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RESEARCH ARTICLE

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Independence day: Political risk and cross-sectional determinants of firm exposure after the Catalan crisis

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Abstract

This article covers the relationship of one of the most uncertainty-generating events in the recent history of Spain: the Catalan secessionist crisis, and the equity market. The research analyses the differences between Catalan companies and the rest of the country and it is focused on the determinants of the variability of returns after the illegal independence referendum. Determinants such as firm country risk concentration, measured as the level of internationalization or the growth opportunities, and others like size or financial constraints. An additional event study examines the impact of the flight of companies from the region. The general approach used in this article is the event study methodology. The experiment is divided in two parts (geographical and firm level). The market model is used to describe the returns, abnormal returns are obtained in one step using dummy variables and all equations are estimated together through a seemingly unrelated regressions framework. Then cross-sectional regressions are employed to explain the abnormal returns' variance. Changes in sample, variables and volatility are also implemented. It demonstrates that larger and more internationalized firms were less exposed to this event, unlike those with higher growth opportunities and higher financial constraints. Lastly, the flight of companies served to mitigate the adverse effect. This research highlights investors' fear of drastic political changes and points out characteristics that make some securities a refuge in a unique case, as an attempt of unilateral independence.

KEYWORDS

Catalonia, event study, internationalization, political uncertainty, stock returns

1 | INTRODUCTION

On first October 2017, a referendum for independence from Spain was held in the region of Catalonia, and the central government ordered the police and other forces to intervene. The next business day, the Spanish index IBEX 35 dropped by 1.22% and the bond risk premium increased by 7.24%.

Following this, the King gave a speech assuring that the law would be enforced, and there was a unilateral declaration of independence which was suspended immediately and eventually the Spanish government took control of the region. It is this series of events that have motivated us to carry out this study.

On the one hand, the Catalan government argued that the referendum was legal and binding, while the Spanish government ended applying article 155. This article states that central government, prior approval by the Senate, must enforce the law cases of disobedience by an autonomous region. Our analysis covers the period from the 1st October up to 27th October when the Senate approved this measure.

During these 27 days, the political uncertainty soared, supported by a monthly index developed to measure economic policy uncertainty (hereafter the EPU index[1]; Baker et al., 2016, but there is also a previous working paper from 2013), plotted in Figure 1 for the period 2001–2018. The secessionist crisis (427.61) is the second event to generate most uncertainty in the country's recent history.

This article seeks to analyse the effect of this uncertainty on the Spanish stock market, determining the differences between Catalan companies and the rest of the country and focussing on explaining the variability of stock returns during the event.

Therefore, it contributes to the literature about the relation between election outcomes and the stock market (Herron et al., 1999; Kelly et al., 2016; Smales, 2016; Gemmill, 1992) and more specifically referendums such as *Brexit* (Hill et al., 2019; Ben Sita, 2017; Davies and Studnicka, 2018).

However, this study fills a gap in research, differing in the fact that this referendum was declared illegal, so the insecurity experienced regarding this process did not come from the technical tie in the surveys (Kelly et al., 2016).

The uncertainty might come from the very possible outcomes, from increasing violence to a military intervention, which implies unanticipated policy changes that are quickly transferred to financial markets (Pástor and Veronesi, 2013).

Based on the event study methodology, we use a multivariate equation system called seemingly unrelated regressions (Zellner, 1962) for estimating abnormal returns in a single step. Using the market model to estimate the normal path of returns, and implementing an extended market model controlling for changes in the VIBEX (the Spanish volatility index) as robustness check.

Dividing the sample into two portfolios, one being only Catalan and the other, the rest of Spain, significant and persistent differences in performance were found. We also found at least two other unexpected market reactions related to political events apart from the referendum day.

Additionally, to explain the variability in abnormal returns at firm level, we run around 70 different cross-sectional regressions, testing up to 13 company-specific variables and controlling for industry-fixed effects and applying various robustness checks. We also test how the variables affected firm performance at seven different lengths. To do so, we collected data from 115 companies listed on the Spanish stock exchange accounting for more than 99% of the country's total market capitalization.

Among other findings, the information regarding investment opportunities was valuable to investors. This is consistent with the view that companies reduced the level of investments while waiting for the contingency to be resolved.

There was also an effect related to company size, and more importantly, the internationalization of companies played a key role. Consistent with the idea that geographical diversification mitigates some national risk.

In a separate section, we evaluated the impact that the flight of companies from Catalonia had on the value of those companies, comparing it with those that did not leave.

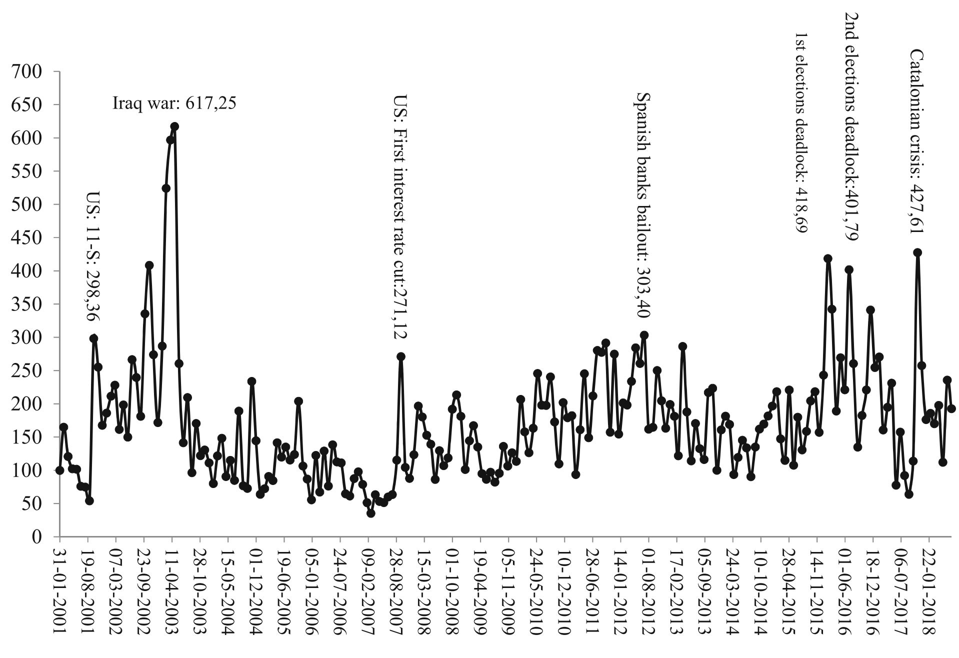

FIGURE 1 Europe Policy Uncertainty Spain News Index (Base 100 in 01/2001)

Next, we discuss and develop the main hypotheses, and then we outline the research design, presenting the main results concerning geographical differences, firm characteristics and business flight and finally highlight some conclusions.

2 | CRISIS IN CATALONIA AND POLITICAL UNCERTAINTY

The stock price reflects future discounted cash flows. However, when there is high uncertainty about potential scenarios, investors cannot discount these effects until the event occurs. This is what happened in the Spanish stock market in October 2017, and the causes of this unpredictability are multiple. However, these aspects are beyond the scope of this research, since we are interested in the immediate reaction of the stock market.

Figure 2 shows the immediate effect of the referendum on both the IBEX 35 and the country risk premium.[2] It covers a period of 5 months using daily data between August and December of 2017, highlighting the first 20 days after the ballot.

During the day after the separatist suffrage, the index dropped by 1.22%, and, by the end of the week, it had fallen to 1.91%, with the worst day being 3rd October when it lost 2.90%. As could be expected, the reaction in the risk premium was exactly the opposite; it experienced an increase of 7.24% during the first day (5.89% the third), and it accumulated an overall increase of 5.60% in that week. Nevertheless, the opposite behaviour was observed after the peak, and on the fourth day, the index rose by 2.48% and the premium fell by 7.17%.

As commented above, this impact on the markets could be a result of the level of political uncertainty. In this regard, we need to clarify how financial markets could be affected by this risk.

With respect to studies more closely related to the elections, the results by Gemmill (1992) during the UK elections of 1987 and Brooks et al., (2003) in a set of negative unanticipated events are in line with the overreaction hypothesis (De Bondt and Thaler, 1985). On the other hand, the findings by Pardo and Furió (2010) for national elections in Spain and those by Smales (2016) for Australia support the Uncertain Information Hypothesis, which says that after a negative event, the market is efficient if the abnormal returns are positive, as the uncertainty disappears (Brown et al., 1988). Nevertheless, what all these papers have in common is that unanticipated outcomes affect stock prices and volatility; the debate between these two theories is whether this reaction is rational or not.

We are particularly interested in why this uncertainty has different effects according to a company's characteristics. This observation is also supported by recent empirical research into the heterogeneity of returns after an unanticipated political event (Goldman et al., 2009; Oehler et al., 2017; Hillier and Loncan, 2019, among others).

In Table 1, we have pointed out the main events during the Catalan crisis. In this regard, the following should be noted: the day after the referendum (δ_0), the day after the king's speech warning about compliance with the law (δ_2) and the day after the unilateral declaration of 'suspended' independence (hereafter DUI) and the start of the procedure for the application of article 155 (δ_7). This horizon was not arbitrarily chosen, since on Day 7, the government began the process to take control of the region, but this was not confirmed until the Senate's approval on October 27th (δ_{19}).

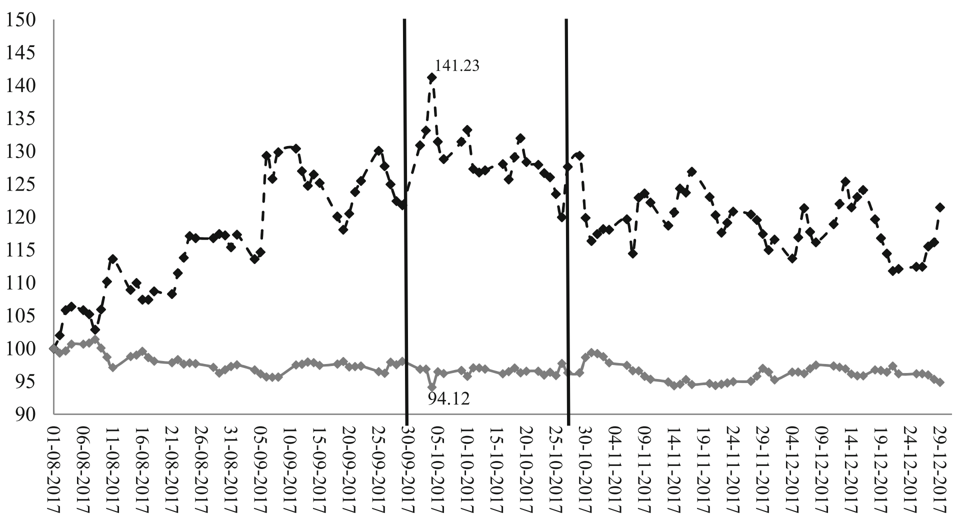

FIGURE 2 Daily risk premium (dashed line) and IBEX 35 Index (continous line) (Base 100:01/08/2017)

TABLE 1 Description of the days considered within the event period

Day	Regression coefficient	Description
02 October 2017	$\delta 0$	First session after 1-O referendum
03 October 2017	$\delta 1$	
04 October 2017	$\delta 2$	First session after the King's speech. One firm left Catalonia
05 October 2017	$\delta 3$	
06 October 2017	$\delta 4$	Two firms left Catalonia
09 October 2017	$\delta 5$	Three firms left Catalonia
10 October 2017	$\delta 6$	DUI was expected. Five firms left Catalonia.
11 October 2017	$\delta 7$	Day after the 'soft' DUI. Began the application process for 155.
12 October 2017	$\delta 8$	One firm left Catalonia
13 October 2017	$\delta 9$	
–	–	
26 October 2017	$\delta 18$	
27 October 2017	$\delta 19$	The 155-application process comes to an end with senate approval: The government takes control of Catalonia

Note: The table shows the days of the selected event window and their corresponding regression coefficients, used later in the model.

In the same table, you can see the days on which the corporations changed their headquarters from the affected region. Exactly, 23 companies listed in the Spanish Stock Exchange were based in Catalonia on 1st October, but only 11 remained by the end of the event window.

Below is a brief description of the hypotheses:

- **Hypothesis** Catalan-based firms performed worse after October 1.

The conflict concerns both sides, but investors might valuate the possible changes in Catalonia more negatively than in the rest of Spain.

In this respect, Beaulieu et al. (2005) found positive abnormal returns on Quebec companies compared to the rest of Canada after voting no to independence. Investors therefore valued positively the permanence of the region in the country. In other paper, Davies and Studnicka (2018) discovered that, after *Brexit*, the British companies most engaged in domestic or European business underperformed compared to those more globalized.

At this point, it is necessary to remember that after the referendum, the Catalan cabinet was going to accept the results and proclaim independence.

The following hypotheses are grounded on the premise that firms from other regions of Spain could also be affected by this process. Although they might not be affected on average, we expect that the heterogeneity observed in the cross-section will depend on their reliance on Catalonia and some other firm characteristics.

- **Hypothesis** Firms with interests in Catalonia performed worse after October 1.

Based on the above, we expect lower abnormal returns for companies whose business would be harmed by an eventual independence. In the real economy, it would be mainly reflected in the worsening or blocking of trade agreements, but it could also be reflected in the flight of capital and workers to the rest of Spain.

- **Hypothesis** Firms with higher growth options and a higher level of internationalization performed better after October 1.

These two firm characteristics follow a similar direction. On the one hand, growth options can be seen as the value of the forecasted future investments of the company, and consequently, a firm with higher growth options might move easily to another country. On the other hand, internationalization can be seen as the current level of business that does not depend on Spain; as a result, the more internationalized the company is, the less investors care about what happens in a single country.

Empirical evidence about the benefits of internationalization within a policy risk framework is extensive. Beaulieu et al. (2005), Hill et al. (2019) and Oehler et al. (2017) support this view. However, this does not match with evidence found by Davies and Studnicka (2019) or Hillier and Loncan (2019).

Furthermore, evidence about growth options is even more entangled, and the reason for this could be that growth options are not easily measurable, and the *proxies* used may be leading to confusing results. Beaulieu et al. (2005) defended this position but could not find significant results. Goldman et al. (2009), however, found that firms with lower market-to-book ratio (growth options' *proxy*) perform better when the incumbent political party is related to the company, meaning that these firms have fewer possibilities of moving abroad if the party connected to them loses the elections.

Nevertheless, there is evidence supporting the opposite position like Hill et al. (2019). Moreover, there is solid evidence regarding the level of investment during periods of political uncertainty, suggesting that growing firms are more affected since they force current and future investments to stop until the contingency is solved (Baker et al., 2016; Aizenman and Marion, 1993; Gulen and Ion, 2016).

Additional hypothesis

First, size is used widely as a control variable due to the historical evidence that market size affects returns (Banz, 1981; Fama and French, 1993), but size might be an explanatory variable as well. On the one hand, larger firms could be more politically connected (Goldman et al., 2009), so they could experience more harm when dealing with political shocks (Wagner et al., 2017). On the other hand, larger firms are less likely to be affected by just one shock, and investors might be more likely to trust a larger and more stable firm to manage political risk (Ben Sita, 2017; Davies and Studnicka, 2018).

It is also important to consider the company's ability to face economic policy risk. Aizenman and Marion (1993) and Gulen and Ion (2016) point out how the aftermath of uncertainty could lead to reductions in investment and employment. We also expect companies with more solvency and, therefore, able to withstand the situation longer, to be more valued by investors.

Finally, we also control for industry-specific effects since it is well documented that political events do not affect all industries equally (Herron et al., 1999 or Smales, 2016).

3 | RESEARCH DESIGN

3.1 | Sample

Our preliminary sample started with 124 companies, all listed in the Spanish Stock Exchange System (*SIBE*), avoiding illiquid firms that are not negotiated in this system. These firms were required to have been trading from 100 sessions before day 0 to 20 days after.

In addition, we only took quotes with enough data so that parameters would remain unbiased as much as possible. To be exact, a firm was included if $T - N_0 \geq 0,75 \times T$, with T being the number of sessions, and N_0 being the number of sessions with absent values or zero returns, following a similar approach to the one by Corrado and Truong (2008). After applying this procedure, our final sample was reduced to 115 companies, accounting for more than 99% of market capitalization.

3.2 | Geographical price reaction

For the first analysis, the sample is split into two portfolios: one built on 23 Catalonian companies and another built on 92 companies from the rest of Spain. Each portfolio is compounded in two ways, equally and value weighted (hereafter EW and VW), and then they are regressed in pairs against the IBEX 35 index and 20 daily *dummies* (from 2nd to 27th October), using a seemingly unrelated regressions (SUR[3]) multivariate system:

$$r_{Ct} = \alpha_C + \beta_C * r_{I35t} + \sum_{j=0}^{N=19} \delta_j^C * D_j + \varepsilon_{Ct}$$

$$r_{RSt} = \alpha_{RS} + \beta_{RS} * r_{I35t} + \sum_{j=0}^{N=19} \delta_j^{RS} * D_j + \varepsilon_{RSt}$$

Let C be the index of portfolios associated with Catalonia and RS be the index associated with the rest of Spain. r_{Ct} and r_{RSt} are returns of C and RS portfolios for day t, α and β are the market model parameters, r_{I35t} is the IBEX 35 return for day t and δ_j is the parameter associated with each day of the event j (D_j), lying from 0 to 19. These parameters are equivalent to classical abnormal returns in event study literature (Warner and Brown, 1985). ε_t is the disturbance term for each day t, with zero mean and constant variance.

With this methodology, there is no differentiation between the estimation window and the event window, so we carry out the event study in a single step. Each portfolio comprises 275 observations, from 04 October 2016, to 27 October 2017 (last day of the event). The starting point is to some extent arbitrary, but MacKinlay (1997) suggests that 120 days prior to the event is suitable for daily data, and we also chose it so that we could have as many companies in the sample as possible.

In addition, SUR methodology is also useful since it considers the contemporaneous dependence of the disturbances. This is an important issue when there is *time-clustering*, such as in political and regulatory events where cross-correlation is implicit.

This first analysis allows us to isolate how being Catalan affects returns, once the change in the market index is discounted.

Table 2 presents descriptive statistics about returns of the four portfolios presented above. In general, portfolios for the rest of Spain seem more stable, having lower standard deviation, lower kurtosis and less pronounced outliers. The VW portfolios present a lower standard deviation than the EW portfolios, with higher minimums and lower maximums and not such fat tails, which is observable in the first and third quartile. Surprisingly, the mean for the Catalan VW portfolio is higher than its counterpart; this might be driven for the good performance of a few number of big companies.

In general, these differences may be due to the fact that capital is highly concentrated in Spain (in the period studied five companies accounted for more than 40% of total capitalization), and therefore the returns of a large number of companies have little influence on the VW portfolio. In addition, the parameters of larger companies are assumed to be more stable, as they tend to be mature firms with lower average returns as well as lower volatility.

The excess of kurtosis present in the Catalan EW portfolio is also conspicuous. While all portfolios have values greater than zero, which might mean their distribution is leptokurtic, this portfolio particularly differs from the others.

3.2.1 | Geographical robustness checks

Many researchers assert that event studies need to be robust to the variance induced by the event (Boehmer, Musumeci and Poulsen, 1991; Corrado and Zivney, 1992) because price changes could be triggered by an unusual increase in volatility.

For this reason, we estimate an extended version of the market model which includes changes in the VIBEX. This Spanish volatility index has the same methodology as the VIX for the S&P 500 which is based on the implied volatility (from the Black-Scholes model) of the IBEX 35 options with 30 days to maturity.[4] The model is as follows:

$$r_{Ct} = \alpha_C + \beta_C * r_{I35t} + \lambda_C * \nabla VIBEX_t + \sum_{j=0}^{N=19} \delta_j^C * D_j + \varepsilon_{Ct}$$

$$r_{RSt} = \alpha_{RS} + \beta_{RS} * r_{I35t} + \lambda_{RS} * \nabla VIBEX_t + \sum_{j=0}^{N=19} \delta_j^{RS} * D_j + \varepsilon_{RSt.}$$

Where $\nabla VIBEX_t$ is the first difference of the VIBEX series, and λ_C and λ_{RS} are the corresponding coefficients according to the region.

This index has recently been officially calculated, but there are previous studies that use their own calculations of the index with the same or a similar methodology. In this regard, González and Novales (2009) showed that the VIBEX has a negative and strong contemporaneous relationship with the Spanish stock market, and as a predictor, it is as good as historical volatility.

3.3 | Firm-level analysis

In order to find out the determinants of exposure to the Catalan crisis, we carried out a firm-level analysis. The main reason for disaggregating the sample is that most of the variables are firm characteristics related to accounting, finance and the level of internationalization.

First, we specify a set of equations in a similar way to those previously presented. For each company i:

TABLE 2 Descriptive statistics of equally and value weighted regional portfolios' returns

	Mean	*SD*	Skewness	Excess of kurtosis	Min	Q1	Median	Q3	Max
Panel A: Equally weighted portfolios									
Catalonia	0.0684	0.8610	0.5785	6.7320	−3.5412	−0.4299	0.0853	0.5873	5.4848
Rest of Spain	0.0775	0.7164	−0.5105	1.3793	−2.7408	−0.2775	0.1037	0.5204	2.1389
Panel B: Value weighted portfolios									
Catalonia	0.1013	0.0843	0.3597	1.8146	−3.0838	−0.4472	0.0875	0.5699	3.5178
Rest of Spain	0.0646	0.7105	0.3737	1.1085	−1.7169	−0.3362	0.0102	0.4870	3.2513

Note: The Catalonian and rest of Spain portfolios are formed by 23 and 92 firms, respectively. All portfolios have the same number of observations, being 275 (from 04 October 2016 to 27 October 2017). All statistics are multiplied by 100 except skewness and kurtosis.

$$r_{it} = \alpha_i + \beta_i * r_{I35t} + \sum_{j=0}^{N=19} \delta_{ij} * D_j + \varepsilon_{it}$$

We also test for autocorrelation of returns, and when it is present:

$$r_{it} = \alpha_i + \partial_i * r_{it-1} + \beta_i * r_{I35t} + \sum_{j=0}^{N=19} \delta_{ij} * D_j + \varepsilon_{it}$$

Where r_{it} is the actual return of company i at time t, α_i is the constant for company i, ∂_i is the coefficient relating to one lagged return for company i, $r_{it\text{-}1}$ is one lagged actual return for company i and the rest of the parameters have been explained in the geographical portfolio section.

Note that here the point is not about the significance of each coefficient. From this system of equations, we only take the coefficients themselves to study the determinants which led Spanish companies to be more exposed.

Therefore, we collected a cross-sectional sample of 115 abnormal returns for each day of the event window. We consider seven different lengths to observe the change over time: Day 0 abnormal returns (δ_{i0}); cumulative abnormal returns from 0 to 2 (δ_{i0}, δ_{i2}); from 0 to 4 (δ_{i0}, δ_{i4}); from 0 to 7 (δ_{i0}, δ_{i6}); from 0 to 9 (δ_{i0}, δ_{i9}); from 0 to 14 (δ_{i0}, δ_{i14}) and from 0 to 19 (δ_{i0}, δ_{i19}). We call them CAR_i (0, *T*) in Table 3, *T* being the last day of the event window.

In the statistics, we can observe that regardless of the period (excepting the interval of 15 days), all our estimators are negative in both mean and median. It can also be noted that the median is consistently higher than the mean.

We also see a pattern that matches with the event days. The most negative CAR corresponds to the period from days 0 to 2, and the King's speech was on Day 1 at night. After this, CAR_i (0, 4) seems to begin recovery, but in the window from 0 to 6, it reaches the second lowest value. Remember that this CAR includes the days up to the failed DUI attempt and just before the government started the article 155 process. After this, there is a reverse behaviour, where CAR_i (0, 14) even takes positive values in mean and median.

3.3.1 | Political risk contributors

Below, we specify the variables used as explanatory factors of the divergence in the abnormal returns during the Catalan crisis.

In order to measure a firm's level of internationalization up to four variables are taken as *proxy*. Two of them are usually used in the study of events measuring political risk (Beaulieu et al., 2005; Oehler et al., 2017): the subsidiaries listed in the firm's last annual report (constructed as the natural logarithm of 1 plus the number of subsidiaries [$lnSub_i$]) and foreign sales as percentage of total sales (FS_i).

Counting the number of companies abroad is a good *proxy* due to its simplicity, availability and objective data, but it does not capture the importance of the subsidiary. Although foreign sales capture the importance of overseas business, they do not differentiate between a company that is expanding abroad and one that is exporting. Therefore, we employ two additional measures of internationalization: foreign assets as a percentage of total assets (FA_i) and foreign fixed assets as a percentage of total fixed assets (FFA_i). In this sense, the annual reports in Spain contain information for one or the other and sometimes for both.

With respect to growth options, the problem is that 'ability to move its operations' is not an easily measurable variable. One approach is the market-to-book ratio

TABLE 3 Descriptive statistics of cumulative abnormal returns

Name	Mean	*SD*	Median	Min	Max
$CAR_i(0,0)$	−0.5990	2.1170	−0.3036	−10.2500	6.8650
$CAR_i(0,2)$	−2.3170	5.2500	−1.2080	−18.4200	10.4400
$CAR_i(0,4)$	−1.4790	4.2390	−0.7325	−14.3200	10.9500
$CAR_i(0,6)$	−2.3080	5.6330	−0.9291	−18.5000	15.0800
$CAR_i(0,9)$	−0.5077	5.3790	−0.1226	−15.2700	17.7200
$CAR_i(0,14)$	0.2647	8.1930	0.2992	−26.4900	54.4900
$CAR_i(0,19)$	−0.3408	8.9710	−0.0633	−30.3500	52.0200

Note: This table provides descriptive information on the cross-section of the cumulative abnormal returns of the complete sample (115). All statistics are multiplied by 100.

(M/B_i), a company with a higher ratio (higher value of future investments) has more growth options than one with a lower ratio (higher value of assets in place). The growth rate of sales ($S.\ Grwth_i$) is used as additional measure, expressed in times one from 2015 to 2016.

Firm size is measured as the natural logarithm of market capitalization ($lnMC_i$), and we employ the following financial constraints: profitability as EBIT over total equity ($Ebit/Eq_i$), cash availability as percentage of total assets ($Cash_i$) and debt as the ratio of total liabilities over total assets (D/A_i).

Finally, as *proxy* of assets in Catalonia, we construct a *dummy*: 1 if the company has a subsidiary in the region and 0 if otherwise ($A.\ Cat_i$).

We also control for industry effects with a set of *dummies*: 1 if the company comes within that industry and 0 if otherwise. We split the sample into six industries according to the classification by the Madrid Exchange Market: finance, energy, industry and construction, consumer goods, consumer services and technology and telecommunications.

Table 4 gives the descriptive statistics of these variables, excluding the industry variables. For cash availability and debt to assets ratio, we have omitted the sample corresponding to finance companies.

In Table 4, it can be observed that the Spanish level of internationalization has an average value of 2.11 in $lnSub_i$, which means that quoted firms have on average 15.41 international subsidiaries.

All measures regarding growth opportunities are left skewed, with medians lower than means. This is also related to a high variability (for sales growth, the standard deviation is almost seven times the average).

3.3.2 | Cross-sectional regressions on determinants of exposure to the Catalan crisis

Then, we estimate the following cross-sectional regression:

$$CAR_i(0,T) = \alpha_0 + \gamma_1 * lnSub_i + \gamma_2 * lnMC_i + \gamma_3 * Ebit/Eq_i + \gamma_4 * M/B_i + \gamma_5 * S.Grwth_i + \gamma_6 * A.Cat_i + \sum_{j=7}^{N=12} \gamma_j * Ind_{ji} + u_i$$

Where CAR_i (0, *T*) is the cumulative abnormal return of company *i* from 0 to day *T* of event.

Following Hill et al. (2019), we run another regression excluding financial industry, since the additional variables included here do not make the same sense for finance companies due to their idiosyncratic characteristics:

$$CAR_i(0,T) = \alpha_0 + \gamma_1 * lnSub_i + \gamma_2 * lnMC_i + \gamma_3 * Ebit/Eq_i + \gamma_4 * M/B_i + \gamma_5 * S.Grwth_i + \gamma_6 * A.Cat_i + \gamma_8 * D/A_i + \gamma_9 * Cash_i + \sum_{j=10}^{N=15} \gamma_j * Ind_{ji} + u_i$$

3.3.3 | Firm-level robustness checks

On one side, we want to know if the economic and statistical significance of the level of internationalization ($lnSub_i$) changes when we change the variable measuring it. To do this, we run another six regressions (three for the full sample and another three for the sample excluding financial industry) substituting $lnSub_i$ for the variables defined above FA_i, FFA_i and FS_i.

TABLE 4 Descriptive statistics of cross-sectional regression variables

Name	Size	Mean	*SD*	Median	Min	Max
lnSub	115	2.1079	1.3050	2.3026	0.0000	4.5433
FS	112	0.5284	0.3416	0.5887	0.0000	0.9981
FA	83	0.4080	0.3566	0.4052	0.0000	0.9988
FFA	78	0.3529	0.3484	0.2949	0.0000	1.0000
M/B	115	3.0049	9.4766	1.7919	−51.3408	77.4717
A.Grwth	92	0.0612	0.2277	0.0364	−0.4038	1.6541
S.Grwth	115	0.1165	0.7711	0.0170	−0.8271	7.5214
lnMC	115	20.9493	2.3203	20.9787	8.5296	25.4508
Ebit/Eq	115	0.1793	0.3471	0.1454	−1.1081	2.0777
Cash	92	0.0901	0.0748	0.0810	0.0004	0.4428
D/A	92	0.6550	0.2235	0.6702	0.1399	1.4824
A. Cat	115	0.7130	0.4543	1.0000	0.0000	1.0000

Note: This table provides information on the explanatory variables used to determine the degree of exposure to Catalan crisis. One hundred and fifteen represents the complete sample, 92 the sample excluding finance industry and the rest of the missing values were not reported.

On the other side, and given the results for regional portfolios, we run the same cross-sectional regressions but including a binary variable called Cat_i. It takes values of 1 if the headquarters of the firm are in Catalonia and 0 if otherwise. The reason for including this variable is to ensure that the results obtained do not disappear when the regional factor is introduced.

Ultimately, we were concerned that our findings may be the outcome of some extreme values. Therefore, we trimmed abnormal returns and cumulative abnormal returns at the 2.50 and 97.50% levels.

4 | EMPIRICAL RESULTS AND DISCUSSION

4.1 | Geographic regression results

The results are presented in the same order as the methodology, so in Table 5, we can find the results regarding the first hypothesis: the performance of the Catalonian-based portfolio is worse during the days of the event.

Thus, we have the results for the VW (EW). At first glance, individual coefficients highlight three specific days since results are robust regardless of how they are measured.

The first one is Day 0 (δ_0), when on average Catalan firms experienced a significant decrease of 1.01% (1.39%) in abnormal returns. Next, we have Day 2 (δ_2) with an average decrease of 0.68% (2.21%) and finally Day 3 (δ_3) with an average increase of 0.74% (1.68%), both for the same portfolio.

One possible explanation is that Day 0 coincided with the day after the separatist referendum, Day 2 with the day after the king's speech and abnormal returns on Day 3 have the opposite sign and a similar size than those obtained on Day 2, suggesting a reversal pattern.

If we look at the portfolio for the rest of Spain, the results are less clear because there are notable differences between the VW and EW portfolios. These are mainly

TABLE 5 Coefficients and standard deviations of market beta (β) and abnormal returns (δ) after the referendum

	VW portfolios				EW portfolios			
	Catalan		Rest of Spain		Catalan		Rest of Spain	
	Coefficient	*SD*	Coefficient	*SD*	Coefficient	*SD*	Coefficient	*SD*
β	0.8514	0.0293***	0.8371	0.0139***	0.4773	0.0521***	0.5031	0.0412***
δ0	−1.0136	0.3831***	0.3150	0.1816*	−1.3913	0.6820**	−0.2653	0.5394
δ1	−0.0357	0.3813	0.0770	0.1807	−0.7115	0.6787	−0.2148	0.5368
δ2	−0.6812	0.3910*	0.6906	0.1854***	−2.2123	0.6960***	−1.3377	0.5505**
δ3	0.7397	0.3878*	−0.3980	0.1838**	1.6770	0.6902**	0.3611	0.5459
δ4	−0.3359	0.3814	0.0710	0.1808	0.2594	0.6789	0.0229	0.5370
δ5	0.1213	0.3815	−0.2380	0.1808	−0.7364	0.6790	0.0969	0.5371
δ6	−0.3396	0.3824	0.0719	0.1813	−1.0773	0.6806	−0.6874	0.5383
δ7	−0.1751	0.3831	−0.0609	0.1816	1.6790	0.6819**	0.9952	0.5393*
δ8	0.0512	0.3813	0.0153	0.1807	1.0533	0.6787	0.1084	0.5368
δ9	0.2342	0.3814	0.1191	0.1808	−0.0153	0.6788	0.2236	0.5369
δ10	−0.1298	0.3820	0.1367	0.1811	−0.4656	0.6.800	0.0247	0.5378
δ11	−0.2113	0.3814	0.4167	0.1808**	0.3788	0.6.788	0.8795	0.5369
δ12	0.6870	0.3816*	−0.2602	0.1809	−0.1077	0.6.792	−0.0314	0.5371
δ13	−0.3512	0.3820	0.0550	0.1811	−0.4302	0.6.800	−0.1697	0.5378
δ14	−0.2633	0.3813	−0.1092	0.1808	0.2101	0.6.787	0.0829	0.5368
δ15	−0.0109	0.3818	0.1108	0.1810	−0.2100	0.6.796	−0.0219	0.5375
δ16	0.2469	0.3814	0.0615	0.1808	0.3886	0.6.790	0.3825	0.5370
δ17	−0.2036	0.3817	−0.1518	0.1809	−0.4384	0.6.794	−0.7260	0.5373
δ18	−0.2276	0.3850	−0.4089	0.1825**	−0.2705	0.6.854	−0.4995	0.5421
δ19	−0.1265	0.3839	0.3251	0.1820*	−0.4721	0.6.834	−0.0828	0.5405

Note: This table presents coefficients' values and their standard deviations for the regional model. Coefficients 0–19 correspond to the abnormal returns for each portfolio (VW/EW) and region (Catalonia/Rest of Spain). Coefficients and standard deviations are multiplied by 100 except betas. *, ** and *** represent significance at 10, 5 and 1%, respectively.

apparent for Day 2, as the sign of abnormal performance depends on the construction of the portfolio.

Figure 3 'cumulative abnormal returns' shows this more clearly, where the VW portfolios can be observed to behave almost inversely, with the biggest drop and rise occurring at Day 3 and remaining pretty stable from that point onwards.

With regard to the EW portfolios, we have negative CAR for both portfolios, although the Catalan portfolio always performed worse.

Table 6 presents the main results of the F-tests for the following joint hypothesis: cumulative abnormal returns were different from 0 during the interval from 0 to T.

Only the results for window (0, 2) are significant regardless of how we weight returns, with the lowest p-value being .04% for the EW Catalan portfolio. This suggests that the small companies from the region obtained lower returns.

All tests for windows greater than 7 days are not significant and depart considerably from the 10% boundary, which hints that investors revised their portfolios in the early days.

In Section 2, we define the next hypothesis: Catalan firms performed worse than those in the rest of Spain. According to Table 7, which presents the critical values

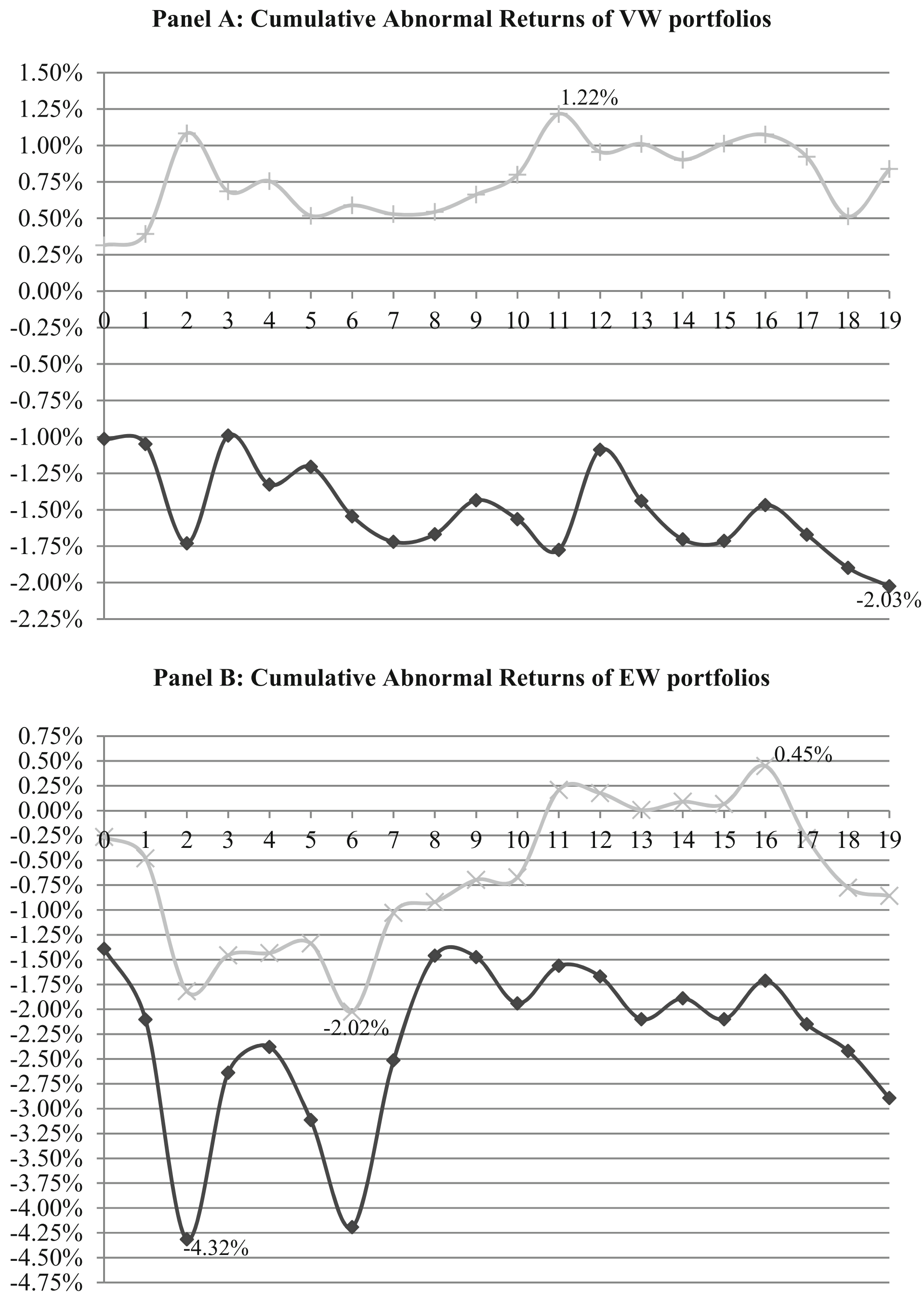

FIGURE 3 Cumulative Abnormal Returns of Catalonia (continuos line) and the rest of Spain (dashed line) from Day 0 up to the interval 0 to 19

TABLE 6 *F*-tests for CAR after referendum at different lenghts

***F* (1,506) CV [*p*-value]**				
VW portfolios			**EW portfolios**	
Hypothesis	Catalan	Rest of Spain	Catalan	Rest of Spain
$\sum\delta_i = 0$ (0,2)	6.5764** [0.0106]	11.4518*** [0.0008]	12.9058*** [0.0004]	3.6609* [0.0563]
$\sum\delta_i = 0$ (0,4)	2.3705 [0.1243]	3.4210* [0.0650]	2.4052 [0.1216]	1.3969 [0.2378]
$\sum\delta_i = 0$ (0,6)	2.2772 [0.1319]	1.4751 [0.2251]	5.2925** [0.0218]	1.9724 [0.1608]
$\sum\delta_i = 0$ (0,9)	1.3651 [0.2432]	1.2971 [0.2553]	0.4557 [0.4999]	0.1626 [0.6870]
$\sum\delta_i = 0$ (0,19)	1.3096 [0.2530]	0.9992 [0.3180]	0.8433 [0.3589]	0.1188 [0.7304]

Note: This table presents the *F*-tests for the joint hypothesis that cumulative abnormal returns are equal to 0. In 'Hypothesis', the number in brackets (0,*T*) represents the cumulative abnormal returns from 0 to T. CV is the corresponding critical value and *, ** and *** represent significance at 10, 5 and 1%, respectively.

and *p*-values of the *F*-tests for regional differences, this statement cannot be rejected. The strongest evidence is found when using VW portfolios. For coefficients δ_0 and δ_2, the *p*-values are .35% and .32%, respectively, meaning that we can reject the null hypothesis that coefficients are equal regardless of company location. The same applies to CAR, where there is evidence for rejecting the null hypothesis for the first three lengths, although significance decreases as we extend the event window.

For coefficients δ_6 and $\delta_{7,}$ there is evidence to the contrary, and we cannot reject that these coefficients are equal.

The results of the EW portfolios are in line with the previous results but only significant for Day 0 and the shortest of the windows CAR (0, 2) with a *p*-value of 3.72%.

TABLE 7 *F*-tests for regional differences

	***F* (1,506) CV [*p*-value]**	
Hypothesis	**VW portfolios**	**EW portfolios**
${\delta_0}^C = {\delta_0}^{RS}$	8.5868*** [0.0035]	2.7520* [0.0978]
${\delta_2}^C = {\delta_2}^{RS}$	8.7895*** [0.0032]	1.5940 [0.2073]
${\delta_6}^C = {\delta_6}^{RS}$	0.8268 [0.3636]	0.3313 [0.5652]
${\delta_7}^C = {\delta_7}^{RS}$	0.0635 [0.8012]	1.0149 [0.3142]
$\sum{\delta_i}^C = \sum{\delta_i}^{RS}$ (0,2)	12.4097*** [0.0005]	4.3639** [0.0372]
$\sum{\delta_i}^C = \sum{\delta_i}^{RS}$ (0,4)	4.1698** [0.0417]	0.3832 [0.5362]
$\sum{\delta_i}^C = \sum{\delta_i}^{RS}$ (0,6)	3.1039* [0.0787]	1.4290 [0.2325]
$\sum{\delta_i}^C = \sum{\delta_i}^{RS}$ (0,9)	2.0839 [0.1495]	0.1281 [0.7206]
$\sum{\delta_i}^C = \sum{\delta_i}^{RS}$ (0,19)	1.8701 [0.1721]	0.4209 [0.5168]

Note: This table presents the critical values of the *F*-tests for joint hypotheses about the differences between Catalonia and the rest of Spain. In 'Hypothesis', we find the period of returns that is contrasted, from 0 to T. Next to the CVs, we find the level of significance and its respective *p*-value. *, ** and *** represent significance at 10, 5 and 1%, respectively.

Overall, we can draw two important insights: regardless of how we form portfolios, there is no evidence of regional differences for periods longer than 7 days. Also, the differences between portfolios suggest that size effect penalizes small firms.

As we explained in the methodology, we also ran another version of the market model, including the VIBEX as an explanatory variable in order to check if our results persist when we control for the volatility of the Spanish market.

In Table 8, we present the coefficients for these regressions, including the coefficient for the differences in daily volatility (λ). The VIBEX parameter is negative and significant (excluding the Catalan VW portfolio). It is also much greater for EW portfolios, suggesting that small firms were more affected by market volatility.

With respect to the level of the daily coefficients, the main change occurs in the VW portfolio for the rest of Spain, where the coefficient for Day 0 decreases and loses its significance.

4.2 | Firm-level results

In this section, we show the incidence of the explanatory variables in all the event windows. In this way, it is possible to observe the change in the loads of different factors over time and to find out how quickly the information was absorbed by the market.

In all the tables, the coefficients are displayed for each variable and for each length, and the standard deviation can be found between brackets. In addition, we present the adjusted *R* square for each equation. Coefficients for industry effects are omitted.

Table 9 presents the results using $\ln Sub_i$ as level of internationalization. Taking the full sample, the number of subsidiaries has the expected sign for all regressions, and it has an increasing path until Day 6, but it is only

TABLE 8 Coefficients and standard deviations of market beta (β), VIBEX changes (λ) and abnormal returns (δ) after the referendum

VW portfolios					EW portfolios			
Catalan			Rest of Spain		Catalan		Rest of Spain	
	Coefficient	*SD*	Coefficient	*SD*	Coefficient	*SD*	Coefficient	*SD*
β	0.8366	0.0334***	0.8060	0.0154***	0.4133	0.0590***	0.4343	0.0463***
λ	−0.0002	0.0003	−0.0005	0.0001***	−0.0010	0.0005**	−0.0011	0.0004***
δ0	−1.0319	0.3831***	0.2765	0.1763	−1.4704	0.6767**	−0.3502	0.5311
δ1	−0.0445	0.3808	0.0584	0.1753	−0.7498	0.6728	−0.2559	0.5279
δ2	−0.6778	0.3904*	0.6979	0.1797***	−2.1973	0.6897***	−1.3215	0.5413**
δ3	0.7765	0.3892**	−0.3206	0.1792*	1.8363	0.6876***	0.5321	0.5396
δ4	−0.3181	0.3813	0.1083	0.1755	0.3362	0.6736	0.1053	0.5286
δ5	0.1482	0.3820	−0.1814	0.1758	−0.6199	0.6749	0.2220	0.5296
δ6	−0.3333	0.3819	0.0850	0.1758	−1.0503	0.6746	−0.6584	0.5294
δ7	−0.1880	0.3828	−0.0880	0.1762	1.6231	0.6762**	0.9353	0.5306*
δ8	0.0357	0.3811	−0.0175	0.1754	0.9859	0.6732	0.0361	0.5283
δ9	0.2138	0.3814	0.0762	0.1756	−0.1036	0.6738	0.1287	0.5.288
δ10	−0.1318	0.3815	0.1325	0.1756	−0.4741	0.6739	0.0155	0.5288
δ11	−0.2359	0.3817	0.3649	0.1757**	0.2722	0.6744	0.7651	0.5292
δ12	0.6947	0.3811*	−0.2440	0.1754	−0.0742	0.6732	0.0046	0.5283
δ13	−0.3374	0.3817	0.0841	0.1757	−0.3701	0.6744	−0.1052	0.5292
δ14	−0.2696	0.3808	−0.1224	0.1753	0.1827	0.6727	0.0535	0.5279
δ15	−0.0326	0.3819	0.0651	0.1758	−0.3041	0.6747	−0.1229	0.5295
δ16	0.2426	0.3809	0.0525	0.1753	0.3702	0.6728	0.3628	0.5280
δ17	−0.2124	0.3812	−0.1702	0.1755	−0.4763	0.6734	−0.7667	0.5285
δ18	−0.1933	0.3863	−0.3368	0.1778*	−0.1221	0.6824	−0.3401	0.5355
δ19	−0.1472	0.3840	0.2817	0.1767	−0.5615	0.6783	−0.1788	0.5323

Note: This table presents coefficients' values and their standard deviations for the model including VIBEX. Coefficients 0–19 correspond to the abnormal returns for each portfolio (VW/EW) and region (Catalonia/Rest of Spain). *, ** and *** represent significance at 10, 5 and 1%, respectively. Coefficients and standard deviations are multiplied by 100 except betas and lamdas.

significant on Day 0. For that day, having two subsidiaries abroad implies an average increase of 0.35% in abnormal returns.

A similar result is obtained with the restricted sample, but significance appears in window (0, 2), probably caused by performance during Day 2. It reaches its maximum at the point where there is a premium of 1.21% for having two subsidiaries overseas. This may indicate that investors reacted quickly to this information.

With regard to growth options, the coefficients for M/B_i are intermittently significant and except for window (0, 2), they are negative for all windows. In any case, economic significance is not large, the largest significant coefficient for both samples is the one corresponding to CAR (0, 6), where having a market value two times the book value implies an average fall in abnormal returns of 0.18%.

$ACAT_i$ also has the expected sign, but it does not follow a clear pattern of adjustment. Furthermore, it is only significant during the first day, where a company with at least one subsidiary in that region has 1.05% lower abnormal returns. Considering the restricted sample, the significance of having subsidiaries in Catalonia vanished.

Additionally, D/A_i and $Cash_i$ have the expected sign and are economically and statistically significant for window (0, 2).

$lnMC_i$ is positive and significant until the last length (the second to last in the restricted sample), confirming our signs of the geographical analysis and suggesting that there was not a rapid absorption of this information. For example, a firm with a market capitalization of 4 billion and 860 million (Q3) obtains a positive premium in CAR (0, 2) of 333 basis points (261 using the restricted sample) compared to a firm with a 267 million market value (Q1).

TABLE 9 Results of cross-sectional regressions

	Full sample ($n = 115$)						
Panel A	**AR (0)**	**CAR (0, 2)**	**CAR (0, 4)**	**CAR (0, 6)**	**CAR (0, 9)**	**CAR (0, 14)**	**CAR (0, 19)**
Constant	−7.8310*** (2.7900)	−28.3072*** (8.8395)	−19.0441*** (5.5596)	−28.3827*** (7.3549)	−15.0983*** (5.1483)	−14.9427** (6.3896)	−17.2890** (7.5296)
lnSub	0.3173* (0.1833)	0.4253 (0.5050)	0.5024 (0.3768)	0.5769 (0.4946)	0.1513 (0.3831)	0.1967 (0.5018)	0.1509 (0.6149)
lnMC	0.3186** (0.1409)	1.1518** (0.4465)	0.7196*** (0.2717)	1.0972*** (0.3646)	0.5701** (0.2456)	0.4839* (0.2907)	0.5325 (0.3401)
Ebit/Eq	−0.1115 (0.8456)	−0.2501 (1.8754)	0.2172 (1.3475)	0.6628 (2.0242)	−0.7238 (1.9566)	−2.1002 (2.6258)	1.3978 (2.7938)
M/B	−0.0428** (0.0189)	0.0381 (0.1061)	−0.0119 (0.0439)	−0.0879** (0.0376)	−0.0199 (0.0595)	−0.0365 (0.0539)	−0.1147** (0.0554)
S.Grwth	0.2484 (0.2500)	0.3956 (0.4038)	−0.1219 (0.3844)	0.2084 (0.6604)	−0.0071 (0.4848)	0.7321* (0.4396)	1.1043** (0.5292)
A.cat	−1.0465** (0.4644)	−0.7471 (1.1386)	−0.8854 (0.8157)	−0.4637 (1.0216)	−1.4982 (1.2306)	−0.3469 (1.6408)	−0.5067 (1.7691)
Adj. R^2	0.2064	0.2345	0.2372	0.2560	0.1132	0.0546	0.0859

	Restricted sample ($n = 92$)						
Panel B	**AR (0)**	**CAR (0, 2)**	**CAR (0, 4)**	**CAR (0, 6)**	**CAR (0, 9)**	**CAR (0, 14)**	**CAR (0, 19)**
Constant	−7.8227** (3.0685)	−40.0954*** (8.2685)	−18.5307** (8.1660)	−33.4083*** (10.1427)	−14.8279*** (10.6993)	−23.6934 (12.3971)	−23.7432 (16.3001)
lnSub	0.3546 (0.2490)	1.0956* (0.6509)	0.4781 (0.5138)	1.0075 (0.6465)	0.3646 (0.5009)	−0.0774 (0.6683)	−0.4034 (0.8574)
lnMC	0.3035* (0.1642)	0.9020* (0.4585)	0.6234** (0.3092)	0.8971** (0.3719)	0.4237** (0.2541)	0.4433 (0.3016)	0.5075 (0.3635)
Ebit/Eq	−0.1786 (0.9786)	0.4019 (2.0706)	−0.0179 (1.3567)	0.7884 (2.1834)	−0.7526 (1.9204)	−1.4101 (2.6787)	2.0662 (2.746)
M/B	−0.0483** (0.0220)	0.0315 (0.0715)	−0.0123 (0.0333)	−0.093*** (0.0346)	−0.0228*** (0.0583)	−0.0298 (0.0605)	−0.1028 (0.0717)
S.Grwth	0.1690 (0.2365)	0.4905 (0.3240)	−0.2267 (0.3299)	0.0242 (0.5408)	−0.1502 (0.4397)	0.6562*** (0.4195)	1.2295*** (0.442)
A.cat	−0.9202 (0.5793)	−1.6841 (1.4330)	−1.0319 (0.9790)	−1.2964 (1.2173)	−2.1103 (1.5648)	0.5306 (2.1425)	1.1076 (2.1705)
A.Grwth	1.1334 (1.0655)	1.8296 (2.1777)	1.7142 (2.3893)	2.2859 (2.5865)	2.1519 (2.1238)	−2.456 (3.3659)	−4.1994 (3.3036)
D/A	0.1147 (1.2522)	−4.6598* (2.5366)	0.3251 (1.7318)	−1.7846 (2.5282)	−0.3265 (2.9381)	2.3641 (3.5566)	0.3356 (4.1518)
Cash	−1.7390 (3.9906)	14.3783** (6.6274)	9.1986 (5.6535)	9.9037 (9.3089)	12.2713 (7.2596)	6.6781 (8.0915)	6.334 (8.9877)
Adj. R^2	0.1213	0.2581	0.1483	0.1944	−0.0220	−0.0939	−0.0496

Note: This table presents the main results of cross-sectional regression for the full sample (Panel A) and the sample without financial companies (Panel B). Acronyms explained in Section 3. All data were obtained from the annual reports and 'Bolsa de Madrid' reports. Adj. R^2 is the adjusted R^2 of the regression. Coefficients and standard deviations are multiplied by 100. The standard deviation is in brackets and ***, ** and * mean significance at 10, 5 and 1%, respectively.

Finally, the R square also gives some valuable information. The ability of this set of regressors to explain the heterogeneity of the abnormal returns is around 20% (25.81% at the top) until Day 6; after this window, the ability to explain variance practically disappears.

TABLE 10 Results of cross-sectional regressions using foreign assets

	Full sample ($n = 83$)						
Panel A	**AR (0)**	**CAR (0, 2)**	**CAR (0, 4)**	**CAR (0, 6)**	**CAR (0, 9)**	**CAR (0, 14)**	**CAR (0, 19)**
Constant	−7.733*** (2.4088)	−24.6198*** (8.1256)	−18.1521*** (5.646)	−29.1184*** (8.1908)	−17.1655*** (5.5951)	−16.9146** (7.5969)	−20.3079** (9.4373)
FA	1.2674** (0.6005)	1.9868 (1.9896)	2.925* (1.4777)	2.3016 (1.8709)	1.1704 (1.5574)	1.4832 (1.7982)	1.3860 (2.0929)
lnMC	0.2929** (0.1219)	0.9212** (0.4139)	0.6532** (0.272)	1.0896*** (0.4092)	0.6513** (0.2604)	0.5546 (0.335)	0.6568 (0.4262)
Ebit/Eq	0.2052 (0.6864)	0.7614 (1.9759)	0.4269 (1.3689)	1.7372 (2.0111)	−0.745 (1.7973)	−0.0685 (2.2224)	1.6662 (3.0053)
M/B	−0.0424** (0.0191)	0.0158 (0.1269)	−0.0231 (0.0373)	−0.0917** (0.0456)	0.0257 (0.029)	−0.0106 (0.0414)	−0.0718* (0.0391)
S.Grwth	0.1974 (0.1943)	0.3442 (0.3562)	−0.1531 (0.3585)	0.1712 (0.579)	−0.0812 (0.4429)	0.9663** (0.4133)	1.2852*** (0.4737)
A.cat	−0.5645 (0.5118)	0.578 (1.6587)	−0.4643 (1.1753)	0.3539 (1.5609)	−1.3172 (1.2483)	−0.5762 (1.7187)	−0.9768 (2.0767)
Adj.R^2	0.2705	0.1743	0.2447	0.2849	0.1934	0.155	0.1292
Panel B	Restricted sample ($n = 63$)						
	AR (0)	CAR (0, 2)	CAR (0, 4)	CAR (0, 6)	CAR (0, 9)	CAR (0, 14)	CAR (0, 19)
Constant	−8.2606** (3.9593)	−37.7555*** (9.8509)	−18.4484 (9.7061)	−35.0146*** (12.9862)	−20.215* (11.6464)	−20.8149 (14.3455)	−18.4026 (18.2603)
FA	1.3707* (0.7804)	5.1725* (2.6101)	2.9578 (1.8428)	4.6318* (2.4735)	1.9605 (2.2248)	1.4485 (1.9307)	0.9156 (2.1734)
lnMC	0.2607** (0.1296)	0.6747* (0.3804)	0.5300* (0.296)	0.9078** (0.4218)	0.5579* (0.2842)	0.3624 (0.2751)	0.4201 (0.3692)
Ebit/Eq	0.209 (0.7077)	1.1364 (2.0366)	0.0563 (1.4594)	1.5998 (2.1671)	−0.8838 (1.7405)	0.3965 (2.2282)	1.8697 (3.0746)
M/B	−0.0466*** (0.0157)	0.0077 (0.0734)	−0.0155 (0.0283)	−0.0977*** (0.0341)	0.0301 (0.0272)	−0.0072 (0.0468)	−0.0636 (0.0522)
S.Grwth	0.1448 (0.1949)	0.5857 (0.3947)	−0.2256 (0.338)	0.1092 (0.5391)	−0.2256 (0.4046)	1.1816*** (0.3835)	1.7127*** (0.5635)
A.cat	−0.0141 (0.6172)	−0.2437 (2.1162)	−0.5247 (1.5745)	−0.5280 (1.963)	−2.3437 (1.7655)	−0.1917 (1.946)	0.2176 (2.2775)
A.Grwth	0.0145 (0.6085)	0.3471 (1.7554)	1.0669 (2.3502)	1.3058 (2.4228)	1.3264 (2.3333)	0.7284 (2.6327)	−0.1786 (3.6467)
D/A	−0.4825 (1.4283)	−6.6877* (3.6018)	0.5682 (2.2293)	−3.4586 (3.7078)	0.2055 (2.9896)	−0.4675 (3.8584)	−2.2124 (5.4037)
Cash	−2.5156 (4.3987)	17.0647** (7.528)	10.7301 (6.9271)	11.4712 (10.7545)	15.7172* (8.8311)	15.4418** (7.3466)	13.3425** (10.1893)
Adj.R^2	0.1359	0.2427	0.1389	0.2100	0.0046	−0.0361	−0.0888

Note: Coefficients and standard deviations are multiplied by 100. This table presents the main results of cross-sectional regresion for the full sample (Panel A) and the sample without financial companies (Panel B) for the specification including foreign assets. Acronyms explained in Section 3. All data were obtained from the annual reports and 'Bolsa de Madrid' reports Adj. R^2 is the adjusted R^2 of the regression. The standard deviation is in brackets and ***, ** and * mean significance at 10, 5 and 1%, respectively.

The next table shows the results for cross-sectional regressions when introducing FA_i. The FS_i results show no qualitative differences compared to the first variable, and the FFA_i results neither because they are quite similar to those obtained for FA_i.

The sample drops by 32 in the full sample and 29 in the restricted one. In general, there is a decrease in the load on size but not in significance.

There are gains in significance for the first and third length in the full sample and an increasing pattern is

TABLE 11 Results of cross-sectional regressions

	Full trimmed sample ($n = 111$)						
Panel A	**AR (0)**	**CAR (0, 2)**	**CAR (0, 4)**	**CAR (0, 6)**	**CAR (0, 9)**	**CAR (0, 14)**	**CAR (0, 19)**
Constant	−6.5907*** (1.8401)	−25.1899*** (7.8741)	−14.285*** (4.3811)	−24.4734*** (6.5287)	−11.355** (3.6282)	−6.9539 (4.4995)	−8.1491* (4.781)
lnSub	0.2708** (0.1349)	0.3309 (0.4619)	0.4569 (0.3358)	0.3957 (0.4342)	0.0132 (0.3249)	0.1123 (0.4333)	0.0939 (0.5313)
lnMC	0.2396** (0.0913)	0.9887** (0.3962)	0.5125** (0.2138)	0.9456*** (0.3234)	0.4123** (0.1858)	0.1527 (0.2098)	0.1526 (0.2186)
Ebit/Eq	0.293 (0.5766)	0.8700 (1.5454)	1.1506 (1.1296)	2.8716* (1.5816)	0.1862 (1.5545)	0.117 (2.0087)	4.1021* (2.1093)
M/B	−0.0384** (0.0174)	−0.0743*** (0.0251)	−0.017 (0.043)	−0.1088*** (0.0316)	−0.009 (0.0472)	−0.0309 (0.0496)	−0.111** (0.0513)
S.Grwth	0.1419 (0.1247)	0.2933 (0.2686)	−0.2746 (0.2465)	0.0279 (0.4764)	−0.2374 (0.2723)	0.6144* (0.3634)	0.9639* (0.5323)
A.cat	−0.3976 (0.3374)	0.0045 (1.0471)	−0.8022 (0.7511)	−0.8068 (0.9519)	−1.2609 (1.0499)	−0.4455 (1.2108)	−0.7272 (1.3387)
Adj.R^2	0.2631	0.2803	0.2013	0.2670	0.1424	0.0648	0.0901
Panel B	Restricted trimmed sample ($n = 88$)						
	AR (0)	CAR (0, 2)	CAR (0, 4)	CAR (0, 6)	CAR (0, 9)	CAR (0, 14)	CAR (0, 19)
Constant	−9.3974*** (2.637)	−36.5827*** (8.4804)	−5.4584 (6.3413)	−21.6754*** (7.8489)	−0.8746 (7.2416)	−9.2371 (10.5289)	−8.4515 (13.5619)
lnSub	0.3093** (0.1517)	0.8114 (0.603)	0.4664 (0.4281)	0.9688* (0.5099)	0.0466 (0.4258)	−0.1824 (0.5717)	−0.1957 (0.7313)
lnMC	0.2002** (0.089)	0.8134* (0.4134)	0.4198* (0.2339)	0.6388** (0.2497)	0.3763* (0.2246)	0.2063 (0.2194)	0.1763 (0.245)
Ebit/Eq	0.3985 (0.5714)	1.4746 (1.6271)	0.63 (1.0994)	4.2719*** (1.1427)	0.173 (1.3184)	0.9584 (1.9285)	2.8678 (1.7609)
M/B	−0.0397*** (0.0131)	−0.0504 (0.0347)	−0.0097 (0.0241)	−0.1288*** (0.0299)	−0.008 (0.0361)	−0.0369 (0.042)	−0.0963** (0.0442)
S.Grwth	0.0822 (0.0912)	0.3129 (0.2614)	−0.3925* (0.2316)	−0.0969 (0.3031)	−0.1884 (0.2896)	0.8661** (0.4076)	1.3025*** (0.4098)
A.cat	−0.1747 (0.4128)	−0.4909 (1.2972)	−1.3071 (0.8891)	−1.2267 (1.1788)	−1.5754 (1.3685)	−0.2314 (1.5426)	0.1293 (1.6165)
A.Grwth	0.2576 (0.4814)	0.9342 (1.4605)	1.4168 (1.9512)	1.8217 (1.9607)	2.2407 (1.835)	1.1005 (2.6488)	−1.5319 (2.1858)
D/A	−0.4898 (0.9098)	−2.4082 (2.671)	1.1208 (1.7017)	−2.7751 (2.1302)	−0.6886 (2.0415)	3.2199 (3.2533)	2.7649 (3.4353)
Cash	2.4717 (2.4191)	10.8745* (6.4033)	3.8257 (4.0297)	−0.6762 (6.2205)	6.1257 (4.256)	8.4913 (6.6177)	8.5844 (7.6965)
Adj.R^2	0.2048	0.2596	0.1460	0.2581	0.0669	−0.0624	−0.0735

Note: Coefficients and standard deviations are multiplied by 100. This table presents the main results of cross-sectional regresion for the full sample (Panel A) and the sample without financial companies (Panel B), both trimmed at 5%. Acronyms explained in Section 3. All data were obtained from the annual reports and 'Bolsa de Madrid' reports Adj. R^2 is the adjusted R^2 of the regression. The standard deviation is in brackets and ***, ** and * mean significance at 10, 5 and 1%, respectively.

observed until CAR (0, 4). For the restricted sample, the significance of the period (0, 2) is maintained and increases for (0) and (0, 6). Compared with $lnSub_i$, this result suggests that investors did not incorporate information so quickly. In the period (0, 4), it reaches the maximum; in this interval, a firm with 74.80% of its assets overseas (Q3) obtained a premium of 2.17% (2.20% in the restricted sample) over a company with 0.37% (Q1) of its assets abroad.

TABLE 12 Business flight statistics

	$AR_i(0)$	$CAR_i(0,1)$
Sample	12	
Mean	3.4795	3.2718
SD	5.9862	6.7162
Positive values	8	10
%Positive	66,67%	83,33%

Note: This table shows statistics of abnormal returns (ARi(0)) and cumulative abnormal returns (CARi(0,1)) for the business flight. Means and standard deviations are multiplied by 100.

There are no surprises in the rest of the factors, except $ACAT_{i,}$ which is not significant in any case.

As previously explained, we also implemented two additional robustness checks. The first one, in Table 10, which includes the regional factor, does not change our previous results quite so much. In the full sample, the variable assets in Catalonia ($ACAT_i$) is not significant in any window. However, in the restricted sample, it is significant and negative in CAR (0, 2), but no variable loses its significance because of this. In this sense, we conclude that our findings at firm level are not exclusively a product of being Catalan.

On the other hand, Table 11 shows the results when we trimmed the sample for each length at 5% level. This table is directly comparable to the first one presented in this section.

First of all, the variable $lnSub_i$ is a bit lower, but it gains significance for both samples on Day 0, while its significance disappears in window (0, 2) for the restricted sample but gains for window (0, 6).

In particular, the most staggering result is that of the variable $Ebit/Eq_i$. Not only does it have the expected sign in all the windows, but it is also economically and statistically significant for the interval from 0 to 6. This finding suggests that our previous results were being driven by firms with a very extreme value in this profitability measure.

Finally, the measure $ACAT_i$ is no longer significant, confirming the results obtained with the other robustness check commented above.

5 | CATALAN BUSINESS FLIGHT EVENT STUDY

In this last section, we include an additional event study because during the crisis, an unusual process took place. Many companies based in Catalonia moved to another region and by the end of 2017 more than 3,000 companies had moved from Catalonia.[5] We call this process business flight, and during our event window, 12 out of 23 listed companies abandoned the region.

TABLE 13 Business flight hypothesis testing

Test/hypothesis	AAR(0) = 0	CAAR(0,1) = 0
CS test (*t*-test[11])	2.0135**	1.6875*
F-test (12, 13,800)	3.5910***	1.4363

Note: This table contains the critical values of the *t*-tests corresponding to the cross-sectional test and the *F*-tests corresponding to the linear restrictions of the model. Degrees of freedom in brackets. Hypothesis is the null hypothesis of no abnormal returns and no cumulative abnormal returns.

This process might prove that political uncertainty was so latent that the boards decided to change their headquarters to reassure investors. This event study aims to assess whether investors valuated this decision positively, and although it is limited because of a very small sample, it is the entire sample.

Therefore, and given our abnormal returns estimators (δ_i), we define AR_i (0) as abnormal return for the day the company left the region (e.g., Oryzon was the first company to leave Catalonia and its $AR_i(0)$ corresponds to the δ_2 coefficient). In addition, we construct CAR_i (0,1) by adding the next business day coefficient, this approach is taken because we are dealing with a sample containing small firms that often have liquidity problems, which could delay reaction to the information provided.

In Table 12, we can see the estimators. We have an AR_i (0) mean of 3.48%, which is large compared with the full sample mean of abnormal returns of −0.02%. Meanwhile, the standard deviation is 5.99% with extreme values ranging from −2.10% up to 17.62%. As can be observed, there is no increase in abnormal returns when enlarging the event window up to 2 days, although in the number of positive returns there is (up to 83.33% of the sample).

For the rest, we carried out a standard event study with the advantage that the SUR model already takes correlation into account. For this reason, we used the F-test for linear restrictions, and furthermore, a standard cross-sectional test, with the same null hypothesis, where the average of abnormal returns during the corporate flight was equal to zero.

In contrast, the alternative hypothesis would be that investors interpret the change of headquarters as a way to avoid the risk associated with the independence process.

In Table 13, we can note strong evidence against the null hypothesis during the first day of the event (at 5% for CS test and 1% for *F*-test), so the information was incorporated rapidly into prices. The evidence is blurred when the event window is wider and is only significant at 10% in the *t*-test.

6 | SUMMARY AND CONCLUSIONS

In this article, we have analysed one of the most uncertainty-generating processes in the recent history of Spain: the Catalan crisis of 2017. We have established that the beginning of this process was when the illegal referendum took place and the end was when the Spanish government took control of the region, understood to be the day when uncertainty came to an end.

According to the main events that occurred, we found economically and statistically significant falls in Catalan companies after the poll and the King's speech. These results are also observable in companies from the rest of Spain when we use equally weighted portfolios.

All these results are maintained when we change our normal returns model for one including changes in the volatility index (VIBEX).

During our second analysis, we confirmed that the early days of the Catalonian crisis affected the relative value of the firms listed in the Spanish Stock Exchange.

In this context, the level of internationalization had a positive and large effect on returns, and the companies with more expected growth were more exposed to the Catalan crisis. Investors also found the size of the company positively valuable.

Last but not least, we found weak evidence that companies with more leverage and lower cash percentage suffered greater falls in abnormal returns.

Concerning what we called business flight, we conclude that on average, the market reacted positively to the change of allocation, although we must be cautious with this finding because it is very limited by the sample.

In general, we believe that this research addresses and generates debate regarding the incidence and duration of specific variables in returns in an environment of political risk. But beyond the academic scope, we hope that it will contribute to the analysis carried out by the different public institutions and investors when it comes to solving conflicts of this type.

ENDNOTES

[1] Available in www.policyuncertainty.com. Last accessed: 29 May 2019.

[2] The difference in base points of the yield of the Spanish 10-year bond with respect to the German one. In this context, an increase can be interpreted as a worsening of investment conditions.

[3] This model was firstly implemented by Zellner (1962) but the methodology regarding the use of *dummies* in event studies (one-step event-study) is thanks to Karafiath (1988) and Binder (1985), among others.

[4] VIBEX historical series have been provided by *Bolsas y Mercados Españoles* (BME) and for further methodological questions consult: http://www.bmerv.es/docs/SBolsas/docsSubidos/NormasIndices/Normas_Acciones_esp.pdf. Last accessed: 29 May 2019.

[5] List of companies that left Catalonia due to the Independence process. (28 December 2017). **20minutos. Recovered from https://www.20minutos.es/. Last accessed: 30 May 2019.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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