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Sunk cost effect in the decision-making process: an analysis with accounting and business administration students

Efecto sunk cost en el proceso de toma de decisión: un análisis con discentes de contabilidad y administración

Efeito *sunk cost* no processo de tomada de decisão: uma análise com discentes de ciências contábeis e administração

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Abstract

Purpose: The objective of this paper was to analyze the influence of the sunk cost effect in the decision-making process of Accounting and Business Administration undergraduate students of the Federal University of Rio Grande do Norte.

Methodology: The sample comprised 655 students, of which 347 were from the Accounting program and 308 from a Business Administration program. Data were collected through the application of structured questionnaires, based on the studies of Arkes and Blumer (1985), Rover, Wuerges, Tomazzia and Borba (2009) and Silva and Domingos (2010). After tabulation, the data were analyzed through descriptive statistics, as well as a Mann-Whitney *U* test to verify if there are differences between the answers of the Accounting and Business Administration students.

Results: The main results suggest that the amount of sunk cost can influence the occurrence of the sunk cost effect, and this evidence is perceived through the mean values, considering that the reduction of the amount of sunk cost is inversely proportional to the average disposition of the respondents in continue investing in the course of action. In addition, to identify that the investigated students take the sunk costs into consideration in the decision-making process, it is verified that there is no statistically significant difference between the medians of the respondents with regard to the questions that allow identifying the susceptibility to the sunk cost effect in the context of business decision-making.

Contributions of the Study: The study contributes to signal that the future professionals of Administration and Accounting are susceptible to the sunk cost effect, which can imply in a report of biased accounting information by future accountants, as well as biased decisions by future administrators. Furthermore, these results contrast previous evidence that suggests that agents from different areas of knowledge react differently to the presence of sunk costs.

Keywords: Sunk cost. Decision-making. Cognitive bias.

Resumen

Objetivo: El objetivo de este estudio es analizar la influencia del efecto sunk cost en el proceso de toma de decisión de los estudiantes de graduación en Administración y Ciencias Contables de la Universidad Federal de Rio Grande do Norte.

Metodología: La muestra del estudio comprende 655 estudiantes, siendo 347 del curso de Ciencias Contables y 308 del curso de Administración. El análisis de datos fue realizado por medio de la aplicación de cuestionarios estructurados elaborados con base en los estudios de Arkes y Blumer (1985), Rover, Wuerges, Tomazzia y Borba (2009) e Silva y Domingos (2010). Después de tabulados, los datos fueron analizados por medio de la estadística descriptiva, así como se realizó la prueba de *U* de Mann-Whitney para verificar si existen diferencias entre las respuestas de los académicos de Ciencias Contables y Administración.

Resultados: Los principales resultados sugieren que el monto de costo perdido puede influir en la ocurrencia del efecto sunk cost, siendo esta evidencia percibida por medio de los valores de las medias, teniendo en vista que la reducción del monto del costo perdido es inversamente proporcional a la disposición media de los medios respondedores en continuar invirtiendo en el curso de acción. Además de identificar que los sunk costs son tomados en consideración en el proceso de toma de decisión por parte de los estudiantes investigados, se verifica que no hay diferencia estadísticamente significativa entre las medianas de los encuestados en lo que se refiere a las cuestiones que permiten identificar la susceptibilidad al efecto costo irrecuperable en el contexto de la decisión empresarial.

Contribuciones del Estudio: El estudio contribuye al señalar que los futuros profesionales de Administración y Contabilidad son susceptibles al efecto sunk cost, lo que puede implicar en un report de informaciones contables venidas por parte de los futuros contadores, así como tomas de decisiones viesadas por futuros administradores. Adicionalmente, contrapone evidencias anteriores que sugieren que los agentes de diferentes áreas de conocimiento reaccionan de forma diferente a la presencia de costos irrecuperables.

Palabras clave: Sunk cost. Toma de decisiones. Vieses cognitivos.

Resumo

Objetivo: O objetivo deste estudo é analisar a influência do efeito *sunk cost* no processo de tomada de decisão dos estudantes de graduação em Administração e Ciências Contábeis da Universidade Federal do Rio Grande do Norte.

Metodologia: A amostra do estudo compreende 655 estudantes, sendo 347 do curso de Ciências Contábeis e 308 do curso de Administração. O levantamento de dados foi realizado por meio da aplicação de questionários estruturados elaborados com base nos estudos de Arkes e Blumer (1985), Rover, Wuerges, Tomazzia e Borba (2009) e Silva e Domingos (2010). Após tabulados, os dados foram analisados por meio da estatística descritiva, bem como foi realizado o teste *U* de Mann-Whitney para verificar se existem diferenças entre as respostas dos acadêmicos de Ciências Contábeis e Administração.

Resultados: Os principais resultados sugerem que o montante de custo perdido pode influenciar na ocorrência do efeito *sunk cost*, sendo esta evidência percebida por meio dos valores das médias, tendo em vista que a redução do montante do custo perdido é inversamente proporcional à disposição média dos respondentes em continuar investindo no curso de ação. Além de identificar que os *sunk costs* são levados em consideração no processo de tomada de decisão por parte dos discentes investigados, verifica-se que não há diferença

estatisticamente significante entre as medianas dos respondentes no que tange às questões que permitem identificar a suscetibilidade ao efeito custo irrecuperável no contexto de decisão empresarial.

Contribuições do Estudo: O estudo contribui ao sinalizar que os futuros profissionais de Administração e Contabilidade são suscetíveis ao efeito *sunk cost*, o que pode implicar em um *report* de informações contábeis viesadas por parte dos futuros contadores, bem como tomadas de decisões viesadas por futuros administradores. Adicionalmente, contrapõe evidências anteriores que sugerem que os agentes de diferentes áreas de conhecimento reagem de forma diferente à presença de custos irrecuperáveis.

Palavras-chave: *Sunk cost*. Tomada de decisão. Vieses cognitivos.

1 Introduction

The decisions are part of the individuals life and are, mostly, influenced by a series of factors that can be conscious or not, since it is rare to find the concepts of perfect rationality in the decision making of the human being. In this sense, what is usually observed is a process full of interferences and misrepresentations created by psychological aspects that are historically intrinsic to individuals, and it is therefore imprudent to believe that man has a hyper-rationality (Mosca, 2009; Magalhães & White, 2014).

In this situation, when starting to execute planning, sometimes it is verified that things do not happen as imagined, as the investments in research and development, and in the brand promotions (Roth, Robbert, & Straus, 2014; Hong, Huang, & Zhao, 2018). This is the moment when the individual questions whether to proceed or abandon the planning (Schulz-Hardt, Vogelgesang, Pfeiffer, & Thurow-Kröning, 2009).

However, in some cases, it may happen that the individual, even receiving a negative return, persists in an investment plan whose committed values cannot be recovered independently of future decisions, that is, they are classified as sunk costs (Coleman, 2010; Ho, Png, & Reza, 2014).

When individuals choose to maintain planning even in the face of a negative return, we are faced with the "fallacy of honoring sunk costs", provided that this decision is sustained on the initially incurred cost (Arkes & Ayton, 1999; Kelly, 2004). Finally, when the individual happens to act according to the decision made, there is the so-called "sunk cost effect". Thus, according to Arkes and Blumer (1985), the sunk costs motivate a growing tendency to continue investing once money, effort or time has been consumed.

In the sunk costs context, the justification for past decisions is to continue investing values in an unstructured project (Silva & Domingos, 2010). Based on this perspective, the authors point out that people are more committed to a previously chosen alternative if they become responsible for that decision at an earlier point in time. Studies such as Bazerman, Giuliano and Appelman (1984), Keil, Truex and Mixon (1995) and Moon (2001) analyze that "blame" for a sunk cost may increase the investment to continue the project.

In this perspective, Kahneman and Tversky (2017) defend the "loss aversion" as an adequate explanation for the sunk cost effect. That is, they consider that in situations where there are certain losses involved, decision-makers tend to be risk-oriented; in the case of certain gains, they are risk-averse.

In order to discuss, compare and investigate the sunk cost effect, investigations have been carried out using questionnaires with hypothetical scenarios (Tversky & Kahneman, 1981; Garland, 1990; Liang, Lee, & Tung, 2014).

Thus, the following research problem arises**: are future accounting and administration professionals influenced by the sunk cost effect?** Thus, the objective of this study is to analyze the influence of the sunk cost effect on the decision-making process of undergraduate students in Business Administration and Accounting of the Federal University of Rio Grande do Norte (UFRN).

This research becomes relevant while analyzing the behavioral aspects of undergraduate students in Accounting and Business Administration regarding the sunk cost effect, considering that the sunk costs can affect the information reported by the future accountants, as well as the judgment of the administrator's decisions, which are responsible for the decision-making process in companies. In addition, it becomes relevant to expand the discussions about this cognitive effect in the strategic decisions of investments, in order to minimize the risk of business failure, as reported by Rodrigues, Freire e Silva (2016).

Thus, the present study contributes to the practice by demonstrating that individuals who will be directly involved in the decision-making process are susceptible to the sunk cost effect, which may negatively affect companies from the moment that these individuals do not consider rational assumptions in deciding to persist (or not) in a given investment.

Furthermore, it contributes by demonstrating that the occurrence of the sunk cost effect is independent of the area of academic formation of the student, indicating the importance of a greater discussion about the study of the sunk costs in both curricular frameworks of the Business Administration and Accounting courses.

Finally, this study contributes to the practice by understanding how business and accounting students behave in situations involving the sunk cost effect in different scenarios, both in the business and in personal contexts. The study differs from the Miranda, Silva, Anjos and Wink (2010) research by inserting a larger number of scenarios in the business context, seeking to better capture the susceptibility of respondents to this cognitive bias, as well as analyzing the sunk effect cost in personal decision-making context, not just in the business context.

2 Theoretical framework

2.1 Behavioral finance

The Modern Finance Theory is based on the assumption that economic agents are rational since they would consider all available information in a decision-making process (Frydman & Camerer, 2016). In this sense, this theory describes the investor *homo economicus* as an economic agent of unlimited rationality, which is able to analyze all available information and consider all hypotheses for problem-solving (Scotti, 2007).

According to Barberis and Thaler (2002), rationality has two meanings in finance. The first is based on the assumption that the beliefs of market agents are appropriate because the subjectivity used to determine the future effects of the unknown variables correlates with the achievements observed earlier. In the second, it is assumed that agents make normally acceptable choices in relation to the expected utility.

To be considered rational, it is necessary that these choices be consistent and coherent. However, human assimilation is prone to imperfections, thus, the change of a point of view

can reverse a decision, which violates the initial assumption of rationality (Tversky & Kahneman, 1981).

According to the model described in the Expected Utility Theory, individuals are totally rational on decision-making, are risk averse and aim to maximize their utility (Savage, 1972). However, through empirical tests, researches on Behavioral Finance disputes these assumptions that individuals are rational, that is, there are aspects capable of inducing their position in the decision-making process.

In this sense, Behavioral Finance Theory began to be developed, being led by two Israeli psychologists, Daniel Kahneman and Amos Tversky, in 1979, to explain the phenomena that affect human behavior (Arruda, 2006).

Considered by Corrêa and Panhoca (2010) as an area that incorporates knowledge from other areas, such as Psychology and Sociology, Behavioral Finance seeks to understand the decisions of economic agents based on the assumption that they have limited rationality, unlike what is predicted by the Modern Financial Theory.

2.1.1 Behavioral Finance: Prospect Theory

The Prospect Theory was created by Kahneman and Tversky (1979) as a possibility of choice compared to Expected Utility Theory, which was seen as the rational choice standard and used as a descriptive model of economic decision-making practice in risky conditions.

Tversky and Kahneman (1979) argue that, unlike the Expected Utility Theory, Prospect Theory assumes that agents are not only concerned with the outcome of their wealth, but with the change of this wealth motivated by their gains or losses. The authors verify that each decision tends to be analyzed independently, and the responses obtained with experiments propitiated them to propose a hypothetical value function, according to Figure 1, in which the agent behaves contrary to risk, for gains, but predisposed to risk, for losses. Kahneman and Smith (2002) explain that, for the Prospect Theory, the hypothetical value function is in the form of S, that is, it is concave for gains and convex for losses, with zero point curvature.

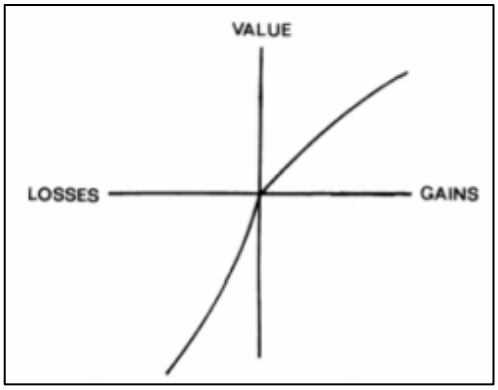

Figure 1. *Hypothetical value function of prospect theory*
Source: Kahneman and Tversky (1979).

Kahneman and Tversky (1979) discerned that some choices in risky conditions showed important effects, which were contradictory to the applicability of the Expected Utility Theory. The progress of Prospect Theory was supported by empirical analyzes which provided evidence that it was possible to reverse a preference among alternatives of a decision

according to the point of view that the problem was presented. Based on this perspective, the study on the framing effect was developed, which considers that the way information is presented influences the way it is captured (Tversky & Kahneman, 1981).

Prospect Theory distinguishes two phases in the individual decision-making process: an initial problem-editing stage, in which it organizes and restructures the options to facilitate the next assessment and choice, and a subsequent evaluation step that converts results and probabilities into proposals offered (Ávila & Figueiredo, 2009).

However, it should be pointed out that Behavioral Finance does not aim to overlap other theories, but rather to complement them by presenting behavioral aspects to understand the decision-making process (Pimenta, Borsato, & Ribeiro, 2012).

2.2 Sunk costs effect

Sunk costs, also unrecoverable costs, are costs that theoretically need not be considered in the face of opinion or decision. However, Arkes and Blumer (1985) and Gourville and Soman (2002) argue that individuals have difficulties in not considering such costs in the decision-making process.

According to Jiambalvo (2009), sunk costs are not important in the decision-making process because they occurred in the past and cannot be modified when decisions are made. The Modern Financial Theory is based on the pursuit of the maximization of expected utility and considers sunk cost as irrelevant, not serving as a basis for future decisions. This is because it refers to costs incurred in the past and that will not be modified regardless of which decision is made (Moon, 2001; Silva & Domingos, 2010).

On the other hand, there is evidence that these costs are not always ignored, since they can interfere in the way that a decision is made, transgressing the Expected Utility Theory, which can lead to misconduct in decision making (Laing, 2010; Laing, Ross, & Joubert, 2014).

Braverman and Blumenthal-Barby (2012) defined the sunk cost effect as the tendency to follow a course of action, even after it has proved to be ineffective because the resources have already been invested. Such perspective may be a justification for people who choose to pursue an investment with a conscience who will not achieve the expected results just because they have already invested some resource and do not reflect on a more effective, more viable and less harmful alternative to correct the situation (Pavlic & Passino, 2010).

One of the first studies that investigate and discusses the sunk cost effect is the field experiment conducted by Arkes and Blumer (1985). The authors aimed to identify differences in behavior among three groups of ticket buyers of a theater season. Participants were chosen occasionally to pay different prices, one group paid the full price and the other two paid the amount with different discounts. The experiment found that those who paid the full ticket price visited the theater during the season more than those who had discounts on the price.

Table 1 shows the studies carried out that investigated the sunk cost effect in the decision-making process.

Table 1
Studies on the sunk cost effect.

Author(s)	Objective	Sample	Main Results
Máñez, Rochina-Barrachina, Sanchis and Sanchis (2009)	Verify the sunk cost effect on research and development decisions. In addition, they also verify if these costs are different based on the firm size and possible differences in terms of technological regimes.	756 companies were analyzed through a balanced panel data from the period of 1990 to 2000.	It has been found that past research and development investments play a relevant role in current research and development investment decisions, indicating a possible existence of sunk costs. In addition, they identified that larger and advanced technology companies have higher sunk costs than smaller and lower technology companies.
Miranda *et al.* (2010)	Investigate whether agents with accounting knowledge react differently in decisions where sunk costs are present.	354 individuals, among students and teachers in the Business Administration, Accounting and Economics areas; Accounting professionals; and Businessmen.	It was concluded that the knowledge in accounting helps significantly in making better investment decisions in the presence of sunk cost.
Silva, Bruno and Baqueiro (2012)	Identify the occurrence of irrational insistence when information about the amount of sunk costs or the project conclusion percentage is presented in a business or personal scenario.	128 professionals with different profiles, selected from postgraduate courses of Higher Education Institutions of Salvador, Bahia.	The fact that the individual has more experience in management positions, apparently, did not influence the occurrence of the bias, as well as the fact of having greater performance in private organizations when compared to those with greater performance in public organizations.
Altoé, Klein, Oliveira, Fragalli and Almeida (2013)	Verify the occurrence of the sunk costs effect in relation to the academic level of students.	46 participants – masters and masters students in Accounting of a Federal Institution of Education located in a state of the South Region.	The results show that the discontinuity decision of the investment project is the predominant one, for masters as well as masters degree students. The test carried out showed that there is no relation of dependence between the academic level of students and the perception of the sunk cost effect in the investment decisions.
Liang, Lee and Tung (2014)	Investigate if the sunk cost effect influence on the behavior of e-commerce consumers.	Experiments were performed with 400 students from an educational institution that is not described in the study.	The results show that the sunk cost effect significantly influence the behavior of e-commerce consumers. It was found that the sunk costs of an initial choice and of a new choice influenced the decision to make a new purchase. Finally, it has also been found that the sunk costs,

			the service quality of an initial choice and a new choice are related to the level of regret felt (or satisfaction) of the initial choice.
Munaro, Cunha, Dalazen, Martins and Silva (2015)	Verify the influence of the framing and sunk costs effects in the decision-making on investments. More specifically, it aims to analyze the intention of investing work, budget and time in the past and future perspective of a project. In addition, it is also intended to compare the effects of the framing and sunk costs between gender.	Three different investment propositions were applied to 226 students of the Business Administration course.	It is observed that the intention of decision-making is focused on the amount of money invested in the project (past) and jeopardizes future investments, especially for the female gender, which presented as more susceptible to the sunk cost effect than the male gender. In addition, small changes in the framework of a project's progress, whether linguistic, quantitative (percentage) or benchmarks, greatly alter the intent of decision-making in whether to continue with the same project or change the project.
Pavão, Grejo and Moraes (2015)	Verify how accounting students are influenced by the sunk cost effect through scenarios of personal decisions following the assumptions of the Prospect Theory.	Students of first and last years of the accounting course of private and public universities in a municipality of the State of Paraná.	It is observed that the unrecoverable value with the choice of alternatives is not considered in decision-making, which means, in a general way, that accounting students are not influenced by the sunk cost effect and it can be stated that individuals who know the sunk cost effect are more impacted by this cost when compared to those they do not know.
Rodrigues, Freire and Silva (2016)	Evaluating the satisfaction level of entrepreneurs with their companies' results and the motivation to start a new business related to the occurrence of sunk costs, house money effect and regret aversion.	64 entrepreneurs from the state of Rio Grande do Norte, through the application of questionnaires for data collection.	The results show that the respondents are subject the sunk costs, House Money effect and regret aversion. However, it is not possible to assert a statistically significant relationship between these three biases and the motivation to start a new business, since it was verified no statistically significant dependence between sunk costs and house-money effect with the satisfaction of current results.

Source: The authors.

Based on the above-mentioned researches, it is observed that various studies' participants, such as undergraduate and graduate students, and professionals as well, consider the sunk cost in their decisions. Thus, this study will use these studies as the basis for the analysis and discussion of the sunk cost effect.

3 Methodology

The data were collected through the application of questionnaires based on Arkes and Blumer (1985), Rover et al. (2009) and Silva and Domingos (2010), including situations that involve sunk cost effect. The questionnaires were segregated into three parts.

The first part contains information that characterizes the respondent (gender, age, marital status, undergraduate course and academic term). The second part, in turn, presents problems in the business financial environment and the third part, finally, presents two questions for personal decisions. Table 2 shows a summary of the instrument applied to respondents.

Table 2
Summary of questionnaire structure

Part	Questions	Relevant information
1	1 to 4	Respondent characterization
2	5	9 million have already been invested
	6	5 million have already been invested
	7	1 million have already been invested
	8	There is no initial investment information
3	9	Paid trip in the amount of R$ 1.200,00
	10	There is no initial investment information

Source: Search data.

Based on the research of Arkes and Blumer (1985), an initial problem was elaborated and, from it, the other variations in relation to the volume invested in the project. The problems presented in the second part of the questionnaire were adapted to the decision-making context of the technology industry. Of the four problems related to the financial environment, three contained scenarios that approached various initial investment amounts (R$ 9 million, R$ 5 million, R$ 1 million e R$ 3 million).

Considering that the questionnaires would be answered by students of Business Administration (questionnaire type A) and Accounting (questionnaire type B), the first problem of the second part of questionnaires A and B investigates the disposition to continue an investment in a creation of ecologically sustainable materials, knowing that R$ 9 million (90% of the budget) had already been invested and could not be used in another project. Besides this information, it is also evidenced that a competitor started a marketing campaign for a material that has the same raw material used, however, the material of this competitor is more economical and efficient.

From this scenario, students should indicate their disposition on a scale of 0 (zero) to 100 (one hundred) on investing (questionnaire A) or suggesting the investment (questionnaire B) of the next 1 million available in this project. In this sense, it is verified that the questionnaires differ, since respondents of questionnaire A, as future administration professionals, should indicate their disposition to invest in the project, while respondents of questionnaire B, such as future accountants, should indicate their disposition to suggest if an investment should be done by the administrators.

To assess the effect of investment information, the following three problems in part 2 also present scenarios involving other values (50%, 10% and 0). In the second problem of this

part, there is a budget of R$ 10 million destined to a third dimension (3D) virtual reality glasses project. Thus, when R$ 5 million have already been invested, knowing that this value cannot be used in another project and that another company started a marketing campaign for a similar glass, but more economical, students should indicate their disposition to invest in the project (questionnaire A) or indicate the disposition to suggest that the administrator should invest (questionnaire B).

The third scenario approaches the development of new business systems (Business Intelligence), in which a budget of R$ 10 million was available for the development of new systems. Thus, knowing that R$ 1 million (10%) had already been invested in the development of the project, and that a competing company had launched a system with some advantages (functionalities), students should indicate their disposition to invest in the project (questionnaire A) or indicate the disposition to suggest that the administrator should invest (questionnaire B).

The fourth situation presents a similar scenario of an investment in a research project for the construction of a new model of automobile that uses only electric energy, informing that it was missing R$ 3 million for the project to be completed. However, the scenario does not inform the initial amount invested, which makes this scenario neutral.

It is highlighted, then, that in the four scenarios, the manager should indicate the disposition to continue investing in the project. Based on the scale proposed by Silva and Domingos (2010), respondents should indicate, on a scale of 0 to 100, the disposition to continue investing in the project considering 0 (zero) as the least disposition to continue investing in the project, and 100 (one hundred) the maximum disposition to continue the investment.

Part 3 presents two personal decision contexts. In the first problem, based on the personal question of Silva and Domingos (2010) research, R$ 1,200.00 was paid for a five-day trip to Porto Seguro, while the five-day trip to Salvador was won in a lottery, in other words, there was no expense. In addition, there is the perception that the trip to Salvador will be more enjoyable.

The second question, based on Rover *et al.* (2009), represents a neutral situation, that is, the initial expenditure is not informed, and the respondent must choose which events he wants to participate. In that case, the students were subscribers to a newspaper and they won tickets for a movie premiere. However, after a few minutes watching the movie, they realize that this was not interesting. Thus, after receiving a message with an invitation from some friends to hang out, respondents should indicate if they would continue to watch the movie or not.

The third part of the questionnaire aims to assess if the situation (personal decision or financial decision) of the participant influences the decision-making process. The purpose of the research was informed to the participants, but their subject was not disclosed in order not to influence the answers of those who were not aware of sunk costs. The mean response time of the questionnaires was 20 minutes.

The Accounting and Business Administration classes were defined by convenience, including students from all academic terms of the course. The data collection was carried out from May to June 2018. A total of 659 questionnaires were applied.

However, given that some questionnaires did not contain all the answers necessary to carry out the study, 4 questionnaires were excluded: 1 questionnaire type A (Business Administration) and 3 questionnaires type B (Accounting). Thus, the final sample of

Accounting is composed by 347 students, out of a population of 686, while the final sample of Business Administration is composed by 308 students, out of a population of 790 students.

After tabulation, the data were analyzed by descriptive statistics, as well as the Mann-Whitney U test to identify if there are statistically significant differences between the responses of Accounting and Business Administration students regarding the sunk cost effect in the decision-making context.

According to Fávero and Belfiore (2017), the Mann-Whitney U test should be applied to quantitative or qualitative variables on an ordinal scale, aiming to verify if there are statistically significant differences between two non-paired samples, having a null hypothesis that there is equality between the medians (H_0: $\mu_1 = \mu_2$).

Considering that the two groups of the present study are not paired (347 students of Accounting and 308 students of Business Administration), as well as that the scales of questions related to the sunk cost effect in the business decision context (questions 5 to 8) are ordinal, the choice of the Mann-Whitney U test was chosen to verify if there are statistically significant differences between the answers of the Accounting and Business Administration students.

However, it should be noted that the tests did not cover questions related to the personal context (questions 9 and 10), since both Mann-Whitney U test and other non-parametric tests that aim to compare groups (such as sign test, McNemar test, Wilcoxon test, Kruskall-Wallis test, among others) should not be applied for two non-paired samples, as well as for nominal qualitative data (Fávero & Belfiore, 2017), as in these questions.

4 Results and discussions

4.1. Respondents' profile

Regarding the Business Administration students, respondents of questionnaire A, 164 were male (53.24% of the sample) and 144 were female (46.75% of the sample), 90.90% presented single marital status and most of the interviewees studied from the fifth to the eighth academic term of the Business Administration course (66.23% of the sample), mostly with ages between 19 and 29 years old (79.54% of the sample), as evidenced in Table 3.

Table 3
Results of the respondents' profile

Item		Quantity			Frequency		
Course		Business Administration	Accounting	Total	Business Administration	Accounting	Total
Gender	Male	164	189	353	53.24%	54.46%	53.89%
	Female	144	158	302	46.75%	45.53%	46.11%
Marital Status	Single	280	294	574	90.90%	84.72%	87.63%
	Married	25	49	74	8.11%	14.12%	11.30%
	Divorced	3	4	7	0.97%	1.15%	1.07%
	Widower	0	0	0	0%	0%	0.00%
Academic Term	1st to 4th	102	-	-	33.11%	-	-
	5th to 8th	204	-	-	66.23%	-	-
	1st to 5th	-	188	-	-	54.17%	-

	6th to 10th	-	159	-	-	45.82%	-
Age	Until 18 years	13	19	32	4.22%	5.47%	4.89%
	19 to 29 years	245	288	533	79.54%	82.99%	81.37%
	30 to 39 years	30	22	52	9.74%	6.34%	7.94%
	40 to 49 years	15	10	25	4.87%	2.88%	3.82%
	Over 50 years	5	8	13	1.62%	2.30%	1.98%

Note: The period of the consolidated classes is not evidenced in view of the fact that the curricular frameworks of the courses are different.
Source: Search data.

As regards questionnaire B, answered by Accounting students, 189 were male (54.46% of the sample) and 158 female (45.53% of the sample), 294 students were single and most respondents studied from the first to the fifth academic term of the Accounting undergraduate program (54.17% of the sample), according to Table 4.

Table 3 also shows the consolidated results of both questionnaires. The predominant marital status between the respondents was “Single” (87.63% of the sample). Regarding the age, most respondents had between 19 and 29 years old (81.37% of the sample). Most respondents were male.

4.2. Sunk cost analysis

The questions presented in the second part of the questionnaire aimed to identify the occurrence or not of the sunk cost effect in a business decision-making context. The situations addressed in these questions were focused on the business financial decisions of technology industries.

Table 4 shows the descriptive statistics of Business Administration and Accounting students aswers for Questions 5 to 8. The students answered on a scale ranging from zero (unlikely to invest) to one hundred (likely to invest).

Table 4
Descriptive Statistics of Business Administration and Accounting students answers in questions 7 to 10.

Program	Question	Average	Median	Std. dev.
Business Administration (questionnaire A)	Question 5	60.01	60	1.85
	Question 6	56.90	60	1.79
	Question 7	64.60	80	1.94
	Question 8	54.37	60	1.89
Accounting (questionnaire B)	Question 5	57.00	60	1.70
	Question 6	57.82	60	1.70
	Question 7	63.37	80	1.93
	Question 8	56.58	60	1.74

Source: Search data.

In question 5 the respondents indicate if they are willing to continue or not to invest in a research project were R$ 9 million, equivalent to 90% of the company’s total budget, had

been invested while facing a competitor announcing a similar product, which is more economical and efficient. In questionnaire A, the average answer was 60.01, the median was 60 and the standard deviation was 1.85. In Questionnaire B the average was 57.00, the median was 60 and the standard deviation, 1.70. These results show that respondents tend to continue investing in this scenario even if they are aware of the competitor's information.

In question 6 the company invested R$ 5 million, equivalent to 50% of the company's total budget, in a 3D glasses design research, in a scenario where a competitor developed a similar and more economical product. In these circumstances, the mean value of the answers in the questionnaire A was 56.90, the median was 60 and the standard deviation, 1.79, indicating that the respondents tend to keep investing even facing competitor's information.

Regarding questionnaire B, the average was like questionnaire A (57.82), showing that, in general, there is a willingness to keep investing. The median was 60 and the standard deviation was 1.70.

Question 7 presents a situation where R$ 1 million has already been invested, while R$ 9 million remains to be invested. It is known that a certain competitor has developed a similar product with more advantages. In this sense, analyzing the average responses, according to Table 4, it is observed that both groups of respondents show a tendency to be affected by the sunk cost effect. In questionnaire A, the average response was 64.70, the median was 80, and the standard deviation was 1.94. Questionnaire B presented similar values. The mean was 63.87, with a median of 80 and a standard deviation of 1.93.

In question 8, the respondents indicate their willingness to continue investing in a project that is lacking R$ 3 million to be concluded and, once again, they are presented with a scenario where a competitor launched to the market a similar and cheaper product. Based on the results presented in Table 4, it is verified that the average answer among the respondents of questionnaire A was 54.37, while the average among the respondents of questionnaire B was 56.58, demonstrating once again the susceptibility of both Accounting and Business Administration students to the sunk cost effect. The median of the answers for questionnaire A and B was 80, with a standard deviation of 1.89 and 1.74, respectively.

Thus, in general, there is a low standard deviation in all questions of both questionnaires. These results suggest that Accounting and Business Administration students have a relatively homogeneous behavior, given the low dispersion in relation to the answers.

The results found for Accounting and Business Administration students corroborate the existence of the sunk cost effect, ratifying results found in previous studies carried out in a national (Silva et al., 2012; Altoé et al., 2012; Munaro et al., 2015; Pavão, Grejo, & Morais, 2015; Rodrigues, Freire, & Silva, 2016) and international context (Máñez et al., 2009; Liang, Lee, & Tung, 2014).

However, these results contradict the evidence found by Miranda et al. (2010), since these authors suggest that the Accounting students presented a performance significantly superior to those from Business Administration and Economics, with respect to the investment decisions in the presence of sunk costs.

A possible reason for this divergence may be related to the fact that the present study analyzed a greater number of scenarios (six) to identify the susceptibility to sunk cost effect by respondents, compared to the two questions used in the study by Miranda et al. (2010).

An additional explanation may be related to the term in which the respondents of Accounting and Business Administration were enrolled. While most of Accounting students were in the first half of the course, most Business Administration students were in the second half, unlike the work of Miranda et al. (2010).

4.3. Personal decisions

Part 3 of the questionnaire investigates the presence or the absence of the sunk cost effect in personal decision-making scenarios. Table 5 presents the results of the questions concerning problems 9 and 10, of questionnaires A and B, respectively.

Respondents, in question 9, could choose between a package tour purchased for Porto Seguro or a more enjoyable trip, won in a lottery, to Salvador. According to the data detailed in Table 5, Business Administration and Accounting students chose the trip to Porto Seguro in a frequency of 53.89% in both groups. The results corroborate the analysis performed by Segantini et al. (2011).

Table 5
Responses from Business Administration and Accounting students in questions 9 and 10.

Course	Question	Answer	Quantity	Frequency
Business Administration (Questionnaire A)	Question 9	Porto Seguro	166	53.89%
		Salvador	142	46.10%
	Question 10	Yes	105	34.09%
		No	203	65.90%
Accounting (Questionnaire B)	Question 9	Porto Seguro	187	53.89%
		Salvador	160	46.10%
	Question 10	Yes	120	34.58%
		No	227	65.41%

Source: Search data.

In this sense, there is a tendency to the sunk cost effect since most of the respondents chose for the trip in which a value was invested. Such evidence of sunk cost can be justified by the loss aversion faced by individuals (Arkes & Blumer, 1985).

The problem of question 10 did not include the cost amount. In this situation, the ticket was won in a lottery, so there was no financial expense. In addition, it is said that the movie did not attend the viewer expectations and, during the session, the viewer was invited to hang out with friends. The question was whether to continue watching the movie. Most respondents opted not to continue watching the movie, corresponding to 65.90% and 65.41% of the students, respectively, in questionnaires A and B, as detailed in Table 5.

In the consolidated results of both questionnaires (Table 6), 34.35% of respondents chose to continue watching the movie. The sunk cost effect in the answers of question 10 was not evident since only 34.35% of the interviewees decided not to insist on a course of action, where they had already spent time and were not benefiting.

Table 6
Consolidated results from question 9 and 10.

Consolidated			
Question	**Answer**	**Quantity**	**Frequency**
Question 9	Porto Seguro	353	53.89%
	Salvador	302	46.10%
Question 10	Yes	225	34.35%
	No	430	65.64%

Source: Search data.

It is observed in question 10 that when there is no exposed amount in the situation, there is a greater tendency for individuals to act in a rational way. Arkes and Ayton (1999) argue that "continue watching the movie option" is associated with the Principle of Responsibility, as time has had already been spent with this activity.

Finally, in order to identify if there are statistically significant differences between the accounting and business administration scholars' answers regarding the sunk cost effect in the business decision context, the Mann-Whitney U test was performed, which is a nonparametric test applied when it is desired to compare two non-paired samples in which there are ordinal or nominal qualitative data (Fávero & Belfiore, 2017).

Table 7
Mann-Whitney U test results.

Question	Z	Prob > |z|
Question 5	-1.314	0.1889
Question 6	-0.448	0.6544
Question 7	-0.234	0.8146
Question 8	0.930	0.3525

Source: Search data.

As can be seen in Table 7, Prob> | z | is higher than 0.05 in all questions related to the sunk cost effect in the business decision-making context, thus, the null hypothesis (equality between the medians) is not rejected. In this perspective, the Mann-Whitney U test shows that there are no statistically significant differences between the responses of Accounting and Business Administration students regarding the effects of sunk costs in the business context.

In this sense, considering that both groups are susceptible to the sunk cost effect, as evidenced in the descriptive analysis, it is verified that both future accountants are susceptible to provide biased information, as the future administrators can be influenced by the sunk cost effect in the decision-making process.

5. Conclusion

Considering that the sunk costs have been widely considered by studies to understand the rationality and behavior of decision-makers in specific situations, this study aimed to verify if sunk costs influence decision makers opinions. An analysis was conducted in a sample of 655 Business Administration and Accounting students to whom questionnaires where applied.

The findings of this research showed that there is a similarity in the perception of both Business Administration and Accounting students regarding the decisions to continue or discontinue investment projects in different scenarios. Thus, with these results, it was confirmed that students are affected by the sunk cost effect in various decision-making situations in the business context.

Furthermore, there was also a tendency by part of respondents to the sunk cost effect in personal decisions context. However, an interesting finding was that when there is no

exposed amount in the personal decision situation, there is a higher tendency for individuals to act in a rationally way.

From the obtained results, it is possible to verify, for the analyzed sample, that the sunk cost effect occurrence is independent of the area (Business Administration or Accounting), suggesting that a discussion about the study of sunk costs in the curriculum framework of both courses is required.

In this sense, the present study contributes to the practice by showing that future decision-makers, and also the future professionals that provides accounting information for the decision-making were susceptible to the sunk cost effect, which may negatively affect companies as these individuals are not considering rational assumptions in investment decisions. In addition, it contributes to show how these individuals behave through situations that involve the sunk cost effect in different scenarios, both business and personal situations.

It should be emphasized that this study was not intended to ascertain the knowledge of Business Administration and Accounting students regarding sunk costs, but rather to show their propensity to consider sunk costs in a decision-making process.

However, this study has some limitations. The sample comprised students from one university only, which restricts the generalization of research results. It is suggested, for further studies, an analysis with students from other higher education institutions, aiming expands the sample. Future studies can be carried out to verify if students are susceptible to other behavioral biases, such as the illusion of control, loss aversion, House Money effect and disposition Effect.

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