TEMPORAL PREFERENCES IN THE CULTURAL CONTEXT BETWEEN BRAZILIAN REGIONS

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ABSTRACT

The literature indicates culture as an element that impacts the decision-making process of individuals in a time preference environment. These studies address comparative contexts between countries. However, Brazil has peculiar cultural characteristics in its regions (Hofstede et al., 2010). Thus, research in Brazil emerges in the face of regional differences, considering socioeconomic aspects. Under this prism, this research seeks to investigate whether the national culture at the regional level is associated with time preferences in the Brazilian context, based on cultural dimensions. The research instrument was a survey composed of three blocks: (i) questions extracted from Frederick, Loewenstein, and O'Donoghue (2002) to measure the influence of time preference in decision-making behavior; (ii) directed to capture the cultural values proposed by Hofstede (2001); and (iii) responsible for capturing the other control variables. We tested hypotheses through block logistic and linear regressions. As a main finding, the results suggest robust evidence that more individualistic subjects with higher long-term perception are more patient, especially when considering the last cultural dimension. These findings were not seen in the work of Wang et al. (2016), who mainly found the relationship between patience and the cultural dimension "uncertainty aversion". Moreover, the cultural context in time preference decisions may go beyond the geographical issue.

Keywords: Time Preferences. Impatience. Culture. Discount Rate.

PREFERÊNCIAS TEMPORAIS NO CONTEXTO CULTURAL ENTRE REGIÕES BRASILEIRAS

RESUMO

A literatura indica a cultura como um elemento que impacta no processo decisório dos indivíduos em um ambiente de preferência temporal. Estes estudos abordam contextos comparativos entre países. Entretanto, o Brasil é um país com características culturais peculiares em suas regiões. Sendo assim, a investigação

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no Brasil emerge diante das diferenças regionais considerando aspectos socioeconômicos. Sob esse prisma, a presente pesquisa busca investigar se a cultura nacional em nível regional está associada a preferências temporais no contexto brasileiro sob a perspectiva das finanças comportamentais, tomando-se por base as dimensões culturais. O instrumento de pesquisa foi um survey composto por três blocos: (i) de perguntas para mensuração da influência da preferência temporal no comportamento decisório; (ii) direcionado a captar os valores culturais; e (iii) responsável para capturar as demais variáveis de controle. As hipóteses foram testadas através das regressões logística e linear por bloco. Como principal achado é possível evidenciar, de forma robusta, que os sujeitos mais individualistas e com maior percepção a longo prazo são mais pacientes, sobretudo ao considerar a última dimensão cultural. Estes achados não foram vistos claramente em estudo similar anterior, que encontrou principalmente a relação entre paciência e a dimensão cultural "aversão à incerteza". Além disso, o contexto cultural nas decisões de preferências temporais, em certa medida, pode ir além da questão geográfica.

Palavras-Chave: Preferências Temporais. Impaciência. Cultura. Taxa de Desconto.

1 INTRODUCTION

Behavioral Economics and Finance literature has shown that social and cultural factors shape individual preferences (Eugster et al., 2011; Hoff, Shetramade & Fehr, 2011). Among individual preferences, there is concern among scholars, policymakers, and private managers about temporal choices. More or less patient people tend to make decisions that affect their income and savings levels, affecting their retirement preparedness and other decisions involving intertemporal choices.

How individuals perceive time is influenced by cultural factors, psychological issues, and sociodemographic characteristics (Ortiz, 2017). From a cultural point of view, Takahashi et al. (2010) indicate, based on neuroscience theories, that Western and Eastern environments may have different types of cognition, thereby promoting differences in economic decisions, especially in intertemporal choices.

Culture is characterized as a stable construct that influences the behavior of individuals in society. Culture can contribute to explaining certain economic phenomena between countries, concerning the idea that individuals in different countries are subject to divergent decisions. In other words, individuals' decisions and feelings are affected by the culture of the local environment in which they live (Kyriacou, 2016; Hajikhameneh & Kimbrough, 2019).

In this sense, Hofstede (2001) established five stable cultural dimensions across nations that were consistent over different periods. Wang et al. (2016) sought to understand the associations between culture and time preferences, focusing on three cultural dimensions: individualism, uncertainty avoidance, and long-term orientation.

Individualism/collectivism is one of the cultural dimensions widely studied through surveys, experiments, and quasi-experiments. According to this cultural dimension, individuals with expressive traits of individualism are loosely connected to society and are expected to be concerned with taking care of themselves.

However, the evidence regarding the relationship between individualism and time preferences is controversial. On the one hand, a collectivist culture seems to provide a kind of "cushion" or safety net against potential losses (Li & Fang, 2004), supporting people to be willing to wait longer. On the other hand, some findings suggest that people in individualistic cultures learn to plan for the future, making them more prepared to wait and, therefore, more patient.

Another cultural dimension related to time preferences is uncertainty aversion. In this sense, societies with a high score in terms of uncertainty aversion tend to be less tolerant of uncertain situations. Furthermore, they tend to be less patient, preferring immediate rewards (Wang et al., 2016).

In the case of long-term orientation, societies that place a high value on the future relative to the present are characterized by greater intertemporal patience. Individuals in such societies tend to seek greater rewards in the future, as opposed to smaller immediate or short-term rewards (Wang et al., 2016).

Wang et al. (2016) identified culture as an element that impacts the decision-making behavior of individuals in a time preference environment. The study approached the topic from the perspective of cross-country comparison. However, Brazil has unique cultural characteristics in its regions (Hofstede et al., 2010). Thus, research in Brazil emerges in light of regional differences.

Several studies have addressed the cultural dimensions of Hofstede et al. (2010), including in Brazil. The subjects of such studies cover issues such as: the effect of Hofstede's cultural dimensions on the banking concentration of countries (Santos & Nunes, 2023); the effect of cultural dimensions on the risk behavior of Brazilians (Andrade, Cerqueira, and Oliveira, 2022), their relationship with Organizational Values (Callefi & Santos, 2021), among others. However, none of the mapped studies relate cultural dimensions to temporal choices in a country with a territorial extension of Brazil's magnitude and such distinct cultural traits. Thus, it advances previous studies in methodological terms by proposing an experimental study and exploring the constructs.

In this context, the present research seeks to answer the following research question: is national culture at the regional level associated with temporal preferences in the Brazilian context from the perspective of behavioral finance? Thus, the investigation aims to identify whether national culture at the regional level is associated with temporal preferences in the Brazilian context from the behavioral finance perspective. To this end, sociodemographic characteristics evidenced in research that influence the decision-making process in time preferences were considered.

Both culture and sociodemographic profile may influence individuals in their regions. In this context, the proposal is to investigate whether these elements impact the level of patience, measured through time preferences from a behavioral finance perspective.

2 LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1 Time Preferences and Discount Rate

The discount rate may be associated with behavioral characteristics and personal traits, such as age, cognitive ability, risk behavior, and even psychiatric disorders or drug use (Chabris, Laibson & Schuldt, 2008). Thus, certain behaviors are strongly associated with the way individuals discount time. The literature on the subject addresses three models for estimating how people make intertemporal decisions: the exponential, hyperbolic, and quasi-hyperbolic models.

The exponential model is the most widely used and is based on the assumption that individuals discount utility over time at a constant rate. The hyperbolic model incorporates behavioral aspects into describing individuals' discount rates. Thus, individuals discount value over time differently, as immediate or short-term consumption/savings decisions are made differently from those involving long-term consumption/savings. As Angeletos et al. (2001) discussed, people are "more impatient when there are short-term trade-offs than long-term ones."

Therefore, hyperbolic preferences better represent dynamic inconsistencies, that is, the incongruity between long-term goals and short-term actions. Hyperbolic discounting suggests that "individuals discount utility at decreasing rates, i.e., the importance of immediate consumption declines as the time horizon expands" (Muramatsu & Fonseca, 2008, p. 105).

The quasi-hyperbolic model combines features of the other two models: it reduces the rate of decline more sharply in the short term than in the long term and incorporates the discount factor (δ) that weights the decline trend.

Several experiments have been developed with the aim of better understanding intertemporal choice behavior and the discount rate used by individuals. Table 1 presents three of these studies. The experiment developed by Coller and Williams (1999) discusses the effect of information on the discount rate in SS-LL (Smaller-Sooner vs Larger-Later) scenarios, the most common scenarios in studies involving intertemporal choices. The experiments by Anderhub et al. (2000) and Carbone (2005), in turn, analyze decisions about the life cycle.

Research on simple outcome discounting indicates that the discount rate is not stable, but appears to vary depending on several contextual factors, contrary to the standard discounted utility model. Some of these factors we discuss below: a) the magnitude effect suggests that discount rates are higher for smaller amounts, in dollars, than for larger amounts (Kirby, 1996); b) the direction effect suggests that the discount rate obtained by increases in the delay for a result is higher than that obtained by reductions in the delay (Loewenstein, 1988); c) the sign effect indicates that discount rates are lower for losses than for gains (Thaler, 1981), although there are demonstrations of the reverse effect in other studies, such as Read and Read (2004); d) the delay effect suggests that the discount rate is lower for longer delays (Thaler, 1981); e) the interval effect indicates that the discount rate depends on the time interval between the two results to which the discount rate is applied – the longer the time interval, the lower the discount rate (Read, 2001).

Such evidence supports the thesis that people are impulsive, inconsistent over time, and unable or unwilling to conceptualize their long-term interests (Clark, 2011). This outline follows the guidance proposed by Simon (1979) and others, in that behavior is best understood as the result of the interaction between predisposition and context (which he defined as environment).

2.2 Cultural Dimensions and Individual Impatience

Hofstede et al. (1991) define culture as a collective programming of the mind that distinguishes the members of one group or category of people from another. At the time, the authors defined four cultural dimensions, to which another was later added, resulting in five cultural dimensions: Power Distance (PDI); Uncertainty Avoidance (UAI); Individualism vs. Collectivism (IDV); Masculinity vs. Femininity (MAS); and Short-Term vs. Long-Term Orientation.

The UAI dimension relates to how much a country's population prefers structured situations over unstructured situations. Structured situations are those in which there are clear rules about how a person should behave in a given situation. Societies with a high rejection of uncertainty are called rigid, while societies with a low rejection of uncertainty are considered flexible. Therefore, it refers to the level of uncertainty that society has about the future. In this dimension, the social structure can develop initiatives to control the future or let it flow naturally. The higher the UAI, the greater the aversion to uncertainty.

The IDV dimension refers to the degree to which a country's people prefer to act as individuals rather than group members. In societies where the degree of individualism is low, i.e., where collectivism prevails, children learn from an early age to respect the group they belong to, usually the family, and to differentiate between members of the group and members outside the group. More individualistic societies focus more on the tasks to be performed and less on interpersonal relationships. In collectivism, however, groups favor teamwork and tend to achieve group rather than individual goals. The higher the IDV, the greater the individualism.

The LTO dimension relates to future-oriented values, such as persistence and perseverance. In contrast, the short term is oriented toward the past and present, such as tradition and social obligations. It quantifies the degree of concern a society has with the future as opposed to achieving quick results. The higher the LTO, the more oriented society is toward long-term plans.

Concerning impatience, also seen in the literature as a present bias, Laibson (1997) indicates that individuals tend to use a high discount rate for short time horizons. In contrast, individuals seek to apply a lower discount rate over a longer horizon, demonstrating a characteristic of patience. For the author, this change in perspective on time preferences is due to individuals having two sides (present and future). In addition, individuals have self-control, which arises when there is a sacrifice to save for the future. However, when this future becomes the present, such sacrifice is postponed.

The decision-making process involving a long-term choice tends to be conflicting. In the present, individuals plan for the future. However, when the

decision about the future reaches the present, it becomes difficult to keep promises because the instant gain is tempting, making self-control unfeasible (Angeletos et al., 2001).

The relationship between cultural dimensions and impatience in temporal issues through the discount factor is seen in the robust study by Wang et al. (2016). The authors' findings indicate that higher Uncertainty Aversion (UAI) levels are associated with stronger hyperbolic discounting. In contrast, higher degrees of Individualism (IDV) and Long-Term Orientation (LTO) indicate a stronger tendency to wait for larger payments.

Behavioral finance is intrinsically linked to cultural dimensions and time preferences, as the financial decisions of individuals and societies are shaped by beliefs, values, and perceptions of time.

Concerning the cultural dimensions proposed by Hofstede, especially uncertainty avoidance and long-term orientation, there is a noticeable influence on how different groups deal with risk, debt, and investments.

Meanwhile, time preferences, which reflect the degree of patience or immediacy in decision-making, play a crucial role in allocating financial resources. More present-oriented individuals often exhibit greater financial impulsivity, higher indebtedness, and a lower propensity to accumulate wealth. At the same time, those with a strong future orientation tend to plan their finances better and accumulate wealth over time.

That said, given this context of the literature review, it is possible to develop the following research hypotheses:

H1: Individuals with a higher level of individualism tend to have a higher level of patience.

H2: Individuals with a lower level of uncertainty aversion tend to have a higher level of patience.

H3: Individuals with a higher level of long-term perception tend to have a higher level of patience.

3 METHODOLOGICAL PROCEDURES

3.1 Sample and data collection instrument

The study has a non-probabilistic convenience sample. In other words, the choice of respondents does not follow a random model. We made the data collection instrument available on social media and disseminated it among the scientific community in each federation state.

This descriptive research followed the protocol of Wang et al. (2016), who developed the "International Test of Risk Attitudes (INTRA)" questionnaire. To this

end, we carried out procedures for translation and language adaptation according to Beaton et al. (2000). The authors emphasize that this step is important, requiring the search for people who are fluent in both languages, highlighting above all the possibility of being a native speaker of the target language. Upon completing this step, the authors highlight the need for three other steps.

The second step involves verifying the translation through comparison. At this point, we verified semantic and conceptual equivalence. The third stage refers to conceptual validation by experts. We sought three researchers in the field who have developed work involving cultural dimensions and/or behavioral finance. They observed whether the questions were appropriate for the language and cultural context. The fourth part aimed to conduct a pre-test of unidimensionality, reliability, and convergence according to the parameters of Hair and Sant'Anna (2009).

This instrument has three parts. The first part uses questions from Frederick Loewenstein and O'Donoghue (2002) to measure the influence of time preference on decision-making behavior. The second part refers to the cultural values proposed by Hofstede (2001). In the last part, we developed the questions to capture other control variables. We explore all of these parts below.

3.2 Measurement of variables

3.2.1 Time preferences

Three questions were used to capture time preferences, following the proposal by Wang et al. (2016), with an exchange rate multiplier of 4 about the questionnaire used by the aforementioned authors. The first question was initially used by Frederick (2005) and asked the following:

Which offer do you prefer?

A. A payment of $3,400.00 this month

B. A payment of $3,800.00 next month

For this binary question (wait versus do not wait), the analysis will look at the percentage of participants in a given region who chose to wait for $3,800.00 next month, a proxy (PACI) for the patience of participants in a given region relative to others. In addition, the potential impact of cultural factors that correlate with the patience or impatience of respondents will be explored.

In addition, the questionnaire included two other questions aimed at capturing the implicit discount rate of participants. These questions were:

Please consider the following alternatives:

A. A payment of $400.00 now

B. A payment of $X one year from now

X must be at least $_____ in order for B to be as attractive as A.

Please consider the following alternatives:

A. A payment of $400.00 now

B. A payment of $X ten years from now

X must be at least $_____, so that B is as attractive as A.

The basis for inferring the discount rate for intertemporal choices using the classical approach was the relationship between the present value of the cash flow, represented by PV, and its future value, denoted by FV. This relationship is formalized by:

$$FV = PV(1+I)^t,$$

Where I is the discount rate and t is the waiting time. Since both VP and t are given in the questions, the discount rate can be obtained as follows:

$$I = (FV/PV)^{(1/t)}-1$$

As described above, we used two questions to infer the subjective discount rate (assuming annual compound interest), where t equals 1 year and 10 years, respectively.

In addition to the classic model, the quasi-hyperbolic discount model was used to infer participants' discount rates and compare them according to Hofstede's (2001) defined cultural factors.

The parameters responsible for describing the subjective discount rate are: β and δ. When $0<\beta<1$ and $0<\delta<1$, people seem more patient in the long term and less patient in the future. Thus, the discount rate per period between now and the next period is $(1-\beta\delta)/\beta\delta$, and the discount rate per period between two future periods is $(1-\delta)/\delta$, which is less than $(1-\beta\delta)/\beta\delta$ (Wang et al., 2016).

In this sense, the main feature of the quasi-hyperbolic discounting model is that it considers a decreasing discount rate between this period and the next, but a constant discount rate from the next period onwards. In behavioral economics literature, β represents the degree of "present bias." Higher values calculated for β represent less influence of present bias on the discount rate. When $\beta=1$, the quasi-hyperbolic discount model is similar to the exponential discount model.

The two questions presented in the questionnaires can be represented in light of the parameters of the quasi-hyperbolic discount model as:

$$400=\beta\delta FV_{1year},$$

$$400=\beta\delta FV_{10year},$$

Therefore, δ and β can be inferred from the responses FV_{1year} and $FV_{10years}$:

$$\delta = \left(\frac{FV_{1year}}{FV_{10years}}\right)^{1/9}$$

$$\beta = \frac{100}{\delta F_{1year}}$$

The subadditive function is expressed by (Read, 2001):

$$f_{T' \to T} = \frac{1}{1 + K(T - T')^S}$$

Where $f_{T' \to T}$ represents the discount factor between times T' and T, k is the hyperbolic discount factor, and s is the parameter that captures the perception of time. Thus, under the subadditive discount model, the two questions about time discounting can be represented by:

$$100 = \frac{FV_{1year}}{1 + k \cdot 1^s}, 100 = \frac{FV_{10years}}{1 + k \cdot 10^s}$$

Therefore, k and s can be inferred from the responses FV_{1year} and $FV_{10years}$:

$$k = \frac{FV_{1year}}{100} - 1,$$

$$s = \left[log_{10}\left(log_{(1+k)}\left(FV_{10years}/FV_{1year}\right)\right) + 1\right]$$

3.2.2 Measurement of Cultural Values

The second part of the data collection questionnaire was designed to capture information about individuals' cultural values. We used the Brazilian Portuguese version of the 2013 Values Survey Module. There are six cultural values in the complete questionnaire. However, in this study, Individualism (IDV), Uncertainty Aversion (UAI), and Long-Term Orientation (LTO) were used, with each cultural value having a set of questions, as shown in Table 1.

Table 1

Set of questions on cultural values

Code	Question	Cultural value
IDV1	Having enough time for personal and domestic life	
IDV2	Having job stability	IDV
IDV3	Working in something you find interesting	

IDV4	Having a job that your family and friends respect	
UAI1	How often do you feel nervous or tense?	UAI
UAI2	Having job stability	
UAI3	A person can be a good manager without having a precise answer to every question a subordinate may ask about their work.	
UAI4	The rules of an organization should never be broken—even when the employee thinks that breaking the rule is for the benefit of the organization.	
LTO1	Being generous with other people	LTO
LTO2	Simplicity: not spending more than necessary	
LTO3	How proud are you to be Brazilian?	
LTO4	Persistence is the best way to achieve results.	

Source: Adapted from Hofstede (2001).

Concerning IDV, the questions were based on disregarding the respondent's current job, but considering their ideal job, and how important it would be on a scale from extremely important to unimportant.

The UAI questions were based on the respondents' personal lives, with UAI1 and UAI2 measuring the level of importance on a scale from extremely important to not important and excellent to poor, respectively. The other questions, UAI3 and UAI4, measured the level of agreement on a scale from strongly agree to disagree strongly.

The LTO questions also follow the context of the respondent's personal life, with LTO1 and LTO2 measuring the level of importance on a scale from extremely important to unimportant. LTO3 measured on a scale from very proud to not proud at all. Finally, LTO measured the level of agreement on a scale from strongly agree to disagree strongly.

To identify the value of each cultural value, the average of respondents in each region is calculated for each question in Table 1. After identifying the regional average, the formula proposed by Hofstede (2001) is applied, as seen in the Values Survey Module 2013 guidelines provided by the author, as follows:

$$IDV_J = [35\ x\ (IDV2 - IDV1)] + [35\ x\ (IDV4 - IDV3)] + C$$

$$UAI_J = [40\ x\ (UAI2 - UAI1)] + [25\ x\ (UAI3 - UAI4)] + C$$

$$LTO_J = [40\ x\ (LTO1 - LTO2)] + [25\ x\ (LTO3 - LTO4)] + C$$

IDV represents the average individualism index; UAI represents the average uncertainty avoidance index; LTO represents the average long-term orientation index; J represents the region; C is a constant (positive or negative) that depends on the nature of the sample, not influencing the comparison between regions.

3.2.3 Measurement of Other Control Variables

Banerjee and Duflo (2012) indicate that socioeconomic context influences decision-making due to heuristics and cognitive biases interfering with temporal

choices. Becker and Mulligan (1997) also emphasize that other endogenous variables lead individuals to be patient, indicating the importance of a scenario with time preference.

An individual's income (INCOME) is a variable that is related to discount rates (Becker & Mulligan, 1997), with wealthier people being more patient (Yesuf & Bluffston, 2008). From this perspective, Banerjee and Mullainathan (2010) argue that lower-income individuals seek immediate gratification without considering the real long-term cost. Another aspect is that, because they have a higher income, they tend to have a greater tolerance for risk than those with lower incomes. Thus, these individuals have an advantage and take more risks, which allows them to profit from existing opportunities and thereby increase their position of superiority (Grable, 2000; Grable & Lytton, 2001). The continuous variable will demonstrate the individual value of monthly income.

The gender variable (SEX) was correlated in Silverman's study (2003). This correlation may be because women indicate that they are more conservative than men, resulting in lower risk tolerance than men (Grable, 2000; Gysler, 2001). In the work of Meier and Sprenger (2010), females showed lower discount rates than males. In contrast, Pereira (2016) found that, in Brazil, men were more patient in their time preferences. The dummy variable will have a value of "0" for male and "1" for female.

Another variable used in the study is age (AGE), as some studies have noted a correlation with the discount rate (Green, Fry & Myerson, 1994; Green & Myerson, 1996). Younger people tend to be more impatient (Wang et al., 2016). The continuous variable will indicate the number of years completed.

Regarding financial management (GFIN), the most relevant study on the subject is that of Meier and Sprenger (2013). The authors noted that subjects with prior financial knowledge have a higher level of patience. Therefore, working in the financial sector may indicate temporal perception, favoring a feeling of patience. The dummy variable will have a value of “0” for those who do not work in financial management and “1” for those who do.

3.4 Statistical technique

Two types of multivariate regressions were structured to test the hypotheses. The first refers to the dependent dummy variable patience, with the application of logistic regression. It is a recommended technique for situations where the dependent variable is dichotomous. Among the five dependent variables, the only variable that fits this technique is the dummy variable, seen in the analysis model. The Ordinary Least Squares multivariate linear regression model with block analysis also tested the other dependent variables.

Considering the possibility of regional influence, a three-level hierarchical model was adopted. This method implies that there are explanatory elements from different levels. In the first block, the independent control variables are seen in the analysis model as a sociodemographic dimension. The second model aggregates the independent variables of interest related to the cultural dimension. Finally, in

the third model, given the findings on cultural differences between Brazilian regions (Hofstede et al., 2010), grouping by region was added.

Given the non-probabilistic sampling, we apply the bootstrap technique, which involves forming a new sample at each resampling for all regressions. So, we considered five thousand replicates in this study.

The equations are shown below:

$Y = a + SEX_1\beta_1 + GFIN_2\beta_2 + INCOME_3\beta_3 + AGE_4\beta_4$

$Y = a + SEX_1\beta_1 + GFIN_2\beta_2 + INCOME_3\beta_3 + AGE_4\beta_4 + IDV_5\beta_5 + UAI_6\beta_6 + LTO_7\beta_7$

$Y = a + SEX_1\beta_1 + GFIN_2\beta_2 + INCOME_3\beta_3 + AGE_4\beta_4 + IDV_5\beta_5 + UAI_6\beta_6 + LTO_7\beta_7 + REGION_8\beta_8$

It should be noted that "Y" represents the dependent variable. However, the dependent variable "PACI" is conducted in logistic regression, and the other dependent variables in multivariate linear regression.

4 ANALYSIS AND DISCUSSION OF RESULTS

4.1 Descriptive analysis

The data collection instrument was available for responses during two semesters. During this period, we got a total of 737 responses. However, we identify some inconsistencies and duplicate responses, resulting in the removal of 35 responses. Therefore, the final sample comprised 702 observations from the five Brazilian regions.

The sample has more respondents from the Northeast and Southeast regions. This concentration of answers is probably linked to the number of graduate programs that confirmed the application of the questionnaire. Table 2 shows more details about descriptive statistics.

Table 2
Descriptive statistics of the sample collected

Variable		North			Northeast			Midwest			Southeast			South		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
INCOME		105	3.42	3.59	197	6.31	36.32	87	4.38	5.64	193	14.34	101.3	120	10.54	32.29
AGE			30	7		29	9		30	11		31	11		31	9
IDV			152	67		178	69		190	57		198	61		179	57
UAI			116	49		127	54		144	63		146	59		153	57
LTO			156	57		182	56		173	43		187	54		194	56
		N	Freq. %		N	Freq. %		N	Freq. %		N	Freq. %		N	Freq. %	
SEX	Male	61	58.1		102	51.8		36	41.4		69	35.8		40	33.3	
	Fem.	44	41.9		95	48.2		51	58.6		124	64.2		80	66.7	
GFIN	No	68	64.8		132	67		76	87.4		163	84.5		103	85.8	
	Yes	37	35.2		65	33		11	12.6		30	15.5		17	14.2	

Source: Research data.

It should be noted that the sample presents a heterogeneous profile concerning some control variables. The highest average income is in the Southeast region. This prevalence of high income in the Southeast region is expected, given

that it has the country's highest gross domestic product per capita. In contrast, the North region has the lowest average income, diverging from the annual report of the Brazilian Institute of Geography and Statistics (IBGE), which points to the Northeast as the region with the lowest average income. The standard deviation indicates a varied income profile in all states.

The average age in all regions was around 30 years, with a similar standard deviation between them. This means of age indicates that the sample is composed of adults. Regarding the GENDER variable, the North and Northeast regions have more male respondents, while the other regions have more female respondents. Overall, 56.13% of the sample is female.

The variable that identifies professional activity involving the financial area indicates that most respondents in all regions do not engage in financial management activities. This finding can be explained by the fact that the data collection instrument was disseminated on social and scientific networks, without convenience bias.

Regarding the average cultural values, the southeast region showed a higher level of individualism. In contrast, the northern region showed a higher level of collectivism. Regarding uncertainty avoidance, the southern region showed a higher degree, while the northeastern region showed the lowest degree. In the cultural dimension of long-term perception, individuals from the southern region showed a higher level, while those from the northern region showed the lowest level. These results are in line with Hofstede et al. (2010).

4.2 Logistic regression

We analyzed the multivariate relationship between the dependent variable PACI (patience) and the other explanatory variables. The results presented in Table 3 suggest that, based on the p-value of the chi-square statistic (LR Chi2), at least one of the coefficients is different from zero at the 1% significance level, confirming the joint relevance of the model. The pseudo-R^2 of Cox and Snell and Nagelkerke give the model low discriminatory power (a maximum of 10.7%), demonstrating other relevant variables to explain individuals' patience that were not considered in this study. Three models are estimated: the first includes the control variables of the individuals, the second aggregates the cultural variables of the individuals, and the last includes the Brazilian regions.

Table 3
Logistic regression of the dependent variable PACI

Variables	**Model 1**	**Model 2**	**Model 3**
	β	β	β
Sex (1 = female)	-.629**	-.704**	-.800***
GFIN (1 = yes)	.422*	.485*	.576**
Incmoe	.000*	.000*	.000
Age	-.008	-.010	-.014
IDV		-.001	-.001
UAI		.000	-.001
LTO		.005**	.004**
North			-1.180***
Northeast			-.661**

Midwest			-.910***
Southeast			-.450
Pseudo R^2 Cox & Snell	0.042	0.053	0.072
Pseudo R2 Nagelkerke	0.062	0.079	0.107
LR Chi2	0.000		

LEGEND: GFIN = Financial management; IDV = Individualism; UAI = Uncertainty aversion; LTO = Long-term orientation.
***. The coefficient is significant at the 1% level (2 tails).
**. The coefficient is significant at the 5% level (2 tails).
*. The coefficient is significant at the 10% level (2 tails).
Source: Research data.

The results of model 1 (Table 3) suggest that respondents are less patient, confirming the findings of Pereira (2016). The variables income and financial management performance are only significant at the 10% level. This result indicates that individuals with higher income and greater financial literacy are more patient in intertemporal monetary value choices. Age was not significant in any of the three models. Regarding cultural dimensions, individualism (IDV) and uncertainty aversion (UAI) did not help explain a higher probability of respondents being more patient in intertemporal choices involving monetary amounts, regardless of their regional distribution. On the other hand, respondents with a greater long-term outlook (LTO) are also more likely to be more patient, diverging from the study by Wang et al. (2016). When considering the region, there are indications that subjects residing in the Southeast are, on average, more patient.

4.3 Multivariate linear regression

We performed some tests to verify the assumptions of the regressions. The first test was to verify the absence of model specification problems and the existence of omitted variables. The results of these tests (Ramsey's Reset method) showed a significance level greater than 10%. The heteroscedasticity test was used to validate the regression models. The Breusch-Pagan method showed a significance level greater than 10% in the three models. We also performed the Tolerance/VIF method to identify the existence of multicollinearity. The results were 1.0 (no multicollinearity problem). Finally, we identified the normality of the distribution of the residuals using the resampling technique (Bootstrap), which is used when the population distribution is unknown. It consists of generating multiple random samples from an original sample, allowing the variability of the means to be estimated.

4.3.1 patience through the present bias discount factor (β)

The first proxy used in the linear regression was the discount factor known as present bias (β) of the quasi-hyperbolic model. A higher value for this variable is associated with a higher level of patience, as it represents less influence of present bias on the discount rate.

Tables 4, 5, 6, and 7 present the three-level hierarchical model. The first model includes the control variables of the individuals. The second model aggregates the cultural variables of the individuals. The last model adds Brazilian regions.

Table 4
Block regression of the dependent variable β

	Model 1		Model 2		Model 3	
Independent variables	Coeficient	Standard error	Coeficient	Standard error	Coeficient	Standard error
SEX (1 = female)	-0.015	0.017	-0.034**	0.017	-0.033*	0.017[a]
GFIN (1 = yes)	0.020	0.022	0.032	0.021	0.030	0.022[a]
INCOME	0.000***	0.000	0.000***	0.000	0.000***	0.000[a]
AGE	0.003**	0.001	0.000**	0.001	0.002**	0.001[a]
IDV			0.001***	0.000	0.001***	0.000[a]
UAI			-0.000**	0.000	-0.000**	0.000[a]
LTO			0.001***	0.000	0.001***	0.000[a]
North					0.036	0.024[a]
Northeast					-0.033	0.029[a]
Midwest					0.044*	0.023[a]
South					-0.010	0.024[a]
Adjusted R^2		0.106		0.193		0.207
F		20.094***		23.091***		15.958***

LEGEND: GFIN = Financial management; IDV = Individualism; UAI = Uncertainty aversion; LTO = Long-term orientation.
***. The coefficient is significant at the 1% level (2 tails).
**. The coefficient is significant at the 5% level (2 tails).
*. The coefficient is significant at the 10% level (2 tails).
a. Limited to 2,652 replicates.
Northeast excluded due to multicollinearity.
Source: Research data.

It should be noted that the inclusion of variables improved explanatory power, as the three models presented F with significance less than 1%. In the last two models, around 20% of the variance of the independent variables is capable of explaining the dependent variable. The F test of r^2 of the change between models showed significance less than 5%. Despite the request to perform 5,000 replications, the bootstrap model was limited to 2,652 times.

Given the results, male respondents show signs of being more patient through the present bias (β), as Pereira (2016) found in Brazil. The financial management control variable did not show any influence. However, the income and age variables show a strong association (significance less than 1%). Individuals with higher monthly income tend to be more patient, which aligns with the findings of Nguyen (2011) and Shah, Mullainathan, and Shafir (2012). Regarding the age variable, older subjects in this sample are more patient, in line with the findings of Nguyen (2011) and Wang et al. (2016).

Regarding cultural dimensions, subjects with higher levels of individualism (IDV) and long-term orientation (LTO) and lower levels of uncertainty avoidance (UAI) showed a strong and significant relationship with feelings of patience, regardless of their regional distribution. Wang et al. (2016) found similar results when comparing 53 countries (Brazil was not included in the sample). When considering the region, there are indications that subjects residing in the Southeast are more patient. Therefore, the results indicate that being patient, from the perspective of present value (β), may not be associated with the region, but rather with the cultural context in which the individual is inserted.

4.3.2 patience through the long-term discount factor (δ)

In this quasi-hyperbolic model regression, long-term time is considered to identify the level of patience. A higher value for δ implies less influence on the discount rate and, therefore, greater patience.

Table 5
Block regression of the dependent variable δ

	Model 1		Model 2		Model 3	
Independent variables	Coeficient	Standard error	Coeficient	Standard error	Coeficient	Standard error
SEX (1 = female)	-0.006	0.008	-0.002	0.008	-0.000	0.008[a]
GFIN (1 = yes)	0.024**	0.010	0.015**	0.010	0.017*	0.010[a]
INCOME	-0.000***	0.000	-0.000***	0.000	-0.000***	0.000[a]
AGE	0.000	0.001	0.001	0.000	0.000	0.001[a]
IDV			0.000***	0.000	0.000***	0.000[a]
UAI			0.000	0.000	0.000	0.000[a]
LTO			0.000**	0.000	0.000**	0.000[a]
North					0.019	0.013[a]
Northeast					-0.007	0.014[a]
Midwest					0.001	0.011[a]
South					-0.008*	0.012[a]
Adjusted R^2		0.021		0.041		0.047
F		3.614***		4.092***		3.011***

LEGEND: GFIN = Financial management; IDV = Individualism; UAI = Uncertainty aversion; LTO = Long-term orientation.
***. The coefficient is significant at the 1% level (2 tails).
**. The coefficient is significant at the 5% level (2 tails).
*. The coefficient is significant at the 10% level (2 tails).
a. Limited to 2,649 replicates.
Northeast excluded due to multicollinearity.
Source: Research data.

The table shows that including levels in the hierarchical regression is accepted, as the significance level is less than 1% in all three models. The R^2 in this regression is lower than in the previous one (Table 4), indicating a reduction in explanatory power. The F test of the marginal r^2 between the models showed a less than 5% significance level. Model 3 has 4.7% of the variance and is capable of explaining the behavior of the dependent variable, proving to be better than the other models. Despite the insertion of 5,000 replicates, the system was limited to 2,649 in the third model.

Regarding the control variables, individuals working in financial management showed a positive relationship with the long-term discount factor (δ) with a significance level of 10%. These results may be related to the fact that findings on the level of financial education promote a sense of patience (Meier & Sprenger, 2013), especially in the long term. The income variable proved to be highly significant (sig. < 1%) in a negative way. In other words, research participants with lower incomes showed a greater relationship with the long-term discount factor (δ), unlike the present bias (β). This result diverges from the constant discount utility model, which expects the same proportion of the factor over time.

The cultural dimensions of individualism (IDV) and long-term orientation (LTO) showed a positive and significant relationship at 1% and 5%, respectively. In these variables, the results followed the constant conception of the utility model, in which individuals tend to exhibit the same patient behavior over time. Therefore, more individualistic subjects who are more concerned about the future are associated with being more patient, following the indication of the results of Mahajan et al. (2008). It should be noted that the most robust study on cultural dimensions by Wang et al. (2016) did not find a significant relationship between these dimensions. Regarding regions, the only one that showed a significant association (sig. < 10%) was the South, negatively. That is, respondents from this region tend to be more impatient.

4.3.3 patience through the hyperbolic discount rate (k)

The next regression reflects the hyperbolic discounting that seeks to capture impulsivity in particular. A lower rate (k) translates into a higher level of patience.

Table 6
Block regression of the dependent variable k

	Model 1		**Model 2**		**Model 3**	
Independent variables	Coeficient	Standard error	Coeficient	Standard error	Coeficient	Standard error
SEX (1 = female)	0.006	0.039	0.047	0.039	0.051	0.039[b]
GFIN (1 = yes)	0.041	0.049	-0.009	0.047	0.006	0.048[b]
INCOME	-0.000***	0.000	-0.000***	0.000	-0.000***	0.000[b]
AGE	-0.006**	0.003	-0.005*	0.003	-0.005**	0.003[b]
IDV			-0.001***	0.000	-0.001***	0.000[b]
UAI			0.000	0.000	0.000	0.000[b]
LTO			-0.002***	0.000	-0.002***	0.000[b]
North					0.029	0.055[b]
Northeast					0.027	0.063[b]
Midwest					-0.069	0.057[b]
South					0.034	0.053[b]
Adjusted R^2		0.105		0.177		0.183
F		19.935***		20.752***		13.674***

LEGEND: GFIN = Financial management; IDV = Individualism; UAI = Uncertainty aversion; LTO = Long-term orientation.
***. The coefficient is significant at the 1% level (2 tails).
**. The coefficient is significant at the 5% level (2 tails).
*. The coefficient is significant at the 10% level (2 tails).
a. Limited to 2,711 replicates.
Northeast excluded due to multicollinearity.
Source: Research data.

As the levels were implemented, the explanatory power increased, considering the adjusted R^2. In the third model, 18.3% of the variance concerning the discount rate (k) is explained by the dependent variables, with validation by the significance level (sig. < 1%). The F test of r^2 for the change between models showed less than 5% significance. In the third model, the maximum number of replays was 2711.

Individuals with higher income and older age in relation to this sample are less impulsive and, consequently, more patient. These results are in line with Nguyen (2011) and Wang et al. (2016).

The cultural dimensions of individualism and long-term perception remained strongly significant in association with the level of patience. Subjects with higher levels of these dimensions show a lower degree of impulsivity, corroborating the findings of Mahajan et al. (2008). It should be noted that Wang et al. (2016) found a relationship with long-term perception and uncertainty aversion. Finally, the Brazilian region did not show a significant relationship.

4.3.4 patience through the subadditive hyperbolic discount rate (s)

The subadditive discount (s) mainly reflect the perception of time, considering the longer time interval, and can capture the decline in patience. For Read (2001), it is proposed that the hyperbolic discount (k) be replaced because it is not constant. Here, we use the subadditive discount as a robustness test.

Table 7
Block regression of the dependent variable s

	Model 1		**Model 2**		**Model 3**	
Independent variables	Coeficient	Standard error	Coeficient	Standard error	Coeficient	Standard error
SEX (1 = female)	0.424*	0.234	0.620***	0.224	0.614***	0.218[b]
GFIN (1 = yes)	0.056	0.299	-0.101	0.317	-0.038	0.320[b]
INCOME	-0.000	0.000	-0.000	0.000	-0.00	0.000[b]
AGE	-0.033**	0.012	-0.29**	0.012	-0.025**	0.011[b]
IDV			-0.007***	0.002	-0.007***	0.002[b]
UAI			0.002	0.002	0.001	0.002[b]
LTO			-0.009***	0.002	-0.008***	0.002[b]
North					-0.609*	0.327[b]
Northeast					1.001**	0.495[b]
Midwest					-0.510**	0.254[b]
South					-0.314	0.279[b]
Adjusted R^2		0.037		0.094		0.126
F		6.570***		10.028***		8.809***

LEGEND: GFIN = Financial management; IDV = Individualism; UAI = Uncertainty aversion; LTO = Long-term orientation.
***. The coefficient is significant at the 1% level (2 tails).
**. The coefficient is significant at the 5% level (2 tails).
*. The coefficient is significant at the 10% level (2 tails).
a. Limited to 2,606 replicates.
Northeast excluded due to multicollinearity.
Source: Research data.

4.4 Measurement of

the odds ratio

We investigated the odds ratio, which is defined as the probability of an event occurring divided by the probability of the event not occurring. It is important to note the need to observe the confidence interval in order to obtain statistical significance. The dependent variable time preference (PACI) was used because it is dichotomous. The others are continuous and are not analyzed by ranges,

making statistical analysis unfeasible. The test was applied to the dichotomous independent variables, and the results that indicated significant differences between the groups were selected.

Table 9
Odds ratio estimate

	SEX	95% confidence interval		GFIN	95% confidence interval		South Region	95% confidence interval	
		Lower	Higher		Lower	Higher		Lower	Higher
Odds ratio	2.182	1.505	3.163	2.12	1.319	3.408	1.775	1.06	2.971
Patient group	1.199	1.103	1.304	1.169	1.075	1.272	1.129	1.028	1.24
Impatient group	0.55	0.41	0.736	0.551	0.372	0.818	0.636	0.417	0.972

Source: Research data.

According to the table, a person who identifies as male has a 1.199 chance of being patient. When female, there is a 0.550 chance of being more impatient. Therefore, males are 2.182 times more likely to be patients than females.

An individual who works in financial management has a 1.169 chance of being patient. When they do not work in financial management, there is a 0.551 chance of being more impatient. Therefore, people who work in financial management are 2.12 times more likely to be patient than those who do not.

Regarding regions, the only one that showed significant differences was the southern region. A person who lives in the South is 1.129 times more likely to be patient than those in other Brazilian regions. When a person lives outside the southern region, they are 0.636 times more likely to be impatient. Therefore, people in the southern region are 1.775 times more likely to be patients than residents of other regions.

In summary, the findings support the three research hypotheses, such that people with higher levels of individualism, lower uncertainty aversion, and higher levels of long-term perception tend to be more patient in temporal choices involving monetary amounts.

5 CONCLUSIONS

This study sought to investigate whether national culture at the regional level is associated with time preferences in the Brazilian context from the behavioral finance perspective, based on the cultural dimensions proposed by Hofstede (2001).

The results indicate that the control variables significantly influenced individuals' level of patience. Male respondents and those older than the sample are significantly more patient. Individuals who work in financial management and have higher incomes have some degree of influence on their level of patience.

When analyzing the dimensions, the results showed robustly and strongly that more individualistic subjects with greater long-term perception are more

patient, especially when considering the last cultural dimension. These findings were not seen in the work of Wang et al. (2016), who mainly found a relationship between patience and the cultural dimension of uncertainty aversion.

Cross-referencing with the mapping of cultural dimensions of Brazilian regions, as evidenced by Hofstede et al. 2010, a certain degree of divergence is noted. For the authors, the North and Southeast regions are antagonistic from the point of view of cultural dimensions. Unlike the Southeast, the North region is less averse to uncertainty, less individualistic, and more long-term oriented. The Midwest tends toward the national average, closer to the North region (Hofstede et al., 2010).

For most respondents, verifying behavior that diverged from what is established in the literature on exponential, hyperbolic, quasi-hyperbolic, and additive discount rates was possible. Survey respondents were willing to wait for a larger delayed reward rather than a smaller immediate reward. In this sense, there is room for future research to investigate more precisely the occurrence of increasing (anti-hyperbolic) discount rates.

The findings suggest that cultural context may go beyond geographical issues. It is feasible to explore, in future improvements to this work, the association of each region and the temporal preferences indicated by individuals, in order to understand, based on these results, the relationship of the individual in financial decisions involving the feeling of patience. This suggestion for future research proved to be a limiting factor in this study.

As an implication of the study, it appears that individuals who are more concerned with planning for the future and who are willing to take greater responsibility for their finances are people who tend to have a lower discount rate, allowing them to make choices that favor a higher long-term rate of return (or lower current consumption rate), avoiding the "temptation" of short-term investments with lower, zero, or even negative returns. It is important to conduct a more detailed investigation of financial knowledge and income levels and their impact on patience levels.

The implications derived from this study include: financial education programs in schools and civil society organizations to increase knowledge about financial mathematics and the value of money over time; urban planning actions, with a focus on sustainability issues and the mitigation of practices that jeopardize the resources available to future generations; social security education programs to improve the preparation of the economically active population for the period of inactivity (due to loss of working capacity); and social programs to reduce regional asymmetries in access to formal employment and to promote the recycling of industrial waste.

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