Relations between CEO characteristics and mergers and acquisition decisions in Brazilian companies

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ABSTRACT

This paper investigates the probability of companies to perform Mergers & Acquisitions (M&As) based on the characteristics of the CEO.. We use a sample of 794 CEOs of nonfinancial firms, which were listed on the B3 from 2000 to 2017. We adopt a descriptive approach and run logistic regressions to examine the probability of a company performing M&As, given the characteristics of its CEO. We show that CEOs with finance backgrounds are less likely to perform M&As. We find no statistically significant correlations for other CEO's characteristics, such as executive tenure, age, education, participation as chair of the board, previous experience as an entrepreneur or being a shareholder of the acquiring company.

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1. INTRODUCTION

The previous literature on mergers and acquisitions (M&A) has shown that companies that go through the M&A process tend to destroy value or present null abnormal returns (Alexandridis et al., 2010; Andrade et al., 2001). In addition, Damodaran (2005) has concluded that synergies are rarely delivered due to planning and evaluation problems. Other effects, such as agency problems among acquirers and manager overconfidence, are also important for explaining the lack of value creation by M&As (Da Silva et al., 2016).

Despite this lack of value creation, the volume of M&As has grown considerably in recent years in Brazil, going from an average of 100 domestic transactions in 2004 to 365 transactions in 2013 (KPMG, 2014). The importance of evaluating the characteristics of the main decision-makers (CEOs) in M&A processes is on the rise due to this considerable increase in the volume of M&A in recent years combined with the stylized fact that M&As destroy value or generate null abnormal returns.

Previous research on M&As in Brazil has highlighted value creation. In a nutshell, researchers have studied the panorama of acquisition operations, the role of corporate governance, and the participation of foreign companies in M&A transactions (Tanure and Cançado, 2005; Brito et al., 2005; Camargos and Barbosa, 2009; Steinberg, 2009 and Simões et al., 2012; Bortoluzzo et al., 2014; Bergmann et al., 2015; Ferreira and Callado, 2015; Da Silva et al., 2016 and; Sales and Zanini, 2017).

To date, we have not identified studies in Brazil that address the effect of characteristics of important decision-makers on M&A operations. Thus, this research assesses the relationship between CEO characteristics and the probability of companies performing M&As for firms listed on the B3 from 2000 to 2017. We investigate whether CEO variables such as finance education background, education level, participation on the company's board, and executive tenure, are related to M&A investments.

Managers are relevant in assessing and deciding on investment opportunities. Good managers can identify optimal capital structures, tax gains, economies of scale and scope, and gains from vertical integration, and can overcome entry barriers in certain markets through M&A strategies (Berkovitch and Narayanan, 1993; Capron and Pistre, 2002). On the other hand, it is also possible that managers seek to maximize their own benefits by increasing decision power and bargaining with shareholders (Jense, 1986; Shleifer & Vishny, 1989).

The relationship between financial decisions and the characteristics of CEOs has been evaluated in several situations. For instance, previous research has analyzed the relationship between CEOs' overconfidence and the firm capital structure. In Brazil, Barros and Silveira (2008) found a positive and significant relationship between CEOs' more optimistic behavior and the level of financial leverage. Choi, Saito, and Silva (2015) also showed that CEO risk aversion profile affects capital structure decisions. However, little is known about which CEO characteristics are related to the probability of a company carrying out an M&A operation in Brazil.

Managers with greater risk aversion naturally postpone the decisions that they make on behalf of shareholders. Overconfident managers misevaluate risks and are less willing to postpone investment decisions (Gervais, Heaton, & Odean, 2003). Roll (1986) shows that managers in acquiring companies make evaluation errors because they are very optimistic about potential synergies in an acquisition proposal.

In addition, Goel and Thakor (2000) show that overconfident managers are more likely to be promoted to CEO than rational managers; and that managers who are competing for a leadership vacancy tend to choose projects with higher risks. These results suggest that overconfidence may be a more common trait among leaders than rationality.

In this paper, we do not directly evaluate whether manager overconfidence contributes to the performance of M&As. As we do not have the same proxies presented by Malmendier and Tate (2008) for Brazilian companies, we only investigate whether the entrepreneurship variable, considered a proxy for overconfidence according to Barros and Silveira (2008), has relevance in our empirical analysis. Our study is descriptive and seeks to assess the relationship between CEOs' aforementioned characteristics and companies' likelihood of performing M&As.

In our research, CEOs are classified into four groups: a) CEOs with a background in finance (administration, economics, accounting sciences, or engineering with a financial core); b) CEOs with engineering backgrounds (that is, engineering that does not have a financial core, such as chemical, metallurgical, naval, forestry, agronomic, mining or aeronautical engineering); c) CEOs with other backgrounds, and d) entrepreneurial CEOs. Unlike the classification scheme used by Malmendier and Tate (2005), the scheme used in this study includes engineering with a financial core in the group of CEOs with a degree in finance because, in Brazil, approximately 35% of financial executives are graduates in engineering. This training offers a good background for students through, for example, immersion in project analysis and financial management (FESA, 2014). We further perform a robustness analysis in which we differentiate finance and engineering education backgrounds.

We study 794 CEOs from nonfinancial companies listed on the B3, from 2000 to 2017. We find that CEOs with a background in finance are less likely to perform M&As. We do not identify statistical significance for other characteristics, such as CEO tenure as an executive, age, education, participation as chair of the board, previous experience as an entrepreneur or being a shareholder of the acquiring company. Our results contribute to the aforementioned literature on M&As and provide new insights for the Brazilian market.

2. CEO PROFILE AND THE M&A PROCESS

Malmendier and Tate (2005) found that CEO characteristics, such as the type of training during college, determine their level of confidence: CEOs with backgrounds in engineering or other sciences have more confidence than CEOs who have graduated from finance courses. These researchers used CEO education background to study the relationship between CEO overconfidence and corporate investments and found that CEOs trained in finance are less overconfident than CEOs trained in engineering or related fields. In addition, Malmendier, Tate, and Yan (2011) found that CEOs who lived through moments of crisis or war during their youth can become more aggressive, resulting in less risk aversion and overconfidence.

Overconfidence can be defined as the "better than average" effect resulting in an overestimation of one's own abilities and the results thereof (Larwood & Whittaker, 1977). This effect is reflected in corporate financial decisions, through excessive CEO optimism concerning future results, which often involve billions of dollars in negotiations that tend to be unsuccessful.

As previously mentioned, our study does not intend to designate a specific variable to determine overconfidence since there are complications in identifying this characteristic a priori. We use some characteristics of CEOs already studied in the literature to evaluate correlations with M&A

investments. For example, studies have already shown a strong correlation between entrepreneurial orientation and overconfidence. Palich and Bagby (1995) signaled that entrepreneurs perceive a greater potential for gains in uncertain situations than those who are not entrepreneurs and that entrepreneurial people tend to have a greater bias in the perception of risks. Additionally, Arabsheibani, De Meza, Maloney, and Pearson (2000) showed that entrepreneurs are more subject to optimism; however, unrealistic financial optimism is less pronounced for people with higher education, women, and singles.

A growing body of literature has documented that men are more confident and less risk-averse than women (Bengtsson, Persson, & Willenhag, 2005). In the context of the financial world, Jianakoplos and Bernasek (1998) found that women have significantly greater risk aversion in making financial decisions than men. It is known that risk aversion and overconfidence are also linked to individuals' education and age. For example, Hryshko, Luengo-Prado, and Sørensen (2011) found that older individuals are more risk averse and that children of more educated parents are less risk averse when they reach adulthood.

Barros and Silveira (2008) used entrepreneurship as a proxy for overconfidence (a binary variable classified as 1 for company founders and 0 for those with no founding relationship with the company). Malmendier and Tate (2005, 2008) used CEO behavior as a proxy for overconfidence. They emphasized that CEOs who hold stock options until the expiration date are persistent and optimistic about the company's prospects, unlike those who take advantage of high-priced opportunities to trade their options before the expiration date. We manage to obtain data on the entrepreneurship variable for this study. However, we are unable to observe the stock options in the hands of CEOs in Brazil.

Brown and Sarma (2007) used media coverage, that is, how the Australian media described each CEO during the sample period (confident, optimistic, cautious, or conservative), as a proxy for overconfidence. Dutta, Macaulay, and Saadi (2011) evaluated the relationship between the power of CEOs and the decision to make acquisitions in Canadian companies, using the total remuneration (salary, bonuses, and stock options) received by the CEO in a given year as a proxy of CEO power and found that CEOs with more power make more acquisitions.

Malmendier and Tate (2005) studied the relationship between CEO overconfidence and the decision to invest in companies. Overconfident CEOs tend to overestimate their projects' returns, impacting companies' investment and M&A decisions. They found that the type of CEO training moderates the confidence level: CEOs with a finance background tend to be less overconfident than CEOs trained in other areas. Years later, Malmendier and Tate (2008) assessed overconfidence in the context of the decision to perform M&As and found that overconfident CEOs are more likely to perform M&As than CEOs who are not overconfident.

Specifically, in M&A operations, Malmendier and Tate (2008) found, for US companies, that the likelihood of making acquisitions is 65% higher if the CEO is classified as overconfident, and that the market reaction is significantly more negative for excessively confident CEOs than for CEOs who are not overconfident. In Australian companies, Brown and Sarma (2007) found that overconfidence and the CEO dominance effect, which is the CEO's ability to impose his views, are important in explaining the decision to acquire another company. Therefore, this current research carried out in Brazil, contributes to the existing literature from the perspective of M&A processes in emerging countries.

3. METHODOLOGY AND DATA

We use the logistic regression model to obtain the probability of a company carrying out M&A operations, the same method used in the studies by Malmendier and Tate (2008) and by Brown and Sarma (2007). First, we organize the data in the form of a stacked cross-section, where information from companies and CEOs is observed over time and the sample period organized in the rows of the database. As we also measure M&As carried out by the same company over time for part of the sample, we organize the base in a panel format and redo the procedure mentioned above for the panel logistic regression model.

Hence, we aim to assess the likelihood of companies conducting M&As according to the characteristics of CEOs. Binary response models, as well as logistic regression, are used to explain the relationship of the independent variables with the probability of a response.

We highlight that this study is descriptive and does not provide any causal evidence. We contribute to the literature by exploring the characteristics of CEOs and M&A operations carried out in Brazil, considering different sectors of activity from 2000 to 2017.

Our sample includes 307 nonfinancial companies with shares traded on the B3 from 2000 to 2017, with 12,489 quarterly observations. The sample contains 79 acquiring companies that undertook M&As in this period, with 177 quarterly observations.

We received the M&A data directly from Anbima (Brazilian Association of Entities in the Financial and Capital Markets), while the companies' quarterly financial data were collected from the Economatica database. Information about CEOs was collected from the CVM (*Comissão de Valores Mobiliários*) website. We searched for information in section 12.5 of the Reference Form for 2008 and the IAN (annual information source) report for information before 2008. All of this information is detailed in Table 1. We winsorized the variables size, Tobin's Q, ROA, EBIT, and cash at the 5% level to eliminate outliers. We use the natural logarithm (Ln) of the variables size, EBIT, leverage, and cash in the regressions.

3.1. HYPOTHESIS

Malmendier and Tate (2008) and Brown and Sarma (2007) found that CEOs' characteristics have a strong influence on M&A decision making in companies. In addition, some other characteristics are relevant and closely related to the characteristic of overconfidence, such as CEO training area, age, gender and even whether the CEO is an entrepreneur.

To understand whether these characteristics are related to the decision making of CEOs, the first hypothesis addresses the area of the educational background of CEOs. **Hypothesis 1 (H1)** is as follows: – the educational background area of the CEO is related to the decision to perform M&As. Malmendier, and Tate (2005) showed that the training of the CEO is a relevant variable in M&A decisions and argued that CEOs with a background in finance are more rational and tend to make decisions with a greater basis in numbers and studies than CEOs with training in other fields.

Palich and Bagby (1995) and Arabsheibani, De Meza, Maloney, and Pearson (2000) signaled that entrepreneurial people are more optimistic and perceive greater earning potential in uncertain situations. Barros and Silveira (2008) found that entrepreneurs tend to be more overconfident in risky situations.

Table 1
Sample

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total	% Part.
Number of companies	113	112	118	126	136	140	158	205	209	215	228	237	239	249	253	257	261	273	**307**	
Number of M&As	3	2	2	8	9	12	17	33	21	9	25	16	14	8	4	2	3	15	**203**	
Number of M&As (firms)	3	2	2	7	8	6	15	20	15	8	15	14	10	7	4	2	3	14	**87**	
Number of CEOs (full sample)	114	115	127	135	144	146	167	213	266	218	234	276	274	289	297	309	309	307	794	**100%**
Number of CEOs (M&As)	3	2	2	7	8	7	15	20	15	8	15	14	10	7	4	2	3	14	**114**	
Tenure as a CEO (years)	0	1	2	2	3	3	4	3	3	3	4	4	5	5	5	5	5	5	**4**	
Average CEO's age	56	56	57	57	58	57	57	55	54	53	54	55	54	55	54	55	55	55	**55**	
Number of male CEOs	113	113	123	131	141	145	166	210	261	212	228	267	264	278	286	301	303	302	774	97%
Number of female CEOs	1	2	4	4	3	1	1	3	5	6	6	9	10	11	11	8	6	5	**20**	3%
CEOs with educational background in finance	82	82	91	94	97	103	118	150	192	164	176	204	208	222	227	246	242	242	587	74%
CEOs with educational background in engineering	10	10	12	10	13	10	11	15	25	15	14	20	19	20	24	25	26	23	71	9%
CEOs with educational background in other areas	13	14	15	22	25	24	27	34	35	29	33	42	38	35	33	29	31	29	105	13%
CEOs without college academic background	9	9	9	9	9	9	11	14	14	10	11	10	9	12	13	11	10	13	**31**	4%
CEOs with graduate degrees	27	30	34	34	38	43	52	72	99	84	90	110	111	119	128	142	143	139	349	44%
CEO and entrepreneur	44	43	47	48	54	50	71	105	114	102	110	130	131	133	132	127	126	125	275	35%
CEO and board president	58	58	64	61	69	61	73	81	85	68	70	79	68	62	58	46	45	40	187	24%
CEOs among the 5 largest shareholders of the company	18	20	24	20	23	21	21	29	29	27	28	31	32	38	35	29	30	34	**86**	11%
M&As value (billions of Reais)	**0.0**	**0.0**	**12.8**	**3.5**	**91.6**	**10.1**	**35.5**	**37.0**	**12.9**	**7.1**	**34.6**	**11.3**	**18.6**	**8.7**	**1.2**	**5.7**	**4.4**	**18.5**	313.6	**100%**

Source: Own elaborated following B3 sector classification.

Therefore, the second hypothesis is that entrepreneurial CEOs are more likely to perform M&As since some studies have found a strong relationship between this characteristic and overconfidence. **Hypothesis 2 (H2)** is as follows: – entrepreneurial CEOs are more likely to perform M&As.

Hryshko, Luengo-Prado, and Sørensen (2011) found that older individuals are more risk-averse. Choi, Saito and Silva (2015) found that older CEOs are more conservative and have greater risk aversion than younger CEOs. Therefore, the third hypothesis posits that younger CEOs are more likely to perform M&As. **Hypothesis 3 (H3)** is as follows – younger CEOs are more likely to perform M&As.

3.2. ECONOMETRIC SPECIFICATION

This research uses the logit nonlinear regression model to verify the probability of performing M&As based on CEO characteristics. The binary dependent variable is M&A, which is equal to 1 for acquiring companies that performed an M&A in the period from 2000 to 2017. The explanatory variables that indicate CEO characteristics are the variables of interest, α, $\beta 1$ ..., $\beta 17$ are the estimated parameters, and G (.) is accumulated distribution function (FDA). All variables used in the model are detailed in Table 2.

Table 2
Variables

Variables	No.	Abbreviation	Description	Data Source/ Proxy	Theory	Expected Sign
Dependent	1	F&A	Equal to 1 for acquiring companies that performed an M&A in the sample period	*Anbima*	Malmendier & Tate (2008), Brown & Sarma (2007)	
	2	DmFin	*Dummy* variable for *CEOs* with an educational background in finance	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2005)	(-)
	3	DmEng	*Dummy* variable for *CEOs* with an educational background in engineering	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2005)	(+)
	4	DmOth	*Dummy* variable for *CEOs* with an educational background in other areas	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2005)	(+)
	5	DmNoCol	*Dummy* variable for CEOs without college academic background	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2005)	(-)
	6	DmGrad	*Dummy* variable for *CEOs* who *hold* an *MBA*, a master's or a Ph.D.	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2005), Choi, Saito & Silva (2015)	(-)

Table 2
Cont.

Variables	No.	Abbreviation	Description	*Data Source/ Proxy*	Theory	Expected Sign
	7	DmEntrep	*Dummy* variable for entrepreneur *CEOs*	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2008), Barros & Silveira (2008), Palich & Bagby (1995)	(+)
	8	DmCEO&Pres	*Dummy* variable for *CEOs* who are presidents of the board	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2008)	(+)
	9	DmCEO&Stock	*Dummy* variable for *CEOs* who are among the 5 largest shareholders of the company	Economatica	Malmendier & Tate (2008)	(+)
	10	Age	*CEO* age	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2008), Hryshko, Luengo-Prado & Sørensen (2011)	(-)
	11	CEO_WT	Tenure as *CEO* (years)	*Formulário de referência 12.5 e IAN*	Malmendier & Tate (2005)	(-)
	12	DmGov	*Dummy* variable for corporate governance tiers (*Ní*veis de governança N2 e Novo Mercado)	Economatica	Brown & Sarma (2007), Malmendier & Tate (2005)	(-)
	13	Size	Size	Ln (Total assets)	Brown & Sarma (2007)	(+)
	14	Tobin's Q	Growth opportunities	(Equity market value + Debt)/ Total assets	Malmendier & Tate (2008)	(+)
	15	Ebit	Earnings before interest and taxes	Ln (Ebit)	Brown & Sarma (2007), Malmendier & Tate (2008)	(+)
	16	ROA	Return on assets	Net earnings / Total assets	Malmendier & Tate (2005)	(+)
	17	Leverage	Debt-to-equity ratio	(Debt/ Equity)	Barros & Silveira (2008), Malmendier & Tate (2008)	(-)
	18	Cash	Cash and equivalents	Ln (Cash)	Malmendier & Tate (2005)	(+)

Note: The variables Size, Tobin's Q, Ebit, ROA, Debt and Cash were collected from the Economatica.

Empirical Model:

$$Prob(y = 1|x)$$
$$= G(\alpha + B_1 DmFin + B_2 DmEng + B_3 DmNoCol + B_4 DmGrad$$
$$+ B_5 DmEntrep + B_6 DmCEO\&Pres + B_7 DmCEO\&Stock + B_8 Age$$
$$+ B_9 Age^2 + B_{10} CEO\_WT + B_{11} DmGov + B_{12} LnSize + B_{13} Tobin's\ Q$$
$$+ B_{14} LnEbit + B_{15} ROA + B_{16} Leverage + B_{17} LnCash) + \varepsilon i$$

4. RESULTS

4.1. DESCRIPTIVE STATISTICS

Tables 3 to 10 show the distribution of our sample by sector, with an analysis of the total sample (which includes all CEOs surveyed) and the sample of only M&A companies with CEOs from the acquiring companies that conducted the M&A process. We follow the B3 for the classification of sectors.

The first descriptive statistics table shows the average tenure as CEO. On average, CEOs spent 4 years in the companies, except for in the telecommunications, health, and oil, gas and biofuels sectors, where CEOs presented an average tenure below 3 years.

The sectors that had the same CEO in the position for the longest period (with a maximum of more than 18 years) are the industrial goods, cyclical consumption, basic materials, and utilities sectors. One can see that 60% of the sample is concentrated in cases of average CEO tenure of up to 2 years, 28% in case with tenure of 2 to 5 years, 11% in cases with tenure of 5 to 10 years, while only 1% of cases have CEOs with a tenure of more 10 years.

In acquiring companies that have undergone an M&A process, the average CEO tenure is 1.17 years less than the average CEO tenure for the total sample. The utility sector has the highest average CEO tenure (5.63 years), while the health sector has the lowest average (1.25 years). It appears that 48% of the sample is concentrated among acquiring companies with an average CEO tenure of up to 2, 42% with tenure from 2 to 5 years, and only 10% with tenure from 5 to 10 years.

Table 4 shows that CEOs' educational backgrounds are concentrated in finance (74%), with 9% in engineering and 13% in other sciences, while 4% of CEOs have no specific training. The acquiring companies that have undergone an M&A process have a very similar distribution of this variable to that of the total sample, with 75% of the sample concentrated in finance, 8% in engineering, 13% in other sciences, and 4% without specific academic training.

In Table 5, we analyze the education levels of CEOs. Of the total sample of CEOs, 44% had an MBA, master's, or doctorate, while in the sample of acquiring companies that underwent M&As, this number was 49%.

The average age of CEOs in the sample is 55 years old, the health sector has the lowest average age (47 years old), while the financial sector has the highest average age (60 years old). The basic materials sector has a maximum age of 96 years, while the utility sector has the lowest age (23 years). Of the total sample, 40% of CEOs are concentrated in the up to 50 years age group, 54% from 50 to 70 years old, and 6% are older than 70.

Table 3

CEO tenure by sector (years)

No.	Sector	Sample Number	Sample Mean	Sample Min	Sample Max	Sample S.D	M&A Number	M&A Mean	M&A Min	M&A Max	M&A S.D
1	Industrial Goods	153	4.77	0.25	18.01	4.16	20	3.12	0.26	9.64	2.47
2	Consumption – cyclical	138	4.57	0.25	18.01	4.17	18	2.21	0.08	10.65	2.32
3	Consumption – non cyclical	57	3.28	0.25	12.18	2.88	14	2.95	0.51	10.15	2.28
4	Financial	37	4.68	0.25	17.25	3.79	4	3.05	2.03	4.57	1.15
5	Basic Materials	114	4.43	0.25	18.01	3.85	24	3.26	0.25	10.66	3.15
6	Oil, gas and biofuels	19	2.31	0.25	9.13	2.06	4	2.24	0.26	5.83	1.98
7	Health	42	2.11	0.25	9.38	2.06	8	1.27	0.08	4.21	1.29
8	Information technology	13	3.61	0.76	11.93	2.83	1	2.54	2.54	2.54	NA
9	Telecommunications	47	2.28	0.26	11.41	2.24	14	2.50	0.25	5.80	1.71
10	Utilities	174	3.06	0.25	18.01	3.15	7	5.63	0.76	13.95	4.17
	Total	**794**	**4.04**	**0.25**	**18.01**	**3.79**	**114**	**2.87**	**0.08**	**13.95**	**2.65**

Source: Own elaboration.

Table 4

CEO educational background by knowledge area

No.	Sector	Sample Finance	Sample Engineering	Sample Others	Sample No College Degree	Sample Total	M&A Finance	M&A Engineering	M&A Others	M&A No College Degree	M&A Total
1	Industrial Goods	131	6	8	9	154	16	0	3	1	20
2	Consumption – cyclical	103	6	23	6	138	12	1	5	0	18
3	Consumption – non cyclical	39	5	5	8	57	10	0	1	3	14
4	Financial	27	1	7	2	37	3	0	0	1	4
5	Basic Materials	80	12	17	5	114	17	4	3	0	24
6	Oil, gas and biofuels.	11	2	6	0	19	3	0	1	0	4
7	Health	30	2	10	0	42	6	1	1	0	8
8	Information technology	12	1	0	0	13	1	0	0	0	1
9	Telecommunications	36	3	7	1	47	14	0	0	0	14
10	Utilities	118	33	22	0	173	3	3	1	0	7
	Total	**587**	**69**	**105**	**31**	**794**	**85**	**9**	**15**	**5**	**114**

Source: Own elaboration

Table 5
CEO graduate degrees by sector

No.	Sector	Sample CEOs with an MBA, *master's or Ph.D*	Sample CEOs without an MBA, *master's or Ph.D*	Sample Total	M&A CEOs with an MBA, *master's or Ph.D*	M&A CEOs without an MBA, *master's or Ph.D*	M&A Total
1	Industrial Goods	54	99	153	6	14	20
2	Consumption – cyclical	53	85	138	11	7	18
3	Consumption – non cyclical	25	32	57	5	9	14
4	Financial	16	21	37	1	3	4
5	Basic Materials	41	73	114	12	12	24
6	Oil, gas and biofuels	9	10	19	2	2	4
7	Health	25	17	42	6	2	8
8	Information technology	3	10	13	0	1	1
9	Telecommunications	27	20	47	9	5	14
10	Utilities	96	78	174	4	3	7
	Total	**349**	**445**	**794**	**56**	**58**	**114**

Source: Own elaboration.

Table 6
CEO age by sector

No.	Sector	Sample Number	Sample Mean	Sample Min	Sample Max	Sample S.D	M&A Number.	M&A Mean	M&A Min	M&A Max	M&A S.D
1	Industrial Goods	153	56	30	92	12	20	51	37	84	11
2	Consumption – cyclical	138	54	29	91	11	18	51	35	65	9
3	Consumption – non cyclical	57	52	32	81	11	14	46	36	64	9
4	Financial	37	60	36	92	13	4	54	48	59	5
5	Basic Materials	114	58	39	96	10	24	54	42	75	7
6	Oil, gas and biofuels	19	58	45	73	7	4	56	49	62	5
7	Health	42	47	25	66	9	8	48	33	66	11
8	Information technology	13	49	35	67	7	1	48	48	48	NA
9	Telecommunications	47	51	39	70	7	14	52	40	70	9
10	Utilities	174	54	23	78	10	7	56	32	78	15
	Total	**794**	**55**	**23**	**96**	**11**	**114**	**52**	**32**	**84**	**10**

Source: Own elaboration

The average age of CEOs of acquiring companies that have undergone an M&A is 3 years less than the total sample average age. The minimum age is in the utility sector (32 years), while the maximum age is in the material goods sector (84 years).

Of the total sample, 40% of CEOs are concentrated in the up to 50 years age group, 57% are in the 50 to 70 years age group, and only 3% are older than 70.

Table 7
CEO gender by sector

No.	Sector	Sample Male	Sample Female	Sample Total	M&A Male	M&A Female	M&A Total
1	Industrial Goods	152	1	**153**	20	0	**20**
2	Consumption – cyclical	135	3	**138**	17	1	**18**
3	Consumption – non cyclical	56	1	**57**	14	0	**14**
4	Financial	37	0	**37**	4	0	**4**
5	Basic Materials	111	3	**114**	24	0	**24**
6	Oil, gas and biofuels.	18	1	**19**	4	0	**4**
7	Health	41	1	**42**	8	0	**8**
8	Information technology	13	0	**13**	1	0	**1**
9	Telecommunications	45	2	**47**	13	1	**14**
10	Utilities	166	8	**174**	7	0	**7**
	Total	**774**	**20**	**794**	**112**	**2**	**114**

Source: Own elaboration

The total sample includes 20 female CEOs, 13 of whom are CEOs with a finance background, 5 have backgrounds in other sciences, and 2 are entrepreneurs. The average age is 48 years, with the lowest age being 32 years and the highest age being 59 years.

The sample of acquiring companies that underwent an M&A has 2 female CEOs, one in cyclical consumption and one in telecommunications. The average age is 52 years, with the lowest age being 43 years and the highest age being 62 years. The sample is distributed in the finance and other sciences training categories.

It is observed that 24% of CEOs also serve as chair of the board of directors and that 29% of these have an MBA, master's, or doctorate. The training of these CEOs is also concentrated in the area of finance (65%).

Among the acquiring companies that have undergone an M&A, 17% have CEOs in the position of president of the board and 26% of these have MBA, master's or doctorate degrees; their training is also concentrated in the area of finance (53%), with 5% in engineering and 26% in other sciences, while 16% are entrepreneurs.

Table 8
CEO and Board president

No.	Sector	Sample CEO & President	Sample CEO only	Sample Total	M&A CEO & President	M&A CEO only	M&A Total
1	Industrial Goods	43	110	**153**	4	16	**20**
2	Consumption – cyclical	37	101	**138**	2	16	**18**
3	Consumption – non cyclical	12	45	**57**	3	11	**14**
4	Financial	14	23	**37**	0	4	**4**
5	Basic Materials	29	85	**114**	5	19	**24**
6	Oil, gas and biofuels	3	16	**19**	0	4	**4**
7	Health	5	37	**42**	1	7	**8**
8	Information technology	1	12	**13**	1	0	**1**
9	Telecommunications	9	38	**47**	3	11	**14**
10	Utilities	34	140	**174**	0	7	**7**
	Total	**187**	**607**	**794**	**19**	**95**	**114**

Source: Own elaboration.

Table 9
CEO and Shareholder

No.	Sector	Sample CEO & shareholder	Sample CEO only	Sample Total	M&A CEO & shareholder	M&A CEO only	M&A Total
1	Industrial Goods	31	122	**153**	3	17	**20**
2	Consumption – cyclical	23	115	**138**	1	17	**18**
3	Consumption – non cyclical	4	53	**57**	0	14	**14**
4	Financial	5	32	**37**	0	4	**4**
5	Basic Materials	14	100	**114**	0	24	**24**
6	Oil, gas and biofuels	0	19	**19**	0	4	**4**
7	Health	2	40	**42**	0	8	**8**
8	Information technology	3	10	**13**	0	1	**1**
9	Telecommunications	3	44	**47**	0	14	**14**
10	Utilities	1	173	**174**	0	7	**7**
	Total	**86**	**708**	**794**	**4**	**110**	**114**

Source: Own elaboration

We also see that 11% of CEOs are among the top 5 shareholders of the company that they operate, and 57% of these are also chairs of the board. In the sample of acquiring companies that have undergone an M&A process, only 4% of CEOs are among the companies' 5 largest shareholders.

Table 10
CEO and entrepreneur

No.	Sector	Sample CEO & Entrepreneur	Sample CEO only	Sample Total	M&A CEO & Entrepreneur	M&A CEO only	M&A Total
1	Industrial Goods	75	78	**153**	10	10	**20**
2	Consumption – cyclical	62	76	**138**	10	8	**18**
3	Consumption – non cyclical	22	35	**57**	4	10	**14**
4	Financial	15	22	**37**	3	1	**4**
5	Basic Materials	36	78	**114**	7	17	**24**
6	Oil, gas and biofuels	5	14	**19**	0	4	**4**
7	Health	13	29	**42**	6	2	**8**
8	Information technology	6	7	**13**	1	0	**1**
9	Telecommunications	9	38	**47**	1	13	**14**
10	Utilities	32	142	**174**	0	7	7
	Total	**275**	**519**	**794**	**42**	**72**	**114**

Source: Own elaboration

With regard to CEOs who are entrepreneurs, they represent 35% of the total sample. Of the total number of entrepreneur CEOs, 32% have an MBA, master's, or doctorate, 68% have a degree in finance, 6% in engineering, and 15% in other sciences, while 11% are entrepreneurs (without specific training).

Among the acquiring companies that have undergone an M&A process, 37% of CEOs are entrepreneurs, and 40% have an MBA, master's, or doctorate. These entrepreneurial CEOs' training is distributed as follows: 62% in finance, 7% in engineering, and 19% in other sciences, with 12% being entrepreneurs.

4.2. ECONOMETRIC RESULTS

The correlation of the variables and the low indexes between the variables can be seen in Table 11. The variance inflation factor test (VIF) indicates no presence of multicollinearity, with an average VIF close to 2 for the regressions.

Table 11
Correlation Matrix

	EBIT	TobinsQ	ROA	Leverage	Cash	Size	Age	CEO tenure
EBIT	1.000	0.012	0.051	0.026	0.496	0.643	- 0.013	- 0.028
TobinsQ		1.000	- 0.039	- 0.016	- 0.063	- 0.151	- 0.059	0.015
ROA			1.000	0.004	0.094	0.101	0.009	- 0.002
Leverage				1.000	0.025	0.027	0.017	0.024
Cash					1.000	- 0.145	- 0.125	
Size						1.000	- 0.066	- 0.070
Age							1.000	0.360
CEO tenure								1.000

Source: Own elaboration.

Table 12 shows the results of our logit regressions. Columns 1 to 4 show the coefficients, and column 5 shows the marginal effect (the marginal effect refers to the result in column 4, in which the regression includes time and sector fixed effects).

Table 12
Logit Regression Results

Independent Variables	Expected Sign	Coef. (1)	Coef. (2)	Coef. (3)	Coef. (4)	Marginal Effect (5)
DmFin	(-)	-0.573**	-0.519**	-0.468*	-0.477*	-0.003*
		(0.249)	(0.257)	(0.261)	(0.268)	(0.268)
DmEng	(+)	-0.394	-0.447	-0.027	-0.057	-0,0004
		(0.348)	(0.359)	(0.366)	(0.379)	(0.379)
DmNoCol	(-)	0.252	0.500	0.309	0.404	0,003
		(0.431)	(0.441)	(0.466)	(0.485)	(0.485)
DmGrad	(-)	0.077	0.159	0.090	0.125	0,001
		(0.175)	(0.178)	(0.180)	(0.184)	(0.184)
DmEntrep	(+)	0.029	0.188	-0.053	0.076	0,000
		(0.188)	(0.193)	(0.195)	(0.201)	(0.201)
DmCEO&Pres	(+)	0.077	-0.334	-0.075	-0.556**	-0.004**
		(0.240)	(0.255)	(0.247)	(0.264)	(0.264)
DmCEO&Stock	(+)	-0.623	-0.461	-0.612	-0.418	-0,003
		(0.483)	(0.489)	(0.492)	(0.499)	(0.499)
Age	(-)	0.041	0.043	0.007	0.019	0,000
		(0.074)	(0.077)	(0.076)	(0.079)	(0.079)
Age²	(-)	-0.001	-0.001	-0.000	-0.000	-0,000002
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CEO_WT	(-)	-0.004*	0.000	-0.004	-0.000	-0,000002
		(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
DmGov	(-)	-0.315*	-0.157	-0.356*	-0.163	-0,001
		(0.168)	(0.175)	(0.186)	(0.193)	(0.193)
Size (Ln)	(+)	0.372***	0.529***	0.259*	0.473***	0.003***
		(0.139)	(0.145)	(0.143)	(0.154)	(0.154)
Tobins'Q	(+)	0.136**	0.111	0.108	-0.055	-0,0004
		(0.059)	(0.073)	(0.077)	(0.119)	(0.119)
EBIT (Ln)	(+)	0.118	0.028	0.233**	0.135	0,001
		(0.111)	(0.114)	(0.119)	(0.125)	(0.125)
ROA	(+)	-3.020	-3.321	-3.858	-2.982	-0,019
		(3.111)	(3.312)	(3.129)	(3.376)	(3.376)
Leverage	(-)	-0.226**	-0.279***	-0.204**	-0.193*	-0.001*
		(0.097)	(0.102)	(0.096)	(0.104)	(0.104)
Cash (Ln)	(+)	0.078*	0.076	0.009	-0.006	-0,0004
		(0.047)	(0.051)	(0.048)	(0.052)	(0.052)

Table 12
Cont.

Independent Variables	Expected Sign	Coef. (1)	Coef. (2)	Coef. (3)	Coef. (4)	Marginal Effect (5)
Constant		-11.716***	-12.997***	-9.744***	-11.903***	-
		(2.222)	(2.384)	(2.290)	(2.511)	-
Year Fixed Effects		No	Yes	No	Yes	Yes
Sector Fixed Effects		No	No	Yes	Yes	Yes
Observations		9.671	9.671	9.671	9.671	9.671

Note. This table presents the Pooled Logit regression coefficients (columns 1 to 4) and the marginal effect in column 5. The pseudo-R^2 ranges between 9,4% and 17,8% for our pooled logit regression models. Standard errors are shown in parentheses. The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

To verify the quality of the nonlinear logit model shown in Table 12, we perform a sensitivity and specificity analysis. The result reveals a correct classification of approximately 98% of the sample. In addition, the ROC curve, shown in Figure 1, confirms the positive result of the model, with an area under the curve equal to 0.8153.
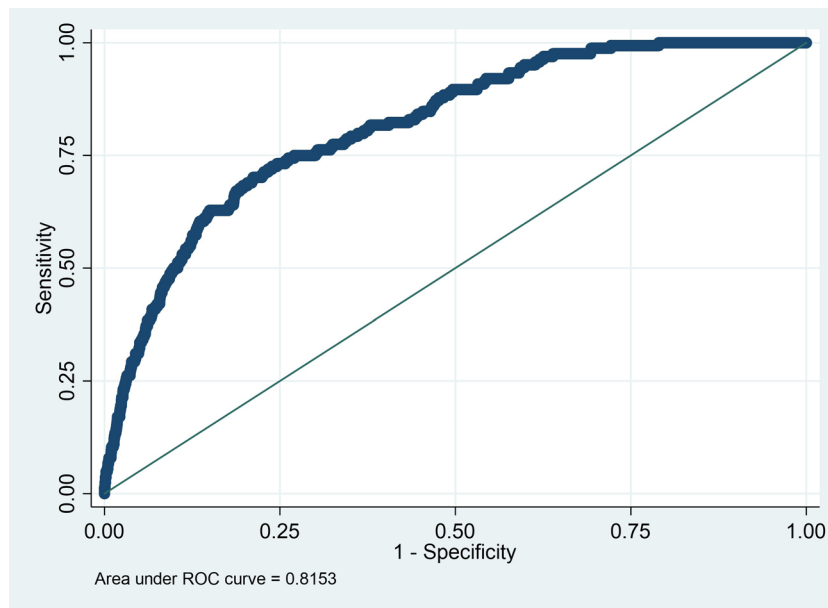

Area under ROC curve = 0.8153

Figure 1. ROC Curve
Source: Own elaboration.

We can see in Table 12 that the dummy variable for an educational background in finance is significant and shows the expected sign. As Malmendier and Tate (2005) found, CEOs with a background in finance are less likely to perform M&As than CEOs trained in other areas. This result may suggest that CEOs with a finance background make their decisions with a greater basis in project numbers, enabling more prudent decisions. Therefore, hypothesis 1, which posits that the area of CEO training moderates the decision to perform an M&A, is confirmed, as the variable education in finance shows statistical significance and the expected sign.

We find no statistical significance for the entrepreneur CEO variables, unlike Barros and Silveira (2008), who find that entrepreneurial CEOs tend to be more overconfident and, consequently, have a greater probability of performing M&As. Therefore, it is not possible to confirm hypothesis 2.

CEO age also does not show a statistically significant result, in contrast to the findings of Hryshko, Luengo-Prado, and Sørensen (2011) and Choi, Saito, and Silva (2015), who reveal that older CEOs are less overconfident and are more risk averse. Therefore, it is not possible to confirm hypothesis 3.

The control variable size showed significant results, showing that large companies are more likely to perform M&As. This result is expected since larger companies have fewer financial limitations and greater capacity to perform M&As than other companies, as is confirmed by the result presented by Brown and Sarma (2007).

Leverage also showed significant results, confirming what was expected: the more leveraged a company is, the less likely it is to carry out M&As. Since more leveraged companies have obligations to creditors, we believe that many M&A transactions are not carried out due to contractual aspects and cash commitments.

4.3. ROBUSTNESS CHECK

To evaluate the consistency of the results obtained in Table 12, we conduct robustness tests. First, we consider law 11.941/2009, which governs financial statements adherence to IFRS standards for our sample period. Table 13 presents the results with data from 2010 since mandatory disclosure of results in IFRS format was implemented from that date. As the regressions use variables from the companies' balance sheets as controls, any change in the construction of the variables between the "pre-and-post" IFRS periods could hinder the regression. Therefore, we present the results only for the period after the mandatory implementation of the IFRS.

Table 13

Logit regression results – data from 2010

Independent Variables	Expected Sign	Coef. (1)	Coef. (2)	Coef. (3)	Coef. (4)	Marginal Effect (5)
DmFin	(-)	-0.663*	-0.638*	-0.659*	-0,579	-0.004*
		(0,369)	(0,372)	(0,385)	(0,392)	(0,392)
DmEng	(+)	-0,428	-0,385	-0,111	0,119	0,001
		(0,545)	(0,550)	(0,582)	(0,595)	(0,595)
DmNoCol	(-)	0,057	0,143	-0,191	-0,134	-0,001
		(0,596)	(0,613)	(0,671)	(0,696)	(0,696)
DmGrad	(-)	-0,057	0,005	-0,032	0,098	0,001
		(0,271)	(0,272)	(0,280)	(0,280)	(0,280)
DmEntrep	(+)	0,303	0,384	0,219	0,307	0,002
		(0,268)	(0,270)	(0,280)	(0,281)	(0,281)
DmCEO&Pres	(+)	-0,047	-0,494	-0,104	-0,668	-0,003
		(0,416)	(0,438)	(0,425)	(0,452)	(0,452)
DmCEO&Stock	(+)	-0,798	-0,680	-0,667	-0,490	-0,002
		(0,635)	(0,639)	(0,650)	(0,658)	(0,658)
Age	(-)	-0,019	-0,025	-0,009	-0,035	-0,0002
		(0,103)	(0,105)	(0,102)	(0,105)	(0,105)

Table 13
Cont.

Independent Variables	Expected Sign	Coef. (1)	Coef. (2)	Coef. (3)	Coef. (4)	Marginal Effect (5)
Age²	(-)	-0,0002	-0,0001	-0,0002	0,000	0,000
		(0,001)	(0,001)	(0,001)	(0,001)	(0,001)
CEO_WT	(-)	-0,002	0,001	-0,001	0,001	0,000
		(0,003)	(0,003)	(0,003)	(0,003)	(0,003)
DmGov	(-)	-0,028	0,053	-0,114	-0,025	-0,0001
		(0,262)	(0,264)	(0,284)	(0,285)	(0,285)
Size (Ln)	(+)	0.366*	0.444**	0.419**	0.556**	0.003**
		(0,197)	(0,201)	(0,211)	(0,217)	(0,217)
Tobins'Q	(+)	0,107	0,080	-0,087	-0,164	-0,0009
		(0,155)	(0,165)	(0,174)	(0,188)	(0,188)
EBIT (Ln)	(+)	0,033	0,002	0,043	-0,030	-0,0002
		(0,156)	(0,159)	(0,169)	(0,172)	(0,172)
ROA	(+)	-3,604	-4,896	-0,874	-0,391	-0,002
		(5,292)	(5,560)	(5,312)	(5,550)	(5,550)
Leverage	(-)	-0,010	-0,011	0,042	0,117	0,001
		(0,145)	(0,148)	(0,143)	(0,151)	(0,151)
Cash (Ln)	(+)	0,038	0,030	-0,005	-0,010	-0,0001
		(0,070)	(0,072)	(0,072)	(0,073)	(0,073)
Constant		-8.907***	-9.228***	-10.537***	-11.353***	-
		(3,108)	(3,196)	(3,236)	(3,387)	(0,000)
Year Fixed Effects		No	Yes	No	Yes	Yes
Sector Fixed Effects		No	No	Yes	Yes	Yes
Observations		5.759	5.759	5.759	5.759	5.759

Note. This table presents the Pooled Logit regression coefficients (columns 1 to 4) and the marginal effect in column 5. Standard errors are shown in parentheses. The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

Table 13 shows that an educational background in finance remains significant when we take only the post-IFRS period into account.

Second, we analyze the regression results with two different classifications for our educational background in finance dummy variable. The original classification is presented in Table 12, where educational background in finance includes engineering courses with a finance core. Table 14 shows the results for other classifications. Hence, we: (a) include all engineering academic programs in our educational background in finance variable, with the results presented in columns 1 to 3, and b) include no engineering academic programs in our educational background in finance dummy variable, with the results presented in columns 4 to 6.

Table 14

Logit regression results – Robustness tests

Independent Variables	Expected Sign	Coef. (1)	Coef. (2)	Marginal Effect. (3)	Coef. (4)	Coef. (5)	Marginal Effect. (6)
DmFin	(-)	-0.553**	-0.441*	-0.003*	-0.543**	-0.592**	-0.004**
		(0,247)	(0,266)	(0,266)	(0,265)	(0,283)	(0,283)
DmEng	(+)				-0.561**	-0,243	-0,002
					(0,262)	(0,289)	(0,289)
DmNoCol	(-)	0,273	0,457	0,004	0,276	0,460	0,004
		(0,429)	(0,483)	(0,483)	(0,430)	(0,485)	(0,485)
DmGrad	(-)	0,086	0,149	0,001	0,086	0,133	0,001
		(0,174)	(0,182)	(0,182)	(0,174)	(0,182)	(0,182)
DmEntrep	(+)	0,019	0,078	0,001	0,016	0,128	0,001
		(0,187)	(0,201)	(0,201)	(0,189)	(0,204)	(0,204)
DmCEO&Pres	(+)	0,072	-0.568**	-0.003**	0,072	-0.604**	-0.003**
		(0,240)	(0,263)	(0,263)	(0,240)	(0,263)	(0,263)
DmCEO&Stock	(+)	-0,626	-0,416	-0,002	-0,627	-0,373	-0,002
		(0,483)	(0,499)	(0,499)	(0,483)	(0,499)	(0,499)
Age	(-)	0,043	0,029	0,000	0,044	0,0121	0,0001
		(0,074)	(0,079)	(0,079)	(0,074)	(0,079)	(0,079)
Age²	(-)	-0,0007	-0,0005	0,0000	-0,001	-0,0003	-0,000002
		(0,001)	(0,001)	(0,001)	(0,001)	(0,001)	(0,001)
CEO_WT	(-)	-0.004*	0,000	0,000	-0.004*	0,000	0,000
		(0,002)	(0,003)	(0,003)	(0,002)	(0,003)	(0,003)
DmGov	(-)	-0.319*	-0,180	-0,001	-0.319*	-0,1757	-0,0011
		(0,168)	(0,192)	(0,192)	(0,168)	(0,192)	(0,192)
Size (Ln)	(+)	0.377***	0.481***	0.003***	0.377***	0.482***	0.003***
		(0,138)	(0,153)	(0,153)	(0,138)	(0,154)	(0,154)
Tobins'Q	(+)	0.135**	-0,056	0,000	0.135**	-0,0535	-0,0003
		(0,060)	(0,119)	(0,119)	(0,060)	(0,119)	(0,119)
EBIT (Ln)	(+)	0,117	0,132	0,001	0,117	0,1364	0,0009
		(0,111)	(0,124)	(0,124)	(0,111)	(0,125)	(0,125)
ROA	(+)	-2,953	-2,924	-0,019	-2,952	-3,176	-0,021
		(3,106)	(3,384)	(3,384)	(3,104)	(3,409)	(3,409)
Leverage	(-)	-0.225**	-0.201*	-0.001*	-0.226**	-0.183*	-0.001*
		(0,097)	(0,104)	(0,104)	(0,098)	(0,105)	(0,105)
Cash (Ln)	(+)	0,074	-0,011	0,000	0,074	-0,0116	-0,0001
		(0,047)	(0,051)	(0,051)	(0,047)	(0,052)	(0,052)

Table 14
Cont.

Independent Variables	Expected Sign	Coef. (1)	Coef. (2)	Marginal Effect. (3)	Coef. (4)	Coef. (5)	Marginal Effect. (6)
Constant		-11.813***	-14.078***		-11.826***	-13.731***	
		(2,220)	(2,542)		(2,224)	(2,543)	
Year Fixed Effects		No	Yes	Yes	No	Yes	Yes
Sector Fixed Effects		No	Yes	Yes	No	Yes	Yes
Observations		9.671	9.671	9.671	9.671	9.671	9.671

Note: This table shows the robustness results where all engineering programs were considered for our educational background in finance dummy variable (columns 1 to 3), and no engineering program was considered (columns 4 to 6). The pseudo-R² ranges between 9,4% and 17,8% for our logit regression models. Standard errors are shown in parentheses. The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

As shown in Table 14, the results for educational background in finance remain significant for each classification.

Noting that the database presents more than one M&A carried out by the same company in several situations, we estimate the aforementioned empirical model considering the database as a panel. Hence, the results of the pooled logit model coefficients are, as expected, equal to the coefficients presented for the previous analyses. However, when estimating logistic longitudinal models, we consider robust standard errors grouped by individuals (which allows us to control for the correlation of error terms for individuals over time), and the results remain robust.

In addition, we also perform regressions using a panel with random effects (it is not possible to use the fixed effects model, as many variables in the model do not change over time). Table 15 shows the results of the estimations with our panel data.

Table 15
Panel Logit – Pooled *and Random Effects*

Independent variables	Expected Sign	Pooled Coef. (1)	Pooled Coef. (2)	Pooled Marginal Effect (3)	Random Effects Coef. (4)	Random Effects Coef. (5)	Random Effects Marginal Effect (6)
DmFin	(-)	-0.573**	-0.477*	-0.003*	-0.666**	-0.617*	-0.007*
		(0.269)	(0.257)	(0,002)	(0.338)	(0.355)	(0.355)
DmEng	(+)	-0.394	-0.057	-0,0004	-0.479	-0.454	-0,005
		(0.458)	(0.477)	(0,003)	(0.528)	(0.543)	(0.543)
DmNoCol	(-)	0.252	0.404	0,003	0.251	0.041	0,000
		(0.398)	(0.529)	(0,003)	(0.655)	(0.700)	(0.700)
DmGrad	(-)	0.077	0.125	0,001	0.269	0.310	0,003
		(0.209)	(0.219)	(0,001)	(0.224)	(0.208)	(0.208)
DmEntrep	(+)	0.029	0.076	0,000	-0.079	0.156	0,002
		(0.216)	(0.214)	(0,001)	(0.277)	(0.250)	(0.250)

Table 15
Cont.

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18

391

Independent variables	Expected Sign	Pooled Coef. (1)	Pooled Coef. (2)	Pooled Marginal Effect (3)	Random Effects Coef. (4)	Random Effects Coef. (5)	Random Effects Marginal Effect (6)
DmCEO&Pres	(+)	0.077	-0.556*	-0.004*	0.116	-0.547	-0,006
		(0.271)	(0.289)	(0,002)	(0.330)	(0.338)	(0.338)
DmCEO&Stock	(+)	-0.623	-0.418	-0,003	-0.900	-0.540	-0,006
		(0.483)	(0.510)	(0,003)	(0.624)	(0.578)	(0.578)
Age	(-)	0.041	0.019	0,000	0.093	0.092	0,0010
		(0.082)	(0.082)	(0,001)	(0.097)	(0.096)	(0.096)
Age²	(-)	-0.001	-0.000	0,0000	-0.001	-0.001	-0,000010
		(0.001)	(0.001)	(0,000)	(0.001)	(0.001)	(0.001)
CEO_WT	(-)	-0.004*	-0.000	0,000	-0.004	0.001	0,000
		(0.003)	(0.003)	(0,000)	(0.003)	(0.004)	(0.004)
DmGov	(-)	-0.315	-0.163	-0,001	-1.018**	-0.763*	-0,008*
		(0.232)	(0.238)	(0,002)	(0.465)	(0.463)	(0.463)
Size (Ln)	(+)	0.372***	0.473***	0.003***	0.270*	0.744***	0.008***
		(0.128)	(0.130)	(0,001)	(0.149)	(0.164)	(0.164)
Tobins'Q	(+)	0.136***	-0.055	0,000	0.189***	0.084	0,0009
		(0.046)	(0.123)	(0,001)	(0.065)	(0.100)	(0.100)
EBIT (Ln)	(+)	0.118	0.135	0,001	0.175	0.038	0,0004
		(0.105)	(0.116)	(0,001)	(0.111)	(0.106)	(0.106)
ROA	(+)	-3.020	-2.982	-0,019	-3.854	-2.417	-0,025
		(3.025)	(3.272)	(0,021)	(3.225)	(3.356)	(3.356)
Leverage	(-)	-0.226**	-0.193*	-0,001*	-0.354**	-0.198	-0,002
		(0.111)	(0.110)	(0,001)	(0.138)	(0.132)	(0.132)
Cash (Ln)	(+)	0.078*	-0.006	0,000	0.074	0.026	0,0003
		(0.046)	(0.047)	(0,000)	(0.048)	(0.051)	(0.051)
Constant		-11.716***	-11.903***		-12.735***	-17.327***	
		(2.522)	(2.585)		(3.212)	(3.435)	
Year Fixed Effects		Não	Sim	Sim	Não	Sim	Sim
Sector Fixed Effects		Não	Sim	Sim	Não	Sim	Sim
Observations		9.671	9.671	9.671	9.671	9.671	9.671

Note: This table presents the results using panel data regressions, Logit Grouped (Pooled) in columns 1 to 3 and Logit with Random Effects in columns 4 to 6. The pseudo-R² ranges between 9,4% and 17,8% for our Logit regression models. Standard errors are shown in parentheses. The symbols *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

Table 15 shows that the results remain robust in both pooled and panel random effects logit models. The educational background in finance dummy variable remains negative and statistically significant, as in the previous analyses.

We also investigate whether the number of dummy variables used in the regression could present any problem for the estimation of the empirical model and the significance of the results for our main variables. We use the results of the likelihood ratio test (which verifies the adequacy of the fit of the model used with another alternative specification) and the Hosmer-Lemeshow test (which divides the base into 10 groups by deciding the estimated probabilities and presents a test of the differences between expected and observed frequencies in the estimation of the model) to assess the adequacy of the model used and the significance of the educational background in finance variable. The specification used in the regressions throughout the study is compared to the model's results, adjusted by the Stepwise method (considering 10% and 5% significance). The results show that the models are qualitatively similar. The educational background in finance dummy variable remain statistically significant in the regressions prepared according to the stepwise method.

As an additional robustness analysis, we performed the tests considering other comparison groups and the other sciences formation group. The tests were performed considering the other comparison groups: entrepreneurship, engineering, and other sciences in the logit model with and without fixed sector and year effects, and panel data using random effects. The dummy variable educational background in finance remained statistically significant, and the same sign was already presented in both models.

Finally, after obtaining the results for the training in finance variable in the binary regression models, we use the adjusted risk ratio (ARR – adjusted risk ratio) and adjusted risk difference (ARD – Adjusted risk difference) measures to assess the risk ratios for the group of CEOs with an educational background in finance in comparison with those of the other groups. The ARR statistic gives the ratio of the probabilities obtained with the forecast model, and the ARD statistic shows the predicted difference in terms of percentage points.

For the regression that compares CEOs with a background in finance with other CEOs trained in other areas (the other sciences variable), we find an ARR result equal to 0.5784. This result indicates that CEOs with a background in finance are, on average, less likely to perform M&As than those in the other sciences group at a rate of 42.16%. The ARD result can be interpreted as a measure of absolute risk and indicates that CEOs with a background in finance carry out, on average, a smaller number of M&A transactions (1.08%) than those in the other sciences comparison group. The comparison group analysis for entrepreneur CEOs has a similar interpretation, with the ARR and ARD measures being 54.37% and 1.70%, respectively. Finally, when comparing CEOs with backgrounds in finance with those with other backgrounds (entrepreneurs, engineers, and those with backgrounds in other sciences), we find similar results (but with less divergence between groups), with ARR and ARD measures of 35.52 % and 0.84%, respectively.

5. FINAL REMARKS

This research investigated the relationship between CEO characteristics and the probability of a company performing M&As in Brazilian nonfinancial firms listed on the B3 from 2000 to 2017. Our research analyzed the profiles of the CEOs who performed M&A, in comparison with the total group of CEOs of companies listed on the B3. We found that the CEO characteristics are relevant for the decision to perform M&As, align with those highlighted in the research by Brown and Sarma (2007) and Malmendier and Tate (2008), who analyzed the impact of CEO overconfidence in the decision to perform M&As in companies, and identified the importance of a CEO background in finance. Our results demonstrate that CEOs' training is relevant in the decision to carry out M&As, corroborating the results of other surveys in which CEOs with a finance background are less likely to perform M&As and tend to be less overconfident.

An education in finance offers a more extensive background in project analysis; and the financial viability of investments; and more rationality in projections of future earnings; hence, CEOs with a background in finance may be more demanding in M&A decision making, basing their reasoning more in numbers and analysis, and being more rational in approving M&As. Thus, their likelihood of performing M&As is reduced in comparison to CEOs with other backgrounds. This study brings to light the importance of a financial background in the M&A decisions made in Brazil. We believe that deeper financial support can help CEOs decide whether to perform an M&A in a more rational and justified manner.

The main limitation of this study is the lack of Brazilian data to use the same overconfidence proxy used by Malmendier and Tate (2005, 2008) that verified the overconfidence of CEOs according to the execution of stock options.

However, we believe that this study can contribute to future research; since there is evidence that CEOs trained in finance are less likely to perform M&As, further studies could examine the characteristics of these CEOs in greater deep as a way of explaining what is most relevant for M&A decisions. For example, the average time in the M&A process, the number of M&As the CEO has already carried out in his career and his length of experience in the financial career. We believe that the following would be good questions for future research: Do CEOs with a finance background take longer in the M&A process than CEOs with other backgrounds? Is career time in finance related to the M&A decision?

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AUTHOR'S CONTRIBUTION

Contribution	Author 1	Author 2
1. Definition of the research problem	x	x
2. Development of hypotheses or research questions	x	x
3. Theoretical foundations	x	x
4. Definition of methodological problems	x	x
5. Data collect	x	
6. Statistics Analysis	x	x
7. Analysis and Interpretation of data	x	x
8. Critical review of the manuscript	x	x
9. Writing of the manuscript	x	

CONFLICTS OF INTEREST

We declare that we have no academic/personal conflicts of interest in the publication of this article.