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Corporate governance, earnings quality and idiosyncratic crash risk during the 2007–2008 financial crisis

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ABSTRACT

This study explores the time-varying nature of the association between financial disclosure quality, corporate governance, and crash risk. Specifically, it evaluates the relevance of the above-mentioned variables in alleviating the abnormal components of crash risk that emerge during periods of mounting mistrust. Our empirical design takes advantage of the 2008 financial crisis as a sudden and negative exogenous shock that affected overall trust in capital markets. This near-natural experiment enables the examination of the influence of accounting quality and corporate governance on abnormal crash risk arising during distress periods, using a sample of 1361 firms from developed countries. While pre-crisis accounting opacity fueled the abnormal component of crash risk associated with the crisis, corporate governance practices had virtually no effect. Our interpretation is that perceived integrity compounded by firms by way of financial disclosure quality bolsters investor confidence in the firms' financial information during a crisis, thereby attenuating crash risk.

1. Introduction

Crash risk is defined as the likelihood of extreme negative returns (Hutton et al., 2009) or the conditional skewness of return distribution (Callen and Fang, 2015; Kim and Zhang, 2016). It captures asymmetry in risk - especially downside risk materialized in sudden and unexpected sharp declines in stock prices. Thus, crash risk is a relevant feature of return distribution with important implications for portfolio theories and asset- and option-pricing models (Kim and Zhang, 2014), and it cannot be alleviated through diversification. A keener understanding on what affects crash risk can potentially offer a noteworthy contribution towards protecting investors' wealth. Pinning down predictors of crash risk can also be useful to policy makers developing future regulation.

The fundamental drivers of crash risk have long generated keen interest among academics and financial industry practitioners. This study addresses this topic by assessing the role of financial disclosure quality and corporate governance mechanisms as moderators of the abnormal component of idiosyncratic crash risk arising during periods of financial turmoil. Indeed, both accounting quality and effectiveness of corporate governance devises enhance investors' perception about

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a firm's reputation, integrity, and trustworthiness. These intangible assets are part of a firm's social capital[1], which, according to previous research, becomes more valuable during financial crises, particularly during those marked by heightened mistrust of capital market foundations (Lins et al., 2017).

An event study analysis is undertaken to ascertain the influence of accounting quality and corporate governance devises on the abnormal component of crash risk that is triggered in periods of generalized disbelief. Indeed, there are channels documented in the literature linking crisis periods to upsurges in crash risk. First, in such periods, the risk premiums demanded by investors tend to hike. Secondly, investors are likely to doubt any information they gather, resulting in higher skepticism in response to positive news and overreaction in response to negative news, ultimately skewing returns. Empirically, Stoyanov et al. (2011) show that returns tend to deviate more from normality during crisis periods, which is compatible with our arguments for financial crises exacerbating crash risk. It will be shown later, however, that while the impact of mistrust on crash risk tends to be severe, it is also heterogeneous, suggesting that some corporate characteristics may soften (or exacerbate) its effects.

The Great Financial Crisis (GFC) is used in this assessment as a "near" natural experiment where investors' perceptions regarding public trust in corporations, capital markets, and institutions suddenly and unexpectedly dropped.[2] In effect, this is consistent with survey results reported by Sapienza and Zingales (2012), according to which the GFC derived from a trust crisis originated in the financial system. Similarly, Edelman (a large independent public relations firm) reports that trust levels in business in the U.S. were stable until early 2008 (scoring 53% and 58% in early 2007 and 2008, respectively), but plummeted to 38% in early 2009.[3],[4] Reassuringly, the use of the GFC as an external shock to individuals' trust in the financial system was also employed in several other studies, including Amiraslani et al. (2017); Chatjuthamard et al. (2018), and Lins et al. (2017), *inter alia*.

While heightened mistrust in the market is expected to yield additional crash risk to virtually all stocks, this study posits that intangible assets from social capital manifested in greater investor confidence in financial reporting and corporate governance practices may alleviate concerns regarding crash risk. Essentially, when mistrust runs deep, as was the case with the GFC, investors become insecure about the true economic value of assets and discount prices, not only based on risky fundamentals, but also on factors related to the credibility and reputation of the firm information. We want to see the extent to which financial reporting and adoption of widely accepted corporate governance practices alleviated effects of the GFC on crash risk.

The abnormal component of crash risk that emerged during the GFC is defined as the change of crash risk recorded during the GFC relative to the pre-crisis period. Two alternative measures of crash risk are appraised: non-negative conditional skew (*NCSKEW*) and down-up volatility ratio (*DUVOL*) of idiosyncratic stock returns. These measures are computed for an international sample of 1389 firms geographically distributed throughout the U.S., the E.U., Japan, and Canada, and for two distinct periods - the pre-crisis period (July 2005 to June 2007) and the crisis period (July 2007 to June 2009). At the same time, a measure of accounting opacity is estimated for each firm following the method employed by Kothari et al. (2005) and Hutton et al. (2009).

The impact of pre-crisis accounting opacity and corporate governance practices on abnormal crash risk is assessed by means of a cross-section regression analysis. Specifically, abnormal crash risk is regressed on the pre-crisis proxy of accounting quality, corporate governance metrics retrieved by a major data provider, a set of control variables (the same as Hutton et al. (2009)) and country and industry fixed-effects. It is important to emphasize three central aspects of this empirical setting. First, key variables are measured prior to the GFC, thereby ruling out concerns of simultaneity and endogeneity. Secondly, the introduction of industry and country fixed-effects imply that only within-country-industry differences in the accounting quality and internal corporate governance mechanisms' adoption are considered in the explanation of the dependent variable.

Finally, the empirical design of this study allows the examination of the impact of these key variables on abnormal crash risk after controlling for effects of changes in economic fundamentals that occurred during the event window. In effect, the set of control variables includes changes in profitability (ROA) when using the baseline setting and changes in firm value (total returns) and idiosyncratic risk in an extended model specification. Put simply, this study intends to exclude the possibility that the association between its key variables and abnormal crash risk is driven by post-crisis profitability or

[1] According to Antoni and Sacconi (2011), cognitive social capital is defined in terms of beliefs (in the conduct of others) and dispositions to conform with ethical principles of cooperation. Plausibly, accounting quality and effectiveness of corporate governance devises substantiate the disposition of firms and management to conform with ethical principles of cooperation.

[2] The GFC was rife with financial scandals, which cast doubt on the foundations of the overall capital markets and damaged investor perception of market integrity and reliability.

[3] https://www.edelman.com/sites/g/files/aatuss191/files/2018-10/2009-Trust-Barometer-Global-Deck.pdf

[4] This reasoning was also shared by other prominent economists, politicians, and the financial media. Nobel laureate and economist Joseph Stiglitz echoed that the GFC was the result of a "catastrophic collapse in confidence". In his view, "financial markets hinge on trust, and that trust eroded" in the wake of the crisis. (http://www.guardian.co.uk/commentisfree/2008/sep/16/economics). Robert Reich contended that the "fundamental problem isn't lack of capital. It's lack of trust." R. Reich: Government needs to rebuild trust in markets, in: US News and World Report, 16 September 2008, http://www.usnews.com/articles/opinion/2008/09/16/robert-reich-government-needs-torebuild-trust-in-the-markets.html. Angel Gurría underscored the relevance of "Trust in governments and regulations, in banks and corporations, in open markets and globalization as a whole." See: http://www.oecd.org/trade/respondingtotheglobaleconomiccrisisoecdsroleinpromotingopenmarketsandjobcreation.htm

firm value change.[5] Because the focus is on the relevance of key variables as channels of influence of social capital (e.g., in terms of reputation and trustworthiness earned by way of the quality of financial disclosure and effectiveness of corporate governance mechanisms) on abnormal crash risk that emerged during the crisis, it is important to rule out effects of financial performance.

Two major conclusions emerge from the empirical analysis. First, pre-crisis accounting quality is an important determinant of abnormal crash risk. Crucially, a cross-sectional change of one standard deviation in accounting opaqueness gives rise to an increase of 0.07 and 0.02 in NCSKEW and DUVOL, respectively, corresponding to 16% and 22% of the pre-crisis cross-sectional standard deviation of the variables. This effect is economically and statistically significant. This conclusion survives several robustness tests, including replacing the raw measure of accounting opaqueness by its (percentile) rank or extending the set of controls so as to include a broader set of control variables employed in earlier research.

As to corporate governance metrics, they lack predictive power over abnormal crash risk. This result holds when different metrics are considered individually (subcores related to board functions, board structure, compensation policy, shareholder rights, and focus on long-term value; and the adoption of specific practices) or in aggregate (an overall corporate governance score comprising all those sub-dimensions). While the statistical and economic significance of accounting opacity is preserved in variants of the baseline model, no evidence is found suggesting that firm-level corporate governance metrics lessen abnormal crash risk during turmoil episodes.

One concern with the baseline setting is the correlation between the adoption of widely accepted corporate governance practices and accounting quality. Arguably, internal corporate governance mechanisms could affect both financial disclosure and abnormal crash risk, implying that the effect of the former on abnormal crash risk is being captured by financial reporting. We collect two pieces of evidence that cut against that possibility.

The first is gathered from a regression of accounting opacity on corporate governance variables and control variables. If the quality of financial reporting mediates the association between corporate governance and abnormal crash risk, then corporate governance metrics should bolster the quality of financial reporting in the first place. The second piece of evidence is obtained from a regression of abnormal crash risk on corporate governance metrics and control variables (i.e. excluding accounting opacity from the baseline regression). Notably, in these two cases the results are at odds with the hypothesis that corporate governance metrics help explain abnormal crash risk, directly or indirectly.

To strengthen the robustness of the conclusions, several additional tests are conducted. Those include controlling for selection bias, adding additional control variables and alternative fixed effects structures. Overall, no meaningful differences are found in the results. The statistical and economic significance of accounting opacity holds, whereas corporate governance metrics continue to lack significance, consistent with the notion that the quality of financial disclosure attenuates the abnormal component of crash risk emerging in turmoil episodes.

The results of this study add to the growing body of literature on crash risk determinants. Most related to our assessment, Andreou et al. (2016) and Hutton et al. (2009), inter alia, establish a link between stock price crash risk and corporate governance and accounting opaqueness, respectively. However, neither of these studies consider the time-varying nature of the association between crash risk and the variables of interest here, which constitutes one of the major novelties of this assessment.

In effect, a clear distinction between the effect of those variables during normal times and during distress periods is warranted, because previous research suggests that the association between crash risk and its determinants might increase when markets collapse. For instance, Rajan and Zingales (1998) and Bernanke et al. (1999) contend that agency problems tend to be amplified during periods of financial distress rather than during an economic boom. Johnson et al. (2000) show that weak corporate governance and poor economic prospects encourage expropriation by managers and thus a larger fall in asset prices when analyzing the Asian financial crisis. We go a step further by also considering the effect of trust in financial reporting and corporate governance practices as drivers of crash risk during turmoil episodes. It is also important to bear in mind that while focusing on the GFC, this study circumvents typical endogeneity issues that make it difficult to pinpoint the impact of internal corporate governance mechanisms and accounting quality on crash risk.

Moreover, this assessment also adds to prior literature by using an extended sample comprising firms headquartered in the U.S., Europe, Japan, and Canada. Remarkably, the results from a sample partition show that pre-crisis accounting opacity fuels abnormal crash risk in the U.S., but not in other regions. Furthermore, this study also unveils a positive association between pre-crisis corporate governance scores and abnormal crash risk for the U.S. sub-sample, but not for other firms. This implies that, if anything, the adoption of widely accepted corporate governance practices by U.S. firms was detrimental with respect to that abnormal component of crash risk. A better understanding of the factors driving these country differences constitutes an interesting avenue for future research.

The remainder of the paper proceeds as follows: section 2 presents related literature and theoretical foundations. Section 3 defines the variables and presents the methodology, whereas section 4 describes the sample. Section 5 discusses the results, and section 6 draws the final remarks.

[5] Ultimately, it could be that pre-crisis accounting quality or corporate governance are somehow linked to the post-crisis economic and financial performance of the firm.

2. Related literature, theoretical foundations, and research hypotheses

This paper hypothesizes that accounting quality and adoption of (widely accepted) corporate governance devices contribute to attesting to corporate integrity and credibility, thereby alleviating mounting idiosyncratic crash risk arising during periods of market turmoil. This study uses a difference-in-difference approach, wherein the GFC constitutes an exogenous shock to investors' trust in the financial system, to test this hypothesis.

The drivers of idiosyncratic crash risk have long generated interest among financial economists. For instance, French et al. (1987) and Campbell and Hentschel (1992) argue that volatility feedback effects fuel crash risk. In effect, bad news not only depresses stock returns, it also tends to amplify market volatility. As a result of mounting volatility, the required risk premia are reassessed by investors, thereby exacerbating the initial impact of bad news on returns and skewedness. Divergent opinions of traders are another driver of crash risk identified by previous research (Romer, 1993). The effect of heterogeneity of expectations increases in the presence of short sale constraints, since it impedes bearish investors of initially participating in the market and revealing their information via trading. This accumulated hidden information comes out during market declines (Hong and Stein, 2003).

Relevant to our assessment, the work of Jin and Myers (2006) uncovers a link between earnings opacity and crash risk. In their model, firm managers hide losses arising from bad performance with the goal of protecting their jobs. At a certain point, they become unable to further impede the release of accumulated negative information, causing all the negative information to become public at once, provoking a price crash. In a similar vein, Kirschenheiter and Melumad (2002) develop a model where earnings smoothing could spark stock price crashes.

Empirically, Kothari et al. (2009) present empirical evidence consistent with a delay in the release of bad news to investors. Accounting quality (Hutton et al., 2009; DeFond et al., 2015), institutional investor stability (Callen and Fang, 2013), conditional conservatism (Kim and Zhang, 2016), CSR performance (Kim et al., 2014), structure of managerial compensation (Gormley et al., 2013), dedicated institutional investors (An and Zhang, 2013), stock liquidity (Chang et al., 2017), trading volumes and past returns (Chen et al., 2001), short interest (Callen and Fang, 2015), corporate governance (Andreou et al., 2016) and real earnings management (Francis et al., 2016) are also shown to influence crash risk.

This study extends the work of Hutton et al. (2009), inter alia, addressing the connection between the transparency of financial statements and the distribution of stock returns using a sample of U.S. firms. This study is distinguished from the former by focusing on an international sample of firms. More prominently, it goes beyond their analysis by exploiting the time-varying nature of the relationship between the variables, and focusing on periods of financial turmoil, which is overlooked by Hutton et al. (2009). Likewise, this study adds to the work of Andreou et al. (2016), which exploits the effect of corporate governance devises on crash risk using a sample of U.S. firms covering the period 2002-2013. Like Hutton et al. (2009); Andreou et al. (2016) do not isolate incremental effects of corporate governance mechanisms during financial turmoil.

The hypothesis of an incremental impact of these variables on idiosyncratic crash risk emerging during crises (i.e. beyond that already documented for "normal" periods) is drawn on a novel strand of research that addresses the importance of trust in financial markets. Trust is fundamental to all trade and investment, but it becomes particularly relevant in financial markets where people depart with their money in exchange for promises (Guiso et al., 2008)[6] . Trust promotes a more predictable environment, thereby lessening "risk premiums" required to deal with uncertain behavior. More significantly, the influence of trust on financial outcomes is time-varying. On the one hand, investors tend to place a higher valuation premium (discount) on firms perceived as reliable (non-trustworthy), when overall trust in the capital market is low (Guiso et al., 2008).

On the other hand, investor trust in the information source shapes his belief about the reliability of the information.[7] During crises, corporate governance practices and the quality of financial disclosure are expected to attract even more scrutiny from investors, thereby factoring incremental impact on crash risk. The adoption of good practices is expected to raise the perception of investors with respect to credibility and integrity of the firm information, an intangible asset that could be useful when overall confidence collapses.

The hypotheses explored in this assessment are summarized as follows:

Hypothesis 1. The quality of accounting disclosure lessens the abnormal component of crash risk that emerges during periods of financial turmoil.

Hypothesis 2. The adoption of widely accepted corporate governance practices lessens the abnormal component of crash risk that emerges during periods of financial turmoil.

Hypothesis 3. The impact of key variables on abnormal crash risk is similar for U.S. firms and firms headquartered outside of the U.S.

[6] According to the authors, the "decision to invest in stocks requires not only an assessment of the risk-return trade-off given the existing data, but also an act of faith (trust) that the data are reliable, and that the overall system is fair".

[7] In line with this claim, La Porta et al. (1997) argued that accounting standards play a critical role in corporate governance by informing investors and by making contracts more verifiable.

Section 3 proceeds with the definition of the variables and the methodology.

3. Variables definition and methodology

This section starts by defining the variables of interest, namely crash risk and accounting quality. These variables are estimated using econometric models. Then, we proceed with the description of the econometric specification.

3.1. Variables definition

Crash risk – the dependent variable of this study is captured employing two alternative variables: the negative conditional skew (*NCSKEW*), and down-to-up volatility (*DUVOL*). Both these metrics are estimated by means of a two-step procedure. Consistent with Jin and Myers (2006), an expanded variant of the market model is estimated and the residuals are saved.

$$r_t = \alpha + \sum_{k=-2}^{2} \beta_k \times r_{m,t+k} + \sum_{k=-2}^{2} \gamma_k \times (r_{US,t+k} + EX_{t+k}) + \varepsilon_t \tag{1}$$

where r_t denotes the weekly returns (Wednesday-to-Wednesday) of the stock, $r_{m,t}$ represents the weekly market return for the country where the stock is headquartered (proxied by Datastream country-market index), $r_{US,t}$ is the weekly market return for the U.S. (proxied by the corresponding Datastream country-market index) and EX_t stands for the weekly change of the exchange rate between USD and the local currency.[8]

It is important to note that we are interested in the component of crash risk that is specific to each firm. Large price jumps motivated by market movements are of no interest to the analysis because they cannot be explained by firm-specific variables, such as the quality of disclosure or corporate governance metrics. Employing the residuals of the market model allow the pinning down of extreme variations owing to firm-related factors. Like DeFond et al. (2015), an adjustment to the residual term is undertaken to lessen the influence of extreme observations.

$$W_t = \ln(1 + \hat{\varepsilon}_t) \tag{2}$$

Subsequently, the negative conditional skew (*NCSKEW*) and the down-to-up volatility (*DUVOL*) are calculated according to the following expressions:

$$NCSKEW = -\frac{[n(n-1)^{\frac{3}{2}} \sum W^3]}{(n-1)(n-2)\left(\sum W^2\right)^{3/2}} \tag{3}$$

$$DUVOL = \ln\left(\frac{\sum_{down} \frac{W_t^2}{n_d - 1}}{\sum_{up} \frac{W_t^2}{n_u - 1}}\right) \tag{4}$$

NCSKEW denotes the negative conditional skew of abnormal returns. It is computed separately for each stock and for each period (pre-crisis or crisis period). Regarding *DUVOL*, for each stock over the period of analysis (pre-crisis or crisis period), all the weeks with firm-specific returns below the average are separated from those firm-specific returns that are above the average and labeled as "down weeks" and "up weeks", respectively. n_u and n_d stand for the number of up and down weeks, respectively, over the analyzed period. Afterwards, the variance for the two predefined subsamples is calculated. *DUVOL* corresponds to the log of the ratio of the variance of the "down weeks" over the variance of the "up weeks".

Turning the focus to the quality of accounting disclosure, the measure of opaqueness (*OPAQUE*) follows Kothari et al. (2005) and Hutton et al. (2009). In a first step, the following equation is estimated for each year and for firms included in the same (48) Fama-French industry-country group:

$$\frac{TA_{jt}}{Assets_{jt-1}} = \alpha_0 \times \frac{1}{Assets_{jt-1}} + \beta_1 \times \frac{\Delta Sales_{jt}}{Assets_{jt-1}} + \beta_2 \times \frac{PPE_{jt}}{Assets_{jt-1}} + \varepsilon_{jt} \tag{5}$$

where TA_{jt} denotes total accruals for firm j during year t and $Assets_{jt}$ denotes total assets for firm j at the end of year t. $\Delta Sales_{jt}$ denotes change in sales for firm j in year t and PPE_{jt} denotes property, plant, and equipment for firm j at the end of year t.

[8] Two lead and lagged terms for the local and U.S. market index returns are added to the market model specification so as to allow for nonsynchronous trading (Dimson, 1979).

Discretionary accruals are estimated as the residuals of the above regression, correcting for the variation of receivables ($\Delta receivables_{jt}$).

$$\hat{DiscAcc}_{jt} = \frac{TA_{jt}}{Assets_{jt-1}} - \left(\hat{\alpha}_0 \times \frac{1}{Assets_{jt-1}} + \hat{\beta}_1 \times \frac{\Delta Sales_{jt} - \Delta receivables_{jt}}{Assets_{jt-1}} + \hat{\beta}_2 \times \frac{PPE_{jt}}{Assets_{jt-1}} \right) \quad (6)$$

Following Hutton et al. (2009), the measure of opacity in financial reporting is computed as the three-year sum of the absolute value of annual discretionary accruals:

$$\hat{OPAQUE}_{jt} = abs(\hat{DiscAcc}_{jt-1}) + abs(\hat{DiscAcc}_{jt-2}) + abs(\hat{DiscAcc}_{jt-3}) \quad (7)$$

In the computation of $\hat{OPAQUE}_{jt}$, all firms from the Worldscope database with data for end-2004, 2005, and 2006 are considered.

3.2. Methodology

To evaluate the time-varying nature of the link between accounting quality (corporate governance) and crash risk, we examine how the former variable relates to the abnormal component of crash risk emerging during market turmoil using an event study framework. It is posited that reputation and confidence in firms' financial reporting and corporate governance practices constitute intangible assets of firms, which are likely to become more valuable in periods of generalized mistrust (Lins et al., 2017), thereby lowering abnormal crash risk.

First, agency problems that ultimately amplify crash risk become more evident during periods of crisis (Johnson et al., 2002). Second, Bleck and Liu (2007); Callen and Fang (2013), and Kim and Zhang (2016), inter alia, explain stock prices crashing as a result of withholding, delaying, or compounding the disclosure of bad news by company management. Such practices are unsustainable in the long term, and revelations are more likely to occur during adverse business cycles or dramatic changes in economic conditions. In effect, crises raise incentives for managers to unveil accumulated bad news all at once and blaming economic conditions for the underperformance; additionally crises may also augment any propensity to manipulate earnings (Jenkins et al., 2009; Bertomeu and Magee, 2011; Filip and Raffournier, 2014).

The empirical design of this study is built on the premise that the GFC sparked a sudden and unexpected exogenous shock on investor trust that disrupted the pre-crisis equilibrium. Correspondingly, this crisis offers an opportunity to undertake multiple difference-in-differences tests using the shock to trust as a quasi-experimental setting. For the empirical tests, we rely on pre-crisis accounting quality and corporate governance scores because it is improbable that firms could have adjusted their practices with respect to those variables in anticipation of the financial crisis, thereby circumventing endogeneity issues that affected former studies related to this topic.

The GFC is employed as an external exogenous shock to trust. Previously, the GFC was also used as a quasi-natural experiment to examine the effect of corporate governance devices, institutional ownership, and corporate social responsibility on outcome variables such as returns or firm profitability (see Francis et al. (2012); Nguyen et al. (2015), Erkens et al. (2012), Beltratti and Stulz (2012); Gupta et al. (2013); Buchanan et al. (2018), and Jenwittayaroje and Jiraporn (2019)).[9]

An event study methodology is used in that the abnormal component of crash risk emerging during the GFC is regressed on pre-crisis accounting opaqueness, corporate governance scores, and a set of control variables:

$$Abnormal\ Crash\ Risk_i = \beta_0 + \beta_1 \times Opaque_{i,pre-crisis} + CorpGov_{i,pre-crisis} + \sum_{h=1}^{H} \theta_h \times controls(h)_i + \varepsilon_i, \quad (8)$$

where subscript i denotes firm i; $Abnormal\ Crash\ Risk_i$ corresponds to the change of crash risk from the pre-crisis period (July-2005 to June-2007) to the crisis period (July-2007 to June-2009); $Opaque_{i,pre-crisis}$ is a measure of accounting opaqueness computed for 2006 and $CorpGov_{i,pre-crisis}$ is the main corporate governance metric measured for 2006. Country-industry fixed effects are added to the specification to isolate the effect of firm-specific covariates from country and industry-level unobservable variables.[10]

Two sets of controls are considered. The first set includes the (log of) market capitalization of the firm in the pre-crisis period (*SIZE*), the market-to-book ratio of the firm in the pre-crisis period (*M/B*), leverage of the firm in the pre-crisis period (*leverage*), and the variation of ROA (Δ *ROA*). The second set includes all the variables from the first set as well as the cumulative returns (*CUM RET*) and change in idiosyncratic risk (Δ*IDIOSY*) during the crisis period (Table 1).

[9] Shocks induced by financial crises have been used in the finance and accounting literature to conduct causal inference experiments involving endogenous variables. For instance, Bae et al. (2012); Johnson et al. (2000), Baek et al. (2004), and Lemmon and Lins (2003) all present evidence consistent with the idea that firms with weaker corporate governance structure or disclosure quality faced large price declines during the 2001-2002 Argentina crisis and the 1997-1998 Asian crisis.

[10] We follow Lins et al. (2017) in this respect. The authors also add industry fixed effects to their empirical setting. Given that their sample focuses on the US, they do not include country fixed effects. The impact of the financial crisis was heterogeneous across industries, making it important to remove that effect from the conclusions. The adoption of certain corporate governance practices tends to cluster within countries and industries. As Lins et al. (2017), Huber-White standard errors are used when conducting statistical inference.

Table 1
Variables definition.

Variable	Definition
SIZE	log of the market value of equity in USD at the end of 2006.
M/B	ratio of the market value of equity to the book value of equity measured at the end of 2006.
leverage	book value of all liabilities scaled by total assets measured at the end of 2006.
ΔROA	variation of income before interest, depreciation and extraordinary items divided by the book value of assets between the pre-crisis and crisis period.
CUM RET	cumulative returns of the firm during the crisis period.
IDIOSY	idiosyncratic volatility measured during the pre-crisis period.
$NCSKEW_{pre-crisis}$	NSKEW measured during the pre-crisis period.
$DUVOL_{pre-crisis}$	DUVOL measured during the pre-crisis period.
ΔIDIOSY	variation of idiosyncratic volatility during the crisis period.
Δ NCSKEW	variation of NCSKEW during the crisis period.
Δ DUVOL	variation of DUVOL during the crisis period.
$OPAQUE_{pre-crisis}$	OPAQUE measured during the pre-crisis period.
$CorpGov_{pre-crisis}$	Corporate governance score retrieved from ASSET4. According to the source, it "measures a company's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders. It reflects a company's capacity, through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives, as well as checks and balances in order to generate long term shareholder value."
$CGBF_{pre-crisis}$	Sub score related to board functions retrieved from ASSET4. According to the source, it "measures a company's management commitment and effectiveness towards following best practice corporate governance principles related to board activities and functions. It reflects a company's capacity to have an effective board by setting up the essential board committees with allocated tasks and responsibilities."
$CGBS_{pre-crisis}$	Sub score related to board structure retrieved from ASSET4. According to the source, it "measures a company's management commitment and effectiveness towards following best practice corporate governance principles related to a well balanced membership of the board. It reflects a company's capacity to ensure a critical exchange of ideas and an independent decision-making process through an experienced, diverse and independent board."
$CGCP_{pre-crisis}$	Sub score related to compensation policy retrieved from ASSET4. According to the source, it "measures a company's management commitment and effectiveness towards following best practice corporate governance principles related to competitive and proportionate management compensation. It reflects a company's capacity to attract and retain executives and board members with the necessary skills by linking their compensation to individual or company-wide financial or extra-financial targets."
$CGVS_{pre-crisis}$	Sub score related to vision and strategy retrieved from ASSET4. According to the source, it "measures a company's management commitment and effectiveness towards the creation of an overarching vision and strategy integrating financial and extra-financial aspects. It reflects a company's capacity to convincingly show and communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes."
$CGSR_{pre-crisis}$	Sub score related to shareholder rights retrieved from ASSET4. According to the source, it "measures a company's management commitment and effectiveness towards following best practice corporate governance principles related to a shareholder policy and equal treatment of shareholders. It reflects a company's capacity to be attractive to minority shareholders by ensuring them equal rights and privileges and by limiting the use of anti-takeover devices."

Unless otherwise stated, all variables are measured in the pre-crisis period. The exceptions are Δ *ROA*, *RET*, and Δ*IDIOSY*. Δ *ROA* and *CUM RET* are included in the empirical setting with the aim of controlling for changes in the economic fundamentals of the firm that could be simultaneously connected to abnormal crash risk and the variables of interest in this study. We anticipate that the firms with the worst performance will also witness greater abnormal crash risk during the GFC, ceteris paribus. By adding these covariates, it is ensured that the impact of pre-crisis accounting quality and corporate governance on abnormal crash risk does not derive from a possible correlation between those variables and changes in profitability (or firm value) in the aftermath of the GFC (as a matter of fact, we wish to gauge whether the influence of these variables on crash risk (partially) stems from the fact that they signal credibility and integrity of the firm's financial information). Equivalently, it is expected that firms with greater idiosyncratic volatility (Δ*IDIOSY*) will also experience greater abnormal crash risk upsurge.[11]

4. Sample and descriptive statistics

4.1. Sample

Data are collected from several sources. With regard to stock prices and financial information about firms, data are retrieved from Datastream and Worldscope. All accounting variables are winsorized at the 1 and 99 percentile tails. Data about corporate governance metrics are gathered from a subsidiary of Thomson-Reuters - ASSET4, which provides

[11] Idiosyncratic volatility may vary due to a change in the risk profile of the firm. Additionally, it captures divergence in opinions, which is also associated to crash risk (Hong and Stein, 2003).

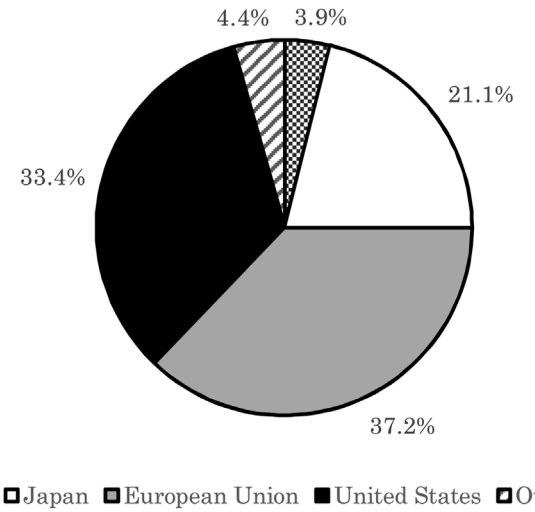

Fig. 1. Distribution of the firms by location. The figure presents the percentage of firms of the sample headquartered in Canada, Japan, European Union and United States.

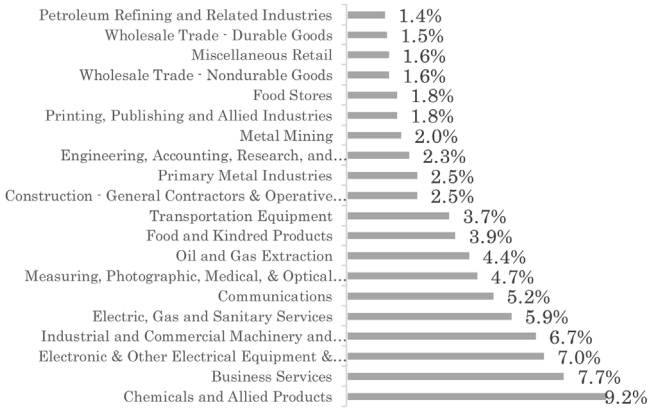

Fig. 2. Distribution of the firms by SIC (two-digit) codes. The figure presents the percentage of firms of the sample according to the SIC (two-digit codes).

a comprehensive Environment-Social-Governance (ESG) database containing information on more than 6000 global companies, covering more than 400 metrics.[12]

In line with previous studies, financial services firms (SIC 6000–6999) are excluded from the assessment. In effect, these companies were at the center of the 2007–2008 financial turmoil and are therefore removed from the analysis. Additionally, firm-year pairs with negative sales or negative total assets are removed as well. The final sample consists of 1361 firms, distributed among the U.S. (33%), the European Union (37%), Japan (21%), Canada (4%) and other countries (4%) (Fig. 1). Fig. 2 provides a visual representation of the distribution of the sample by industry (two-digit SIC code). Chemicals and Allied Products (9.2%), Business Services (7.7%), Electronic (7.0%), and Industrial and Commercial Machinery and Computer Equipment (6.7%) are the sectors with greater representation in our sample.

4.2. Sample statistics

Table 2 reports sample statistics at the firm level for 2006, i.e. the year preceding the beginning of the GFC. It can be seen that the sample contains large listed firms. The average (median) market capitalization of this sample is 14,456 million USD (5646 million USD). In general, the sample covers profitable firms; the average (median) ROA hovers around 8.1% (7.3%), however the standard deviation is roughly 11.2%. Almost 25% of the firms included in the sample display a ROA lower than

[12] According to the data source, data are gathered from publicly available information sources and is manually collected to ensure that the information is standardized, comparable, and reliable. Additionally, the provider ensures that all of the ESG data collected is quality-controlled and verified in a rigorous process by their experienced analysts and employing robust automated checks.

Table 2
Description of the sample.

	Mean	Median	Std. Dev.	Perc (25)	Perc (75)
$NCSKEW_{pre-crisis}$	−0.03	0.00	0.48	0.25	−0.25
$DUVOL_{pre-crisis}$	−0.01	−0.01	0.08	−0.04	0.03
$IDIOSY_{pre-crisis}$	0.02	0.02	0.01	0.02	0.03
Δ NCSKEW	0.04	0.05	0.69	0.42	−0.31
Δ DUVOL	0.01	0.01	0.23	−0.09	0.12
Market Cap. USD	14.456	5.646	29.691	2.957	13.780
Sales USD	11.440	4.334	25.034	1.800	11.155
Leverage (%)	23.8	22.1	18.0	11.0	33.7
ROA(%)	8.1	7.3	11.2	4.3	11.0
M/B	3.4	2.7	12.4	1.8	4.2
$OPAQUE_{pre-crisis}$	0.53	0.18	0.88	0.08	0.58
Δ IDIOSY	0.00	0.00	0.01	0.00	0.01
CUM RET (%)	−15.8	−16.3	23.2	−29.8	−2.2
$CorpGov_{pre-crisis}$	52,3	60,8	30,8	19,7	80,0
$CGBF_{pre-crisis}$	51,6	61,9	31,5	16,0	80,5
$CGBS_{pre-crisis}$	52,0	61,7	30,4	24,0	79,1
$CGCP_{pre-crisis}$	52,0	59,7	30,7	22,3	79,7
$CGVS_{pre-crisis}$	49,0	40,0	30,9	18,9	83,8
$CGSR_{pre-crisis}$	50,7	47,0	30,0	24,3	79,3

The table presents descriptive statistics (mean, median, standard deviation, minimum, maximum, and percentiles 25 and 75) for the sample of firms.

4.3%. The market-to-book ratio of the typical firm included in the sample is large with the average (median) market-to-book ratio standing at 3.4 (2.7). The average leverage equals 23.8% and the standard deviation is around 18.0%.

The main corporate governance metric is retrieved from ASSET4. $CorpGov_{pre-crisis}$ (labeled as CGVSCORE in ASSET4 database) is a composite score. Essentially, it indicates the degree of concordance of a company's corporate governance devices with so-called best practices in terms of board structure, compensation policy, board functions, shareholder rights, and vision & strategy. The average (median) $CorpGov_{pre-crisis}$ in this sample is roughly 52.3 (60.8). The dispersion of this variable is relatively high: the standard deviation stands at 30.8, whereas the interquartile range is approximately 60.

In addition to the main score, attention is also given to the sub-components of that variable. The methodology to construct these scores is proprietary. Five subscores are considered: board structure (CGBS), compensation policy (CGCP), board functions (CGBF), shareholder rights (CGSR), and vision & strategy (CGVS). The average values of these scores range between 49.0 (CGVS) and 52.0 (CGBS).

This study is based on an event study analysis with a primary focus on abnormal crash risk. This variable is defined as the change of crash risk in the crisis period (July 2007 to June 2009) relative to the pre-crisis period (July 2005 to June 2007). The average *NCSKEW* in the pre-crisis period is around -0.03, whereas the median equals 0.00. The average and median of *DUVOL* are roughly -0.01. The average (median) $\Delta NCSKEW$ is 0.04 (0.05). The average and median $\Delta DUVOL$ are 0.01. These results are consistent with the premise that the GFC heightened crash risk. Importantly, both the standard deviation and the interquartile range indicate that these two variables present substantial cross-sectional variation.

Parametric and non-parametric tests are undertaken to see whether $\Delta NCSKEW$ and $\Delta DUVOL$ are statistically different from zero. In regard to the parametric test, it shows t-statistics of 2.87 and 3.77 for $\Delta NCSKEW$ and $\Delta DUVOL$, respectively. As to the non-parametric test, the Wilcoxon Signed Rank test also rejects the null hypothesis of the GFC not affecting crash risk. In conjunction, these results point in the direction of a strong impact of the GFC on crash risk.

Finally, a numerical break down of $\Delta NCSKEW$ and $\Delta DUVOL$ according to $OPAQUE_{pre-crisis}$ (or $CorpGov_{pre-crisis}$) is undertaken. That is, firms are ranked according to $OPAQUE_{pre-crisis}$ ($CorpGov_{pre-crisis}$) inside each country-industry cell, and quintile groups are formed. Then, the average $\Delta NCSKEW$ ($\Delta DUVOL$) is computed for each quintile group. Fig. 3 tracks the (average) abnormal component of crash risk by quintile group in terms of $OPAQUE_{pre-crisis}$ and $CorpGov_{pre-crisis}$. In general, the abnormal component of crash risk rises along with the level of accounting opacity, but no (linear) relationship is found between the former variable and adoption of widely accepted corporate governance devices.

In what follows, we present the results of the main empirical analysis.

5. Discussion of the results

A natural starting point to the empirical analysis is to estimate the baseline specification (Eq. (**8**)). That is, abnormal crash risk ($\Delta DUVOL$ or $\Delta NCSKEW$) is regressed on $M/B_{pre-crisis}$, $leverage_{pre-crisis}$, $SIZE_{pre-crisis}$, $OPAQUE_{pre-crisis}$, $CorpGov_{pre-crisis}$, and concurrent ΔROA. Because the GFC produced heterogeneous impact across countries and industries, industry-country fixed effects are added to the model specification.

Panel A of Table 3 presents results of the estimation of the baseline setting using $\Delta NCSKEW$ as proxy for abnormal crash risk. As we can see in column [1], apart from ΔROA, control variables are not statistically meaningful. The point estimate for ΔROA is negative and statistically significant, implying that firms with a greater decline in profitability recorded greater

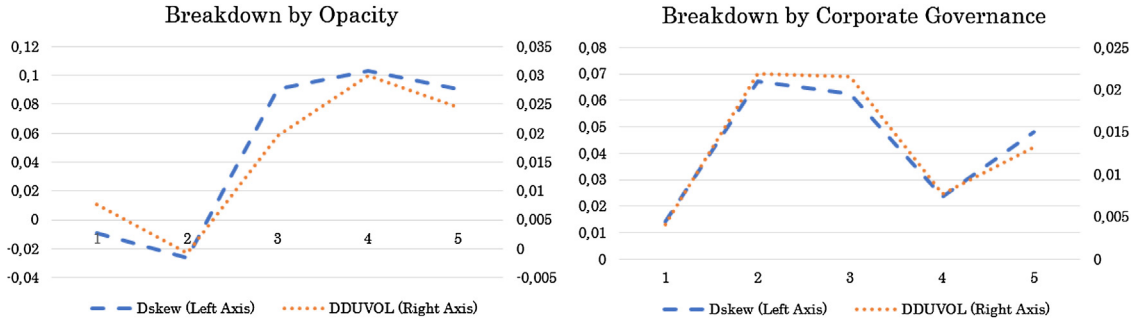

Fig. 3. Opacity, corporate governance and abnormal crash risk. The figure shows average abnormal crash risk by groups of observations. First, the sample of firms is broken down into quintiles based on $OPAQUE_{pre-crisis}$ ($CorpGov_{pre-crisis}$). The average of abnormal crash risk ($\Delta NCSKEW$ and $\Delta DUVOL$) is calculated for each group thereafter.

abnormal crash risk during the GFC. Strikingly, the point estimate for $OPAQUE_{pre-crisis}$ is positive and statistically significant at the 5% level. As to $CorpGov_{pre-crisis}$, the point estimate is positive, but not statistically or economically significant.

The previous regression is reproduced using $\Delta DUVOL$ as a proxy for abnormal crash risk. Consistently, the point estimate for $OPAQUE_{pre-crisis}$ is positive and statistically significant at the 5% level again, whereas the estimated loading for $CorpGov_{pre-crisis}$ is not statistically significant (see column [1] of panel B). Put simply, accounting opacity observed during the pre-crisis period exacerbated the abnormal component of crash risk emerging from the GFC, whereas firms' conformity with best standards of corporate governance had no impact. The baseline setting is already controlling for changes in profitability recorded during the GFC (ΔROA), implying that abnormal crash risk not justified by economic fundamentals is captured by pre-crisis accounting opacity.

In contrast with $OPAQUE_{pre-crisis}$, $CorpGov_{pre-crisis}$ is found not statistically significant when running the baseline regression. One concern with the use of scores, such as that produced by ASSET4, is that they cover multiple aspects from the firm's corporate governance devices. Some of them could affect the dependent variable, whereas other do not. Arguably, some practices heighten crash risk, while others prompt the opposite effect. The bottom line is that the main score ($CorpGov_{pre-crisis}$) averages out the impact of a high number of mechanisms. It is thus compelling to delve further into which mechanisms might matter to alleviate the abnormal component of crash risk emerging in periods of financial distress.

To that end, the main metric is broken down into five sub scores: board functions ($CGBF_{pre-crisis}$), board structure ($CBGS_{pre-crisis}$), compensation policy ($CBCP_{pre-crisis}$), shareholder rights ($CBSR_{pre-crisis}$), and focus on long term value ($CGVS_{pre-crisis}$). Corporate governance sub scores are highly correlated (in effect, the first principal component of the scores explains 35% of the total variance). To avoid multicollinearity issues, each sub score is introduced separately in the baseline setting, i.e. a regression is run for each sub score. As can be seen in columns [2] to [6] of panels A and B, neither of these scores is statistically significant, but $OPAQUE_{pre-crisis}$ continues to load positively with abnormal crash risk.

Up to now, variation in firm's profitability was used to capture changes in economic fundamentals in the aftermath of the financial crisis. By doing so, we expect to rule out firm-specific economic factors that changed during the course of the crisis and prompted crash risk. Nevertheless, *ROA* can be subject to accounting manipulation, which casts doubt of its ability to accurately capture variation in profitability. One alternative is to use a firm's cumulative stock returns during the crisis period (*CUM RET*) to rule out abnormal crash risk sparked by a decay in economic fundamentals during that span. In addition to the firm's cumulative stock returns, the change in idiosyncratic volatility ($\Delta IDIOSY$) is also added with the aim of capturing changes in the risk profile of the firm during the turmoil period.

Table 4 reproduces the results for a variant of the baseline specification that includes *CUM RET* and $\Delta IDIOSY$ as additional covariates. A first look at columns [1] from panels A and B reveals that both the covariates are statistically significant, but ΔROA loses significance. Notably, the results suggest that firms with the worst stock market performance during the GFC present higher abnormal crash risk. As to idiosyncratic volatility variation, it goes hand-in-hand with abnormal crash risk. In regard to the key variables, the statistical significance of $OPAQUE_{pre-crisis}$ is retained, implying that pre-crisis accounting opacity brought about abnormal crash risk that is not explained by changes in economic fundaments during the GFC. $CorpGov_{pre-crisis}$ continues to lack significance. In effect, when looking into the effect of individual sub scores (columns [2]-[6]), these also lack statistical significance.

Our empirical findings are at odds with the idea that pre-crisis corporate governance lessened the abnormal component of crash risk that emanated from the GFC. One justification for the lack of significance of that variable could be that the adoption of widely accepted corporate governance practices goes hand in hand with the quality of financial disclosure. With this in mind, we hypothesized that strong corporate governance mechanisms did not produce direct effects on abnormal crash risk, as those effects are already being captured by a lower prevalence of accounting opacity in those firms.

To test this assertion, a mediation analysis in the spirit of Baron and Kenny (1986) is undertaken. Their method consists of the estimation of two auxiliary regression equations. First, $OPAQUE_{pre-crisis}$ is regressed on $CorpGov_{pre-crisis}$ and control variables. Second, abnormal crash risk is regressed on $CorpGov_{pre-crisis}$ and control variables, i.e. omitting $OPAQUE_{pre-crisis}$

Table 3
Baseline setting.

	Panel A: ΔNCSKEW						*Panel B: ΔDUVOL*					
	[1]	[2]	[3]	[4]	[5]	[6]	[1]	[2]	[3]	[4]	[5]	[6]
$M/B_{pre-crisis}$	0.003	0.003	0.003	0.003	0.003	0.003	0.001	0.001	0.001	0.001	0.000	0.001
	(0.49)	(0.48)	(0.48)	(0.51)	(0.44)	(0.49)	(0.39)	(0.39)	(0.38)	(0.43)	(0.34)	(0.39)
$leverage_{pre-crisis}$	0.048	0.047	0.048	0.049	0.048	0.048	0.003	0.003	0.003	0.003	0.003	0.003
	(0.37)	(0.36)	(0.37)	(0.37)	(0.37)	(0.37)	(0.10)	(0.09)	(0.09)	(0.11)	(0.10)	(0.10)
$SIZE_{pre-crisis}$	−0.001	0.001	0.000	0.001	0.004	−0.001	−0.001	0.000	0.000	0.000	0.001	0.000
	(-0.08)	(0.05)	(-0.02)	(0.05)	(0.21)	(-0.07)	(-0.11)	(-0.06)	(-0.11)	(-0.04)	(0.14)	(-0.11)
ΔROA	−0.753**	−0.762**	−0.755**	−0.741**	−0.757**	−0.756**	−0.139	−0.140	−0.139	−0.135	−0.139	−0.139
	(-2.08)	(-2.10)	(-2.08)	(-2.04)	(-2.08)	(-2.08)	(-1.60)	(-1.62)	(-1.60)	(-1.55)	(-1.61)	(-1.60)
$OPAQUE_{pre-crisis}$	0.085**	0.086**	0.085**	0.085**	0.086**	0.085**	0.020**	0.020**	0.020**	0.020**	0.020**	0.020**
	(2.36)	(2.37)	(2.36)	(2.36)	(2.39)	(2.36)	(2.18)	(2.19)	(2.17)	(2.18)	(2.20)	(2.18)
$CorpGov_{pre-crisis}$	0.000						0.000					
	(0.22)						(-0.03)					
$CGBF_{pre-crisis}$		−0.001						0.000				
		(-0.85)						(-0.84)				
$CGBS_{pre-crisis}$			0.000						0.000			
			(-0.04)						(-0.25)			
$CGCP_{pre-crisis}$				0.001						0.000		
				(0.81)						(1.01)		
$CGVS_{pre-crisis}$					0.000						0.000	
					(-0.49)						(-0.53)	
$CGSR_{pre-crisis}$						0.000						0.000
						(0.34)						(-0.10)
R2	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
N	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361

The table presents the results of the regression of *ΔNCSKEW* (or alternatively, *ΔDUVOL*) against pre-crisis opaqueness ($OPAQUE_{pre-crisis}$), pre-crisis corporate governance metrics, control variables, and country-industry fixed effects (Fama-French 48 industries). T-statistics are reported in parenthesis. Statistical inference is conducted with Huber-White robust S.E. (***), (**), (*) represent two-side statistical significance at the 1, 5, and 10% levels.

Table 4
Extended setting.

	Panel A: ΔNCSKEW						*Panel B: ΔDUVOL*					
	[1]	[2]	[3]	[4]	[5]	[6]	[1]	[2]	[3]	[4]	[5]	[6]
$M/B_{pre-crisis}$	0.005	0.006	0.006	0.006	0.005	0.006	0.001	0.001	0.001	0.001	0.001	0.001
	(0.90)	(0.92)	(0.92)	(0.93)	(0.84)	(0.92)	(0.75)	(0.77)	(0.77)	(0.80)	(0.70)	(0.76)
$leverage_{pre-crisis}$	−0.048	−0.049	−0.048	−0.046	−0.046	−0.047	−0.017	−0.017	−0.017	−0.017	−0.017	−0.017
	(-0.39)	(-0.40)	(-0.39)	(-0.38)	(-0.38)	(-0.39)	(-0.58)	(-0.59)	(-0.58)	(-0.57)	(-0.57)	(-0.58)
$SIZE_{pre-crisis}$	0.007	0.008	0.006	0.007	0.014	0.006	0.002	0.001	0.001	0.001	0.003	0.001
	(0.44)	(0.47)	(0.38)	(0.40)	(0.72)	(0.37)	(0.35)	(0.34)	(0.28)	(0.32)	(0.56)	(0.32)
ΔROA	−0.354	−0.360	−0.351	−0.344	−0.356	−0.351	−0.044	−0.045	−0.043	−0.040	−0.044	−0.042
	(-0.94)	(-0.95)	(-0.93)	(-0.91)	(-0.94)	(-0.92)	(-0.48)	(-0.49)	(-0.47)	(-0.44)	(-0.48)	(-0.46)
ΔIDIOSY	20.980***	21.097***	20.941***	20.851***	21.077***	20.916***	3.486***	3.505***	3.475***	3.437***	3.500***	3.471***
	(5.92)	(5.97)	(5.93)	(5.88)	(5.95)	(5.92)	(4.18)	(4.21)	(4.17)	(4.11)	(4.20)	(4.16)
CUM RET	−25.386***	−25.244***	−25.361***	−25.378***	−25.055***	−25.403***	−7.115***	−7.084***	−7.107***	−7.112***	−7.043***	−7.164***
	(-2.63)	(-2.60)	(-2.63)	(-2.63)	(-2.60)	(-2.62)	(-3.08)	(-3.06)	(-3.08)	(-3.08)	(-3.06)	(-3.08)
$OPAQUE_{pre-crisis}$	0.080**	0.080**	0.080**	0.080**	0.081**	0.080**	0.019**	0.019**	0.019**	0.019**	0.019**	0.019**
	(2.22)	(2.23)	(2.21)	(2.22)	(2.26)	(2.22)	(2.06)	(2.06)	(2.04)	(2.06)	(2.09)	(2.06)
$CorpGov_{pre-crisis}$	0.000						0.000					
	(-0.33)						(-0.42)					
$CGBF_{pre-crisis}$		−0.001						0.000				
		(-1.22)						(-1.09)				
$CGBS_{pre-crisis}$			0.000						0.000			
			(-0.28)						(-0.41)			
$CGCP_{pre-crisis}$				0.000						0.000		
				(0.42)						(0.74)		
$CGVS_{pre-crisis}$					−0.001						0.000	
					(-0.88)						(-0.74)	
$CGSR_{pre-crisis}$						0.000						0.000
						(-0.04)						(-0.43)
R2	0.17	0.17	0.17	0.17	0.17	0.17	0.14	0.14	0.14	0.14	0.14	0.14
N	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361

The table presents the results of the regression of *ΔNCSKEW* (or alternatively, *ΔDUVOL*) against pre-crisis opaqueness ($OPAQUE_{pre-crisis}$), pre-crisis corporate governance metrics, control variables (pre-crisis *M/B*, leverage, log of market capitalization; variation of ROA; cumulative returns during the GFC span; variation of idiosyncratic volatility) and country-industry fixed effects. T-statistics are reported in parenthesis. Statistical inference is conducted with Huber-White robust S.E. (***), (**), (*) represent two-side statistical significance at the 1, 5, and 10% levels.

Table 5
Mediation analysis and other tests.

Panel A - Baron and Kenny (1986) approach

Dependent Variable	OPAQUE [1]	ΔNCSKEW [2]	ΔDUVOL [3]
$M/B_{pre-crisis}$	−0.011**	0.003	0.000
	(-2.08)	(0.47)	(0.26)
$leverage_{pre-crisis}$	0.317**	0.101	0.017
	(2.16)	(0.84)	(0.61)
$SIZE_{pre-crisis}$	−0.008	0.002	0.000
	(-0.52)	(0.14)	(0.00)
$ROA_{pre-crisis}$	0.767***		
	(2.60)		
ΔROA		−0.672*	−0.112
		(-1.93)	(-1.37)
$CorpGov_{pre-crisis}$	0.083	0.074	0.015
	(1.02)	(0.79)	(0.66)
R2	0.59	0.12	0.12
N	1395	1487	1487

Panel B - Sobel-Goodman Mediation Tests

	ΔNCSKEW		ΔDUVOL	
	Coef	P>|Z|	Coef	P>|Z|
Sobel	0.0001	23.8%	0.0000	23.8%
Goodman-1(Aroian)	0.0001	27.2%	0.0000	27.3%
Goodman-2	0.0001	19.9%	0.0000	20.0%

Panel C – Other auxiliary tests

Dependent Variable	ΔNCSKEW [1]	ΔDUVOL [2]	ΔNCSKEW [3]	ΔDUVOL [4]
$M/B_{pre-crisis}$	0.003	0.001	0.003	0.000
	(0.47)	(0.36)	(0.40)	(0.29)
$leverage_{pre-crisis}$	0.000	0.000	0.001	0.000
	(0.38)	(0.11)	(0.53)	(0.26)
$SIZE_{pre-crisis}$	−0.001	−0.001	−0.001	−0.001
	(-0.08)	(-0.12)	(-0.08)	(-0.12)
ΔROA	−0.007**	−0.001	−0.008**	−0.001*
	(-2.05)	(-1.58)	(-2.16)	(-1.68)
$CorpGov_{pre-crisis}$	0.000	0.000	0.000	0.000
	(-0.33)	(-0.52)	(0.28)	(0.02)
$CorpGov_{pre-crisis} \times OPAQUE_{pre-crisis}$	0.001**	0.000**		
	(2.47)	(2.19)		
$orthOPAQUE_{pre-crisis}$			0.080**	0.018**
			(2.21)	(2.03)
R2	0.12	0.12	0.12	0.11
N	1361	1361	1361	1361

Panel A outlines the results of a mediation analysis in the spirit of Baron and Kenny (1986). First, $OPAQUE_{pre-crisis}$ is regressed against the corporate governance metric, control variables, and country-industry fixed effects (see column [1]). Secondly, $OPAQUE_{pre-crisis}$ is excluded from the baseline regression (see columns [2]-[3]).
Panel B shows results from Sobel-Goodman mediation tests. The dependent variable is abnormal crash risk. $CorpGov_{pre-crisis}$ proxies the "treatment variable" and $OPAQUE_{pre-crisis}$ is the mediator. Lagged market-to-book, lagged log of market capitalization, lagged leverage and lagged ROA are introduced in the specification as control variables jointly with country-industry fixed effects.
Panel C introduces auxiliary tests. Columns [1] and [2] introduce an alternative setting where $OPAQUE_{pre-crisis}$ is replaced in the baseline regression with $CorpGov_{pre-crisis} \times OPAQUE_{pre-crisis}$. In columns [3] and [4], $OPAQUE_{pre-crisis}$ is replaced with *orthOPAQUE*, i.e. the residuals of a regression of $OPAQUE_{pre-crisis}$ on other covariates included in the baseline regression.

from the baseline setting. $OPAQUE_{pre-crisis}$ is a mediator if it is determined by $CorpGov_{pre-crisis}$, and if $CorpGov_{pre-crisis}$ has predictive power over abnormal crash risk when $OPAQUE_{pre-crisis}$ is omitted from the baseline specification.

Considering the regression of $OPAQUE_{pre-crisis}$ against $CorpGov_{pre-crisis}$, it can be seen in panel A of Table 5 that the point estimate for $CorpGov_{pre-crisis}$ is not statistically significant (see column [1]). This result conflicts with the idea that the two variables are connected. Adding to that, the results for the restricted baseline model indicate that $CorpGov_{pre-crisis}$ lacks statistical significance even when $OPAQUE_{pre-crisis}$ is omitted from the baseline specification (see columns [2] and [3]). The conclusion remains the same if Sobel-Goodman mediation tests are considered instead (see panel B).

Two additional variants of the baseline setting are examined in panel C. First, a proxy for abnormal crash risk is regressed against $M/B_{pre-crisis}$, $leverage_{pre-crisis}$, $SIZE_{pre-crisis}$, $CorpGov_{pre-crisis}$, ΔROA, and $OPAQUE_{pre-crisis} \times CorpGov_{pre-crisis}$. The point estimate for $OPAQUE_{pre-crisis} \times CorpGov_{pre-crisis}$ is positive and statistically significant, implying that firms that had

simultaneously higher corporate governance scores and accounting opacity in the pre-crisis period suffered from greater abnormal crash risk emanating from the GFC (see columns [1] and [2]). In the second variant, orthogonalized *OPAQUE* ($orthOPAQUE_{pre-crisis}$) with respect to other covariates is considered in place of raw *OPAQUE* in the baseline specification. $orthOPAQUE_{pre-crisis}$ is obtained as the residuals of the regression of *OPAQUE* against other explanatory variables from the baseline setup. Remarkably, $orthOPAQUE_{pre-crisis}$ loads positively with abnormal crash risk, signifying that even after ruling out the effect from other explanatory variables, the impact of pre-crisis accounting opacity on abnormal crash risk continues to be positive (see columns [3] and [4]).

Our sample covers firms with different patterns in terms of pre-crisis profitability. Arguably, the impact of key variables could differ for firms that were doing well prior to the crisis relative to those performing poorly. This assertion is tested in the following way. First, firms are ranked inside country-industry bins by pre-crisis ROA. After that, a binary variable ($qROA_{pre-crisis}$) is created. It is set to zero if the firm has below-median ROA prior to the crisis and to one otherwise. Two additional variables are then added to the baseline regression: $qROA_{pre-crisis} \times OPAQUE_{pre-crisis}$ and $qROA_{pre-crisis} \times CorpGov_{pre-crisis}$.

If $qROA_{pre-crisis} \times OPAQUE_{pre-crisis}$ ($qROA_{pre-crisis} \times CorpGov_{pre-crisis}$) is statistically significant, then the impact of accounting opacity (corporate governance) differs in the two subsets of firms. Examining the panel A of Table 6, neither of the additional covariates is statistically significant (see column [1] for $\Delta NCSKEW$ and column [2] for $\Delta DUVOL$). This result suggests that pre-crisis financial performance did not influence the impact of the variables of interest on abnormal crash risk.

In a similar vein, another test is made as to whether the change in financial profitability and cumulative stock returns during the GFC influenced the impact of key variables on the abnormal component of crash risk emerging from the GFC. As with pre-crisis ROA, the sample is first split into two bins: firms with above-median change in profitability (cumulative stock returns) and firms with below-median change in profitability (cumulative stock returns). Two binary variables are created thereafter: $q\Delta ROA$ and *mRet*. In the case of $q\Delta ROA$ (*qCumRet*), the value of zero is assigned for firms with below-median change in profitability (cumulative stock returns), and one otherwise.

The results reported in columns [3]-[6] show that $q\Delta ROA \times OPAQUE_{pre-crisis}$ and $qCumRet \times OPAQUE_{pre-crisis}$ are not statistically significant, wherefore it can be inferred that changes in financial profitability or in market value during the GFC do not affect the predictive power of $OPAQUE_{pre-crisis}$ on abnormal crash risk.

Finally, an evaluation is made as to whether the predictive power of $OPAQUE_{pre-crisis}$ and $CorpGov_{pre-crisis}$ varies with the location of firm's headquarters. To that end, a binary variable indicating whether a firm is headquartered in the US is created (the variable *US* assumes the value of one for US firms and zero otherwise). Afterwards, $US \times OPAQUE_{pre-crisis}$ and $US \times CorpGov_{pre-crisis}$ are added as explanatory variables to the baseline setting. The results of these supplementary regressions are tabulated in panel B. While the point estimate for $OPAQUE_{pre-crisis}$ loses statistical significance, $US \times CorpGov_{pre-crisis}$ and $US \times OPAQUE_{pre-crisis}$ are statistically significant and load positively with the dependent variable.

It can be inferred from these results that the association between pre-crisis accounting opacity and abnormal crash risk emanates from firms headquartered in the U.S., and not in other geographies. Equally important, firms headquartered in the U.S. classified with higher corporate governance scores prior to the crisis also featured higher abnormal crash risk during the GFC.

5.1. Robustness checks: corporate governance metrics

Next follow the results of supplementary tests focusing on corporate governance metrics. In the aggregate, they confirm previous conclusions. The predictive power of pre-crisis corporate governance metrics on the dependent variable is explored further. In doing so, the adoption of specific corporate governance practices is examined, in lieu of scores that comprise the effect of different provisions. These scores tend to average out the impact of different devices of internal corporate governance. Not only the impact of relevant aspects could be diluted when irrelevant practices are also accounted for, as there could be practices producing opposite effects on abnormal crash risk.

To conduct this robustness test, the baseline setting is altered in order to concentrate on specific metrics of internal corporate governance measured at the end of 2006. In a first step, variables associated to the board structure and functioning are considered, namely (i) the average percentage of board attendance, (ii) the log of the number of meetings of the board of directors, (iii) the log of the number of board members, (iv) the percentage of board members who have either an industry-specific background or a strong financial background, (v) the average number of years each member is serving on the board of directors, (vi) the average number of other corporate affiliations of the members of the board of directors, (vii) the percentage of independent board members, (viii) the percentage of strictly independent board members, and (ix) a binary variable that takes the value of one if the CEO is also the chairman of the board.

The baseline setting is estimated using each of the variables associated to the board structure and functioning individually in lieu of $CorpGov_{pre-crisis}$. To conserve space, the results are not presented herein, but they are available upon request. Interestingly, neither of the variables is statistically significant. Moreover, when considering the proxies altogether in the same regression, they continue not to be jointly statistically significant. These results are valid when using $\Delta DUVOL$ or $\Delta NCSKEW$ as the dependent variable.

Next, variables related to the audit committee are added to the baseline specification: (i) a binary variable that takes the value of one if the firm had an audit committee, (ii) the percentage of independent directors on the audit committee,

Table 6
Sample partition.

Panel A – Partitions based on profitability Dependent Variable	$\Delta NCSKEW$ [1]	$\Delta DUVOL$ [2]	$\Delta NCSKEW$ [3]	$\Delta DUVOL$ [4]	$\Delta NCSKEW$ [5]	$\Delta DUVOL$ [6]
$M/B_{pre-crisis}$	0.001	0.000	0.002	0.000	0.003	0.001
	(0.09)	(-0.02)	(0.31)	(0.20)	(0.45)	(0.36)
$leverage_{pre-crisis}$	0.095	0.014	0.067	0.007	0.047	0.002
	(0.73)	(0.45)	(0.52)	(0.23)	(0.36)	(0.05)
$SIZE_{pre-crisis}$	−0.005	−0.001	0.000	0.000	0.005	0.001
	(-0.28)	(-0.31)	(0.01)	(-0.03)	(0.29)	(0.26)
ΔROA	−0.632*	−0.112	−0.198	0.003	−0.498	−0.075
	(-1.73)	(-1.29)	(-0.43)	(0.02)	(-1.33)	(-0.85)
$OPAQUE_{pre-crisis}$	0.0015*	0.0003	0.0018**	0.0004**	0.0020***	0.0005***
	(1.83)	(1.60)	(2.46)	(2.44)	(2.77)	(2.63)
$CorpGov_{pre-crisis}$	0.000	0.000	0.001	0.000	0.001	0.000
	(-0.19)	(-0.40)	(0.78)	(0.36)	(0.56)	(0.23)
$OPAQUE_{pre-crisis} \times qROA_{pre-crisis}$	0.000	0.000				
	(0.00)	(-0.01)				
$CorpGov_{pre-crisis} \times qROA_{pre-crisis}$	0.001	0.000				
	(1.01)	(0.96)				
$OPAQUE_{pre-crisis} \times q\Delta ROA$			0.000	0.000		
			(-0.45)	(-0.98)		
$CorpGov_{pre-crisis} \times q\Delta ROA$			−0.001	0.000		
			(-1.17)	(-0.77)		
$OPAQUE_{pre-crisis} \times qCumRet$					−0.001	0.000
					(-1.14)	(-1.50)
$CorpGov_{pre-crisis} \times qCumRet$					−0.001	0.000
					(-0.79)	(-0.60)
R2	0.12	0.12	0.12	0.12	0.12	0.12
N	1361	1361	1361	1361	1361	1361

Panel B – U.S. firms versus non-U.S. firms Dependent Variable	$\Delta NCSKEW$ [1]	$\Delta DUVOL$ [2]
$M/B_{pre-crisis}$	0.002	0.000
	(0.36)	(0.27)
$leverage_{pre-crisis}$	0.066	0.007
	(0.51)	(0.24)
$SIZE_{pre-crisis}$	−0.002	−0.001
	(-0.12)	(-0.15)
ΔROA	−0.701*	−0.129
	(-1.94)	(-1.49)
$rOPAQUE_{pre-crisis}$	0.001	0.000
	(1.12)	(0.78)
$CorpGov_{pre-crisis}$	−0.001	0.000
	(-1.01)	(-0.91)
$rOPAQUE_{pre-crisis} \times US$	0.002*	0.001*
	(1.84)	(1.86)
$CorpGov_{pre-crisis} \times US$	0.007***	0.001**
	(2.72)	(2.28)
R2	0.13	0.12
N	1361	1361

Panel A presents the results of the regression of abnormal crash risk against pre-crisis opaqueness ($OPAQUE_{pre-crisis}$), corporate governance metric ($CorpGov_{pre-crisis}$), the product of a binary variable indicating a partition of the sample and $OPAQUE_{pre-crisis}$, the product of a binary variable indicating a partition of the sample and $CorpGov_{pre-crisis}$, control variables (pre-crisis *M/B*, leverage, log of market capitalization; variation of ROA), and country-industry fixed effects. These sample partitions are considered: $qROA_{pre-crisis}$ (set to one if the ROA of a firm prior to the GFC is above the median and zero otherwise), $q\Delta ROA$ (set to one if the change in the ROA during the GFC is above the median and zero otherwise), and *qCumRet* (set to one if the stock returns of the firm during the GFC is above the median and zero otherwise).
Panel B presents the results of the regression of abnormal crash risk against pre-crisis opaqueness ($OPAQUE_{pre-crisis}$), corporate governance metric ($CorpGov_{pre-crisis}$), the product of a binary variable indicating whether the firm is headquartered in the U.S. (*US*) and $OPAQUE_{pre-crisis}$, $CorpGov_{pre-crisis}$ *US, control variables, and country and industry fixed effects. T-statistics are reported in brackets. Statistical inference is conducted with Huber-White robust S.E. (***), (**), (*) represent two-side statistical significance at the 1, 5, and 10% levels.

and (iii) a binary variable that takes the value of one if the firm had an audit committee with at least three members and a financial expert within the meaning of Sarbanes-Oxley. Again, these audit committee metrics are found to be non-significant (individually and jointly).

Finally, the following compensation practices are considered: (i) a binary variable equal to one if the firm had a compensation committee, (ii) a binary variable equal to one if the firm had a performance-oriented compensation scheme, (iii) a binary variable equal to one if stocks or stock options granted to managers were vested in a three-year period at a minimum, (iv)

Table 7
Robustness tests.

Panel A – Outliers and extended settings Dependent Variable	$\Delta NCSKEW$ [1]	$\Delta DUVOL$ [2]	$\Delta NCSKEW$ [3]	$\Delta DUVOL$ [4]
$M/B_{pre-crisis}$	0.002	0.000	0.002	0.000
	(0.33)	(0.23)	(0.25)	(0.13)
$leverage_{pre-crisis}$	0.071	0.008	0.097	0.015
	(0.55)	(0.27)	(0.68)	(0.46)
$SIZE_{pre-crisis}$	−0.001	0.000	−0.011	−0.003
	(-0.06)	(-0.11)	(-0.46)	(-0.46)
ΔROA	−0.705*	−0.129	−0.625*	−0.106
	(-1.95)	(-1.50)	(-1.66)	(-1.17)
$OPAQUE_{pre-crisis}$			0.073**	0.017*
			(2.06)	(1.89)
$CorpGov_{pre-crisis}$	0.000	0.000	0.001	0.000
	(0.28)	(0.02)	(0.76)	(0.41)
$rOPAQUE_{pre-crisis}$	0.002***	0.0003**		
	(2.73)	(2.33)		
R2	0.12	0.11	0.15	0.14
N	1361	1361	1346	1346

Panel B – Sample selection

	Heckman Selection Model		Propensity Score Weighting	
Dependent Variable	$\Delta NCSKEW$ [1]	$\Delta DUVOL$ [2]	$\Delta NCSKEW$ [3]	$\Delta DUVOL$ [4]
$OPAQUE_{pre-crisis}$	0.072**	0.017**	0.072**	0.018*
	(2.10)	(1.98)	(1.99)	(1.93)
$CorpGov_{pre-crisis}$	0.000	0.000	0.000	0.000
	(0.39)	(0.06)	(0.11)	(-0.27)

The table presents results of supplementary tests. In columns [1] and [2] of panel A, the baseline specification is changed by replacing the raw measure of $OPAQUE_{pre-crisis}$ by a rank-based measure ($rOPAQUE_{pre-crisis}$). Columns [3] and [4] present results of kitchen sink regressions where various controls are added to the baseline regression. Panel B reports results from auxiliary regressions aimed at controlling for selection bias. Two methods are adopted: the Heckman Selection Model and Propensity Score Weighting. The selection model regresses ASSET4 reporting binary variable as a function of the market capitalization of the firm (USD), number of analysts following the firm, free float of the firm, and country-industry fixed effects. Results are not reported in the interest of conserving space. Next, the inverse of Mills ratio is added to the baseline specification (columns [1] and [2]) or the inverse of the propensity score is utilized as a weight in the baseline regression (columns [3] and [4]). Statistical inference conducted with Huber-White robust S.E. (***), (**), (*) represent two-side statistical significance at the 1, 5, and 10% levels.

binary variable that takes the value of one if management and board members remuneration was partly linked to objectives or targets which were more than two years forward looking, and (v) binary variable set to one if the CEO's compensation was linked to total shareholder return (TSR). Overall, the empirical findings do not confirm the relevance of these variables, either individually or jointly, but the statistical significance of $OPAQUE_{pre-crisis}$ is retained in all these regressions. [13]

5.2. Robustness checks: accounting opacity

Now, another battery of robustness tests is implemented, aimed at controlling for measurement errors in the computation of $OPAQUE_{pre-crisis}$ and – more precisely – ruling out effects of outliers. Columns [1] and [2] of panel A of Table 7 report regression results for the baseline specification when using $rankOPAQUE_{pre-crisis}$ as a proxy for accounting quality. $rankOPAQUE_{pre-crisis}$ is calculated as the percentage rank for $OPAQUE_{pre-crisis}$ within a country-industry group. Correspondingly, $rankOPAQUE_{pre-crisis}$ is hardly affected by the presence of extreme observations. Remarkably, *rankOPAQUE* loads positively with abnormal crash risk ($\Delta NCSKEW$ and $\Delta DUVOL$ in columns [1] and [2], respectively) and it is statistically significant. It is also noteworthy that $CorpGov_{pre-crisis}$ remains non-significant in this variant of the baseline setting.

5.3. Robustness checks: adding additional determinants of crash risk

Columns [3] and [4] of panel A of Table 7 exhibit extended versions of the baseline setting. A kitchen sink regression of a long list of variables (including the original set of control covariates) is undertaken to ascertain whether the economic

[13] In other tests, the corporate governance score was first regressed against all individual metrics considered above and the fitted dependent variable saved. Then, that variable is introduced into the baseline setting as a proxy for corporate governance. Using this alternative setup, the proxy for corporate governance remains non-significant. The advantage of this method is that it outlines the various metrics in one score, accounting simultaneously for industry-country effects and for the correlation structure of the metrics. The fitted value of the regression model mirrors the component of the score that is explained by the metrics employed earlier and added as an explanatory variable in our baseline model.

and statistical significance of $OPAQUE_{pre-crisis}$ survives their inclusion. The following additional variables are considered: net sales growth, current ratio, sales variability, net margin, R&D scaled by sales, number of segments in which the firm operates, percentage of votes of the biggest owner, number of analysts following the firm, foreign sales as a percentage of total sales, pension funds' ownership as percentage of outstanding shares, investment funds and investment companies' holdings as percentage of outstanding shares, insider ownership as percentage of outstanding shares, interest coverage, short term debt, a corporate social responsibility score, a dummy variable indicating international diversification, and number of segments accounting for more than 25% of sales. All variables are measured for end-of-2006, aside from those that capture variability, which are computed using data for the period 2002–2006.

By and large, the purpose for these additional variables is to capture external monitoring from creditors, liquidity risk, outside monitoring, insider ownership, firm complexity, diversification, and information risk. As can be seen in Table 7, the coefficient for $OPAQUE_{pre-crisis}$ remains positive and statistically significant in this empirical setting, whereas that for $CorpGov_{pre-crisis}$ continues to be statistically meaningless. Accordingly, the results from kitchen sink regressions closely parallel those of more parsimonious econometric specifications.

5.4. Robustness checks: sample representativeness

Another potential criticism of this study concerns unrepresentativeness and selection bias. In effect, the assessment covers a small fraction of stocks from a potential universe containing 25,428 stocks (based on the Datastream universe of stocks for the countries where the analyzed firms are headquartered). Furthermore, it is reasonable to assume that the coverage of the provider of data for corporate governance metrics (ASSET4) is based on criteria such as size, analyst coverage, free float and country of domicile of the firm. It is thus compelling to verify whether our findings are driven by selection bias or lack of sample representativeness.

Two alternative procedures are carried out to deal with this issue. First, a Heckman selection model is estimated. Secondly, propensity score weighting in the regression models is considered. With respect to the Heckman selection model, in the first stage regression, coverage is determined by the log of market capitalization, free float measured as a percentage of the number of shares outstanding, and analyst coverage. Additionally, country and industry fixed effects are added as well. The fitted probability of coverage is estimated by means of a PROBIT model specification.[14] In the second stage, the Mills ratio is added to the baseline setting. Columns [1] to [2] of panel B in Table 7 present the results for second stage regressions where the Mills ratio is added to the baseline setting (abnormal crash risk proxied by $\Delta NCSKEW$ and $\Delta DUVOL$, respectively).

As to the application of propensity score weighting, an estimate is made of the baseline setting weighting observations by the inverse of the propensity score, i.e. the fitted probability of coverage (results reported in columns [3] and [4]). The advantage of employing propensity score weighting is that a higher weight is provided to firms that are less likely to be covered by the data provider, thereby attenuating selection bias. In all regressions, the effect of internal governance metrics on abnormal crash risk is residual, whereas that for accounting opacity is positive and statistically meaningful. On the aggregate, the primary conclusions survive while controlling for selection bias.

6. Final remarks

Several studies have suggested that the 2008 financial crisis was primarily a crisis of trust. It constituted a sudden and negative exogenous shock to the trust investors put in capital markets and related institutions. This study takes advantage of this "near natural experiment" to evaluate the role of accounting quality and internal corporate governance devices as buffers against abnormal crash risk emerging during periods of mistrust in capital markets. Specifically, we posit that integrity and credibility stemming from the quality of financial reporting and adoption of widely accepted corporate governance practices add to the social capital of firms (e.g. firms with better practices may be viewed by investors as more reliable and credible). As these intangible assets tend to become more valuable during periods of generalized mistrust, the adoption of good practices could alleviate the abnormal component of crash risk associated with the lack of confidence in capital markets.

Using an event study approach, we start by estimating the abnormal component of crash risk that is justified by the GFC (defined as the difference between the idiosyncratic crash risk registered during and prior the crisis period). After that, regression analysis is conducted to examine the impact of pre-crisis accounting quality and of the adoption of widely accepted internal corporate governance practices on that abnormal component. Our findings are consistent with the notion that pre-crisis accounting quality has predictive power over the abnormal component of crash risk that emerged during the GFC. As to the adoption of widely accepted corporate governance practices, it hardly affects the dependent variable.

As a whole, these results unveil the time-varying nature of the link between accounting opacity and crash risk by showing that the impact of the former is exacerbated during market turmoil. Notably, no similar connection was found with respect to corporate governance. Combining this result with the conclusions of Andreou et al. (2016), it can be inferred that although an association between some governance attributes and future crash risk exists through the business cycle, the former are unable to further alleviate additional crash risk emerging in periods of generalized mistrust.

[14] The pseudo-R2 associated to that model stands at 55% (result not tabulated). This figure indicates that the first-stage model predicts reasonably well the probability of coverage by the data provider.

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