the behavioural finance perspective to the recognition of 'normal investors' who are prone to cognitive errors and influenced by emotions, as opposed to the dispassionate and logical 'rational investors' prevalent in traditional financial narratives. Arbitrage, in essence, refers to the strategic manoeuvre of buying or selling commodities to exploit price discrepancies between markets. However, a lack of information or ignorance can lead to unintentionally wrong decisions (Hirshleifer, 2015; Sara et al., 2023).

Highlighting contemporary strides in the field, Rahman and Gan's (2020) investigation into the investment behaviours of Malaysian millennials stands out. Their findings underscore the inverse relationship between anxiety and overconfidence traits with sound investment choices. Similarly, Sengupta et al. (2021) sought to unearth the motivational drivers influencing asset portfolio diversification decisions. Drawing on empirical data from 586 participants, their findings spotlighted that investor with a penchant for promotional alignment across varied contexts showed a marked preference for diversified portfolios.

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for diversified portfolios. Other empirical research conducted in Japan on financial literacy and behavioural finance has shown that behavioural traits affect decision-making (Long et al., 2023).

Specifically, within the sphere of auctions, behavioural nuances take an even more intriguing turn. Dass et al. (2014) illustrated this by investigating behavioural disparities based on auction formats. For example, while in-person auctions promote direct interactions with bidders, the anonymity of online auctions introduces an element of unpredictability, making participants' behaviours more enigmatic. Therefore, the buyer's experience in online interactions influences purchase and repurchase intentions, that is, further participation in an auction (Lei et al., 2021; Anshu et al., 2022; Singh et al., 2022).

2.2 Auction market

Auction markets have progressively garnered attention in academic and managerial realms due to their distinct dynamics and pivotal role in numerous economic transactions. Rooted in game theory, auction theory provides the foundational architecture for understanding these markets (Vickrey, 1961; Klemperer, 1999; Fernandez-Perez et al., 2023).

Typically, auctions offer a decentralised mechanism to equitably allocate diverse goods, resources, and services among stakeholders. A seller's aspiration to optimise profits is at the heart of this process, juxtaposed with the bidders' intent to secure the item at the most favourable price (Sandholm, 2002; Mu'alem and Nisan, 2008). Auction theory, over time, has transcended its traditional confines, evolving as an essential tool for price determination in an array of resources and products, invariably shaped by the interplay of supply and demand within specific timeframes (Izakian et al., 2010; Samimi et al., 2016; Kang et al., 2021).

Within the auction landscape, the valuation of auctioned goods is anchored in supply-demand dynamics and the governance rules set by the auction platforms (Kang et al., 2021). These platforms necessitate meticulous design and planning to cater effectively to participants' requirements (Milgrom, 2019). As Kumar et al. (2017) noted, the inherent simplicity of auctions renders them ideal for implementing dynamic pricing.

Within the auction scenario, the evaluation of auctioned goods is anchored in the supply-demand dynamics and the governance rules established by auction platforms (Kang et al., 2021). These platforms require meticulous design and planning to meet participants' needs effectively (Milgrom, 2019). Kumar et al. (2017) noted that the inherent simplicity of auctions makes them ideal for implementing dynamic pricing. First and second price auctions are used for high-value goods, thus reducing the disparity between the values offered, due to price optimisation factors and improving the result obtained by auctions in the drive for revenue maximisation (Bobkova, 2020; Boulatov and Severinov, 2021; Shui, 2023).

The influence of the auction market can be felt across multiple sectors. These auctions range from specialised types designed for fractional ownership of autonomous vehicles (Bogyrbayeva et al., 2021) to sustainable logistics products intertwined with cloud service sharing (Kang et al., 2021), energy resource sharing (Teixeira et al., 2021) and even in online auctions, with nuanced emotional purchasing behaviours, in addition to more traditional sectors such as real estate and vehicles (Lee et al., 2013; Shui, 2023).

Auctions are a mosaic of different models, the predominant ones being English closed auctions (ascending price), Dutch auctions (descending price), sealed first price and closed second price auctions. The English auction remains the most ubiquitous, in which sellers can set a minimum bid and potential buyers raise their offers. In accordance with Krishna (2002), bidding continues until a solitary highest bid remains. By contrast, the Dutch model takes a decremental approach, starting at an aspirational high and decreasing until a buyer is found. This model has notably permeated sectors such as civil construction (Karl, 2016). Shui (2023) added that auctioneers prefer closed-price auctions, when they are averse to risk, guaranteeing minimum revenue. However, there is an apparent gap in the literature investigating the behavioural nuances of auction participants (Ku et al., 2005; Simonsohn and Ariely, 2008; Dass et al., 2014).

Given the study's nexus with behavioural finance and its emphasis on personality traits, the research employed questionnaires for individuals engaged in English auctions. This ubiquitous auction modality facilitated a comprehensive evaluation of the outlined research variables, providing deeper insights into participants' behavioural inclinations (Lee et al., 2013).

3 Methods

3.1 Data collection

To answer the research question, we collected data through interviews in the qualitative phase, and applied a structured online questionnaire in the quantitative phase. In this context, information complementary to the literature was extracted from the interviews as a way of narrowing the questions for the formulation of the questionnaire, which made it possible to achieve the proposed objectives.

We used the interview to allow the researcher to introduce new questions, as he deemed relevant, in addition to the pre-established questions in his initial script, in order to generate theoretical and practical knowledge relevant to the construction of the research instrument, as recommended by Sampieri et al. (2006). Thus, the interviews aimed to analyse the auction from the point of view of sellers and buyers. In the stage of constructing the questionnaire from the theoretical framework, combined with the interviews, we carried out a pre-test, with approximately 58 respondents who did not belong to the target sample. These respondents were chosen for convenience. The analysis of the responses enabled us to make changes both to the content and the formal aspect, aiming to refine the instrument for subsequent application.

After applying the pre-test based on the online structured questionnaire, this research instrument was applied to 282 respondents who participated in auctions from June to August 2021. To assess personality traits, those proposed by Schaefer et al. (2004), Zaidi and Tauni (2012) and Noman et al. (2020) were used in the instrument, which was composed of 44 questions, divided into five constructs, which are known in the literature as:

- a extraversion
- b neuroticism
- c pleasantness

- d openness to experience
- e conscientiousness.

To assess the risk profile of the respondents, the scale proposed by Grable (1997, 2000) was used, containing 11 questions, divided into risk perception and tolerance.

3.2 Data analysis method

After collection, the data were statistically treated according to the type of variable analysed and their respective statistics, namely:

- 1 descriptive statistics
- 2 parametric and non-parametric hypothesis tests
- 3 exploratory factor analysis
- 4 confirmatory factor analysis, used in the validation of the scales
- 5 regression analysis.

The collected data were processed and analysed using a Microsoft Excel spreadsheet, Statistical Package for the Social Sciences (SPSS), Analysis of Moment Structures (AMOS) and STATA.

4 Data presentation and analysis

4.1 Characteristics of the researched sample

The data collection process resulted in a total of 282 valid questionnaires. Of these, 72 were excluded from the analysis of the results due to either having missing values (14), or because they were collected in the pre-test phase of the research (58).

With regard to the respondents, the majority, 75.18% (212), were male and 24.18% (70) were female, indicating that this kind of market in Brazil is strongly male. As for the age of the respondents, most of them (63.9%) were between 26 and 55 years old, evidencing a sample formed by adults of working age. According to the Brazilian Institute of Geography and Statistics (IBGE) (2021), the total Brazilian population in this age group corresponds to 49% of the total. Therefore, a striking characteristic of the participants in auctions is that they belong to this age group, considered to be adults of working age. When it came to marital status, married people were the largest group, with 47.52%, while singles represented 45.74%. Finally, divorced participants made up a total of 6.74% of the respondents. These numbers are very close to the figures published by the IBGE (2021), with 45.8% married and 42.8% single. In other words, the survey results point to a profile similar to the distribution of Brazilian society today. We also verified that, although the majority are married, the number is very close to the percentage of single people, demonstrating that marital status is not a determining characteristic for participation in an auction.

Concerning education, most of the respondents had earned at least a university degree, representing 64.89% of the total. This finding differs from the average number of university graduates in the Brazilian population, which is around 18%, according to the

IBGE (2021). Thus, we can see that the analysed sample had a high level of education. In addition, we found that this high level of education is a driver of the profile of individuals who participate in auctions. It is noteworthy that the perception of risk and the level of education vary in an inversely proportional way. Therefore, a higher level of education attenuates the perception of risk (Gava and Vieira, 2006; Grable and Lytton, 2001).

As for the respondents' professions, they were distributed as follows: self-employed or self-employed professionals, at 18.4% (52); civil servants, at 20.2% (57); and employees of private companies, at 25.9% (73), the latter being the largest group. The survey data converge with the distribution of the workforce in Brazil according to the IBGE (2021), except in the case of civil servants, who account for 12.5% of the workforce, but constitute 20.2% of the research sample. The remaining respondents were divided into: businessmen, at 12.8% (36); retirees or pensioners, at 1.4% (4); interns, at 5% (14); other types of undetermined occupations, at 7.8% (22); and not working, at 8.5% (24). It should also be noted that the majority of the respondents had a formal employment relationship, either in the public or private sector. Over half of the respondents (53.80%) had an income of over R\$5,000.00 per month, which indicates a medium to high income by Brazilian standards.

Most participants (70.2%) had their own home, representing another characteristic inherent to the profile of auction participants. Regarding the number of people who are financially dependent on the respondent, it was found that 55.67% (157) had no financial dependents, 19.50% (55) had one dependent, around 9.57% (27) had two dependents and 15.25% (43) had 3 or more dependents.

With this homogeneous distribution, the results can be generalised regardless of the form of participation and type of asset acquired. This analysis makes it possible to build a profile separating the research participants by modality and type of good at auction. Each respondent was asked in the questionnaire how many times they had participated in a bottom = up auction. The results showed that 58% had already participated in at least 02 auctions, thus reinforcing that individuals tend to participate in auctions more than once.

4.2 *Analysis and discussion of hypotheses*

In order to statistically test the hypotheses supported by theory, the first hypothesis (H1) can be formally stated as follows: personality traits significantly influence the risk profile of individuals in the act of purchasing a good. This hypothesis has been evaluated in several studies in the area of finance and/or marketing in different contexts, by the following authors: Barkhi and Wallace (2007), Hani et al. (2012), Lin (2010), Shahjehan and Qureshi (2019) and Lixândroiu et al. (2021).

It is noteworthy that, from the first research hypothesis (H1) mentioned above, the other secondary hypotheses are derived, listed as follows:

- H1a: The extraversion personality trait significantly influences the risk profile of individuals in the act of purchasing a good.
- H1b: The pleasantness personality trait significantly influences the risk profile of individuals in the act of purchasing a good.
- H1c: The neuroticism personality trait significantly influences the risk profile of individuals in the act of purchasing a good.

- H1d: The openness to experience personality trait exerts significant influence on the risk profile of individuals in the act of purchasing a good.
- H1e: The conscientiousness personality trait significantly influences the risk profile of individuals in the act of purchasing a good.

For the analysis of the above hypotheses, the respondents were divided into two groups:

- high score
- low score.

We adopted this classification based on the score obtained for each personality trait.

Individuals who obtained a mean value greater than or equal to 5.10 were classified as having a high score, while those who obtained a mean value lower than 5.10 were classified as having a low score. The secondary hypotheses will be statistically tested subsequently. In the case of the first secondary hypothesis, it can be stated that:

- H1a: The extraversion personality trait significantly influences the risk profile of individuals in the act of purchasing a good.

Regarding the extraversion personality trait, out of a total of 282 respondents, 214 were classified as having a high score, while 68 were classified as having a low score. Student's t-test was performed for independent samples, aiming to verify whether there were statistically significant differences between the groups in relation to the risk profile, which is represented by the perception and risk tolerance variables. The results are shown in Table 1.

Table 1 Results of Student's t-test for perception in terms of risk tolerance in relation to extroversion

<i>Extroversion</i>		<i>N</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>t</i>	<i>Sig.</i>	<i>Decision</i>
Risk perception	High	214	4.1065	0.7409	3.109	0.341	Confirm H0
	Low	68	4.0147	0.5059			
Risk tolerance	High	214	3.1076	0.7590	0.525	0.911	Confirm H0
	Low	68	3.0959	0.7285			

Source: Authors own creation

The results in Figure 1 show the mean values obtained for perception in terms of risk tolerance in relation to the respondents' extroversion variable.

Based on Figure 1, we have the mean values of the perception of the respondents who were classified as having high and low scores, as well as the result of Student's t-test, presented in Table 1. It can be seen that there is evidence that the two groups behave similarly in terms of perception in terms of risk tolerance, considering a significance level of 5%. Therefore, the extraversion personality trait is not a determinant of behaviour regarding the perception of risk tolerance.:

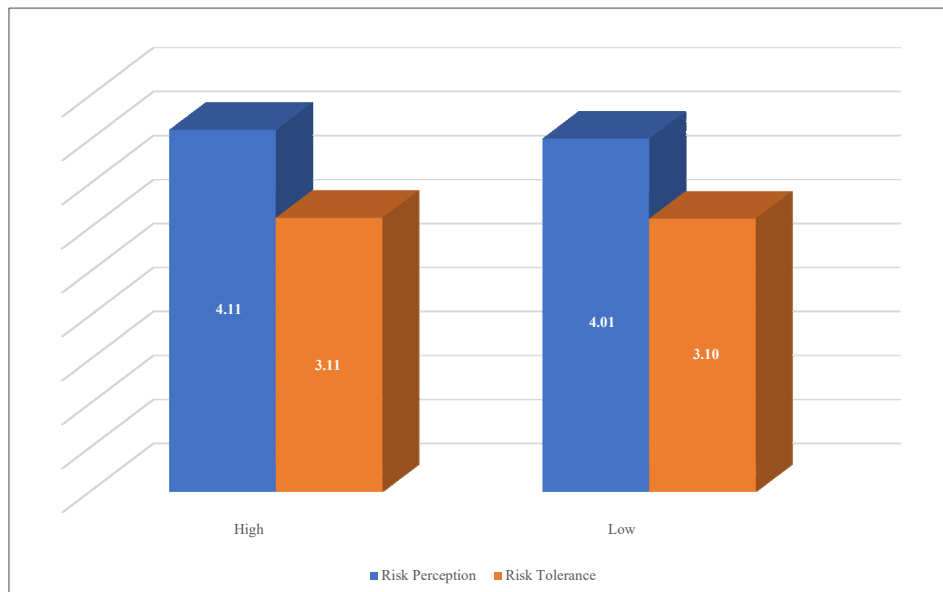
In the case of the second secondary hypothesis, it can be stated that:

- H1b: The pleasantness personality trait significantly influences the risk profile of individuals in the act of purchasing a good.

Regarding the pleasantness personality trait, it can be seen that, of the 282 respondents, 198 were classified as having a high score, while 84 were classified as having a low

score. Student's t-test was performed out for independent samples in order to gauge whether there were statistically significant differences between the groups in relation to the risk profile, which were represented by the variables of perception and risk tolerance. The results evidenced in the statistical tests are shown in Table 2.

Figure 1 Mean values of perception in terms of risk tolerance in relation to extroversion (see online version for colours)



Source: Authors own creation

Table 2 Results of Student's t-test for perception in terms of risk tolerance in relation to pleasantness

<i>Pleasantness</i>		<i>n</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>t</i>	<i>Sig.</i>	<i>Decision</i>
Risk perception	High	198	4.0929	0.6298	2.124	0.751	Confirm H0
	Low	84	4.0643	0.8238			
Risk tolerance	High	198	3.1718	0.6776	13.380	0.039	Reject H0
	Low	84	2.9468	0.8838			

Source: Authors own creation

In Figure 2, the results of the means for risk perception and tolerance in relation to the respondents' pleasantness variable are shown.

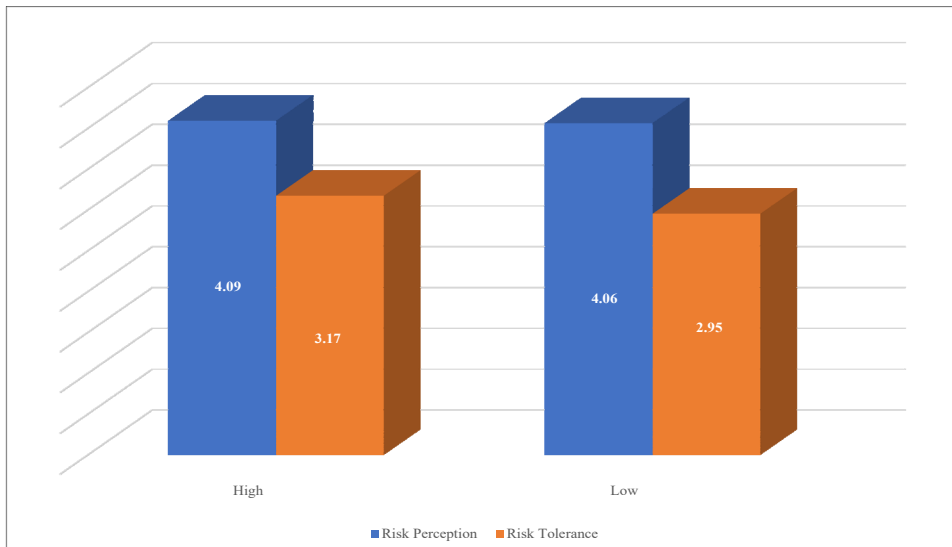
Figure 2 shows the results of the means of the responses in high and low scores in terms of risk perception and risk tolerance, as well as Student's t-test. The results lead to the conclusion that there are no statistically significant differences between the two groups, using a significance level of 5% for risk perception ($p\text{-value} = 0.751$). Regarding the risk tolerance analysis, we observed evidence of the existence of statistically significant differences between the mean values ($p\text{-value} = 0.039$), refuting the null hypothesis. Thus, the pleasantness personality trait is a determinant of the behaviour of

individuals in relation to risk tolerance. In the case of the third secondary hypothesis, it can be stated that:

- H1c: The neuroticism personality trait significantly influences the risk profile of individuals in the act of purchasing a good.

Regarding the neuroticism personality trait, of the 282 respondents, 52 obtained a high score, while 230 were classified as having a low score. Student's t-test was performed for independent samples, aiming to verify whether such differences between the groups are statistically significant in relation to the risk profile, which is represented by the variables of risk perception and risk tolerance. The results are shown in Table 3.

Figure 2 Mean values of the respondents' perception of risk tolerance in relation to pleasantness (see online version for colours)



Source: Authors own creation

Table 3 Results of Student's t-test for risk perception and tolerance in relation to neuroticism

Neuroticism		n	Mean	Standard deviation	t	Sig.	Decision
Risk perception	High	52	4.1692	0.6354	0.384	0.328	Confirm H0
	Low	230	4.0652	0.7039			
Risk tolerance	High	52	3.1596	0.7742	0.555	0.560	Confirm H0
	Low	230	3.0923	0.7462			

Source: Authors own creation

Figure 3 shows the results of the estimation of means for the risk perception and tolerance in relation to the respondents' neuroticism variable.

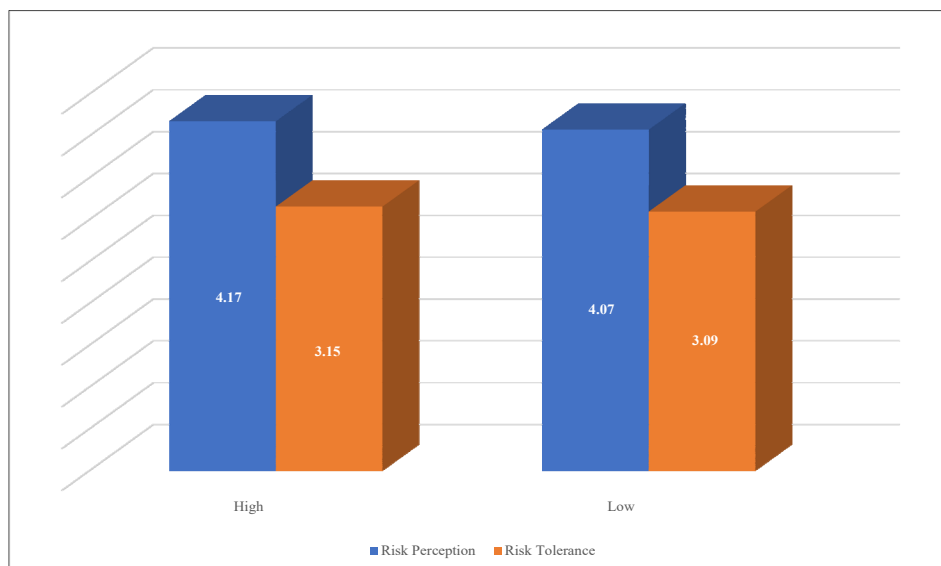
As shown in Figure 3, the means of the responses classified as high and low scores were estimated. The results of Student's t-test from Table 3 are also shown, and no evidence was found of statistically significant differences between the means of the groups, using a significance level of 5%. In other words, the mean values of the two

groups have statistically acceptable differences in relation to risk perception and tolerance. Thus, the neuroticism personality trait is not a determinant of behaviour in relation to risk perception and tolerance. In the case of the fourth secondary hypothesis, it can be stated that:

- H1d: The openness to experience personality trait exerts a significant influence on the risk profile of individuals in the act of purchasing a good.

Regarding the openness to experience personality trait, it was noted that, of the 282 respondents, 211 obtained a high score, while 71 were classified as having a low score. Student's *t*-test was performed for independent samples, aiming to assess whether the differences were statistically significant between the groups in relation to the risk profile, which is represented by the variables of risk perception and risk tolerance. The results of this evaluation are shown in Table 4.

Figure 3 Mean values of risk perception and tolerance in relation to neuroticism (see online version for colours)



Source: Authors own creation

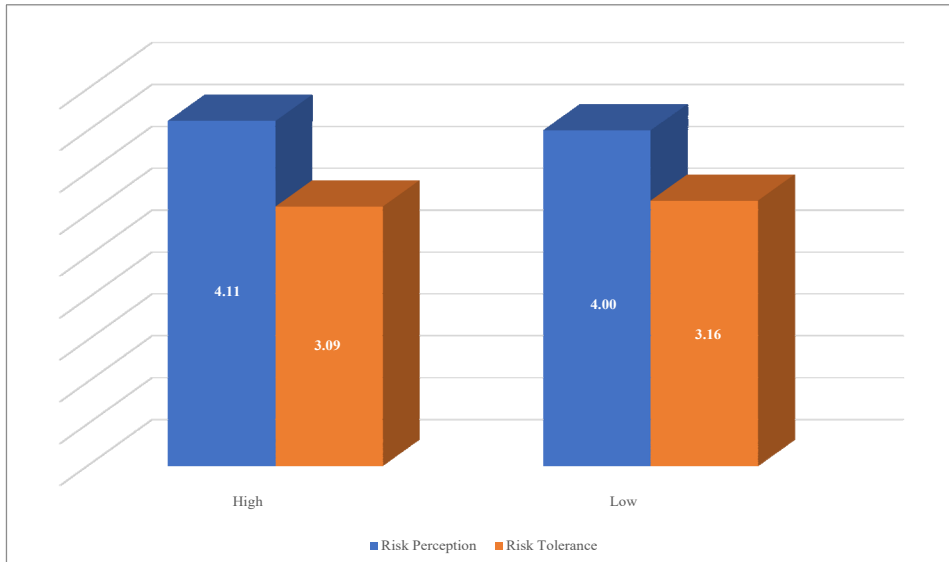
Table 4 Student's *t*-test results for risk perception and tolerance in relation to openness to experience

<i>Openness to experience</i>	<i>n</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>t</i>	<i>Sig.</i>	<i>Decision</i>
Risk perception	High	211	4.1118	2.932	0.251	Confirm H0
	Low	71	4.0028			
Risk tolerance	High	211	3.0863	0.005	0.477	Confirm H0
	Low	71	3.1597			

Source: Authors own creation

Figure 4 presents the mean values for risk perception and tolerance in relation to the respondents' openness to the experience variable.

Figure 4 Mean values of risk perception and tolerance in relation to openness to experience (see online version for colours)



Source: Authors own creation

As shown in Figure 4, the estimated mean values of the scores were classified as high and low. Furthermore, the estimate of Student's t-test, also shown in Table 4, shows that there are no statistically significant differences between the means, using a significance level of 5%. In other words, the means of the two groups have very similar values in terms of risk perception and tolerance. Thus, the personality trait of openness to experience is not a determinant of behaviour in relation to risk perception and tolerance. In the case of the fifth secondary hypothesis, it can be stated that:

- H1e: The conscientiousness personality trait significantly influences the risk profile of individuals in the act of purchasing a good.

Regarding the conscientiousness personality trait, it was noted that, of the 282 respondents, 203 had high scores, while 79 had low scores. Student's t-test was performed for independent samples to gauge whether there are statistically significant differences between the mean values of the groups in relation to the risk profile, which is represented by the variables of risk perception and tolerance. The results of the hypothesis test are shown in Table 5.

Figure 5 shows the results of the estimation of the means for risk perception and tolerance in relation to the respondents' conscientiousness variable.

Figure 5 presents the estimate of the mean values of the responses of the scores classified as high and low in terms of the respondents' risk perception and tolerance for the conscientiousness variable.

Analogous to the previous figure, Table 5 shows that there are no statistically significant differences between the means of high and low score responses, using a significance level of 5%. In other words, there is evidence that the means of the two groups are very close in terms of risk perception and tolerance. In this respect, the

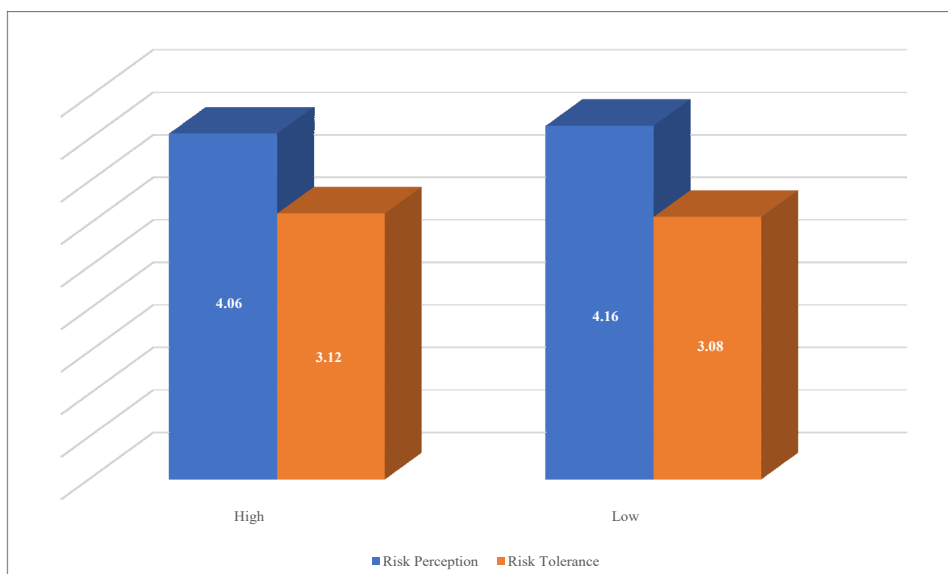
conscientiousness personality trait is not a determinant of behaviour in relation to risk perception and tolerance.

Table 5 Student's t-test results for risk perception and tolerance in relation to conscientiousness

<i>Conscientiousness</i>		<i>n</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>t</i>	<i>Sig.</i>	<i>Decision</i>
Risk perception	High	203	4.0571	0.754	3.221	0.290	Confirm H0
	Low	79	4.1544	0.496			
Risk tolerance	High	203	3.1158	0.756	0.021	0.692	Confirm H0
	Low	79	3.0763	0.739			

Source: Authors own creation

Figure 5 Mean values of risk perception and tolerance in relation to conscientiousness (see online version for colours)



Source: Authors own creation

4.2 Results of the regression estimates

The aim of this subsection is to seek efficient estimators for the model so that disturbances in the sample distribution produce small changes in the estimates. In this context, the robust regression used at this stage is intended to adjust models in the presence of outliers, taking into account extreme points that refer to those designated in the matrix model with considerable influence on the result because, as the number of variables increases, the identification of outliers becomes more complex using classical regression techniques.

According to Ryan (2009), robust estimators represent a modelling alternative for linear regression in situations where assumptions regarding error distributions are potentially invalid. When categorising robust regression, the regression curve estimator is

considered robust because no single observation (or small group of observations) will have a significant influence on the estimated model (Kvam and Vidakovic, 2007). In order to assess the impact of personality traits on tolerance, as well as sociodemographic characteristics on risk tolerance (*RiskTol*) and risk perception (*PercRisk*), two robust regressions were estimated taking into account the following econometric specifications presented in equations (1) and (2).

$$\begin{aligned} RiskTol = & \alpha_0 + \alpha_1 Gender + \alpha_2 Income + \alpha_3 School + \alpha_4 Age + \alpha_5 Consc \\ & + \alpha_6 OpenExp + \alpha_7 Neuro + \alpha_8 Pleas + \alpha_9 Extrov + \varepsilon_i \end{aligned} \quad (1)$$

$$\begin{aligned} PercRisk = & \alpha_0 + \alpha_1 Gender + \alpha_2 Income + \alpha_3 School + \alpha_4 Age + \alpha_5 Consc \\ & + \alpha_6 OpenExp + \alpha_7 Neuro + \alpha_8 Pleas + \alpha_9 Extrov + \varepsilon_i \end{aligned} \quad (2)$$

where the values denoted by $\alpha_0, \alpha_1, \alpha_2, \alpha_{12}$ and ε_i refer to the parameters to be estimated by the robust regression. In the case of equation (1), the intention is to evaluate the effect of independent variables on risk tolerance (*RiskTol*) and, in equation (2), the effect of the same variables on risk perception (*PercRisk*), while concerned with the residuals from the regressions. The econometric package that was used was STATA version 14, and the results for risk tolerance can be seen in Table 6.

Table 6 Robust regression estimates for risk tolerance

<i>RiskTol</i>	<i>Coef.</i>	<i>Std. err.</i>	<i>Student's t-test</i>	<i>P > t</i>	<i>[95% conf. interval]</i>	
Pleasantness	0.2046	0.03995	5.12	0.000	0.1259	0.2832
Neuroticism	-0.0235	0.0279	-0.84	0.402	-0.0786	0.0316
Extroversion	-0.0278	0.0298	-0.94	0.351	-0.0864	0.0308
Openness to experience	-0.0023	0.0291	-0.08	0.938	-0.0597	0.0551
Conscientiousness	0.0183	0.0284	0.64	0.521	-0.0377	0.0742

Note: F (13; 251) = 4.09. Prob > F = 0.0000.

Source: Authors own creation

Based on the estimated results in Table 6, it can be seen that all the parameters were statistically significant, except for the pleasantness personality trait, whose estimated parameter was positive and statistically significant at a level of 5%. It can be deduced that the more the cooperative and pleasant a person an auction participant is, the greater his or her risk tolerance level will be. The findings evidenced in this research concerning this relationship are in keeping with the work of developed by Biais et al. (2005), Grable and Lytton (2001), and Nofsinger (2006), who identified a positive relationship between the described constructs.

Table 7 shows the estimates for the regression, relating the personality traits with Risk Perception (*PercRisk*).

Regarding the personality traits presented in Table 7, it was noted that two traits were statistically significant, since their probability values were below the 5% level, namely: Extraversion and Pleasantness. In both cases, the parameters estimated in relation to risk perception were significant, with pleasantness having a more pronounced impact due to the higher Student's t-test score. It is also noteworthy that this personality trait was the one that presented the same significance in risk tolerance. However, in the consulted

literature, no research in the financial and marketing field revealed a relationship between risk perception and the two personality traits.

Table 7 Robust regression estimates for personality traits and risk perception

<i>PercRisk</i>	<i>Coef.</i>	<i>Std. err.</i>	<i>Student's t-test</i>	<i>p-value</i>	<i>[95% conf. interval]</i>	
Pleasantness	0.0953	0.0309	3.09	0.002	0.0345	0.1562
Neuroticism	-0.0249	0.0216	-1.15	0.250	-0.0676	0.0176
Extroversion	0.0503	0.0230	2.18	0.030	0.0049	0.0956
Openness to experience	0.0134	0.0225	0.59	0.554	-0.0310	0.0577
Conscientiousness	0.0015	0.0219	0.07	0.945	-0.0417	0.0448

Note: $F(13; 251) = 5.25$. Prob > $F = 0.0000$.

Source: Authors own creation

5 Conclusions

The present work analysed the influence of personality traits on the risk profile of the decision maker in the purchase of a good traded in an auction type market. To achieve the proposed objective and answer the research question, research hypotheses were prepared that allowed them to be statistically tested.

This article makes five contributions to the literature. The first is related to the risk tolerance score. The results point to decision makers who mostly consider themselves moderate or conservative, a factor that was also mentioned by the interviewees. Therefore, participating in an auction does not mean having an aggressive profile, with participants considering participation as another business opportunity. The second contribution lies in the social relevance and practical implications of the work. The purpose is to help auctioneers, sellers and buyers to understand better the profile and behaviour of individuals who participate in auctions and, thus, improve how auctions function and enable the definition of new business and operating strategies. The third contribution is related to the methodological field. The findings allowed advances in the joint analysis of personality traits with regard to risk tolerance. The results show that, for the target audience in question, pleasantness influences the behaviour of individuals in relation to risk tolerance. Furthermore, this work validated a scale that can be used in other academic contexts. The questionnaire is available in Annex A.

In the theoretical field, the fourth contribution lies in enhancing the definition of risk tolerance by analysing a specific target audience and demonstrating results that diverge from other studies in relation to the variables under study, for example, in relation to sex and tolerance concerning risk, since Faff et al. (2011) identified men as being more prone to risk, a finding that differs from the results of the present study. Another possibility is in relation to declared income and risk tolerance, for which Grable and Lytton (1999) and Sjoberg (2000) found a positive relationship between higher income and greater risk tolerance, also differing from the results of the present study. It is these divergences of results that open up the field for further research to be conducted and for new concepts to be defined based on the results.

Among the main findings, the fifth contribution of the research stands out. This contribution is related to a point that is in keeping with the findings of Milgrom (2019), that the individual characteristics and the form of access to information and behavioural factors affect the actions of individuals in auctions. Therefore, by identifying behavioural factors as supply-forming agents, conjoint analysis represents a new field of individual behavioural analysis.

The main limitations of this research are related to:

- 1 the difficulty in obtaining responses, as the public is very specific, and results cannot be generalised
- 2 lack of interest on the part of the entities that hold auctions, including associations of auctioneers, auctioneers and auction users
- 3 absence of previous work with auction participants that could serve as a basis for research, with an alternative being to use a simulated auction to obtain new insights, in accordance with Karl (2016)
- 4 the need interview more auction participants (auctioneers, sellers and buyers) to conduct deeper qualitative research.

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