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Theoretical-empirical Article

Behavioral Biases and the Decision-Making in Entrepreneurs and Managers

Vieses Comportamentais e a Tomada de Decisão em Empreendedores e Gestores

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ABSTRACT

Objective: the present research aims to understand the role of behavioral biases present in the investment decision in entrepreneurs and managers, in the light of the behavioral finance. **Theoretical approach:** Considering that non-financial aspects influence the decision making of investments in real assets, the present research focuses on how individual characteristics, notably behavioral biases, can affect these investment decisions, from the perspective of Behavioral Finance. **Method:** a qualitative research was developed. Interviews were held with eight managers or entrepreneurs who usually make investment decisions in real assets within their organizations. Interviews were transcribed and content analysis was used to analyze the data. **Results:** findings suggest the presence of behavioral biases in the decision-making presented by the interviewees, specifically the optimism and overconfidence, loss aversion, self-attribution, sunk cost, endowment effect, regret, conservatism, and external agent effect. Optimism, overconfidence, and loss aversion were present in all the interviewees' speeches. Regret and external agent effect emerged in entrepreneurs' speech while conservatism bias emerged in the speech of managers. **Conclusions:** entrepreneurs and managers indistinctly presented behavioral biases; however, the triggers for those biases are diverse. When it refers to insecurity in deciding, entrepreneurs allow themselves to question their own decision-making ability, by either regret or consulting an external agent, while managers hold themselves in conservative decisions.

Keywords: behavioral biases; decision-making process; qualitative research.

RESUMO

Objetivo: a presente pesquisa visa a compreender o papel dos vieses comportamentais presentes na decisão de investimento em empreendedores e gestores, à luz das finanças comportamentais. **Marco teórico:** Considerando que aspectos não financeiros influenciam a tomada de decisão de investimentos em ativos reais, a presente pesquisa se concentra em como as características individuais, notadamente os vieses comportamentais, podem afetar essas decisões de investimento, sob a perspectiva das Finanças Comportamentais. **Método:** desenvolveu-se uma pesquisa qualitativa. Foram realizadas entrevistas com oito gestores ou empreendedores que costumam tomar decisões de investimento em ativos reais dentro de suas organizações. As entrevistas foram transcritas e a análise de conteúdo foi utilizada para analisar os dados. **Resultados:** os resultados sugerem a presença de vieses comportamentais na tomada de decisão apresentados pelos entrevistados, especificamente otimismo e excesso de confiança, aversão à perda, autoatribuição, *sunk cost*, efeito dotação, arrependimento, conservadorismo e efeito agente externo. Otimismo, excesso de confiança e aversão à perda estiveram presentes em todas as falas dos entrevistados. O arrependimento e o efeito do agente externo emergiram no discurso dos empresários, enquanto o preconceito do conservadorismo emergiu no discurso dos gestores. **Conclusões:** empreendedores e gestores apresentaram indistintamente vieses comportamentais no processo decisório, mas os gatilhos para esses vieses são diversos. Quando se trata de insegurança para decidir, o empreendedor se permite questionar sua própria capacidade de decisão, seja por arrependimento, seja por consulta a um agente externo, enquanto os gestores se mantêm em decisões conservadoras.

Palavras-chave: vieses comportamentais; processo de tomada de decisão; pesquisa qualitativa.

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INTRODUCTION

The investment decision-making process in a corporate level is quite complex and many theories try to explain how such decision can be taken to achieve the best outcome possible. Financial literature theories have been showing the evolution of the subject and, nowadays, there are two different trends that are considered complementary by some authors: the traditional finance theory and the behavioral finance theory (Iquiapaza, Amaral, & Bressan, 2009). These theories diverge on the boundaries of rationality of economic agent when deciding, and those divergences originate when Smith (1776) first presents this seminal idea analyzing the market dynamics.

Behavioral finance studies the cognitive effect on decision-making, an effect ignored by the classic financial theories (Baker, Kumar, & Singh, 2018; Lobão, 2012; Macedo, 2003). While cognitive effects facilitate decision-making on the one hand, they are subject to biases, systematic and unintentional deviations from judgment caused by individual decision-maker behaviors that overlap with expected rational behavior. To explain those systematic deviations, there are several cognitive biases related to mental shortcuts (mental structures) pointed out by the literature (Camerer, Loewenstein, & Prelec, 2005).

The systematic incidence of rationality deviations can occur both in individual and corporate investment decisions. Those bypasses affect, in the long run, the alleged efficiency in the market proposed by models based on perfect rationality and provoke heterogeneous behaviors of agents, as some of them will consider their values, beliefs, cognitive and emotional elements when deciding (Lobão, 2012). The economic agent's behavioral evidence on investment decision-making is hard to explain and must be considered (Macedo, Kolinsky, & Morais, 2011), being relevant studies in this area in the finance and business markets.

Aspects connected to the decision-maker characteristics are already acknowledged as determinants of the decision-maker's behavior when making decisions (Baker & Wurgler, 2013; Kahneman & Tversky, 1979; Malmendier & Tate, 2005; Thaler, 1999; Tversky & Kahneman, 1974). Specifically on financial decisions in companies, research has highlighted personal characteristics of the decision-makers in non-financial investments. Some examples of research that consider the individuality of the manager in the financial decision-making process in companies are: Bradrania, Westerholm, and Yeoh (2016), who developed a study to investigate the effect of CEOs' behaviors in corporative investments; Liang and Reiner (2009), who researched the behavioral influence on financial decisions in low carbon plants, analyzing the effect of the institutional structure as well as the manager's behavior; and Baker, Kumar, and Singh (2018), who analyzed the effect of behavioral biases in SME owners' decision-making.

Àstebro, Jeffrey, and Adomdza (2007) identified that managers biased by optimism attract financing and other important resources for the venture. Findings of Gudmundsson and Lechner (2013) highlighted that entrepreneurs biased by optimism and by the overconfidence contribute to the opening of new ventures, showing that biases can carry out an effective role in the management of an organization. However, it must be considered that some biases, such as optimism and overconfidence, can lead the manager to make riskier decisions than the organization can hold (Koellinger, Minniti, & Schade, 2007) and, by that, incur in returns below the expectations or even losses for the company and its stockholders.

Therefore, the decision-making influenced by behavioral biases within a business world becomes complex due to the limitation of the managers' decision process, as well as the environment that surrounds them. In other words, the limitation of market information allied to the need for a fast decision can lead managers to make decisions based on their beliefs (heuristics) and, therefore, make wrong decisions that, within the business field, can financially jeopardize the company, as the studies by Agnew (2006) and Shore (2008) substantiate.

Even though behavioral biases have been studied in the investment decision-making context in companies, few studies have focused on the roles of the decision-maker: considering the agency theory, being either an owner (therefore, principal) or being an agent should lead to different decisions as they diverge in difference in priorities and interests. In that matter, developing a qualitative research might provide a potential understanding as to why the decision-making may shift. Few qualitative studies have been developed to date: when developing a qualitative study about the investment behavior of women entrepreneur, Kappal and Rastogi (2020) acknowledged the scope for research to analyze the behavior of decision-makers using primary data. Besides their work, which focused on the gender of the decision-maker, those authors also cited a qualitative study about psychological biases in individuals' financial investment behavior.

Considering the problem presented about the manager and the influence of behavioral biases in the decision-making of investments in real assets, the following research problem arises: "How behavioral biases affect the decision-making process of investment in real assets in entrepreneurs and managers?" To answer the presented question, the objective of the current research is to understand the role of behavioral biases present at

the decision-making process of investment in real assets, considering the behavioral finance theory.

LITERATURE REVIEW

Decision-making in investments

The decision-making in the business world is not simple, once there are the organization's inner and outer factors that force them to adapt or foresee opportunities evinced by the market, implicating assertive decisions so organizations can survive in a dynamic environment. Therefore, the management must be prepared to interpret such factors and, from this starting point, make decisions that will contribute to the development and growth of the organization.

In doing so, understanding the nature of the decision is necessary for the managers comprehend the outer and inner factors differently, whether working in various companies or in only one. This variation on the market understanding mainly happens when it comes to crisis and market opportunity (Dutton, 1993; Krueger Jr., 2000). An example of understanding of these factors, when managers see the same situation in different ways between organizations, is in the elaboration of the capital budget — in other words, in investment in real assets proposals.

A capital budget decision, that is, an investment project, is a concrete mark of the pursued strategy. When the individual decides for the acquisition of equipment, a brand, or a real asset substitution, he believes the projections of the cash flow compensate the amount invested and the consequent risk. Therefore, decision-making in real assets becomes even more complex once it always finds room for various interpretations about existent alternatives (Maritan, 2001) in a competitive environment that demands fast and assertive decisions (Hough & White, 2003).

Going beyond the traditional viability analysis, Lima, Yu, Silveira, and Santos (2016) point out that the decision-making varies between objective and measurable approaches and subjective and intuitive approaches, and the degree of use of each approach is determinant to the decision process. The authors attest that every decision has a subjective judgment and, therefore, cannot be taken apart from the decision-making. This is a position that converges with that of other authors who consider that personal values and individual consideration are important factors for decision-making (MacCrimmon & Wehrung, 1990). However, subjectivity in the decision-making is adamant to the principles of behavioral finance.

The effect of subjectivity in the building of the capital budget begins with the project's proposal, once ongoing projects already executed or aimed by the competition can be proposed and, therefore, the company would not look after more profitable alternatives (Lima, Yu, Silveira, & Santos 2016). This fact is called availability heuristic in behavioral finance.

Another fact pointed by Lima et al. (2016) is related to representative heuristics, that is, managers can elaborate superficial analysis based on a sole setting, disregarding other possibilities in the cash flow generation capacity. This can impact the NPV and IRR calculation; making a decision based on superficial numbers can lead to a decision error.

The role of the decision-maker in investments decisions

There are non-financial aspects that influence the decision-making of investments in real assets that are not usually considered by the normative model of traditional finance. Schneider and Meyer (1991) itemize three factor categories that influence the decision-making process: (a) individual characteristics and group dynamics; (b) internal context of the organization; and (c) environmental factors. About the internal context quoted by the authors, Pettigrew (1990) deepens the discussion and adds that the nature of the decision-making process must be considered. Internal context of organization and environmental factors, while determinants for the decision-making context, are not the scope of this study.

As for individual characteristics and group dynamics, Papadakis, Lioukas, and Chambers (1998) developed a model of factors that influence the strategic decision-making process to the board of directors and CEOs. This model highlights the dimensions of the decision-making process and the specific characteristics of the decision and emphasizes that the CEO's personality, that has as a characteristic the tendency to take risks, the level of the manager's education, the aggressiveness, and the achievement need influence the decision-making. Regarding the board of directors, the model shows that the education level and the aggressive philosophy of its members influence the decision-making process. Consequently, the authors finish with the context analysis of the external environment (heterogeneous, dynamic, and hostile) and internal (internal characteristics of the companies, business performance, corporate control, type of property, and company size). However, the model presented does not make clear if the best decisions are made by the CEOs or the board of directors; or if there is a predominance of individual decisions or group decisions.

In this discussion about the quality on decision-making (individual or group), finance literature emphasizes that research on group decisions have evolved significantly over the last years and that the more relevant decisions on

the companies economic and financial policy are made by groups, because they are prone to make more rational decisions if compared with individual decisions (Charness & Sutter, 2012; Kugler, Kausel, & Kocher, 2012; Meub & Proeger, 2018).

Although financial literature emphasized that decisions made in group have as their objective to diminish cognitive and emotional limitations of individual decisions and tries to align to the three principles described by Fama (1970) about efficient market, it neglects the heuristics in group decisions in the context of experimental economic research (Meub & Proeger, 2018).

For that matter, Kugler, Kausel, and Kocher (2012) raise doubts about the effectiveness of the group decision-making, i.e., if it is freer from cognitive and emotional effects than individual decisions. However, to some biases, group decisions are less tendentious, as in the retrospective bias case (Stahlberg, Eller, Maass, & Frey, 1995) and the overconfidence bias (Sniezek & Henry, 1989). Hinsz and Indahl's (1995) findings about anchorage in legal judgment decisions report that the legal judgments are influenced by anchors, making no difference in the cognitive and emotional influences on individual decisions.

METHODOLOGY

Research paradigm

The design of scientific research tries to establish connections between plans and structure in which the research problem was conceived and, thus, fundament the answer to such problem (Cervo, Bervian, & Silva, 2007). This work is guided by social construction, which tries to explain how people perceive, describe, and/or experiment with the world around them, including themselves (Crotty, 1998; Gergen, 2009). The authors discuss how managers and entrepreneurs perceive the organization's internal and external environments, how they describe situations experimented within a given environment, and, finally, how managers experience these changing effects in the business environment within their daily lives. Thus, the research tries to analyze how managers behave and relate with the business world in an external, market way and in an internal, individual, and everyday way.

This work can also be classified as interpretivist, as it is dedicated to the interpretation of the individual perceptions over the investment decision-making on real assets and how such decisions influence the social context in which each entrepreneur/manager and their companies are located. This approach converges with Crotty (1998) and Merriam and Tisdell (2015) ideas, who explain that the interpretative approach can be considered as a search of cultural and historical interpretations related to social life.

Research methods

The approach of this work is qualitative, considering both data collection and data analysis. The technique used for data collection was a semi-structured interview, and data analysis was supported by content analysis (Bardin, 2011). Data obtained through interview can produce a mapping of practices, values, beliefs, as well as a classification system to help the participants' speech interpretation (Duarte, 2004). The semi-structured interview is suitable for this research, as it allows the interviewees to expatiate on the subject according to their lived experiences, enabling these answers to be spontaneous and free (Lima, Almeida, & Lima, 1999). It depends on the researcher to conduct the interview according to the research's objectives, listening attentively the answers and avoiding that the interviewee speech diverges from the subject. The data obtained through such technique is adequate to the interpretive and constructivist purposes of this work.

Regarding the data analysis, the content analysis technique was used, allowing the researchers to code and to infer from the transcriptions of the interviews. Schwandt (2007) states that contemporary forms of content analysis are adopting interpretive analysis and qualitative practices, being an effective way of identifying and organizing text data and offering a good opportunity for the researcher to know how the participants see their social world (Berg, 1989). The steps of the technique are the categorization of the interview body according to theories about the research subject; the identification of words or phrases more often repeated; and the interpretation of the speeches. Bardin (2011) understands that the content analysis is a group of techniques that tries to obtain quantitative and qualitative indicators and allows to make knowledge inferences over the communication analysis.

The content analysis technique was suitable to this research, once it enabled the categorization of each dimension researched according to literature, as well as the identification of the routine words of the respondent, which helped in the categorization and data analysis and, finally, in the interpretation of the speeches, that allowed the data inferences about the factors (determined by the research) that influence the decision-making in real assets.

For Bradshaw and Stratford (2010), to ensure rigor in qualitative research, it is necessary to establish trustworthiness. For those authors, one of the strategies to ensure trustworthiness is to involve the interpretive community since the early stages of the research, assessing from the research design and schedule until the results. In

the present study, the interview schedule and coding were assessed and validated by three field experts, scholars with doctorate in business with common area of interest.

Interview schedule

The elaboration of the interview schedule was based on Merriam and Tisdell (2015). The authors explain that all the questions must be used with flexibility, aiming to facilitate the respondent understanding and to reach the research's goals. Open-ended questions were made, addressing examples of past investments. From the six types of questions for an interview suggested by Patton (2015), the questions can be categorized as experience and behavior questions — that address what was the participant's role in a decision, what did he do or not; opinion and values questions — relating to how the participant considers the results, the decision-making process; and feeling questions — related to the affective dimension of the respondent. Those questions intended to bring elements of behavioral biases, both cognitive and emotional, in the decision-making process. Background/demographic questions were made to describe the particular demographics (age, education, number of years in the job) of the participants.

Participants

The interviewees are executives, entrepreneurs, and managers. The inclusion criteria for the selection of individuals were related to the authority to make the company's investment decisions. The group of interviewees was defined according to their availability to be interviewed. The process of selecting the participants was held to maximize the variability of speech and, therefore, managers were chosen with particular social and historical characteristics that could lead to different speeches. The definition of the number of interviewees came from the perception of data saturation. Pires (2008) points out that the analysis by contrast-saturation allows the accretion and comparison of cases. The advantage of this kind of selection is the creation of models that do not require representativeness of the population; however, it excels in a careful and controlled choice of individuals who have the specified characteristics in the research problem.

According to Guest, Bunce, and Johnson (2006), saturation is obtained around six to twelve participants, because in this numbers is presented the entire researcher's targeted theme, as well as the data repetition — in other words, saturation. In this research, the saturation point was reached after seven interviews. However, the eighth interview was scheduled, and it was held. The overview of the research participants is shown in Table 1.

Table 1. Research participants.

Participant		Gender	Age	Education	Position	Business
1	PART1	M	43	Graduate	General manager	Salt extraction
2	PART2	M	54	High school	Entrepreneur	Pulp industry
3	PART3	M	56	Graduate	Director	Industrial automation
4	PART4	M	36	Graduate	General manager	Food and beverages
5	PART5	M	55	Master	Director	Energy (oil)
6	PART6	M	45	Graduate	Entrepreneur and partner	Food and beverages
7	PART7	F	26	Undergraduate	Entrepreneur and partner	Grain processing
8	PART8	M	29	Master	Entrepreneur and partner	Food and beverages

Each respondent was identified by labels to enable categorizing the text data for the content analysis. The identification label was used for depersonalizing the respondents and it was composed by 'PART' and a sequential number.

Data collection

The first contact with the participants was made through phone call, when the research objectives and procedures were explained, as well as the confidentiality of information related to the disclosure of the respondent and companies' names. The names of participants and companies were suppressed, and a consent term was signed in which the researcher pledged not to disclose the interviewees' names.

Data collection took place before the COVID-19 pandemic. The interviews were conducted in appropriate rooms, with the presence of only the researcher and the interviewee, and the average duration of the interviews was 56 minutes. In two interviews, it was mandatory to send the interview schedule before so the interviewee could read it

and decide to accept or refuse to be part of the research. The interviews were held in person and were recorded with the respondent's due consent.

Data coding

The interviews were fully transcribed, and the text files were imported into the software NVivo® v. 11. The software was used for organizing, managing, and coding data, as well as for generating maps for grouping the results for interpretation. The next step was identifying meaningful text segments, the units of data (Merriam & Tisdell, 2015), that were related to behavioral biases present in investment decision-making. The units of analysis were coded as shown in Table 2.

Table 2. Codebook for behavioral biases.

Codes	Description
Conservatism	Participants attach to a position related to an investment and they would not change it even when they are presented with information that is contradictory to their original position
Endowment effect	Participants show evidence of a skewed perception of the value of an investment depending upon whether they own it or not
External agent effect	Participants overrate consultants' or others' opinions about the decision to be made
Loss aversion	Participants expressed the long grief of losses in opposite for short celebration of positive outcomes
Optimism and overconfidence	Participants overrate their abilities in decision-making and/or foresee positive outcomes for their decisions
Regret	Participants relate regret on missing an investment opportunity because of the fear that the decision will turn out to be wrong
Self-attribution	Participants emphasize their roles in the good results of investments made as they attribute negative outcomes to others, to external sources, or to bad luck
Sunk cost	Participants show evidence that they still allocate resources on investments with low return or negative outcomes

FINDINGS

Data revealed the behavioral biases in the participants' speeches: optimism and overconfidence, aversion to loss, and self-attribution are biases manifested in almost all the individuals of this research. Sunk cost, regret, conservatism, endowment effect, and external agent effect were also identified in the participants' speech.

Optimism and overconfidence relate to the co-occurrence of the optimism bias and the overconfidence bias. Both biases overlapped at the situations reported by the interviewees. These two biases are often studied and analyzed as a whole in the financial literature (Baker et al., 2018; Barros, 2005; Weinstein, 1980; 1982), because they are close in meaning. Only the interviewee PART8 did not present signs of optimism/overconfidence. Observing the speeches' transcription, it was noticed this bias presence on the real assets decision-making, especially in equipment acquisition and in the market analysis. Excerpts like "my endorsement," "I always made and still make rentable investments," "I don't use technique to evaluate if the investment is profitable," appeared during the interviews, characterizing the bias in relation to overestimating future prediction not considering what reality allowed (Lobão, 2012; Tversky & Kahneman, 1974), which is consistent with Baker et al. (2018). The reports emphasize the optimism bias in relation to the individuals' capacity to overestimate the reality that they consider favorable, as well as not considering the unfavorable events in their analysis (Lovallo & Kahneman, 2003).

Managers PART1, PART3, PART4, PART5 and entrepreneurs PART6, PART7, and PART8 presented signs of the self-attribution bias in their speeches. The bias was not found in the individual entrepreneur's (PART2) speech; even though he could blame some external factor for the negative outcomes, this bias did not emerge in his discourse. The excerpts from interviews of both managers and entrepreneurs reveal self-attribution bias regarding the positive results obtained through new investment or a new process deployed. The positive aspect of this bias emerges in terms such as "due to my persistence," "I created …," "I was able to get a higher yield, an increase in sales," among others, showing that positive outcomes were attributed to whom made the decision.

Considering the aspect related to the imputation of negative results to others, one can also identify the presence of self-attribution in the interviewees' reports. Quotes from entrepreneurs PART6, PART7, and PART8 reveal that, although there is the attribution of wrong decisions to another associate or to the "consensus," further consideration of these results was superficial for not "interfering in the partnership," because "this could cause a commotion."

Regarding managers, decisions with negative outcomes were usually attributed to the team.

The loss aversion bias relates to the feeling of loss and earnings of the managers. In the speech of the entrepreneurs, it is noticeable that even presenting the loss aversion bias, they search for new investment opportunities, new projects, because they state that the market is dynamic and, thus, they "do not take long celebrating positive results."

On the other hand, when the results of an investment cause loss or do not bring the result expected, the individuals stated that these results "mark their memory and careers," because what remains evident is the failure, frustration, loss of personal reputation, time, and capital. There was a convergence of statements about the feeling of loss lasting longer because it is difficult to recover from a loss of invested capital and because it can lead to the company bankruptcy.

In order to characterize the presence of sunk cost bias, excerpts of the interviews that reveals the acquisition and/or substitution of real assets that failed to achieve the desired outcome were analyzed: "[the investment] hasn't paid back yet but there is still hope to recover and that is why we keep it." When the decision was to keep the investment, spending financial resources in their maintenance, the presence of the bias was positive. In the speech of the manager PART1, and entrepreneurs PART2 and PART7, the presence of sunk cost bias was clear. From the excerpts, it was noticed that the losses of investments poorly planned create a discomfort for the individuals that made the decision.

The endowment effect refers to the decision-making of real assets when the individual attributed a value to the asset and then, when deciding to discard it, would have difficulty in selling because he feels somehow attached to it. An example of this bias is "we plan to sell these obsolete assets and we try to sell them at a price above the market and we don't always succeed, but we always try." Participants PART4 and PART8 presented the endowment effect bias, and they apparently do not see the contradiction of overpricing an obsolete asset.

The conservatism bias refers to the way in which the decision-maker makes a change caused by the appearance of new information. According to this bias, the manager is even willing to make an adaptation to the new configuration; however, he will do it slowly, due to the commitment with the past and the resistance to change. It emerged at the reports of managers PART4 and PART5, when they were asked about past investments that did not work out as predicted. In PART4's speech, it was noticed that the decision-making is no longer agile, due to group decision-making. Even though PART4 is the CEO, he shows caution when deciding (Lobão, 2012; Ritter, 2003; Shiller, 2005), because the company has many stockholders, and he reports that he feels more comfortable when sharing the responsibilities of the decisions taken: "you have to be more conservative at some point because you are not making the decision all by yourself." Observing PART5's speech, it is noticeable that the company made slow changes and was attached to projects that presented loss, and that it wanted to maintain them in order to turn them into profitable projects.

The regret bias aims to emphasize the regret of the individual when decisions that should be made on a given moment were not made. At the present moment, there is the perception that such decisions would present positive results. This bias emerged in the research made from the reports of entrepreneurs PART6 and PART8, who presented signs of regret from decisions that could have been made and that would have affected, in a positive manner, the company's profits. An example of a unit of analysis that reveal the regret bias was "you are terrified to make an investment and you do not have the expected return."

Lastly, the external agent effect is about the influence external agents have at the decision-making. The decision-maker only decides over some investment after consulting an external agent, in this case, a consultant. The effect of this decision is an excessive value of the external agent's decision; however, this decision's risk keeps belonging integrally to the company. Entrepreneurs PART2 and PART6 showed the presence of the external agent effect. It is noted that there is a dependence on the external agent's opinion about investments in real assets, even though they state they are making the decisions: "I'm the one who decides to buy any equipment, but I always consult the São Paulo people [consultants] about the best option." The external agent appears as confirmer of what the individual should decide, even though the agent does not share the risk or the responsibility of the outcome of such decision.

DISCUSSION

Kahneman and Tversky (1979) comment that, in behavioral finance theory, biases are systematic deviations that do not happen randomly; they appear in a large number of people. In the systematic review realized by Calzadilla, Bordonado-Bermejo, and González-Rodrigo (2020), overconfidence, conservatism bias, loss aversion, self-attribution, regret bias, and endowment effect figure amidst the biases most associated with behavioral finance. In the present study, sunk cost bias and external agent effect also were identified in the investment decision-making. Figure 1 shows this research's interviewees and their relationship with the three biases: optimism and overconfidence, loss aversion, and self-attribution. The figure also emphasizes the influence by at least two out of the three biases on decision-making, which is compatible with the behavioral finance idea that the biases occurrence is systematic.

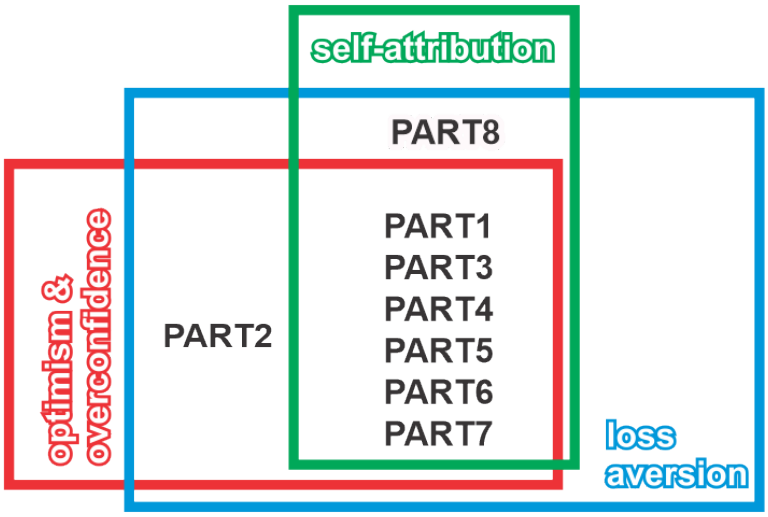

Figure 1. Biases in common: Optimism and overconfidence; loss aversion; and self-attribution.

Data corroborate Cassars' (2010) findings that optimistic forecasts of entrepreneurs are exacerbated by the fact that "predictions are anchored on plans in which individuals have a vested interest." Overconfidence and excess of optimism were also linked to experience (PART1), to previous performances (PART2), and to the illusion of control (PART4). PART3's speech did not reveal any reason or justification for those biases. The co-occurrence of illusion of control and excess of optimism was reported by Simon, Houghton, and Aquino (2000): facing uncertainty, entrepreneurs convince themselves that they can control and predict the outcome of their investments. Kartini and Nahda (2021) also reported that overconfidence and optimism significantly affect the investment decisions and relate both biases to the illusion of control and illusion of knowledge. For Butt, Jamil, and Nawaz (2015), overconfidence bias was not related as a significant characteristic of entrepreneurs, corroborating the current finding that this bias is also found in managers.

Through the self-attribution bias, one seeks to analyze the evidence that individuals attribute the decisions with positive results to themselves and the wrong decisions to others, whether by chance, bad luck, or some external factor that he honestly thinks is the cause of the negative outcome resulting from the wrong decision (Doukas & Petmezas, 2007). From all the participants, only the individual entrepreneur did not associate good performance with his decisions, maybe because he is the only decision-maker at the company. The segments analyzed reveal that participants attribute to themselves a judgment ability to decide over investments in real assets superior to their peers, as the findings of Doukas and Petmezas (2007) and Lybby and Rennekamp (2012). The findings are also aligned with Baker et al. (2018): when studying behavioral biases in SME owners, those authors found that those owners attribute success more often to internal factors, while poor performances are attributed to external factors. Furthermore, the co-occurrence of self-attribution and overconfidence in the individuals also corroborate the findings of Mushinada and Veluri (2019), who found a significant positive covariance between those biases, and they both arise with the extent of uncertainty (Mushinada & Veluri, 2020).

The loss aversion bias was the only one manifested by all participants, and it corroborates the findings of Baker et al. (2018) and Kartini and Nahda (2021). This is an emotional aspect and concerns the individuals who react more to the pain of loss than to the benefit of the earn (Hardin & Looney, 2012; Shafir, Diamond, & Tversky, 1997; Thaler, Tversky, Kahneman, & Schwartz, 1997). Managers and entrepreneurs state that the earning is projected and, when it is obtained, it generates a feeling of well-being, revealing the business efficiency (Hardin & Looney, 2012; Shafir et al., 1997; Thaler et al., 1997). Other factor to be considered refers to the loss aversion of managers and entrepreneurs, that is to say, managers understand that aversion to loss does not only apply to unsatisfactory liability or turnover to the company, but also to the matter of the impact that the investment can bring to their careers and reputations. To entrepreneurs, loss aversion can be characterized as loss of competitiveness and, ultimately, the deterioration of personal assets.

The other biases present in the study were not manifest in all participants. Figure 2 exposes the participants who presented the following biases: sunk cost bias, endowment, external agent effect, regret, and conservatism. Those biases appear to be responses to negative outcomes from past decisions, whether maintaining those investments, fearing to make new investments and regretting not making them in the future, or not changing positions in the presence of new information.

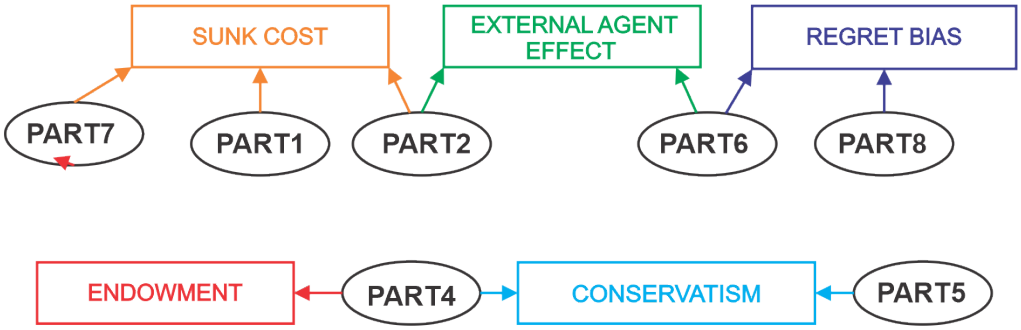

Figure 2. Sunk cost bias, external agent effect, regret, endowment effect, and conservatism effect.

Sunk cost bias was manifest in investments' decision-making process, corroborating the findings of Long, Nasiry, and Wu (2020) that decision-makers show a strong tendency to delay project termination. Participants tried to recover from investments' losses incorporating them to new investments or solving them on routine results of the company, as predicted by Arkes and Blumer (1985). There are signs that these loss incorporations in new investments are connected to the individual's personal responsibility, in the sense of causing a positive feeling that justifies the discomfort brought by the lost investment (Schaubroeck & Davis, 1994). When questioned about past investments, managers PART3, PART4, PART5 and entrepreneurs PART6 and PART8 presented signs of a behavior aligned to the rational finance theory in relation to the decision-making of not incorporating loss costs in new investments, thus not harming the evaluation of these new investments.

Their reports reveal that decision-makers, knowing the equipment situation, hamper their sell in relation to establishing prices above market, or 'interest values.' Such fact supports Thaler's (1980) findings, that an individual understands the difference between the effective good cost and the opportunity cost; in other words, he tries to obtain an earning in the act of selling the good because he knows its properties and, thus, hampers the sell until getting the desired value.

Even though PART4 is the CEO, he overcares when deciding, avoiding disruptive changes (Lobão, 2012; Ritter, 2003; Shiller, 2005), because the company has many stockholders, and he reports that he feels more comfortable when sharing the responsibilities of the decisions taken. Observing PART5's speech, it is noticeable that the company made slow changes and was attached to projects that presented loss, and that it wanted to maintain them in order to turn them into profitable projects. These findings go against Hirshleifer's (2001) research, once the management, even having the data that show that the investment presented loss, continued to invest and, in this manner, increased the conservatism bias effect. It is important to notice that the new administration does not promote these changes in a fast pace and, thus, does not eliminate this bias according to the participant's speech.

In these entrepreneurs' speeches, one can notice that investments that could have been made in the past but were not made, and that after a while proved to be profitable, made managers regret not having invested (Shefrin, 2002). Another important factor lies in the speech of PART8, as it shows that if an investment brought loss, it implies that the entrepreneurs are wary about making another investment, validating Bailey's and Kinerson's (2005) findings, connecting this bias to risk tolerance.

From this last group of biases, both regret and external agent effect show that even though entrepreneurs' behavior is imbued with overconfidence, they seem to doubt their own ability in past or current decision-making processes. Conservatism, which appeared only in managers' speeches, reveals a sense of insecurity, as they suggest a hesitation in taking a risk.

In Shepherd, Williams, and Patzelt's (2015) review of entrepreneurial decision-making, they state that studies found that entrepreneurs are more biased than non-entrepreneurs are. They report, for instance, that entrepreneurs are more optimistic and overconfident. The current research did not intend to measure or quantify the effect of behavioral biases in investing, but instead, it intended to detect the presence of those biases in decision-makers.

CONCLUSIONS, IMPLICATIONS, LIMITATIONS, AND FUTURE RESEARCH DIRECTIONS

The investment decision-making in real assets requires a consistent set of information, technical studies, risk evaluations, formulations of financial and economical settings, etc., so the mentioned investment can bring the

desired outcome. However, the investment decision-making is not only made by objective factors, as the ones mentioned above, which, by being elaborated, imply the guarantee of the planned result. Besides the objective factors, the individual's subjectivity influences investment decision-making. The literature emphasizes that such factors influence the decision-makers and the results of the investments they plan. Consequently, this research tried to enlighten the relation between behavioral bias and decision-making.

For that matter, the objective of understanding the effects of behavioral biases present in investment decision-making in real assets in entrepreneurs and managers was achieved. The results emphasize that there are signs of behavioral biases influencing investment decision-making in real assets, when the decision-maker is either an entrepreneur or a manager.

Implications

The present study is theoretically valuable for exploring the understanding of investment decision-making by the perspective of biased individuals as it highlights the indistinctly presence of behavioral biases in both entrepreneurs and managers. However, the triggers for those biases are diverse: when it refers to insecurity in deciding, entrepreneurs allow themselves to question their own decision-making ability, by either regret or consulting an external agent, while managers hold themselves in conservative decisions. The study is also valuable for practice as the awareness of the behavioral biases is the first step in mitigating their negative effects on decision-making.

Limitation of the study and directions for future research

This research's limitation can be related to the subject's availability to disclose information about the investments and the possibility of answers that do not correspond to the subject's reality, thus retaining important data for the development of the research in order to hide the subject's identity or its leakage. Other limitations are the gender imbalance of research participants, which in fact might reflect the predominance of male individuals in decision-making positions, and the possibility of answer induction lead by the researcher, despite the extreme caution of the researcher in that matter. There is the possibility of over-explanation in each question, and this can enlighten what the researcher expects as the answer and, thus, induce the interviewee's answer, harming the research results.

For future research, it is recommended to increase the number of participants, considering company size, corporate structure, and environmental dynamics to explore the variation in triggering factors of the behavioral biases in samples of entrepreneurs and managers.

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1st author: conceptualization (lead); data curation (lead); formal analysis (lead); funding acquisition (lead); investigation (lead); methodology (lead); project administration (lead); resources (lead); software (lead); validation (equal); visualization (equal); writing – original draft (lead); writing – review & editing (equal).

2nd author: conceptualization (supporting); formal analysis (supporting); investigation (supporting); methodology (supporting); project administration (supporting); supervision (lead); validation (equal); visualization (equal); writing – review & editing (supporting).

3rd author: conceptualization (supporting); formal analysis (supporting); methodology (supporting); writing – original draft (supporting); writing – review & editing (equal).

Peer Review Method

This content was evaluated using the double-blind peer review process. The disclosure of the reviewers' information on the first page, as well as the Peer Review Report, is made only after concluding the evaluation process, and with the voluntary consent of the respective reviewers and authors.

Data Availability

The authors claim that all data used in the research have been made publicly available through the Harvard Dataverse platform and can be accessed at:

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