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Does Economic Policy Uncertainty Affect M&A Operations? Evidence from the Brazilian Market

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ABSTRACT

The objective of this work was to investigate the effect of Economic Policy Uncertainty on Mergers and Acquisitions operations of listed companies in Brazil. For this purpose, we have run a binomial logistic regression model to verify the impact of Economic Policy Uncertainty on the propensity for Mergers and Acquisitions in the following year. Using a sample of 128 publicly traded non-financial companies, from 2010 to 2018, we identified that Economic Policy Uncertainty reduces the propensity of acquiring firms to engage in Mergers and Acquisitions activities. The alternative metric used as a proxy for uncertainty, the Economic Uncertainty Indicator - Brazil, was not statistically significant. The results are consistent with international evidence. This study proposes a hybrid model that can be used to estimate the propensity for Mergers and Acquisitions in other contexts. Furthermore, it contributes to a series of emerging discussions on factors triggered by economic policy uncertainty that can alter the dynamics of corporate decisions.

KEYWORDS

Corporate Investments, Real Options, Political Uncertainty

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1. INTRODUCTION

One of the most relevant forms of corporate investment is Mergers and Acquisitions (M&A), forms of business combinations in which one company (acquirer) gains control over another (target) through the purchase of its assets, or when two companies come together to engage in some new businesses, among other possibilities. Such investments stand out for their magnitude, strategic implications at both industry and corporate level, and for their total or partial irreversibility (Nguyen & Phan, 2017). This last feature implies that, if the acquiring firm managers change their minds after closing such a deal with the target firm, it will not be possible to easily recover the invested capital. Thus, when there is uncertainty associated with the value of the target firm, managers may choose to delay investments to wait for some more accurate information (Bernanke, 1983; Dixit & Pindyck, 1994).

The Real Options approach to investments suggests that uncertainty can be an important source of variation in M&A activities. Within this context, it is important to highlight the difference between risk and uncertainty according to Economic Theory (Knight, 1921). Risk is the probability of an undesired event occurring, considering that its design and alternative possibilities are known to investors at present. Whereas uncertainty is the inability to predict that a certain event will occur, preventing investors from reacting in advance accurately. In these circumstances, new information can only be known by experiencing such an event. Therefore, an environment marked by heightened uncertainty seems to delay investments regardless of the operation risk (Bernanke, 1983), since agents may prefer to wait and see how the future will unfold.

This discussion was recently resumed (Nguyen & Phan, 2017) due to the development of an index capable of capturing the perceived uncertainty in the political and economic dimension, the Economic Policy Uncertainty Index (EPU) (Baker et al., 2016). Calculated for several countries, the EPU seeks to measure the uncertainty generated by government measures in the economic scenario and has been shown to be strongly related to corporate decisions (Attig et al., 2021; Duong et al., 2020; Roma et al., 2020; Schwarz & Dalmácio, 2020). After the index development by Baker et al. (2016) and its recognized importance, other uncertainty indexes derived from it were developed considering local adaptations and particularities, as the Economic Uncertainty Indicator – Brazil (IIE-Br), for the Brazilian economic scenario (Ferreira et al, 2019).

Few studies in the world so far have contributed to the discussion of the relationship between EPU and M&A, and generally found that there is a negative association (Bonaime et al., 2018; Borthwick et al., 2020; Nguyen & Phan, 2017). According to Borthwick et al. (2020), one of the reasons for this relationship is that the unpredictability of changes in government policies can affect the value of target firms in M&A processes. These changes may be related to tax, monetary, or regulatory macroeconomic policies, as well as government spending. Having that in mind, acquiring firms may prefer to postpone their investments until these policies are well resolved (Borthwick et al., 2020). This can also imply deals being lost rather than postponed (Bonaime et al., 2018).

It is intriguing to researchers that the historical evolution of M&A deals occurs in a "wavy" shape, which are correlated with increases in the market indexes of publicly traded companies, such as stock prices and price/earnings ratio, according to evidence in the capital markets of developed countries (Gugler et al., 2012; Shleifer & Vishny, 2003). Cortés et al. (2017) also identified such a pattern in the evolution of M&A in Latin American countries. In these countries, the

waves started in the 2000s, and were possibly driven by international waves, which implies that macroeconomic changes, and changes in the global business environment can be determinants of M&A operations in emerging economies (Cortés et al., 2017).

The Brazilian case fits the evidence for emerging markets and, according to Wood et al. (2004), this was motivated by the liberalization of the economy, favoring M&A, with the deregulation of local markets, privatization programs, and increased levels of international competition, which forced domestic companies to engage in these activities. With the notes of Wood et al. (2004) it is possible to hypothetically deduce that the first wave of M&A in Brazil was triggered mainly by factors derived from economic policy—a fact that gives rise to an empirical investigation.

The country presented a record in the historical series of M&A transactions with the announcement of 1038 transactions in 2020, a 14% increase compared to 2019 and 48% higher compared to the average of the five years before that (2019-2015), according to consultancy Pricewaterhouse Coopers (PricewaterhouseCoopers, 2021). It should be noted that this peak in M&A operations occurred in the midst of an economic recession, with a reduction in the level of economic activity, an increase in consumer price indexes, and an increase in the unemployment rate and fiscal imbalance, although new projections point to a recovery trajectory in 2021 (Souza et al., 2021).

Concurrent with the Brazilian recession scenario in recent years, Brazil's uncertainty indexes also experienced high volatility, reaching extreme values and higher than usual ranges from 2015 on. Much of this was due to the political and fiscal instability of that period, which was marked by a presidential impeachment process, corruption scandals, widespread protests, and highly polarized elections (Gouveia, 2020).

In this way, the Brazilian scenario may be conducive to investigating the possibility of economic policy uncertainty affecting M&A activities in a country. In this context, we elaborated the following guiding question of this research: ***What are the effects of economic policy uncertainty on mergers and acquisitions of companies in the Brazilian market?*** Thus, the objective of this work is to investigate the effect of economic policy uncertainty on mergers and acquisitions operations of listed companies in Brazil in recent years.

Applying a binomial logistic regression model with a sample of 128 Brazilian companies traded on (Brazilian Stock Exchange) B3, from 2010 to 2019, we identified that the uncertainty of economic policy, as measured by the EPU, has a negative effect on the propensity of acquiring companies to engage in M&A activities in the following year. The effect remained negative and significant for different model specifications, however, the alternative uncertainty variable, the IIE-Br, did not show statistical significance. The results were consistent with international evidence, despite institutional differences between countries. It is also worth noting that the level of statistical significance adopted for the interpretation of results in Brazil is less rigorous than in international studies for the USA and China. A limitation that contributes to this is the impossibility of using data from a wide range of acquiring companies in the country, as in international studies, hence the inferences being limited to the sample of publicly traded companies. Even so, this study points to evidence for a negative effect of EPU on M&A, which can be explored in future studies. In addition, a comparative table is presented among the results of studies that have already tested the relationship with domestic M&As, including the variables that were used in the models.

This study contributes to a series of emerging studies in the Corporate Finance literature, still incipient in Brazil, on factors triggered by economic policy uncertainty that can alter the conventional dynamics of financial decisions. Specifically, it contributes to a better understanding of the reasons why companies seek (or not) the merger and acquisition processes, with emphasis on political and institutional external factors. Furthermore, it proposes a hybrid model that can be used to investigate the propensity for M&A and the effect of other factors (macroeconomic, institutional, industry, and firm level) on these activities.

2. THEORETICAL FRAMEWORK

2.1. Uncertainty as a Source of Variation in Mergers and Acquisitions Activities

M&A transactions allow firms to consolidate their long-term strategic objectives. The business combination can provide market power in the same industry or in the formation of conglomerates, gains from synergy benefits in the form of greater growth, or economies of scale, and positive effects on returns, placing the target firm under a more experienced management (Damodaran, 2008). In this way, M&A activities can move the economy and generate interest for analysts, academics, and policymakers (Bonaime et al., 2018).

Wood et al. (2004) listed some reasons for the practice of M&A, which can be organized into two groups: (i) Strategic reasons, involving anticipation of a move by competitors; intensity of competition, with the emergence of new entrants and substitutes; and the need to generate economies of scale. (ii) Political and institutional reasons, which involve the influence of shareholders and other primary stakeholders such as government and business partners; political motives within the organization; and the tendency of companies to follow one another, leading to mimetic behavior.

This last behavior is particularly interesting in the context of this research, as taking other organizations as a model can constitute a response to uncertainty (DiMaggio & Powell, 1983). Some studies predicted a positive association between uncertainty and M&A transactions (Duchin & Schmidt, 2013; Sha et al., 2020).

On the other hand, the most conventional approach used to explain this relationship is the Real Options Theory (Bernanke, 1983; Dixit & Pindyck, 1994), which predicts a negative relationship. This theoretical strand signals that real corporate investments react negatively to uncertainty, because, due to its irreversibility, firms may prefer to keep their cash holdings for the purpose of prevention and/or speculation and risk reduction (Duong et al., 2020). In these circumstances, firms would have incentives to postpone their acquisitions, as the option of waiting for new information is valued in this context (Bonaime et al., 2018). New studies contribute to this current discussion, relating a specific source of uncertainty, in its political dimension, due to the EPU metric developed by Baker et al. (2016).

Such empirical studies have confirmed the theoretical hypothesis that economic policy uncertainty can often delay corporate investment (Akron et al., 2020; Chen et al., 2020; Gulen & Ion, 2015; Wang et al., 2014), with some exceptions (Liu et al., 2020). Specifically with Mergers and Acquisitions, using a sample of American companies over the period from 1986 to 2014, Nguyen and Phan (2017) identified that economic policy uncertainty is negatively related to the propensity to acquire other firms and is positively related to the time taken to complete the deals. The authors also found that uncertainty motivates acquiring firms to use shares as a form of payment and to pay lower acquisition premiums.

Moving along this line, Bonaime et al. (2018) found a strong negative association between economic policy uncertainty and M&A activity with a specific sample of US companies and, at a macroeconomic level, considering all the announcements made in the country. Consistent with the Real Options Theory, the authors identified that this effect is intensified for less reversible trades. On the other hand, the effect is mitigated for businesses that cannot be delayed due to the level of competition. The analysis at the macroeconomic level, based on a Vector Autoregressive model (VAR), showed that both the total value and the total number of transactions respond negatively to a shock of economic policy uncertainty, with a persistent effect for up to 12 months ahead.

Replicating the study by Bonaime et al. (2018), Borthwick et al. (2020) investigated this relationship in the Chinese M&A market. The authors identified that economic policy uncertainty reduced the probability of mergers and acquisitions in the following year among Chinese companies, confirming the existence of a negative effect.

Thus, consistent with the stream of empirical evidence and discussions on the general relationship between the variables of interest in this study, the following research hypothesis is proposed:

- (**H1**) *Publicly traded Brazilian companies reduce their merger and acquisition activity in response to heightened economic policy uncertainty.*

2.2. Economic Policy Uncertainty

Uncertainty has been the target of several contributions in macro finance (Barboza & Zilberman, 2018; Godeiro & Lima, 2020; Pereira, 2001; Souza et al., 2019; Zerbinatti et al., 2021). In the Brazilian scenario, Barboza and Zilberman (2018) investigated the impacts of uncertainty on economic activity and attested that there is a contractionary effect of both domestic uncertainty (in greater intensity) and external uncertainty. In that same scenario, the countercyclical pattern of uncertainty was evidenced, and it was shown that increases in its magnitude precede economic crises (Godeiro & Lima, 2017). Using conditional volatility models to build uncertainty proxies from macroeconomic variables, studies from the early 2000s already showed that investment is negatively affected by uncertainty, corroborating the economic theory for Brazil (Pereira, 2001).

With the evolution of computational capacity recently, associated with criticisms about the use of uncertainty proxies based on volatility (Godeiro & Lima, 2017), proper measures of uncertainty could be developed from techniques that allow capturing it in more specific dimensions, such as economic policy (Baker et al., 2016), which is featured in this manuscript.

The conduct of economic policy by the government impacts the behavior of the financial market and companies, which must respond to government actions. Such an impact can be intensified when there is uncertainty about who will make policy decisions, when and what decisions will be made, and their subsequent effects on the economy (Baker et al., 2016). The inability to predict these characteristics can be signaled with preventive and/or precautionary decisions to cushion the shocks derived from uncertainty and reduce risks. Companies can increase their cash holdings (Demir & Ersan, 2017; Duong et al., 2020), increase their payout levels (Attig et al., 2021), reduce funding levels (Zhang et al., 2015) and delay their investments (Akron et al., 2020; Gulen & Ion, 2015), including M&A transactions (Bonaime et al., 2018; Nguyen & Phan, 2017).

Uncertainty is a construct not directly observable and therefore difficult to measure. It is often captured by the dispersion of macroeconomic expectations and asset price volatility in the financial market. Nonetheless, Baker et al. (2016) proposed an indicator for this quantification, which is based on counting the frequency of news in newspapers that report uncertainty in the political scenario. Originally created for the United States, the EPU has three types of underlying components: (i) the first is a textual analysis component, derived from search results in the ten largest newspapers in the country, to get the average monthly news count that contains the terms "uncertain" or "uncertainty" and "economic" or "economy", along with other relevant political terms: "congress", "deficit", "federal reserve", "legislation", "regulation", or "white house" (including more variants for all terms); (ii) the second component is based on reports from the Congressional Budget Office (CBO) which compiles lists of temporary federal tax code provisions, given that temporary fiscal measures are a source of uncertainty for businesses and households; and (iii) the third is based on market analysts' forecasts dispersion on future levels of the consumer price index and government spending at the federal, state, and local level (Baker et al. 2016).

All components are disclosed separately and in aggregate on the website https://www.policyuncertainty.com/. According to Baker et al. (2016), the extension of the measure over time, and, for the other countries, focused only on component (i) of journalistic media. For that reason, they can also be called Newspaper-based EPU. The EPU for Brazil is officially calculated and published on the policyuncertainty portal with the component (i), only, with adaptations to the local reality in the political terms sought, using archives from the newspaper "Folha de São Paulo" since 1991.

Alternatively, Brazil has the Economic Uncertainty Index (IIE-Br), which was developed by Ferreira et al. (2019) and measures, however, the general levels of economic uncertainty. The IIE-Br is produced by the Brazilian Institute of Economics – IBRE/FGV and comprises two components, the (i) media component (80% weighted) with the frequency of articles mentioning economic uncertainty in the six largest high-circulation newspapers in the country, namely: "*Valor Econômico*", "*Folha de São Paulo*", "*Correio Brasiliense*", "*Estadão*", "*O Globo*" and "*Zero Hora*". To address economic uncertainty, textual analysis comprises the terms "ECON" for economy and "INSTAB", "UNERT" and "CRISES" for uncertainty. The second specific component of that metric comprises an indicator of market analysts' forecasts dispersion on macroeconomic variables: Basic interest rate (Selic), Broad Consumer Price Index (IPCA) and exchange rate (PTAX) (Ferreira et al., 2019).

Both EPU Brazil and IIE-Br capture the volatility of the perception of uncertainty in their political and economic dimensions, respectively. A greater variability of the EPU index is noticed, when comparing the historical evolutions of the two metrics. Despite being measured with a similar methodology, the differences in their magnitudes are consistent with their purposes and calculation methods, in addition to the fact that different periods were used for its standardization (the EPU Brazil starts in 1991, while the IIE-Br starts in 2000). Furthermore, the EPU has a greater emphasis on economic policy and may suffer from some perspective bias from the only news source it includes, which may contribute to its greater volatility (Schymura, 2019). Figure 1 below shows the evolution of the historical series for the two indices:

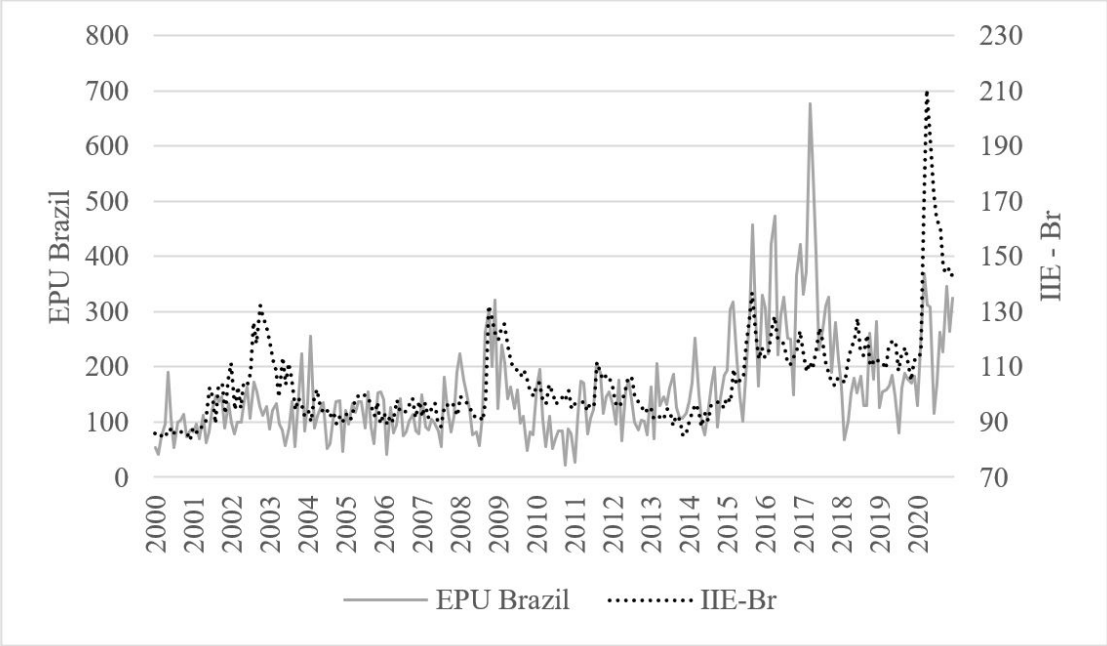

Figure 1. Historical Series EPU Brazil and IIE-Br indexes, developed by Baker et al. (2016) and Ferreira et al. (2019).
Source: Data available at policyuncertainty.com.

We noticed that both indexes have a persistent upward trend from 2015 on. This increase can be explained by the deterioration of the political situation in the period, which led to several events involving political actors, in addition to the loss of investment grade, with the downgrade of Brazil's credit rating by Standard & Poor's (Schymura, 2019).

Thus, we use the two indicators alternatively as proxies of uncertainty in the following econometric analysis. With this, we expect to see possible differences in the responsiveness of M&A transactions, in relation to uncertainty in the political and economic dimension in Brazil.

3. METHODOLOGY

3.1. Sample and definition of variables

To reach the objectives, this investigation proposes models that estimate the propensity for M&A, based on studies by Bonaime et al. (2018), Borthwick et al. (2020), Nguyen and Phan (2017) and Sha et al. (2020), with adaptations for the Brazilian market and for the available data. To this end, the binomial logistic regression was used to estimate the parameters of the model, for predicting the probabilities of an acquisition announcement in the following year (t+n) as a function of EPU and IIE-Br indexes in t, as well as control variables at the firm, industry, and macroeconomic levels, for a sample of publicly traded companies.

Initially, firm-level data was collected from a sample of 172 publicly traded non-financial companies listed on the Brazilian stock exchange (B3). Companies in the financial industry were excluded, following previous studies (Borthwick et al., 2020) in order to maintain the possibility of comparability among them. The number of companies is the result of a previous filter, from the Economatica® database, which considered a total of 313 non-financial companies over 9 years, from 2010 to 2018. Of this total, 141 companies with uncovered liabilities or did

not disclose financial information in all fiscal years were excluded, which could hamper the collection of indicators. At this point, we reached 1,548 observations of companies/year. It was also verified that not all these companies have an active presence in the trading sessions of the stock exchange, which could jeopardize the calculation of its market ratios. With this, we delimited the observations to those in which the company had a presence greater than 40% in the year. This caused 44 companies to be removed from the analysis, as they had a presence below this level in all years. Thus, the final number of companies analyzed was 128, comprising 943 observations of companies/year with complete information in an unbalanced panel. The pooled logit model was used in the regression analysis of the independent variables on the defined dependent variable.

The dependent variable in this study (MA_{it+1}) takes the binary form, where it receives the value one if the firm announces an acquisition in the subsequent period (t+1) and zero otherwise. The companies' mergers and acquisitions data were extracted from the SDC Platinum® database (Refinitiv®) until the year 2019, the date on which the database was available to the authors at the time of collection. The independent variable is the economic policy uncertainty, represented by the EPU metric by Baker et al. (2016) and alternatively the IIE-Br metric by Ferreira et al. (2019). The uncertainty proxies were both extracted from the Economic Policy Uncertainty Index portal (policyuncertainty.com). The data for the construction of the other macroeconomic control variables were extracted from the Time Series Management System – SGS of the Central Bank of Brazil (bcb.gov.br/sgspub). As there is a time lag of the explanatory variables in relation to the dependent variable, the data series for the former extend to 2018.

The explanatory and control variables at the firm, industry and macroeconomic levels are detailed next (Table 1).

For the explanatory variables of uncertainty, which are calculated and reported monthly, the weighted average was applied, considering greater weighting in the last month, as the level of uncertainty of the most recent month can have a greater impact on decisions (Nguyen & Phan, 2017; Schwarz & Dalmácio, 2020). Alternatively, the arithmetic mean was also used, and its significance indicated in an explanatory note to the table.

All firm-level variables were winsorized at the 1st and 99th percentiles, following the guidelines by Bonaime et al. (2018) and Borthwick et al. (2020). Furthermore, considering that industry common factors of companies can affect acquisitions, we have included industry fixed effects controls in some models, classified according to macro industry segmentation of B3. Following Nguyen and Phan (2017), we did not control for year fixed effects, since all firms are subject to the same political uncertainty in a given year and this could absorb the explanatory power of the variable of interest (Gulen & Ion, 2015; Nguyen & Phan, 2017). Models include robust standard error estimates with clustering criteria by year (Bonaime et al., 2018; Borthwick et al., 2020; Nguyen & Phan, 2017).

Both EPU and M&A volume show a cyclical movement over time and can be simultaneously correlated with unobservable factors at the macro level (Nguyen & Phan, 2017). Such a fact can exacerbate concerns about the existence of endogeneity in the model (Hill et al., 2021). One way to deal with this is running the model with instrumental variables (IV). In similar reasoning to previous empirical studies (Nguyen & Phan, 2017; Sha et al., 2020; Schwarz & Dalmácio, 2020), the variables yearly level of "Chamber of Deputies support to the president's position" (Estadão, 2022) and US EPU were used alternatively as instruments. However, we were not successful in instrumentalizing the uncertainty variables, which is a limiting factor of this study. In fact, it can be a challenge to find valid instruments in management research (Hill et al., 2021) and such consideration remains as a suggestion for further studies.

Table 1
Variables Inserted in Models

Explanatory Variables	Description	Source
LNEPU	Natural logarithm of the weighted average between the months of each year of the EPU Brazil index.	
LNIIE	Natural logarithm of the weighted average between the months of each year of the IIE Brazil index.	
Firm level		
LNSIZE	Natural logarithm of total assets.	
ROA	Ratio of earnings before interest and taxes to total assets.	
VSALES	Change in net revenue in relation to t-1.	
LEV	Ratio between total debt and total assets.	
CX	Ratio between cash and equivalents and total assets.	
MTB	Market-to-Book Index. Ratio between market value and book value of equity.	
RET	Buy-and-hold stock return during period t trading days.	Nguyen and Phan (2017); Bonaime et al. (2018); Borthwick et al. (2020); Sha et al. (2020).
VOL	Annualized standard deviation of daily stock returns during period t.	
Industry level		
IMTB	Median of the Market-to-Book index for each industry in period t	
IRET	Median of returns for each industry in period t	
IVOL	Median of annualized standard deviations of daily returns for each sector in period t	
HHI	Herfindahl-Hirschman Index: sum of the square of the market shares of companies in the industry.	
Macroeconomic level		
INVOP	Investment opportunities: first principal component extracted from the linear combination between four indexes: Consumer Confidence Index - ICC; Economic Activity Index - IBC; Future Expectations Index – IEX; and yearly change in GDP .	
SELIC	Yearly variation of the Selic rate.	

Note: the calculation of industry level variables was not restricted to the companies in the sample. In this case, all listed companies with available data in the industry in period t were considered to calculate the medians and the HHI. In calculating the macroeconomic level variable INVOP, the year average was considered for the ICC, IBC and IEX indexes, that are released monthly by the Central Bank of Brazil (https://www3.bcb.gov.br/sgspub/). Details of the PCA results are provided in Appendix A. Due to limitations in the available data, some variables used to calculate INVOP differ from those used by Bonaime et al. (2018).

Source: Authors' own elaboration.

3.2. Model Specification

As we deal with the modeling of a binary variable and, therefore, a limited dependent variable (Maddala, 1986), this analysis should employ a suitable econometric modeling. Among the possibilities of models for this specificity, Wooldridge (2019) highlights the Linear Probability Model (LPM, which uses the Ordinary Least Squares estimator) and the Probit and Logit models (that employ the Maximum Likelihood estimator), which are non-linear models. The empirical literature on M&A uses these three possibilities to estimate the acquisition propensity (Bonaime et al., 2018; Erel et al., 2021; Nguyen & Phan, 2017) depending on some modeling specificities, such as, for instance, the existence of interaction terms and/or many dummy variables among the explanatory variables, in which, in this case, the LPM would be indicated to mitigate the problem of incidental parameters, which can occur with non-linear models (Erel et al., 2021; Nguyen et al., 2020). Probit and Logit models often result in qualitatively similar estimates and for this analysis, we chose to follow the approach adopted by Bonaime et al. (2018) using Logit. The Logit model employed can be specified according to the functional form (Wooldridge, 2019):

$$P\left(MA_{it+1}=1\,|\,\mathbf{x}\right)=G\left(\beta_0+\mathbf{x}\boldsymbol{\beta}\right) \tag{1}$$

where,

$$G\left(\beta_0+\mathbf{x}\boldsymbol{\beta}\right)=\frac{1}{1+e^{-(\beta_0+\mathbf{x}\boldsymbol{\beta})}}=\frac{1}{1+e^{-(Z)}}=\frac{e^{Z}}{1+e^{Z}} \tag{2}$$

and

$$\mathbf{x}\boldsymbol{\beta}=\lambda Uncertainty_t+\delta Firm_{it}+\gamma Industry_{st}+\omega Macro_t+dFE\_Industry_s \tag{3}$$

Where the model response variable is a probability of becoming an acquirer in the following year (MA_{it+1} = 1) conditional on a vector **x** that denotes the set of explanatory and control variables, described in the previous section, and varies between 0 and 1. *G* is the cumulative logistic distribution function that takes values strictly between 0 and 1 and ensures that the estimated probability is limited to this range. β_0 is the constant term. β is a vector that denotes the set of estimated parameters for the explanatory and control variables: λ, δ, γ, ω, *d*. $Uncertainty_t$ represents the interest explanatory variable that assumes EPU and IIE-Br indexes, alternatively. $Firm_{it}$, $Industry_{st}$, and $Macro_t$ are the set of firm, industry, and macro-level control variables, respectively. $FE\_Industry_s$ denotes the use of dummies for industry fixed effects control. The subscripts *i,s* and *t* indicate, for its respective vector, that the variables vary between companies *i*, between industries *s* and/or between years *t*.

It is important to note that the interpretation of the coefficients of the Probit and Logit models is not straightforward. A priori, the sign of the coefficient is interpreted, but not its magnitude, due to the non-linear nature of the function *G* (Wooldridge, 2019). For this purpose, the marginal effect of the variable x must be reported, which measures the change in the probability of success of y (y = 1) given a unit change in x. For this, we need to resort to the partial derivative of the function *G*, given $p(\mathbf{x}) = P(y = 1|\mathbf{x})$ (Wooldridge, 2019):

$$\frac{\partial p(\mathbf{x})}{\partial x_j} = G'(\beta_0 + \mathbf{x}\boldsymbol{\beta})\beta_j = \frac{e^Z}{1+e^Z}\frac{1}{1+e^Z}\beta_j \Rightarrow \frac{e^Z}{(1+e^Z)^2}\beta_j \quad (4)$$

Or, simplifying, given the equality in Eq. (1), we have that $P = \frac{e^Z}{1+e^Z}$ and $(1-P) = \frac{1}{1+e^Z}$. Thus, substituting the terms of Eq. (4) the calculation of the marginal effect for the variable *j*:

$$\beta_j P(1-P) \quad (5)$$

In which subscript *j* refers to the parameter β estimated for the *j*-th independent variable. In this way, it is possible to interpret the effect of oscillations in the variable **x** on the probability of success of y.

4. PRESENTATION AND ANALYSIS OF RESULTS

4.1. Descriptive Analysis

Table 2 presents the summary statistics for the sample of companies and for the industry and macroeconomic variables in the studied period. The average political and economic uncertainty levels for the period were 171.419 (Ln: 5.114) and 104.766 (Ln: 4.652) respectively. There is greater volatility for the EPU, a behavior also perceived in Figure 1. The average assets (AA) of these companies in the period was BRL 6.66 billion, approximately (Ln: 15.712). The companies' average annual ROA was 4.5% and they also saw a change in revenue (VSALES) positive, at 5.6% per year—with high dispersion, however. Average indebtedness (LEV) represented 29.2% of total assets and cash and cash equivalents (CX) 8.8%. It can be considered that the market value of the shares of these companies represented, on average, 2.34 times the book value of their equity in the period (MTB). The shares of these companies offered annual returns (RET) of 14.1% on average in the period, with a standard deviation (VOL) of 30%. The industry median indexes IMTB, IRET and IVOL were 1.39, 5.9% and 37.6% on average, respectively. The Herfindahl-Hirschman index (HHI) indicated low concentration in the industries on average (0.123), showing that markets were more competitive among publicly traded companies. The macroeconomic level proxy for Investment Opportunities (INVOP) is a standardized variable, however, it is possible to see that its average is greater than the median, indicating that the values to the right side of the distribution are further from the center. The average annual Selic rate in the period was 10.3%.

Figures 2 and 3 show the evolution of the EPU and IIE-Br and the number of M&A announcements of the sample companies over the period. The 128 companies in the sample engaged, on average, in 31.6 M&A transactions per year during the period. It should be noted that a company can make more than one announcement per year, so this volume is not restricted to one per company.

The volume of deals announced fell sharply between 2010 and 2014 and did not return to the initial level (51 announcements in 2010) until 2019. On the other hand, the weighted average EPU showed an upward trend until 2016. The IIE-Br was less dispersed over the period, but with a jump from 100 to 120, approximately, in 2015, the year in which the announcements of the companies in the sample started to increase. It is important to highlight that the M&A announcements of the companies in the sample followed a different movement from the aggregate number of announcements in Brazil (PricewaterhouseCoopers, 2021). According to the PwC

consultancy, the period from 2015 to 2019 showed a decrease in the average of transactions compared to the period from 2010 to 2014. In the next section, empirical tests of the statistical relationship between these variables will be presented.

Table 2

Summary Statistics of the Variables Inserted in the Models

Variable	N	Mean	Median	Std.Dev	CV	Minimum	Maximum
MA (t+1)	980	0.164	0	0.371	2.257	0.000	1.000
(Ln) EPU	980	5.144	4.987	0.441	0.086	4.347	5.726
(Ln) IIE-Br	980	4.652	4.638	0.093	0.020	4.497	4.766
(Ln) SIZE	980	15.712	15.656	1.594	0.101	10.973	19.874
ROA	980	0.045	0.045	0.067	1.500	-0.221	0.231
VSALES	958	0.056	0.034	0.273	4.880	-0.631	1.569
LEV	977	0.292	0.296	0.165	0.565	0.000	0.686
CX	977	0.088	0.667	0.079	0.900	0.000	0.409
MTB	977	2.238	1.425	2.229	0.996	0.170	11.896
RET	968	0.141	0.059	0.482	3,417	-0.721	1.889
VOL	980	0.300	0.251	0.164	0.545	0.136	1.131
IMTB	980	1.399	1.313	0.601	0.430	0.208	4.905
IRET	980	0.059	0.012	0.256	4.352	-0.345	0.750
IVOL	980	0.376	0.361	0.077	0.203	0.241	0.699
HHI	980	0.123	0.062	0.125	1.014	0.041	0.683
INVOP	980	-0.191	-0.738	1.929	-10.096	-3.322	2.658
SELIC	980	0.103	0.099	0.023	0.228	0.064	0.140

Note: N: number of observations. Std.Dev: Standard Deviation. CV: Coefficient of Variation. Obs.: The correlation matrix between the variables used in the regressions and their analysis can be found in Appendix B of this document.

Source: Authors' own elaboration with research data.

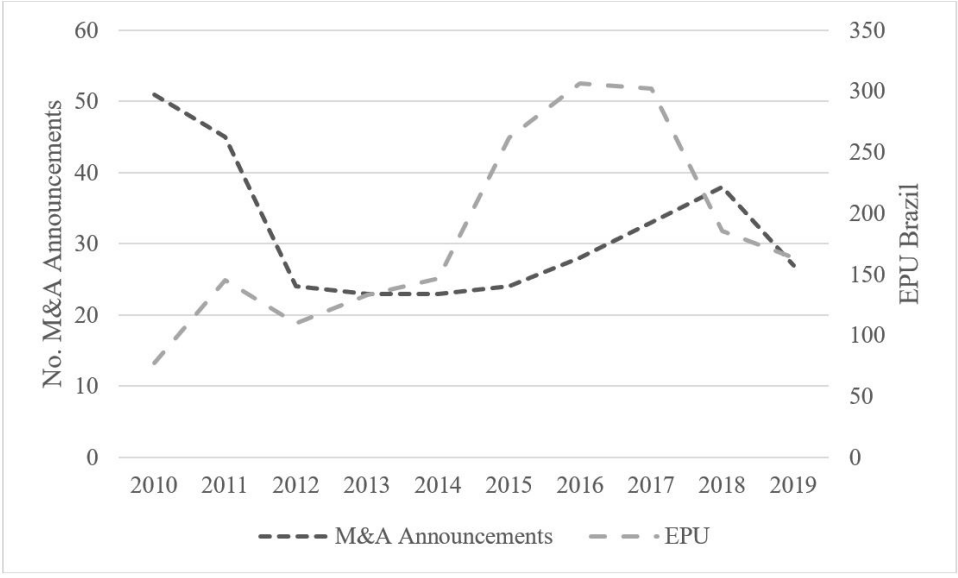

Figure 2. Economic Policy Uncertainty and the number of announcements per year of sample companies.
Note: The weighted average EPU over the months of each year was considered.
Source: Data available at SDC Platinum and policyuncertainty.com.

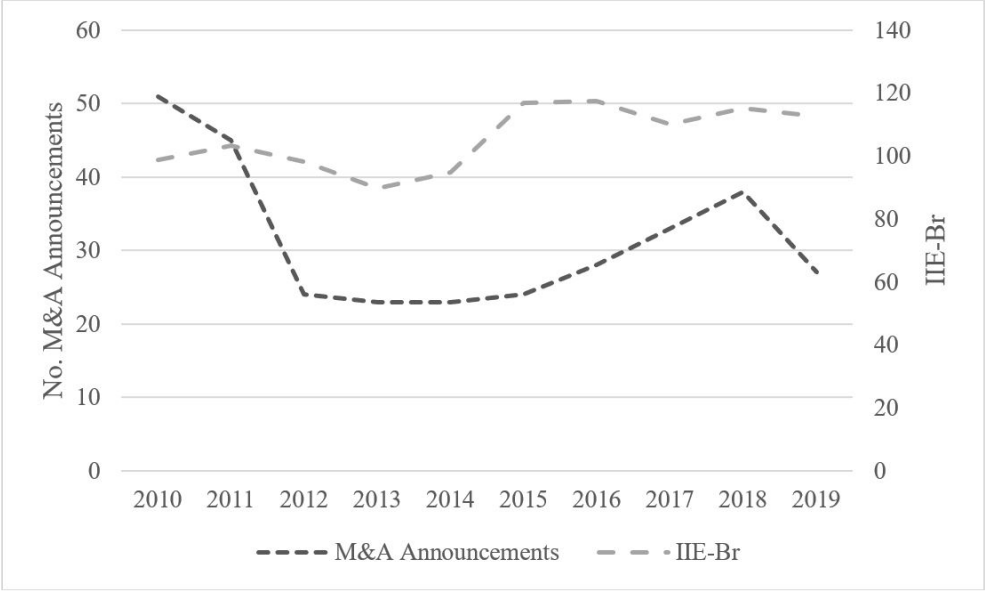

Figure 3. Economic uncertainty – Brazil and number of announcements per year of sample companies.
Note: The weighted average IIE-Br over the months of each year was considered.
Source: Data available at SDC Platinum and policyuncertainty.com.

4.2. Effects of Economic Policy Uncertainty on the Propensity for M&A

Table 3 presents the results of the logistic regression of the propensity to acquire as a function of political and economic uncertainty in Brazil, considering the companies in the selected sample. For the first specification (1), the results were consistent with the hypothesis that economic policy uncertainty reduces the propensity of acquiring firms to engage in M&A activities. The negative coefficient (-0.754) was statistically significant. Furthermore, increases in the size of assests, on cash levels, stock returns and on their volatility, increase the likelihood that the firm will announce an acquisition in the following year. These results are more consistent with the findings by Borthwick et al. (2020), replicating the model in Chinese firms, especially for the sign of the volatility coefficient of returns (VOL) which was also positive, contrary to the results by Bonaime et al. (2018) with American companies, for this variable. As in the study by Sha et al. (2020), the estimated coefficients for the variables ROA, MTB and LEV had no statistical significance.

The coefficient of the variable at the industry level HHI was negative and statistically significant. This indicates that firms in less concentrated (and more competitive) sectors are more likely to announce an acquisition. Excluding the intercept, the other coefficients of this estimation were not statistically significant. In the second specification (2), the coefficient for the uncertainty proxy IIE-Br was not statistically significant.

We observed that the estimated coefficients for the control variables at the industry level IMTB, IRET, and IVOL, of these companies did not show statistical significance. These variables were inserted into the model of Bonaime et al. (2018) considering the Fama and French (1997) industry classifications for 48 industries with 115 thousand company year-observations. The limitation of the diversity of companies and industries that can be studied, considering companies listed in Brazil, and especially for this sample cut, may have contributed to the irrelevance of these variables in the present model. Moreover, Borthwick et al. (2020) replicating the model by Bonaime et al. (2018), also obtained results with low consistency for these variables, which may indicate that these variables in fact have low responsiveness for this model.

Table 3
Economic Policy Uncertainty and Propensity for Mergers and Acquisitions

	Dependent Variable *MA (t+1)*					
	(1)			(2)		
	(Ln) EPU	Standard Error	|z|	(Ln) IIE-Br	Standard Error	|z|
Uncertainty	-0.754	0.386	-1.96*	-0.263	1.153	-0.23
(Ln) SIZE	0.338	0.091	3.73***	0.337	0.088	3.82***
ROA	1.513	1.921	0.79	1.670	1.936	0.86
VSALES	0.262	0.459	0.57	0.338	0.438	0.77
LEV	-0.054	0.355	-0.15	-0.033	0.350	-0.09
CX	2.145	0.907	2.37**	2.160	0.884	2.44**
MTB	-0.053	0.042	-1.27	-0.052	0.042	-1.24
RET	0.453	0.269	1.69*	0.422	0.259	1.63
VOL	1.286	0.778	1.65*	1.260	0.766	1.65
IMTB	0.203	0.310	0.66	0.183	0.293	0.62
IRET	-0.181	0.678	-0.27	-0.411	0.704	-0.58
IVOL	-0.052	1.959	-0.03	0.086	2.645	0.03
HHI	-6.539	3.378	-1.94*	-6.330	3.253	-1.95*
INVOP	-0.092	0.058	-1.59	0.047	0.082	0.57
SELIC	0.088	2.138	0.04	-0.603	3.567	-0.17
Constant	-3.206	1.911	-1.68*	-5.769	5.808	-0.99
Obs.		943			943	
Pseudo-R2		0.0704			0.0671	

Note: The area under the ROC curve indicated that the models have acceptable discriminatory power (> 68%). The dependent variable MA *(t+1)* takes the value 1 if the firm announces at least one acquisition in the following year and 0 otherwise. All independent variables are measured in period t. The sample consists of 128 selected companies, listed on B3 from 2010 to 2018. Model (1) assumes the weighted average EPU as a proxy for uncertainty, while model (2) assumes the weighted average IIE-Br. The coefficients estimated from the arithmetic mean had no statistical significance in any of the estimations. Models include robust standard error estimates with year clustering criteria and receive dummy controls for industry fixed effects. *, ** and *** indicate the significance level at 10%, 5% and 1%, respectively.
Source: Authors' own elaboration with research data.

Nguyen and Phan (2017) and Sha et al. (2020) used more parsimonious models to try to explain the propensity for M&A. The common variables in at least 3 of the 4 studies cited are usually proxies for the size (Ln SIZE), cash (CX), profitability (ROA), sales variation (VSALES), leverage (LEV), market-to-book (MTB) and stock returns (RET). In particular, the stock return variable, which has a positive and significant estimated coefficient in all models, is consistent with the proposition by Harford (2005), on behavioral theoretical foundations that explain M&A waves. He explains that these waves coincide with bull market moments and are, consequently, positively correlated with the stock price and that this engages acquiring firms in M&A activities, who can also choose to pay in stocks, since they are overvalued. The fact that the sample consisted of listed companies may have contributed to this result. New studies in Brazil may seek to assess this relationship.

Having exposed the limitations on the data used in this research, we decided to estimate models with reduced specification, applying a filter to the models in Table 4, which is close to the proposal by Nguyen and Phan (2017) and Sha et al. (2020), including only variables that intersect between the models of these authors and the models by Bonaime et al. (2018) and Borthwick et al. (2020). Thus, the variables VOL, IMTB, IRET, IVOL and SELIC were excluded from the specification. The variables HHI and INVOP were maintained, as representatives of industry and macroeconomic control, respectively.

Table 4
Economic Policy Uncertainty and Propensity for Mergers and Acquisitions (Hybrid Models)

	Dependent Variable *MA (t+1)*					
	(3)			**(4)**		
	(Ln) EPU	Standard Error	|z|	(Ln) IIE-Br	Standard Error	|z|
Uncertainty	-0.745	0.298	-2.5**	-0.352	0.800	-0.44
(Ln) SIZE	0.283	0.072	3.93***	0.283	0.071	3.97***
ROA	0.714	1.589	0.45	0.983	1.509	0.65
VSALES	0.300	0.428	0.7	0.383	0.398	0.96
LEV	-0.065	0.343	-0.19	-0.037	0.334	-0.11
CX	1.905	0.765	2.49**	1.901	0.760	2.5**
MTB	-0.049	0.047	-1.06	-0.049	0.046	-1.06
RET	0.457	0.183	2.5**	0.365	0.156	2.34**
HHI	-6.429	3.118	-2.06**	-6.087	3.168	-1.92*
INVOP	-0.090	0.046	-1.95**	0.045	0.072	0.63
Constant	-1.719	1.432	-1.2	-3.911	4.153	-0.94
Obs.		943			943	
Pseudo-R2		0.0656			0.0619	

Note: The area under the ROC curve indicated that the models have acceptable discriminatory power (> 67%). The dependent variable MA *(t+1)* receives the value 1 if the firm announces at least one acquisition in the following year and 0 otherwise. All independent variables are measured in period t. The sample consists of 128 selected companies, listed on B3 from 2010 to 2018. Model (3) assumes the weighted average EPU as a proxy for uncertainty, while model (4) assumes the weighted average IIE-Br. The coefficient estimated from the arithmetic mean was significant at the 5% level for estimation 3 and not significant in estimation 4. Models include robust standard error estimates with year clustering criteria and receive dummy controls for industry fixed effects. *, ** and *** indicate the significance level at 10%, 5% and 1% respectively.
Source: Authors' own elaboration with research data.

The smaller specification of the models would allow adopting a more rigorous level of significance (5%) for the interpretation and analysis of the results. Furthermore, the use of the arithmetic mean to represent the annual uncertainty index also produced significant statistics in the case of the EPU (estimation 3). In addition, the variable INVOP now has a negative and significant estimated coefficient. The signal obtained is consistent with the findings by Bonaime et al. (2018) and Borthwick et al. (2020). Despite the changes in its calculation for this study, the statistical significance and the verified sign validate this adaptation. This variable, formed from the extraction of the first principal component of the linear combination between macroeconomic variables, captures important properties of these variables and can avoid multicollinearity problems. Its use is suggested in other models that relate corporate decisions to macroeconomic factors.

The estimation of the logistic model using dummies for fixed sector effects can lead to a bias in the estimation, unless there are many companies per sector and the longitudinal dimension (T) of the panel is long (Wooldridge, 2019). The estimation of the marginal effect, which measures the effect of a unit change in the explanatory variable on the probability of occurrence of the event, could be harmed. In this sense, new models were estimated without industry fixed effects controls (Table 5).

Table 5

Economic Policy Uncertainty and Propensity for Mergers and Acquisitions (Hybrid Models without Controls for Industry Fixed Effects)

	Dependent Variable *MA (t+1)*					
	(5)			**(6)**		
	(Ln) EPU	Standard Error	|z|	(Ln) IIE-Br	Standard Error	|z|
Uncertainty	-0.638	0.300	-2.13**	-0.045	0.729	-0.06
(Ln) SIZE	0.252	0.042	6.03***	0.251	0.040	6.25***
ROA	0.756	1.586	0.48	0.975	1.497	0.65
VSALES	0.403	0.423	0.95	0.474	0.400	1.19
LEV	0.322	0.235	1.37	0.340	0.233	1.46
CX	1.778	0.844	2.11**	1.785	0.850	2.1**
MTB	-0.023	0.044	-0.52	-0;021	0.044	-0.49
RET	0.412	0.159	2.59***	0;320	0.129	2.49**
HHI	0.126	0.737	0.17	0;112	0.737	0.15
INVOP	-0.069	0.046	-1.48	0;054	0.069	0.79
Constant	-2.747	1.500	-1.83*	-5;780	3.475	-1.66*
Obs.		943			943	
Pseudo-R2		0.0384			0.035	

Note: The area under the ROC curve indicated that the models have acceptable discriminatory power (> 63%). The dependent variable *MA (t+1)* receives the value 1 if the firm announces at least one acquisition in the following year and 0 otherwise. All independent variables are measured in period t. The sample consists of 128 selected companies, listed on the B3 from 2010 to 2018. Model (3) assumes the weighted average EPU as a proxy for uncertainty, while model (4) assumes the weighted average IIE-Br. The coefficient estimated from the arithmetic mean was significant at the 5% level for estimation 5 and not significant in estimation 6. Models include robust standard error estimates with clustering criteria by year. *, ** and *** indicate the significance level at 10%, 5% and 1% respectively.
Source: Authors' own elaboration with research data.

The marginal effect associated with the estimated coefficient for the EPU (-0.638), suggests that, *cetris paribus*, 1 unit increase is associated with a 0.0824 percentage point decrease in probability for mergers and acquisitions, given the unconditional probability of the announcement of an acquisition of 15.24%.

Table 6 summarizes the main results of the studies that related EPU and M&A, compared to the findings of this research.

In Table 6 we include in the comparison only the estimated models that used the EPU variable (1 and 3), because it is the dimension of uncertainty analyzed in international studies. The results are consistent with international evidence, despite the considerably smaller number of observations, a fact that hampered the comparability of the studies.

Table 6

Comparison among studies that analyzed the effects of Economic Policy Uncertainty on the Propensity for Mergers and Acquisitions

Models	Bonaime et al. (2018)	Borthwick et al. (2020)	Nguyen and Phan (2017)	Sha et al. (2020)	Model 1	Model 3
Country	**USA**	**China**	**USA**	**China**	**Brazil**	**Brazil**
Obs.	**115,796**	**20,966**	**88,768**	**29,588**	**943**	**943**
Pseudo-R2	**-**	**0.02**	**0.07**	**0.01**	**0.07**	**0.07**
Variables						
Economic Policy Uncertainty	-	-	-	+	-	-
Size	+	+	+	+	+	+
Return on Assets	+	+	n/a	.	.	.
Sales Variation	+	+	+	n/a	.	.
Leverage	-	+	-	.	.	.
Cash and Equivalents	+	+	n/a	+	+	+
Operating Working Capital	n/a	n/a	+	n/a	n/a	n/a
Market-to-book	+	-	+	.	.	.
Past Returns	+	+	+	+	+	+
Returns Volatility	-	+	n/a	n/a	+	n/a
Shiller's CAPE	+	.	n/a	n/a	n/a	n/a
Market-to-book (industry median)	.	+	n/a	n/a	.	n/a
Past returns (industry median)	+	.	n/a	n/a	.	n/a
Volatility (industry median)	-	-	n/a	n/a	.	n/a
Industry Economic Shocks	+	-	n/a	n/a	n/a	n/a
Herfindahl-Hirschman	n/a	n/a	n/a	n/a	-	-
Investment Opportunities	-	-	n/a	n/a	.	-
Interest Rate	+	+	n/a	n/a	.	n/a
Macroeconomic Uncertainty	-	+	n/a	n/a	n/a	n/a
Firm Age	n/a	n/a	+	n/a	n/a	n/a
Constant	.	-	-	-	-	.

Note: "+"for positive and significant coefficient; "-"for negative and significant coefficient; "."For non-significant coefficient; n/a (does not apply) the model did not include the variable. All models have controls for industry fixed effects.

Source: Authors' own elaboration.

5. CONCLUDING REMARKS

Recent literature has shown that economic policy uncertainty has a great influence on corporate decisions, especially on investment decisions, which can have their dynamics explained by the Real Options approach. This study expands the understanding of this literature in the current of economic policy uncertainty, introducing into the discussion its relationship with Mergers and Acquisitions in Brazil. Until the present moment, the existence of works that investigated this relationship in the Brazilian scenario is unknown.

The first preliminary empirical evidence of a relationship between uncertainty in its political dimension and M&A in Brazil was presented, indicating that Economic Policy Uncertainty may negatively influence these operations. This suggested that companies in the sample studied are less likely to engage in M&A activities if economic policy uncertainty increases, consistent with the research hypothesis. In the comparative analysis, the results were consistent with international evidence for the United States of America and China, indicating a negative effect (predominant in most studies), despite institutional differences between countries and the number of observations used. Furthermore, this study proposes a hybrid model that can be used to investigate the propensity for Mergers and Acquisitions and the effect of other factors (macroeconomic, industry and firm-level) on these activities.

The alternative uncertainty metric used as the dependent variable in the study, the Economic Uncertainty Indicator – Brazil, did not show statistical significance, despite the greater expectation about this metric regarding its use in empirical studies in Brazil, consistent with its calculation method, which can mitigate possible biases of the journalistic media which was used and takes into account the dispersion of important macroeconomic variables in M&A decisions.

The analysis was limited in comparison with international studies, both in the level of significance used to interpret the coefficients, less rigorous, and in the adjustment of the model in terms of significance of the other control variables. Therefore, the evidence leads to the understanding that this is a weaker relationship in Brazil. Due to data limitations, the number of company year-observations considered in the study is substantially lower than international studies, which may have hampered the general adjustment of the logistic model. New studies in Brazil may wish to increase the number of observations used, as well as verify the impact of economic policy uncertainty on the acquisition value and premium, proportion of capital acquired (partial or total), time required to complete the deal, and the predominant instrument used for payment, whether in cash or in stocks.

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AUTHOR'S CONTRIBUTION

ATNB: Conceptualization, Methodology, Formal Analysis, Data Processing, Research, Writing – original draft, writing – proofreading and editing. WML: Conceptualization, Validation, Supervision, Writing – proofreading and editing. PCM: Conceptualization, Validation, Supervision, Writing – proofreading and editing.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

APPENDIX A: RESULTS OF PRINCIPAL COMPONENTS ANALYSIS

In Table A1 below, the PCA results are presented. The results were obtained with the variables ICC, IBC, IEX and real variation of GDP per year. We consider the average between the months of each year for the ICC, IBC, IEX indexes, which have a monthly frequency, to coincide with the periodicity of the series used in the regression analysis, which are annual. To obtain the correlation matrix and the extracted components, we used the entire history of available data for these variables, starting in 2003, since it is the year in which the publication of the series of the analyzed indexes begins, until the date of the analysis (2020).

Table A1
Eigenvalues and Proportion of Total Variance Explained

Component	Eigenvalue	Difference	Proportion	Accumulated
1	2.43362	1.33377	0.6084	0.6084
2	1.09985	0.711264	0.2750	0.8834
3	0.388591	0.310659	0.0971	0.9805
4	0.0779318	0	0.0195	1.0000

Source: Authors' own elaboration.

Through linear combinations between the original variables, 4 components were extracted, however, only the first component was considered for the variable INVOP, as it explains most of the total variance of the variables included, with a proportion of 60.84%. According to Hair et al. (2009, p. 112), principal component analysis is most appropriate when "data reduction is a priority concern, focusing on the minimum number of factors necessary to explain the maximum proportion of the total variance represented in the original set of variables". Therefore, it is a less restrictive and simpler component extraction method than common factor analysis.

In Table A2, the eigenvectors are shown, which denote the importance of each variable for the extracted component and the sign indicates the direction in which they are related.

Table A2
Eigenvectors and Principal Components

Variable	Comp. 1	Comp. 2	Comp. 3	Comp. 4
IBC	-0.0417	0.9303	0.3282	0.1582
ICC	0.6129	0.1856	-0.0801	-0.7639
IEX	0.5836	0.1328	-0.5723	0.5606
GDP	0.5311	-0.2870	0.7472	0.2780

Source: Authors' own elaboration.

Bartlett's sphericity test tests the null hypothesis that the correlation matrix is an identity matrix. The results for this test showed a p-value of less than 0.05, which indicates the existence of significant correlations between the variables and allows the analysis to proceed (Hair et al., 2009).

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APPENDIX B: CORRELATION MATRIX

The preliminary relationship between the variables analyzed in this study can be seen in the following table:

Table B1

Correlation Matrix between the variables used in the regressions

		MA t+1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2	(Ln) EPU	**-0.07**															
3	(Ln) IIE	-0.03	**0.75**														
4	(Ln) SIZE	**0.13**	0.00	0.00													
5	ROA	0.03	**-0.18**	**-0.11**	-0.01												
6	VSALES	**0.07**	**-0.23**	**-0.13**	0.05	**0.17**											
7	LEV	0.04	0.02	0.00	**0.30**	**-0.33**	0.01										
8	CX	0.03	0.02	0.01	-0.03	**0.08**	0.00	**0.10**									
9	MTB	0.00	**-0.13**	**-0.09**	**-0.10**	**0.32**	0.08	**0.07**	**0.08**								
10	RET	**0.05**	**0.11**	**0.12**	-0.04	**0.25**	**0.18**	**-0.10**	0.05	**0.22**							
11	VOL	-0.02	**0.17**	**0.17**	**-0.34**	**-0.29**	**-0.07**	0.00	**-0.11**	-0.05	0.05						
12	IMTB	0.04	**-0.27**	**-0.21**	**-0.10**	**0.15**	**0.11**	**-0.06**	0.03	**0.24**	**0.08**	**-0.15**					
13	IRET	0.01	**0.25**	**0.26**	-0.03	0.02	0.01	-0.05	0.00	**0.08**	**0.53**	0.05	**0.20**				
14	IVOL	-0.05	**0.46**	**0.50**	-0.01	**-0.17**	**-0.14**	-0.01	0.06	**-0.15**	0.02	**0.25**	**-0.56**	0.03			
15	HHI	0.05	0.01	-0.01	**0.27**	-0.05	0.03	**-0.07**	**0.10**	-0.03	**-0.07**	**-0.06**	-0.02	**-0.14**	**0.29**		
16	INVOP	0.05	**-0.85**	**-0.66**	-0.01	**0.18**	**0.21**	-0.04	-0.02	**0.15**	0.04	**-0.16**	**0.35**	-0.01	**-0.48**	-0.01	
17	SELIC	-0.03	**0.46**	**0.37**	-0.02	**-0.09**	**-0.17**	0.03	0.03	**-0.08**	-0.04	**0.15**	**-0.26**	0.00	**0.38**	0.03	**-0.48**

Note: In bold significant correlations at 10%.

Source: Authors' own elaboration.

Moderate and strong correlations were found in some cases between the independent variables of the model, however the mean VIF was 1.96 for the specification with EPU and 1.63 for the specification with IIE-Br. The correlations that take into account the variable MA(t+1) were significant in four cases: EPU, SIZE, VSALES and RET, with a negative sign in the uncertainty variable. It is worth highlighting some correlations that consider the uncertainty variables. It was noticed that ROA, revenue variation, Market-to-Book at firm and industry levels react negatively to uncertainty fluctuations, with greater intensity for political uncertainty. Stock volatility tends to positively accompany measures of uncertainty, with emphasis on the median volatility of the industry, which has moderate intensity. Such evidence shows that this measure may be able to capture the effects of uncertainty in the environment, reflected in greater dispersion of returns at the industry level and is a fact that may justify its use as a proxy for uncertainty. The INVOP variable has a strong negative correlation with uncertainty (considering the EPU, IIE-Br and median industry volatility). This shows that moments of high uncertainty are strongly associated with poor economic conditions, reflected in expectations of agents about economic activity. On the other hand, the interest rate has a positive association with uncertainty. The causal effects of uncertainty on financial and market variables are still unclear. In this sense, with the analysis of the preliminary relationship between these variables, we suggest that their causality be tested in new studies.