

Corporate Governance in the 2007-2008 Financial Crisis: Evidence from Financial Institutions Worldwide

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Abstract

This paper investigates the influence of corporate governance on financial firms' performance during the 2007-2008 financial crisis. Using a unique dataset of 296 financial firms from 30 countries that were at the center of the crisis, we find that firms with more independent boards and higher institutional ownership experienced worse stock returns during the crisis period. Further exploration suggests that this is because (1) firms with higher institutional ownership took more risk prior to the crisis, which resulted in larger shareholder losses during the crisis period, and (2) firms with more independent boards raised more equity capital during the crisis, which led to a wealth transfer from existing shareholders to debtholders. Overall, our findings add to the literature by examining the corporate governance determinants of financial firms' performance during the 2007-2008 crisis.

JEL classification: G2; G3; N2

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1. Introduction

An unprecedented large number of financial institutions collapsed or were bailed out by governments during the global financial crisis of 2007-2008.¹ The failure of these institutions resulted in a freeze of global credit markets and required government interventions worldwide. While the macroeconomic factors (e.g., loose monetary policies) that are at the roots of the financial crisis affected all firms (Taylor, 2009), some firms were affected much more than others. Recent studies argue that firms' risk management and financing policies had a significant impact on the degree to which firms were impacted by the financial crisis (Brunnermeier, 2009). Because firms' risk management and financing policies are ultimately the result of cost-benefit trade-offs made by corporate boards and shareholders (Kashyap et al., 2008), an important implication from these studies is that corporate governance affected firm performance during the crisis period.

In this paper, we provide empirical evidence on whether, and how corporate governance influenced the performance of financial firms during the crisis period. We examine in particular the role of independent directors and influential shareholders. We perform our investigation using a unique dataset of 296 of the world's largest financial firms across 30 countries that were at the center of the crisis. We examine the relation between firm performance and corporate governance by regressing stock returns during the crisis on measures of corporate governance and control variables. We capture stock returns during the crisis as buy-and-hold returns from January 2007 to September 2008 or to the date on which the firm was delisted, whichever is earlier. We include three corporate governance factors: (1) board independence, (2) institutional

¹ The list of casualties includes Bear Stearns, Citigroup, Lehman Brothers, Merrill Lynch (in the U.S.), HBOS and RBS (in the U.K.), and Dexia, Fortis, Hypo Real Estate and UBS (in continental Europe).

ownership, and (3) the presence of large shareholders, measured as of December 2006. In addition, we control for a dummy indicating whether a firm is cross-listed on U.S. stock exchanges, leverage, firm size, and dummy variables indicating a firm's industry and country.² Finally, we control for stock return in 2006 because the performance during the crisis period may reflect a reversal of pre-crisis performance (Beltratti and Stulz, 2010).³

Our analysis shows that firms with more independent boards and greater institutional ownership experienced worse stock returns during the crisis period. A potential explanation for this finding is that independent directors and institutional shareholders encouraged managers to increase shareholder returns through greater risk-taking prior to the crisis. Shareholders may find it optimal to increase risk because they do not internalize the social costs of financial institution failures and institutional arrangements such as deposit insurance may weaken debtholder discipline. In addition, because of their firm-specific human capital and private benefits of control, managers tend to seek a lower level of risk than shareholders (Laeven and Levine, 2009). Consistent with this view, DeYoung et al. (2012) find that in the years leading up to the financial crisis (2000-2006), banks changed CEO compensation packages to encourage executives to exploit new growth opportunities created by deregulation and the explosion of debt securitization.

² We do not control for a dummy variable indicating whether a firm has a Big N auditor as in Mitton (2002) because only five of our sample firms have non-Big Four auditors. As reported in Section 4, our result is not sensitive to excluding firms with non-Big Four auditors or including a dummy variable indicating a Big Four auditor.

³ We do not control for country-level regulatory and macroeconomic variables (as in Beltratti and Stulz, 2010) because this will introduce perfect multicollinearity with our country dummies. By controlling for country dummies in our regression model, our analysis essentially examines how the cross-sectional within-country variation in firm performance is related to within-country variation in corporate governance characteristics. In addition, since our sample consists of all financial institutions including not only banks, but also brokerage and insurance companies, we do not include the bank-specific financial statement variables (such as deposits or loans) used in Beltratti and Stulz (2010). Instead, our model addresses differences in balance sheet characteristics and capital requirements across global financial institutions by controlling for leverage, industry dummies (3-digit SIC), and country dummies.

We test the risk-taking explanation by regressing expected default frequency (EDF) and stock return volatility on the governance factors and the same set of control variables.⁴ We find mixed support for this explanation. In particular, while we find that firms with greater institutional ownership took more risk before the crisis, we do not find that firms with more independent boards did so. Thus, our findings are inconsistent with independent board members having encouraged managers to take greater risk in their investment policies before the onset of the crisis.

An alternative explanation for the negative relation between stock returns and board independence is that independent directors pressured managers into raising equity capital during the crisis to ensure capital adequacy and reduce bankruptcy risk. Capital raisings at depressed stock prices may have led to a significant wealth transfer from shareholders to debtholders during the crisis period (Kashyap et al., 2008; Myers, 1977). Consistent with this wealth transfer, we find negative abnormal stock returns and abnormal decreases in credit default swap (CDS) spreads in the 3-day window around the announcement of equity offerings.⁵ To test our alternative explanation for the relation between stock returns and board independence we regress the amount of equity capital raised during the crisis (scaled by total assets) on the corporate governance factors and control variables. Consistent with this alternative explanation, we find that firms with more independent boards raised more equity capital. Moreover, we find that the association between stock returns and board independence becomes insignificant once we exclude firms that raised equity capital during the crisis from our sample.

⁴ EDF is computed by Moody's KMV CreditMonitor implementation of Merton's (1974) structural model and has been used in prior studies to capture credit risk (Covitz and Downing, 2007).

⁵ CDS is an "insurance" contract against the risk of default, in which the buyer makes a series of payments in exchange for the right to receive a payoff in case of default by the referenced entity. The more likely a firm is to default on its debt obligations, the higher a firm's CDS spread.

While equity capital raisings may have led to poor performance during the crisis, they also may have helped firms survive the crisis and perform better after the crisis. We investigate this issue by performing additional analyses in which we examine whether equity capital raisings had a positive impact on the likelihood that a firm survived the financial crisis and firm performance over the long run. Consistent with equity capital raisings helping firms survive the crisis, we find that firms that raised more equity capital were less likely to be delisted during the crisis than firms matched on pre-capital raising performance. However, inconsistent with equity capital raisings helping firms perform better over the long run, we find that equity capital raising firms perform similarly to the matched firms in the period subsequent to equity capital raisings. One possible explanation is that regulatory interventions such as the Troubled Asset Relief Program (TARP) may have attenuated the positive effect of equity raisings on firm performance in the long run.

Although we focus on firm-level governance mechanisms, we also examine how country-level governance mechanisms, such as the quality of legal institutions and the extent of laws protecting shareholder rights, influenced firm performance during the crisis. We find an insignificant relation between firm performance and the country-level governance variables. This evidence is consistent with firm-level, but not country-level governance mechanisms being important in explaining why some financial firms were much more affected by the financial crisis than others.

One concern for our analysis is that our corporate governance measures are correlated with some other firm characteristic that is not included in our model, but that has an important influence on financial firms' performance during the crisis period. The exclusion of board size from our analysis may particularly be a concern because firms with more complex operations may have performed worse during the crisis and prior literature suggests that board size is

associated with board independence and operating complexity (Adams and Mehran, 2011; Linck et al., 2009). Thus, we repeat our analysis after including various measures of board size (i.e., the natural logarithm of the number of board members, the number of board members, and a piecewise linear specification). We find that our results remain qualitatively similar

In addition, we find that our results are also robust to controlling for other board characteristics (i.e., the existence of a risk committee, the financial expertise of the board, and CEO-chairman duality), controlling for additional ownership characteristics (i.e., percentage of shares held by insiders), using alternative definitions of the crisis period (i.e., July 2007-September 2008 or July 2007-December 2008), and using an alternative measure of stock returns (i.e., abnormal stock returns based on a market model).

Our paper contributes to an emerging body of research that attempts to identify the mechanisms that influenced how severely financial firms were impacted by the 2007-2008 crisis (Brunnermeier, 2009; Kashyap et al., 2008) in primarily two ways. First, concurrent studies on the financial crisis have mostly focused on the macroeconomic factors that are at the roots of the financial crisis (Taylor, 2009), but have not examined why some firms were significantly more affected by the crisis than others. To our knowledge, our study is among the first that examines the role of corporate boards, institutional investors, and large shareholders in the 2007-2008 financial crisis using a global sample. Furthermore, we take a broader view of the role of corporate governance in the financial crisis than other concurrent papers by investigating various aspects of the crisis including risk-taking prior to the crisis and capital raisings during the crisis.

Our paper is closely related to a concurrent paper by Beltratti and Stulz (2010), which examines how firm-level and country-level factors (e.g., bank characteristics, governance indices, bank regulation, and macroeconomic factors) relate to bank performance during the

crisis. We complement their study by documenting why corporate governance is related to firm-performance during the financial crisis. Specifically, Beltratti and Stulz (2010) find that a shareholder-friendly board (as captured by the RiskMetrics governance index) is negatively associated with firm performance during the crisis, but do not find the source of this association. We find that firms with more independent boards performed worse during the crisis because independent board members are associated with more equity capital raisings during the crisis, which led to a wealth transfer from shareholders to debtholders. Moreover, Beltratti and Stulz (2010) do not explore the role of institutional investors. We find that firms with higher institutional ownership performed worse during the crisis because they took more risk before the crisis.

Second, we contribute to the large literature on corporate governance (e.g., Bushman and Smith, 2001; Hermalin and Weisbach, 2003) by showing that corporate governance had an important impact on firm performance during the crisis through influencing firms' risk-taking and financing policies. Hermalin and Weisbach (2003) point out that the absence of a significant relation between board composition (such as board independence) and firm performance is a notable finding in the literature. They suggest that the absence of this relation is consistent with board independence not being important on a day to day basis and propose that board independence should only matter for certain board actions, 'particularly those that occur infrequently or only in a crisis situation' (Hermalin and Weisbach 2003, p. 17). Our study adds to this literature by providing evidence consistent with the crisis period being a unique setting in which the actions of board members mattered.⁶

⁶ One common problem for governance studies is that the relation between board characteristics and firm performance may be spurious because they are endogenously determined (Wintoki et al., 2012). We argue that this issue is less likely to be problematic in our setting because the financial crisis is largely an exogenous

Our study also complements prior studies on the governance determinants of short-term stock return performance during financial crises. Specifically, prior studies on the 1997-1998 Asian financial crisis find that greater external monitoring (e.g., non-management block holdings) is associated with better performance during the crisis (Johnson et al., 2000; Mitton, 2002), and attribute this finding to worse economic prospects resulting in more expropriation by managers. In contrast, we find that firms with greater external monitoring (i.e., more independent boards and higher institutional ownership) performed worse, and that this relation is driven by the influence of corporate governance on firms' risk management and financing policies. Thus, our study suggests that the impact of corporate governance on firm performance during the crisis in developed markets such as the U.S. and most of the EU member countries differs from that in emerging markets.

An important caveat of our study is that our analysis neither considers the optimal level, nor addresses the net benefits, of risk-taking and equity capital raisings for financial firms. Rather, as in prior studies on bank governance such as Laeven and Levin (2009), we provide an empirical assessment of theoretical predictions concerning the influence of key corporate governance mechanisms on short-term firm performance and managerial actions during the crisis. We also caution that our study is not designed to be prescriptive to the debate on the regulatory reform of financial institutions (Kirkpatrick, 2009; Schapiro, 2009). Regulatory reform on corporate governance is a social welfare decision that involves an evaluation of numerous factors and extensive cost-benefit analyses that are beyond the scope of our study. Finally, since we focus on large financial institutions, we caution that our findings may not generalize to smaller financial firms.

macroeconomic shock (Baek et al., 2004). Moreover, our study also attempts to mitigate this concern by examining how board independence impacted firm actions, and not just firm performance.

The remainder of the study proceeds as follows. Section 2 provides the institutional background and motivation of this paper. Section 3 presents the sample and data and Section 4 shows the empirical results. Section 5 presents additional analyses and Section 6 reports sensitivity tests. Section 7 concludes our study.

2. Institutional background and motivation

The 2007-2008 financial crisis is commonly viewed as the worst financial crisis since the Great Depression of the 1930s.⁷ The crisis not only resulted in the collapse of well-known financial institutions such as Lehman Brothers, but also halted global credit markets and required unprecedented government intervention worldwide. For example, in October 2008, the U.S. government launched TARP to purchase or insure up to \$700 billion of assets from financial institutions. In the same month, the British government announced a bank rescue package totaling £500 (\$740) billion in loans and guarantees.

Motivated by the significance of the 2007-2008 financial crisis, an emerging body of literature has attempted to identify and examine the global roots of the crisis. This literature proposes that a combination of macroeconomic factors such as loose monetary policies and complex securitizations have contributed to the crisis (Taylor, 2009). While these studies are clearly important, they do not explain why some financial firms performed much worse during the crisis than others, despite that these firms were exposed to the same macroeconomic factors. For example, while Citigroup in the U.S. and UBS in Switzerland experienced severe subprime mortgage related losses, JP Morgan Chase and Credit Suisse (also in the U.S. and Switzerland,

⁷ See Brunnermeier (2009) and “Worst crisis since ‘30s, with no end yet in sight” (*The Wall Street Journal*, September 18, 2008).

respectively) suffered much less damage.⁸ Since macroeconomic factors can only partially explain why some firms performed worse than others during the crisis (e.g., U.S. versus Swiss financial firms), it is important to examine how firm-level policies have influenced firm performance during the financial crisis.

Two firm-level policies that significantly affected the magnitude of shareholder losses during the crisis have received considerable attention from academics and investors: (1) risk management before the crisis and (2) equity capital raisings during the crisis. As explained by Brunnermeier (2009), the interplay between banks' exposure to subprime mortgages and their reliance on short-term borrowing had a significant impact on the performance of financial firms during the crisis period. As the value of risky assets deteriorated during the crisis period, financial institutions could no longer rely on rolling over short-term loans against these assets and were forced to raise capital. Raising equity capital was particularly costly to shareholders during the crisis because it led to a significant wealth transfer from shareholders to debtholders (Kashyap et al., 2008; Myers, 1977).

Financial firms' risk management before the crisis and capital raising activities during the crisis were ultimately the result of corporate boards and shareholders making a cost-benefit trade-off (Kashyap et al., 2008). Investing heavily in subprime mortgage related assets and relying on short-term credit lines could have looked very lucrative before the crisis, but exposed firms to considerable risks that led to large losses during the crisis.⁹ Consistent with the notion that corporate boards and shareholders encouraged risk-taking prior to the crisis, DeYoung et al.

⁸ Based on company reports, by January 2008 the subprime losses for these firms were \$18 billion for Citigroup, \$13.5 billion for UBS, \$1.3 billion for JP Morgan Chase, and \$1 billion for Credit Suisse ('JP Morgan's 1.3 bn subprime hit,' *BBC news*, January 16, 2008).

⁹ Citigroup CEO Chuck Prince famously said "When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you've got to get up and dance. We're still dancing." (*Financial Times*, July 9, 2007).

(2012) find that, in the years leading up to the financial crisis (2000-2006), banks included stronger risk-taking incentives in CEO compensation packages to encourage executives to exploit new growth opportunities created by deregulation and the explosion of debt securitization.^{10,11} Similarly, while raising equity capital helped reduce bankruptcy risk, it was very costly to existing shareholders during the crisis period.

Consequently, we examine whether board characteristics and ownership structure have affected firm performance during the crisis period by influencing risk-taking before the crisis and equity capital raisings during the crisis. In particular, we focus our analysis on board independence, institutional ownership and the presence of controlling shareholders, because these are the most commonly examined corporate governance attributes in the literature (Denis and McConnell, 2003).

3. Sample and data description

3.1. Timeline

We conduct our empirical analysis using data from January 2007 to September 2008. We begin our investigation period at the start of 2007 because this is generally regarded as the period when the market first realized the severity of the losses related to subprime mortgages (Ryan, 2008). We end our investigation period in the third quarter of 2008 for three main reasons: (1) The massive government bailouts, such as TARP in the U.S., were initiated from October 2008 onwards. (2) At the end of the third quarter of 2008, regulators in several countries imposed

¹⁰ As discussed in DeYoung et al. (2012), due to innovations and deregulation in financial markets the business model of large banks has switched from the traditional “originate-and-hold” lending model that relies on interest income to an “originate-and-securitize” lending model that relies heavily on the fee income from non-repeat, arms-length financial transactions in the past two decades.

¹¹ We thank our referee for pointing out that executive compensation arrangements could have been an important channel through which corporate boards and shareholders encouraged executives at global financial institutions to take greater risk before the crisis.

short-selling bans on the stocks of many financial institutions to curb steep declines of their stock prices. (3) In October 2008, changes in the International Financial Reporting Standards (IFRS) allowed financial institutions to avoid recognizing asset writedowns.^{12,13}

3.2. Sample of financial firms

3.2.1 Sample selection

Our sample consists of 296 financial firms that were publicly listed at the end of December 2006 across 30 countries. Among these firms, 28 firms (such as Bear Stearns, EuroHypo, and Lehman Brothers) were listed at the end of December 2006, but subsequently delisted during our sample period.

We use the following criteria to compile our sample. First, we restrict our sample to financial firms (banks, brokerages, and insurance companies) that were publicly traded at the end of 2006 and covered by *Compustat* Global and North America databases. This results in 4,766 financial firms. Second, we restrict our sample to firms with total assets greater than US \$10 billion because large global financial institutions were at the center of public attention during the 2007-2008 crisis.¹⁴ In addition, the focus on large financial institutions also helps minimize the cost of extensive manual data collection for the variables used in our analysis (such as governance characteristics, credit default swaps, and capital raisings). This restriction reduces our sample to

¹² The International Accounting Standards Board (IASB) issued amendments to the use of fair value accounting on financial instruments in October 2008 that allow companies to reclassify financial assets from market value based to historical cost based valuation. Consequently, many European banks used the opportunity to forgo substantial writedowns on financial assets whose market prices had substantially fallen during 2008 (Bischof et al., 2010).

¹³ While the definition of the crisis period is more comprehensive by including early 2007 when the market first woke up to the substantial subprime mortgage problems, we note that the credit crunch did not really begin until July 2007 (Ryan, 2008). Thus, we also perform sensitivity tests in which we use July 2007 as the start of the crisis period. As reported in Section 6, our result is not sensitive to this alternative definition of the crisis period.

¹⁴ For example, see “Trying to rein in ‘Too Big to Fail’ Institutions” (*The New York Times*, October 25, 2009). Our size restriction is comparable to the concurrent study by Beltratti and Stulz (2010). Specifically, the sample in Beltratti and Stulz (2010) includes 165 banks with assets in excess of \$50 billion and 386 banks with assets in excess of \$10 billion. Moreover, by restricting our sample to large firms, we ensure that we do not miscode small firms with material writedowns as not having writedowns. This is because Bloomberg limits its coverage to firms with cumulative writedowns exceeding US \$100 million.

771 firms. Third, we restrict our sample to firms that are covered by *BoardEx*, our data source on board composition. While BoardEx is the leading database on board composition of publicly listed firms and covers approximately 10,000 firms in nearly 50 countries, only 347 of the 771 large financial firms are covered in the database. Fourth, we drop 47 firms without necessary data on firm performance and ownership structure. Finally, we delete four Puerto Rican financial firms to ensure that our results are not confounded by the 2006 budget crisis in Puerto Rico. Panel A of Table 1 summarizes our sample selection process. Appendix A provides a list of our sample firms and their countries.

3.2.2 Representativeness of our sample

While the focus on large financial institutions is common in the literature (Adams and Mehran, 2003), we caution that our findings may not generalize to smaller financial firms. Panels B and C of Table 1 provide descriptive statistics on how our sample firms differ from the population of *Compustat* financial firms (4,766 firms). Panel B reports the distribution of our sample firms and the *Compustat* financial firms by industry, following the industry classification scheme in Fama and French (1997). The panel shows that compared to the *Compustat* financial firms, our sample includes more banks, fewer brokerages and more insurance companies. Moreover, Panel B shows that while our sample represents only a small fraction of the number of financial firms covered by *Compustat*, it is economically important and represents 63% (65,128/103,615) of aggregate industry assets.

Panel C of Table 1 compares common firm characteristics (i.e., total assets, leverage, return on assets, and asset growth, measured prior to the crisis) between our sample firms and the *Compustat* financial firms with necessary data for each variable. Consistent with our sample selection criteria, the panel shows that the average of total assets for our sample firms is much

larger than that for the *Compustat* financial firms (\$219.57 billion for our sample firms versus \$21.74 billion for the *Compustat* financial firms). In addition, the panel shows that compared to the *Compustat* financial firms, our sample firms are more highly leveraged, have lower return on assets, and have less asset growth. Overall, these results are consistent with prior studies that find size to be associated with other firm characteristics (Rajan and Zingales, 1995).¹⁵

3.3. Main variables

3.3.1. Measuring firm performance

Our primary measure of firm performance is buy-and-hold stock returns, measured from the first quarter of 2007 until the end of the third quarter of 2008 or the date on which the firm was delisted, whichever is earlier. We gather data on stock returns from *Datastream*.

We supplement our analysis on firm performance with a measure capturing cumulative accounting writedowns during the crisis. The writedown data is a unique feature of our setting because they directly relate to the impairment of assets due to investments in subprime mortgage related assets. We obtain data on accounting writedowns from Bloomberg's WDCI database, which covers banks, brokerages, and insurance companies. Because financial firms' asset impairments and credit losses were of great interest to the investment community, Bloomberg collected this data from regulatory filings, news articles, and company press releases (such as quarterly earnings announcements). We measure writedowns as negative figures so that the regression coefficients on writedowns can be compared to those on stock returns. An important caveat of the writedown measure, however, is that it is subject to managerial discretion and does

¹⁵ We also perform additional analyses in which we include return on assets and asset growth as additional control variables. The results (untabulated) remain qualitatively similar to those reported in Panel A of Table 3.

not capture the full extent of shareholder losses during the crisis.¹⁶

Figure 1 plots the magnitude of writedowns (in US \$billions) per quarter for all financial firms covered in Bloomberg. We classify writedowns into three categories: (1) losses related to mortgage-backed securities (“Mortgage-backed securities” – Bloomberg codes CDO, CMBS, MTGE, and SUB), (2) losses related to loan portfolios (“Loan portfolios” - COST), and (3) losses related to investments in other firms (“Investment in other firms” – CORP and OCI).¹⁷ The figure shows a spike in writedowns related to mortgage-backed securities in the fourth quarter of 2007, followed later on by an increase in writedowns related to investments in other firms (such as in Lehman Brothers or Icelandic banks). It also shows a steady increase in credit losses related to loan portfolios from the second quarter of 2007 to the third quarter of 2008.

3.3.2. *Measuring corporate governance*

We focus our analysis on firms’ corporate boards and ownership structures, the two key firm-specific governance mechanisms (Denis and McConnell, 2003). We measure these corporate governance mechanisms as of December 2006 (i.e., prior to the onset of the crisis).

¹⁶ For example, Lehman was criticized for not having taken adequate accounting writedowns on its mortgage portfolio in 2008 because it took only a 3% writedown on its portfolio in the first quarter of 2008 while an index of commercial mortgage-backed bonds fell 10% in the same quarter (Onaran, *Bloomberg News*, June 9, 2008).

¹⁷ The total magnitude of losses in all firms covered by Bloomberg is US \$ 1,073 billion for the period from the first quarter of 2007 to the fourth quarter of 2008. Bloomberg classifies writedowns into various groups based on company disclosure. The top thirteen groups (in terms of total magnitude of writedowns) are: *ABS* - Non-mortgage asset-backed securities, *CDO* - Collateralized debt obligations, *CDS* - Credit default swaps, *CMBS* - Commercial mortgage-backed securities, *CORP* - Corporate investment, *COST* - Credit costs/ loan charge offs, *LEV* - leveraged loans, *MTGE* - Mortgage-related securities, *MONO* - Monolines, *OCI* - Revaluation reserve/ other comprehensive income, *RES* - Uncategorized residential mortgage asset writedowns, *SUB* - Subprime residential mortgage backed securities, and *TRA* - Trading losses. In Figure 1, under “Mortgage-backed Securities” we only include the four major groups that are likely to be most directly related to mortgage-backed securities (CDO, CMBS, MTGE, and SUB). However, Figure 1 is a conservative estimate of losses related to mortgage-backed securities because other groups (such as *CDS*, *RES*, and *TRA*) can also include writedowns related to mortgage-backed securities.

For boards of directors, we focus on board independence because this is one of the most extensively studied board characteristics (Weisbach, 1988).¹⁸ We define *Board independence* as the percentage of independent directors. Using *BoardEx* data, we classify directors as “independent” if they are non-executive directors (i.e., not full-time employees).

For ownership structure, we focus on institutional ownership and large shareholders because prior studies suggest that they serve important disciplining and monitoring roles (Gillan and Starks, 2007). We measure *Institutional ownership* as the percentage of shares held by institutional money managers (e.g. mutual funds, pension plans, and bank trusts) using 13F filings for U.S. companies and *FactSet/Lionshares* for non-U.S. companies.¹⁹ We measure *Large shareholder* as a dummy variable equal to 1 if a firm has a large owner with direct or indirect voting rights greater than 10%, using ownership data from *Bureau van Dijk*.²⁰ We chose the 10% cutoff based on prior studies such as Laeven and Levine (2009).

3.3.3. Summary statistics

Table 2 presents the summary statistics by geographic region and country.²¹ Panel A shows the sample distribution and summary descriptive statistics on firm performance. It shows that the sample of 296 firms is relatively balanced between U.S. (125) and European (131) firms, and also reports 40 firms from other regions/countries. The panel reports large negative average stock returns for both the U.S. (-32%) and Europe (-33%). In addition, the panel shows that while both U.S. and European firms were significantly affected by writedowns, the average writedowns

¹⁸ Our focus on board independence is also consistent with Hermalin and Weisbach (2003), who state on page 15 ‘we tend to see independence as the true causal variable, with size, compensation, and board composition as correlates.’

¹⁹ *FactSet/Lionshares* institutional ownership database captures 13-F equivalent institutional holding data for non-U.S. companies and has been used in prior studies such as Ferreira and Matos (2008).

²⁰ We exclude cases in which share holdings are aggregated across funds (such as funds belonging to the Fidelity management company) because these funds are supervised by different managers representing different shareholder groups.

²¹ To mitigate the influence of outliers, we winsorize all continuous variables at the top and bottom 1% of their distributions.

were substantially higher in the U.S. (-1.36% of assets) than in Europe (-0.30% of assets). Moreover, the panel shows that there is substantial within-country variation in firm performance, which is consistent with macroeconomic factors only partially explaining why some firms performed worse than others during the crisis.

Panel B of Table 2 presents summary descriptive statistics on corporate governance and our control variables. Consistent with Adams and Mehran (2003), we find that the percentage of independent directors in U.S. financial firms is high (85%) relative to other studies that have typically focused on manufacturing firms. Moreover, consistent with country-specific factors such as regulation and capital market development having an influence on corporate governance, the panel shows that there is a large cross-country variation in corporate governance characteristics. In particular, the panel shows that compared to European firms, U.S. firms tend to have more independent boards, higher institutional ownership, and are less likely to have a large shareholder. Finally, the panel shows that there is not only large cross-country, but also within-country variation in corporate governance.

4. Empirical results

4.1. Firm performance and corporate governance

We examine the relation between firm performance and corporate governance during the crisis by estimating models regressing buy-and-hold stock returns during the crisis on our corporate governance variables and control variables. Our variables of interest are the following three corporate governance mechanisms: (1) board independence, (2) institutional ownership, and (3) the presence of large shareholders. Following Mitton (2002), we include a dummy indicating whether a firm is cross-listed on U.S. stock exchanges, leverage, firm size, and

dummy variables indicating a firm's industry (3-digit SIC) and country.^{22,23} In addition, we control for stock returns in 2006 because the performance during the crisis period may reflect a reversal of pre-crisis performance (Beltratti and Stulz, 2010). We note that by including leverage, and industry and country dummies, our model controls for differences in balance sheet characteristics and capital requirements across global financial institutions. Moreover, by including country dummies, our analysis essentially examines how the cross-sectional within-country variation in firm performance is related to within-country variation in corporate governance characteristics. To control for dependence in the error terms for firms within the same country, we use robust standard errors clustered by country. Our formal regression model follows:

$$\begin{aligned}
 \text{Firm performance} = & \\
 & \beta_0 + \beta_1(\text{Board independence}) + \beta_2(\text{Institutional ownership}) + \beta_3(\text{Large shareholder}) \\
 & + \beta_4(\text{ADR}) + \beta_5(\text{Leverage}) + \beta_6(\text{Firm size}) + \beta_7(\text{2006 stock returns}) \\
 & + \beta_m(\text{DIndustry}) + \beta_n(\text{DCountry}) + \varepsilon
 \end{aligned} \tag{1}$$

Where:

Firm performance = Buy-and-hold stock returns measured from the first quarter of 2007 until the end of the third quarter of 2008 or the date on which the firm was delisted, whichever is earlier.

Board independence = Percentage of nonexecutive directors, as of December 2006.

Institutional ownership = Percentage of shares owned by institutional investors, as of December 2006.

Large shareholders = A dummy variable equal to 1 if a firm has a large owner with voting rights greater than 10%, as of December 2006.

ADR = A dummy variable indicating whether a firm is cross-listed on U.S. stock exchanges, as of December 2006.

Leverage = Total liabilities divided by total assets as of December 2006.

Firm size = Natural log of total assets as of December 2006.

2006 stock returns = Buy-and-hold stock returns from January 2006 to December 2006.

DIndustry = Dummy variables indicating a firm's industry membership, based on 3-digit SIC.

²² We do not control for a dummy variable indicating whether a firm has a Big N auditor as in Mitton (2002) because all but five of our sample firms have a Big Four auditor. Our additional sensitivity tests (untabulated) find that board independence and institutional ownership remain negative and significant at $p < 5\%$ (two-tailed) in our analysis in Table 3 after excluding these five firms or including a dummy variable indicating a Big Four auditor.

²³ Although not the focus of our paper, we also explore the effect of country-specific governance factors on firm performance in an additional analysis in section 5.

DCountry = Dummy variables indicating a firm's country of incorporation.

Panel A of Table 3 presents the regression results. Columns (1)-(3) report the regression result including the corporate governance factor one at a time and our control variables. Column (4) reports the results of our full regression model. The panel shows that the coefficients on board independence and institutional ownership are negative and significant, with $p < 5\%$ (two-tailed), but the coefficient on the large shareholder indicator is insignificant at conventional levels. Thus, our analysis finds that board independence and institutional ownership are associated with worse stock returns during the crisis, but does not find that firms with large shareholders experienced worse stock returns.

Panel B of Table 3 repeats our analysis on firm performance in Panel A by replacing buy-and-hold stock returns with cumulative accounting writedowns. We use a Tobit regression for this analysis because our sample contains a high proportion of firms with zero writedowns and an OLS regression will result in biased coefficient estimates when the observations are censored.²⁴ Consistent with Panel A, it shows that the coefficients on board independence and institutional ownership are negative and significant in both models, with $p < 1\%$ (two-tailed), but the coefficient on the large shareholder indicator is insignificant at conventional levels. While this result is consistent with board independence and institutional ownership being associated with poor firm performance (as reflected in accounting writedowns), it is also consistent with independent board members and institutional investors pressuring firms into timelier recognition of writedowns during the crisis (Vyas, 2011). In the next section, we further explore explanations for the corporate governance determinants of firm performance during the crisis – that is, the

²⁴ We report χ^2 rather than Pseudo- R^2 because the Pseudo- R^2 of a Tobit model is meaningless (Sribney, 1997).

influence of corporate governance on risk-taking before the crisis and equity capital raisings during the crisis.²⁵

4.2. The influence of corporate governance on pre-crisis risk-taking

One explanation for why firm performance is worse during the crisis for firms with more independent boards and institutional ownership is that boards and shareholders encouraged managers to increase shareholder returns by taking more risk prior to the crisis. Prior literature argues that managers that have accumulated firm-specific human capital and enjoy private benefits of control tend to seek a lower level of risk than shareholders that do not have those skills and privileges (Laeven and Levine, 2009). One implication from this literature is that external monitoring by boards and shareholders will encourage risk-taking to increase shareholder returns.

We test the risk-taking explanation by regressing our proxies of risk-taking on the corporate governance factors and the same set of control variables used in the previous analysis. We use two risk-taking proxies: expected default probability (EDF) and stock return volatility. We obtain EDF from Moody's KMV CreditMonitor. The EDF measure is an implementation of Merton's (1974) structural model and has been used in prior studies to capture credit risk (Covitz and Downing, 2007). It uses financial statement data, equity market information, and proprietary data on the empirical distribution of defaults to estimate the probability that a firm will default within one year, which in Moody's KMV scale ranges from 0.01% to 35%. Following Covitz and Downing (2007), we use the log of EDF (as of December 2006, prior to the crisis) as a measure

²⁵ In an untabulated analysis we regress firm performance on our measures of risk-taking and equity capital raisings. Consistent with risk-taking and equity capital raisings being important in explaining shareholder losses we find that firms that took more risk before the crisis and/or raised more equity capital during the crisis had worse stock returns during the crisis.

of risk in our analysis. We measure stock return volatility as the standard deviation of weekly stock returns from January 2004 to December 2006. Our formal regression model follows:

$$\begin{aligned}
 \text{Risk-taking} = & \\
 & \beta_0 + \beta_1(\text{Board independence}) + \beta_2(\text{Institutional ownership}) + \beta_3(\text{Large shareholder}) \\
 & + \beta_4(\text{ADR}) + \beta_5(\text{Leverage}) + \beta_6(\text{Firm size}) + \beta_7(\text{2006 stock returns}) \\
 & + \beta_m(\text{DIndustry}) + \beta_n(\text{DCountry}) + \varepsilon \tag{2}
 \end{aligned}$$

Where:

Risk-taking = Two proxies for risk taking as follows:

LogEDF = Natural logarithm of EDF, as of December 2006.

Stock return volatility = Standard deviation of weekly stock returns, measured from January 2004 to December 2006.

See equation (1) for definitions of other variables.

Panel A of Table 4 presents the descriptive statistics of our risk-taking measures: logEDF and volatility.²⁶ Panel B of Table 4 reports the results of regressing pre-crisis risk-taking on corporate governance. The panel shows that the coefficient on institutional ownership is positive and significant in both models, with $p < 1\%$ (two-tailed). Thus, our results are consistent with institutional investors having encouraged managers to increase shareholder returns through greater risk-taking.

The analysis in Panel B of Table 4, however, shows that the coefficient on board independence is insignificant in both models.²⁷ Therefore, while pre-crisis risk-taking can explain why firms with larger institutional ownership experienced worse stock returns during the crisis period, it does not explain why firms with more independent boards performed worse. To provide further insight into the factors that drive the inverse relation between firm performance

²⁶ The number of observations for our EDF regressions is smaller because of the additional data requirement.

²⁷ We also perform a sensitivity test in which we use idiosyncratic volatility as a proxy for risk-taking. We compute this variable by measuring the standard deviation of the residuals from a market model (using the MSCI World index as the market index) based on weekly stock returns from January 2004 to December 2006. The results (untabulated) remain qualitatively the same as those reported in Panel B of Table 4. Specifically, the coefficient on institutional ownership continues to be positive and significant at $p < 5\%$ (two-tailed) and the coefficient on board independence continues to be insignificant.

during the crisis and board independence, we next explore the influence of corporate governance on equity capital raisings during the crisis.

4.3. The influence of corporate governance on equity capital raisings during the crisis

An alternative explanation for why firms with more independent boards experienced worse stock returns during the crisis is that independent board members encouraged managers to raise equity capital during the crisis period to ensure capital adequacy and reduce bankruptcy risk. In addition, prior studies suggest that an important role of independent directorships is to ensure transparent financial reporting (Anderson et al., 2004; Klein, 2002). During the crisis period transparent reporting implied the timely recognition of losses related to subprime mortgages. Because the recognition of losses led to lower capital adequacy ratios, firms had to resort to raising equity capital to avoid regulatory intervention when they recognized losses related to subprime mortgage related assets. Raising equity capital, however, was very costly during the crisis period. It could have led to worse stock returns during the crisis because it caused a wealth transfer from existing equity holders to debtholders (Kashyap et al., 2008; Myers, 1977).²⁸

To examine whether equity capital raisings led to a wealth transfer from existing shareholders to debtholders we perform an event study in which we examine cumulative abnormal stock returns and abnormal changes in CDS (credit default swaps) spreads surrounding equity offering announcements for our sample firms. A CDS is an “insurance” contract in which the buyer makes a series of payments in exchange for the right to receive a payoff if a credit instrument goes into default. The price of this contract, often referred to as CDS

²⁸ Consistent with equity capital raisings lowering shareholder returns during the crisis period, Kashyap et al. (2008, p. 3) state that capital raising tends to be sluggish during the crisis because “not only is capital a relatively costly mode of funding at all times, it is particularly costly for a bank to raise new capital during times of great uncertainty.”

spread, is expressed in basis points of the notional value of the underlying debt instrument. Thus, the more likely a firm is to default on its debt obligations, the higher a firm's CDS spread.

Equity offering announcements may affect stock returns and CDS spreads in two ways. First, equity offering announcements signaled to the market that more losses were to come (Kashyap et al., 2008). Therefore, we expect the signaling effect of equity offering announcements to not only lower the value of equity, but also the value of debt (i.e., increase CDS spreads). Second, equity offerings reduce bankruptcy risk and could have led to a wealth transfer from existing shareholders to bondholders in the crisis period because the severely depressed valuations of subprime mortgage related assets could have caused the expected payoff to debt holders to be lower than the value of existing debt (Myers, 1977). Thus, we expect the effect of equity offerings on bankruptcy risk to decrease the value of equity, and increase the value of debt (i.e., decrease CDS spreads). Consequently, while we expect a negative stock market reaction to equity offering announcements, we expect a decrease in CDS spreads only if the wealth transfer from existing shareholders to debtholders more than offsets the signaling effect.

We obtain data on equity offerings from the SDC platinum database and data on CDS spreads from Datastream.²⁹ We compute abnormal stock returns and abnormal changes in CDS spreads over a three-day [-1, +1] event window, with day 0 being the reported filing date. We measure abnormal stock returns as stock returns minus the return on the MSCI World index. Further, following Veronesi and Zingales (2010) we measure abnormal CDS spread changes as

²⁹ While Bloomberg's WDCI function also provides data on capital raisings, it covers only firms for which it reports accounting writedowns. The SDC capital raising database is not subject to this selection bias.

changes in CDS spreads on senior 5-year debt minus the change in a CDS index comprising the universe of global CDS in Datastream.³⁰

Panel A of Table 5 shows additional descriptive statistics on equity capital raisings. It shows that 19% (57/296) of our sample firms raised equity capital, with the average amount raised being equal to 2.0% of total assets. Panel B provides the results of our abnormal stock return and abnormal change in CDS spread test.³¹ It shows that on average firms that raised equity capital experienced a negative abnormal stock return of 2% and an abnormal decrease in CDS spreads of approximately 4 basis points, with both being significantly different from zero at $p < 5\%$ (two-sided). Therefore, the results in Panel B of Table 5 show that the wealth transfer from existing shareholders to debtholders due to equity capital raisings was substantial, as it outweighed the signaling effect of equity offering announcements on CDS spreads.

To test whether equity capital raisings drive the relation between stock returns and board independence, we estimate a Tobit model regressing equity capital raisings on our governance variables. The equity capital raisings variable equals the amount of equity capital raised scaled by total assets. As in our prior analyses we control for ADR, leverage, firm size, 2006 stock returns, and industry and country indicators. Our formal regression model follows:

$$\begin{aligned}
 \text{Equity capital raising} = & \\
 & \beta_0 + \beta_1(\text{Board independence}) + \beta_2(\text{Institutional ownership}) + \beta_3(\text{Large shareholder}) \\
 & + \beta_4(\text{ADR}) + \beta_5(\text{Leverage}) + \beta_6(\text{Firm size}) + \beta_7(\text{2006 stock returns}) \\
 & + \beta_m(\text{DIndustry}) + \beta_n(\text{DCountry}) + \varepsilon
 \end{aligned} \tag{3}$$

Where:

Equity capital raising = Amount of equity capital raised scaled by total assets from the first quarter of 2007 until the third quarter of 2008.

See equation (1) for definitions of other variables.

³⁰ In contrast to Veronesi and Zingales (2010), who use the CDX (North American Investment Grade) index as a benchmark, we use a CDS index comprising the universe of global CDS because we have a global sample.

³¹ Because not all equity capital raising firms have CDS spreads, the sample size for this analysis is slightly reduced.

Panel C of Table 5 reports the result of this analysis. Column (1) of the panel shows that the coefficient on board independence in the capital raising regression is positive and significant at $p < 1\%$ (two-tailed). This finding suggests that firms with more independent boards raised more equity capital during the crisis period. Column (2) of the panel further includes writedowns as a control variable. Consistent with writedowns triggering the need to raise equity capital in order to maintain capital adequacy ratios, we find that the coefficient on writedowns is negative and significant at $p < 5\%$ (two-tailed). Moreover, while the magnitude of the coefficient on board independence is smaller (with the decrease being significant at $p < 10\%$, not reported in the panel), it remains positive and significant at $p < 5\%$ (two-tailed). This finding is consistent with not only disclosure considerations, but also other factors such as the risk of bankruptcy explaining why independent board members pushed their firms into raising equity capital during the crisis.

Column (3) of Panel C excludes firms that raised equity capital during the crisis and repeats the analysis in Panel A of Table 3, in which we examine the relation between stock returns and corporate governance. If the inverse relation between firm performance and board independence is mainly driven by independent board members pressuring firms to raise equity capital during the crisis, we expect the coefficient on board independence to become insignificant. Consistent with this prediction, column (3) shows that once we eliminate firms that raised equity capital during the crisis period from our sample, the coefficient on board independence becomes insignificant. Thus, the evidence in Panel C of Table 5 suggests that the inverse relation between stock returns during the crisis and board independence is driven by equity capital raisings.

5. Additional analyses

5.1. *The effect of equity capital raisings on firm survival and long term performance*

While equity capital raisings may have led to poor performance during the crisis, they also may have helped firms survive the crisis and perform better after the crisis. We explore this issue by performing additional analyses in which we examine whether equity capital raisings had a positive impact on the likelihood that a firm survived the financial crisis and firm performance over the long run.

To ensure that our results are not driven by equity capital raising firms having worse performance than non-equity capital raising firms, we perform our tests using a matched pair design. Specifically, we match each capital raising firm to one non-capital raising firm using buy-and-hold returns measured from the beginning of our sample period to the date on which the firm first announced equity capital raisings. We require each matched pair to have buy-and-hold returns that differ less than 10% in the same time period. To capture whether a firm survived the crisis, we use a dummy variable indicating whether the firm was delisted during the crisis period. To capture long-term performance subsequent to equity capital raisings, we measure buy-and-hold stock returns from the first day after the first equity capital raising announcement until December 2009.³² We compute long term performance for control firms using the long term performance measurement period of the firm that they are matched to. We end the performance measurement period 15 months after the crisis period (December 2009) because by then the stock market recovered most of the losses it suffered during the crisis, and the market has remained relatively flat since then.³³

³² We find similar results when we start the performance measurement period one month after the first equity capital raising announcement.

³³ Ending the measurement period in December 2009 also ensures that our results are not influenced by actions that boards took in response to the European sovereign debt crisis that erupted in 2010.

Table 6 reports the results of this analysis. Panel A of the table provides descriptive statistics on delisting and long term performance partitioned on whether a firm raised equity capital during our sample period. Consistent with equity capital raisings helping firms survive during the crisis, the panel shows that equity capital raising firms are less likely to be delisted. However, inconsistent with equity capital raisings helping firms perform better, the panel shows that capital raising firms have similar long term performance as non-capital raising firms.

Column (1) in Panel B of Table 6 reports the results of regressing a dummy variable that captures whether a firm was delisted during our sample period on equity capital raisings and control variables.³⁴ Consistent with equity capital raisings reducing bankruptcy risk, we find that the coefficient on equity capital raisings is negative and significant at $p < 10\%$ (two-tailed). Column (2) of the panel reports the results of regressing equity capital raisings on long term performance and controls. Inconsistent with equity capital raisings helping firms perform better after the crisis, we find that the coefficient on equity capital raisings is insignificant. Thus, although equity capital raisings helped firms survive the crisis, our results do not suggest that they helped firms perform better in the long term.

We caution that the lack of evidence on the positive effect of equity capital raisings on long term firm performance may be due to regulatory interventions such as the TARP. That is, the massive government bailout such as the TARP initiated in October 2008 may have attenuated the positive effect of equity capital raisings on firms' long term performance.

³⁴ We do not include country and industry indicators in the logit model in Column (1) because more than half of the observations in our matched sample would otherwise be dropped. This occurs because country and industry indicators that do not represent at least one delisted firm and one non-delisted firm perfectly explain the dependent measure in the logit model. In an untabulated analysis we find similar results when we include the country and industry indicators using our full sample.

5.2. Additional analysis on country-level governance

Our primary analysis focuses on the role of corporate boards and ownership structure, two key firm-level governance mechanisms (Denis and McConnell, 2003). The international corporate governance literature suggests that another important dimension of corporate governance is the external governance mechanism in a country, primarily the legal institutions that protect shareholder rights, both in terms of the quality of legal institutions and a country's laws protecting shareholder rights (La Porta et al., 1998). Since our primary analysis includes country indicators to control for country-specific factors, it does not address how country-level legal institutions influenced the performance of global financial institutions during the crisis. In this section, we explore the influence of country-level governance on firm performance.

We perform our analysis by regressing stock returns on our country-level governance variables (measures that capture a country's quality of legal institutions and its laws protecting shareholder rights) and our firm-level control variables.³⁵ We capture the quality of legal institutions based on the aggregate governance index compiled by Kaufmann et al. (2009) and measure the laws protecting shareholder rights based on the updated antidirector rights index compiled by Spamann (2010).³⁶ As in our analysis in Table 3, we use robust standard errors clustered by country to control for dependence in the error terms for firms in the same country.

Our formal regression model is as follows:

³⁵ We do not include country indicators in our Table 7 analysis because doing so will introduce perfect multicollinearity with the country-level variables. In addition, we do not include other country-level institutions such as macroeconomic policies because the purpose of this analysis is to explore whether firm-performance is associated with country-level governance.

³⁶ We used the legal institutions variable based on Kaufmann et al. (2009) and antidirector rights index based on Spamann (2010) because we want to use an index measured closest to the beginning of the crisis period. We also perform sensitivity tests after using the rule of law measure and the antidirector rights index compiled by La Porta et al. (1998), two variables that are commonly used in prior studies to capture the quality of legal institutions and a country's laws protecting shareholder rights. The coefficients on these variables remain insignificant at conventional levels (similar those reported in Panel B of Table 7).

$$\begin{aligned}
\text{Firm performance} = & \alpha_0 + \beta_1(\text{Institutions}) + \beta_2(\text{Antidirector rights}) + \beta_3(\text{ADR}) + \beta_4(\text{Leverage}) \\
& + \beta_5(\text{Firm size}) + \beta_6(\text{2006 stock returns}) + \beta_m(\text{DIndustry}) + \varepsilon \quad (4)
\end{aligned}$$

Where:

Institutions = An average of six governance indicators: (1) voice & accountability, (2) political stability & absence of violence, (3) government effectiveness, (4) regulatory quality, (5) rule of law, and (6) control of corruption, based on the 2006 index value in Kaufmann et al. (2009).

Antidirector rights = The corrected antidirector rights index, based on the 2005 index value in Spamann (2010).

See equation (1) for definitions of other variables.

Table 7 reports the results of this analysis. Panel A shows the values of the country-level governance variables. Panel B presents the results from the regression analysis. Columns (1)-(2) report the results including the country-level governance variables one at a time and our control variables. Column (3) reports our full model. The panel shows that the coefficients on the country-level governance variables are insignificant in all models. Thus, we do not find that country-level governance factors affected firm performance during the crisis.

6. Sensitivity tests

6.1. Controlling for board size

Endogeneity is a common issue in governance studies that makes interpretation of the results difficult. As pointed out by Hermalin and Weisbach (2003), the relation between board characteristics and firm performance may be spurious because a firm's governance structure and performance are endogenously determined. While this issue is less likely to be problematic in our setting because the financial crisis is largely an exogenous macroeconomic shock, we attempt to mitigate this concern by focusing on how key corporate governance characteristics impact firm actions. For example, our examination of the negative relation between board independence and firm performance during the crisis is inconsistent with this relation being

spuriously driven by past performance, but is consistent with this relation being driven by independent directors' influence on equity capital raisings.

Since governance variables tend to be highly correlated, correlated omitted variables remain a concern. The exclusion of board size from our analysis may particularly be a concern because firms with more complex operations may have performed worse during the crisis and prior literature suggests that board size is associated with board independence and operating complexity (Adams and Mehran, 2011; Linck et al., 2009). To the extent that our control variables such as firm size and leverage do not adequately control for complexity, it is possible that our results with respect to board independence are driven by board size. Thus, we repeat our analysis in Panel A of Table 3 after further controlling for board size. Following Adams and Mehran (2011), we use three alternative measures of board size: the natural logarithm of the number of board members, the number of board members, and a piecewise linear specification. For the piecewise linear specification we divide board size into its terciles of 7-11, 12-14 and 15-31 directors and allow for different intercepts on the terciles.

Panel A of Table 8 reports the results of this analysis. We find that our results remain qualitatively similar to those reported in Panel A of Table 3.³⁷ Thus, our conclusion on the relation between crisis-period performance and corporate governance is not sensitive to controlling for board size.

6.2. Controlling for additional board and ownership characteristics

In addition, to explore whether our results are sensitive to controlling for other board characteristics that potentially affect the oversight of risk management and financing policies by

³⁷ In an unreported analysis, we find that all coefficients on the board size partitions are insignificant when we use partitions based on the median of board size and partitions based on the quartiles of board size. Thus, there is no clear relation between board size and performance during the financial crisis.

corporate boards, we repeat our analysis in Panel A of Table 3 after including the following board characteristics: *Risk committee* (a dummy variable indicating whether the firm has a risk committee), *Board financial expertise* (percentage of nonexecutive directors that either has a CFA/CPA or has worked in accounting or finance functions), and *CEO-chairman duality* (a dummy variable indicating whether the CEO also serves as the chairman of the board). Moreover, we include *Closely held shares* (the percentage of shares held by insiders) to control for ownership characteristics that are potentially correlated with the level of institutional ownership and the presence of large shareholders.

We obtain the additional board characteristics from *BoardEx* and the closely held shares data from *Worldscope*. We then repeat our analysis in Panel A of Table 3 after controlling for the additional board and ownership characteristics. Panel B of Table 8 reports the results of this analysis. Columns (1)-(4) report the results after including the additional board and ownership characteristics one at a time. Column (5) reports the results of the full model regression.³⁸ We find that our results continue to be qualitatively similar to those reported in Panel A of Table 3. Thus, our conclusion on the relation between crisis-period performance and corporate governance is not sensitive to controlling for additional board and ownership characteristics.

6.3. Using an alternative definition of the crisis period

We define our crisis period as starting in the beginning of 2007 because according to Ryan (2008) the first wave of the crisis started in early 2007.³⁹ While our definition of the crisis period is comprehensive, we note that the credit crunch did not really begin until the second wave,

³⁸ The number of observations in Columns (4) and (5) of Panel B, Table 8 is slightly smaller due to the additional data requirement on closely held shares.

³⁹ Specifically, on February 7, 2007, New Century Financial announced restating its financial reports due to inadequate allowance for repurchase losses on mortgages. On the same day, HSBC announced that its aggregate loan impairments and loss provisions would be substantially higher than expected due to deteriorating conditions in the U.S. housing market and increased subprime mortgage defaults.

which started in July 2007 (Ryan, 2008). Thus, we also perform a sensitivity test in which we rerun our full model regression in Panel A of Table 3 after using July 2007 as the start of the crisis period. In addition, while we end the crisis period in the third quarter of 2008 to avoid the confounding effects of government intervention, we also perform a sensitivity test using an alternative crisis period from July 2007 to December 2008, as in Beltratti and Stulz (2010).

Panel C of Table 8 reports the results of this analysis. Column (1) reports the results after defining the crisis period as starting in July 2007 and ending in September 2008 (Q3/07-Q3/08) and column (2) reports the results after defining the crisis period as starting in July 2007 and ending in December 2008 (Q3/07-Q4/08). We dropped two firms from our sample that delisted during January 2007-July 2007 (i.e., prior to the start of our alternative definitions of the crisis period). We find that the results from this analysis are qualitatively similar to those reported in Panel A of Table 3. Thus, our conclusion on the relation between firm performance during the crisis and governance is not sensitive to alternative definitions of the crisis period.

6.3. Using an alternative measure of stock returns

Our primary analysis uses raw stock returns to capture firm performance. Although we control for cross-industry and cross-country variation in stock returns by including industry and country indicators, we also perform a sensitivity test using abnormal stock returns to capture firm performance. Specifically, we repeat our full model regression in Panel A of Table 3 after re-measuring stock returns as abnormal stock returns (calculated as stock returns minus expected returns based on a market model using the MSCI World index as the market index estimated over the period January 2004-December 2006). Column (3) in Panel B of Table 8 reports the results of this analysis. We find that our results continue to be qualitatively similar to those

reported in Panel A of Table 3. Thus, our conclusion on the relation between performance and governance is not sensitive to an alternative measure of stock returns.

7. Conclusion

In this paper, we provide empirical evidence on how corporate governance influenced the performance of financial firms during the 2007-2008 financial crisis. Although all firms were affected by the crisis, we find that firms with higher institutional ownership and more independent boards had worse stock returns than other firms during the crisis. Further exploration of this finding suggests that this is because (1) firms with higher institutional ownership took more risk prior to the crisis, which resulted in larger shareholder losses during the crisis period, and (2) firms with more independent board members raised more equity capital during the crisis, which led to a wealth transfer from existing shareholders to debtholders.

Overall, our study provides insight into why some financial firms were much more affected by the 2007-2008 crisis than others. Our results suggest that corporate governance had an important impact on firm performance during the crisis through firms' risk-taking and financing policies.

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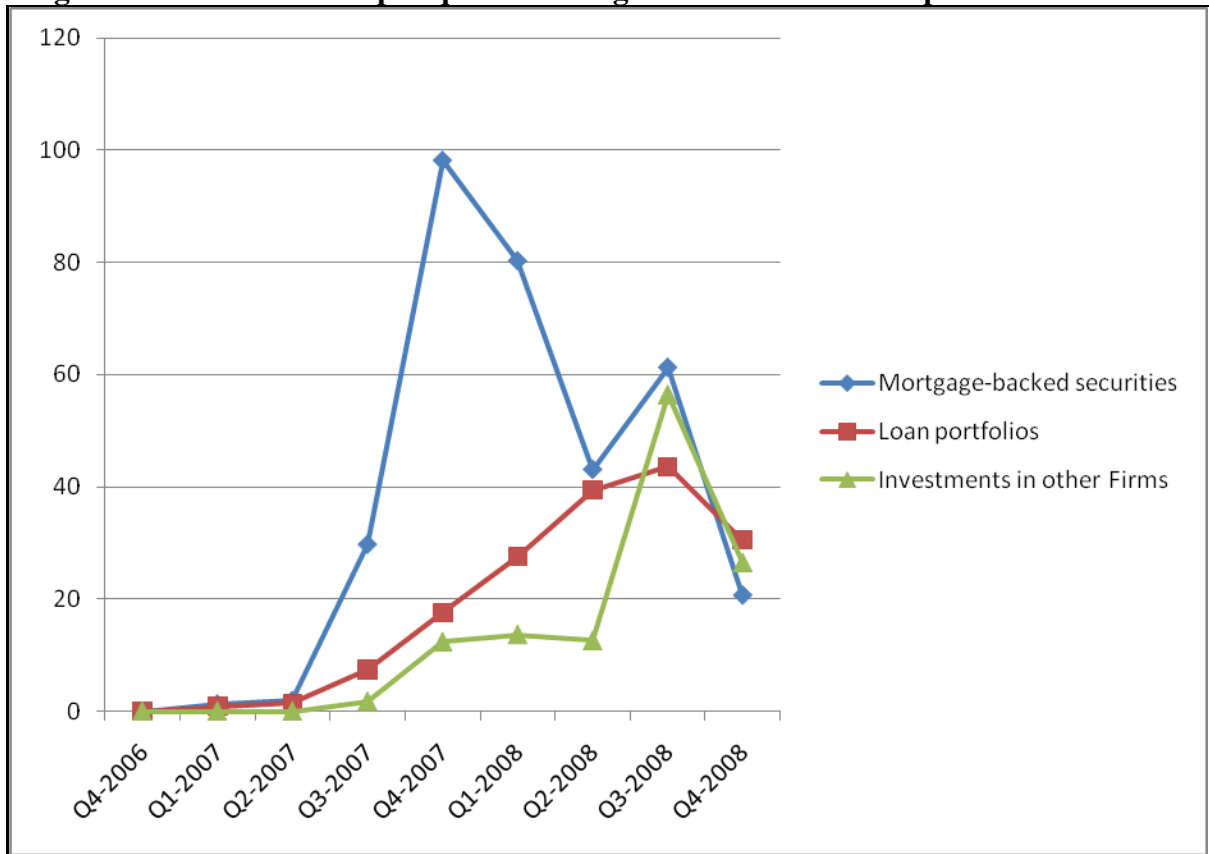
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Figure 1
Magnitudes of writedowns per quarter during the 2007-2008 crisis period



This figure plots the magnitudes of writedowns (in US \$billion) per quarter for all financial firms covered in Bloomberg by three categories: (1) losses associated with mortgage-backed securities (“CDO/CMBS/MTGE/SUB”), (2) losses related to loan portfolios (“COST”), and (3) losses related to investments in other firms (“CORP/OCP”).

Table 1
Sample selection

Panel A: Sample selection

	N of firms dropped	Remaining firms
Compustat financial firms		4,766
Less:		
Firms with total assets less than US \$10 billion	3,995	771
Firms without board characteristics data (i.e., not covered in BoardEx)	424	347
Other data constraints (i.e., firms without stock returns, institutional ownership, large shareholders data)	47	300
Firms from Puerto Rico (2006 budget crisis)	4	
Final sample		296

Panel B: Distribution of financial firms across industries, final sample versus Compustat financial firms

Industry as in Fama and French (1997)	4-digit SIC	Final sample				Compustat financial firms			
		N firms		Total assets		N firms		Total assets	
		N	%	US \$bln.	%	N	%	US \$bln.	%
Banking	6000-6099								
	6100-6199	177	60%	40,998	63%	2,019	42%	72,510	70%
	6200-6299								
Brokerage/Trading	6700-6799	19	6%	15,657	24%	2,150	45%	19,254	19%
	6300-6399								
Insurance	6400-6411	100	34%	8,473	13%	597	13%	11,850	11%
Total		296	100%	65,128	100%	4,766	100%	103,615	100%

Panel C: Firm characteristics prior to the crisis (as of December 2006), final sample versus Compustat financial firms

	N	Mean	Median	Std. dev.	p-value, diff. ^a
Total assets (US \$bln.)					
Final sample	296	219.57	56.54	384.66	<0.01
Compustat financial firms	4,766	21.74	0.66	120.96	
Leverage					
Final sample	296	0.91	0.93	0.07	<0.01
Compustat financial firms	4,764	0.74	0.75	0.16	
Return on assets					
Final sample	296	0.02	0.02	0.02	<0.01
Compustat financial firms	4,759	0.04	0.02	0.04	
Asset growth					
Final sample	296	0.20	0.12	0.58	<0.01
Compustat financial firms	4,394	0.36	0.13	1.04	

^a p-value based on a t-statistic for difference in means.

Table 2
Summary statistics by geographic region and country

Panel A: Summary statistics of firm performance during the crisis

Region	Country	N of firms	Stock returns [Q1/2007-Q3/2008]			Writedowns [Q1/2007-Q3/2008]		
			Mean	Med.	Std. dev.	Mean	Med.	Std. dev.
North-America	U.S.	125	-32%	-27%	38%	-1.36%	0.00%	2.95%
	Canada	13	-3%	-3%	23%	-0.35%	-0.09%	0.65%
	Other North America	5	-20%	-2%	45%	-3.04%	-0.77%	5.53%
	<i>Subtotal North America</i>	<i>143</i>	<i>-29%</i>	<i>-23%</i>	<i>38%</i>	<i>-1.32%</i>	<i>0.00%</i>	<i>2.95%</i>
Europe	Germany	19	-28%	-19%	37%	-1.11%	0.00%	3.82%
	Italy	19	-32%	-34%	29%	-0.02%	0.00%	0.09%
	U.K.	17	-36%	-43%	26%	-0.27%	0.00%	0.45%
	Switzerland	15	-17%	-24%	30%	-0.45%	0.00%	0.76%
	France	9	-33%	-34%	30%	-0.26%	-0.14%	0.30%
	Spain	9	-32%	-33%	15%	-0.04%	0.00%	0.11%
	Greece	7	-40%	-40%	16%	0.00%	0.00%	0.00%
	Netherlands	6	-34%	-48%	48%	-0.41%	-0.38%	0.41%
	Ireland	5	-56%	-74%	39%	-0.04%	0.00%	0.06%
	Sweden	4	-36%	-33%	23%	-0.04%	0.00%	0.07%
	Belgium	3	-38%	-32%	21%	-0.32%	-0.21%	0.39%
	Denmark	3	-41%	-41%	6%	-0.00%	0.00%	0.01%
	Portugal	3	-48%	-54%	14%	0.00%	0.00%	0.00%
	Other Europe	12	-39%	-44%	13%	-0.03%	0.00%	0.10%
	<i>Subtotal Europe</i>	<i>131</i>	<i>-33%</i>	<i>-35%</i>	<i>28%</i>	<i>-0.30%</i>	<i>0.00%</i>	<i>1.50%</i>
Other	Australia	15	-18%	-22%	21%	-0.46%	0.00%	1.69%
	Other countries	7	10%	10%	29%	-0.04%	0.00%	0.10%
	Total/Average	296	-29%	-29%	34%	-0.80%	0.00%	2.36%

Table 2, continued

Panel B: Summary statistics of corporate governance and controls

Region	Country	Board independence [December 2006]			Institutional ownership [December 2006]			Large shareholder [December 2006]			ADR [December 2006]		
		Mean	Med.	Std. dev.	Mean	Med.	Std. dev.	Mean	Med.	Std. dev.	Mean	Med.	Std. dev.
North- America	U.S.	85%	87%	8%	67%	67%	21%	0.30	0	0.46	0.00	0.00	0.00
	Canada	87%	92%	9%	48%	50%	21%	0.23	0	0.44	0.00	0.00	0.00
	Other North America	85%	90%	8%	79%	78%	17%	0.00	0	0.00	0.00	0.00	0.00
	<i>Subtotal North America</i>	<i>85%</i>	<i>88%</i>	<i>8%</i>	<i>66%</i>	<i>66%</i>	<i>21%</i>	<i>0.29</i>	<i>0</i>	<i>0.45</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>
Europe	Germany	72%	69%	11%	17%	11%	16%	0.74	1	0.45	0.05	0.00	0.23
	Italy	88%	94%	11%	13%	11%	10%	0.58	1	0.51	0.00	0.00	0.00
	U.K.	64%	64%	9%	63%	72%	24%	0.29	0	0.47	0.24	0.00	0.44
	Switzerland	93%	100%	11%	26%	72%	24%	0.40	0	0.51	0.13	0.00	0.35
	France	85%	83%	8%	33%	15%	32%	0.67	1	0.50	0.22	0.00	0.44
	Spain	78%	80%	6%	12%	8%	9%	0.78	1	0.44	0.22	0.00	0.44
	Greece	71%	71%	8%	13%	12%	7%	0.57	1	0.53	0.14	0.00	0.38
	Netherlands	69%	67%	12%	32%	32%	15%	1.00	1	0.00	0.50	0.50	0.55
	Ireland	68%	67%	7%	35%	35%	2%	0.00	0	0.00	0.40	0.00	0.55
	Sweden	90%	92%	4%	58%	52%	27%	1.00	1	0.00	0.00	0.00	0.00
	Belgium	78%	88%	19%	17%	14%	16%	1.00	1	0.00	0.00	0.00	0.00
	Denmark	81%	75%	16%	24%	24%	5%	0.33	0	0.58	0.00	0.00	0.00
	Portugal	71%	67%	15%	46%	22%	47%	0.67	1	0.58	0.00	0.00	0.00
	Other Europe	83%	84%	16%	17%	11%	16%	0.92	1	0.29	0.00	0.00	0.00
	<i>Sub-total Europe</i>	<i>78%</i>	<i>80%</i>	<i>14%</i>	<i>27%</i>	<i>20%</i>	<i>25%</i>	<i>0.61</i>	<i>1</i>	<i>0.49</i>	<i>0.13</i>	<i>0.00</i>	<i>0.34</i>
Other	Australia	85%	88%	8%	18%	16%	13%	0.33	0	0.49	0.20	0.00	0.41
	Other countries	83%	81%	10%	43%	43%	21%	0.71	1	0.49	0.43	0.00	0.53
	<i>Average</i>	<i>82%</i>	<i>86%</i>	<i>12%</i>	<i>46%</i>	<i>48%</i>	<i>30%</i>	<i>0.44</i>	<i>0</i>	<i>0.50</i>	<i>0.08</i>	<i>0.00</i>	<i>0.27</i>

Table 2, continued

Panel B, continued

Region	Country	Leverage			Firm size			2006 stock return		
		[December 2006]			[December 2006]			[Q1/2006-Q4/2006]		
		Mean	Med.	Std. dev.	Mean	Med.	Std. dev.	Mean	Med.	Std. dev.
North- America	U.S.	0.87	0.90	0.09	10.79	10.48	1.38	0.12	0.13	0.15
	Canada	0.92	0.94	0.04	11.75	11.99	1.17	0.18	0.17	0.12
	Other North America	0.76	0.75	0.09	9.59	9.57	0.10	0.03	0.09	0.19
	<i>Subtotal North America</i>	0.87	0.90	0.09	10.83	10.54	1.38	0.13	0.14	0.15
Europe	Germany	0.95	0.96	0.03	11.90	12.01	1.34	0.31	0.23	0.36
	Italy	0.92	0.93	0.03	11.21	10.91	1.15	0.28	0.20	0.23
	U.K.	0.95	0.97	0.03	12.27	12.47	1.54	0.22	0.21	0.14
	Switzerland	0.90	0.91	0.06	10.96	10.29	1.74	0.28	0.28	0.15
	France	0.94	0.96	0.03	13.03	13.31	1.39	0.39	0.30	0.21
	Spain	0.94	0.94	0.02	11.49	11.47	1.41	0.36	0.36	0.10
	Greece	0.93	0.93	0.02	10.66	10.62	0.64	0.19	0.27	0.33
	Netherlands	0.95	0.96	0.02	12.80	13.39	1.66	0.13	0.15	0.09
	Ireland	0.96	0.97	0.02	12.00	12.19	0.50	0.25	0.25	0.10
	Sweden	0.96	0.96	0.00	12.56	12.51	0.35	0.24	0.26	0.13
	Belgium	0.95	0.94	0.02	12.70	12.97	0.99	0.14	0.13	0.06
	Denmark	0.95	0.94	0.01	11.09	10.25	1.74	0.43	0.30	0.34
	Portugal	0.94	0.94	0.02	11.19	11.26	0.41	0.37	0.31	0.17
	Other Europe	0.92	0.92	0.03	10.99	11.00	0.87	0.61	0.39	0.57
	<i>Sub-total Europe</i>	0.94	0.94	0.04	11.69	11.52	1.43	0.31	0.25	0.29
Other	Australia	0.92	0.94	0.06	10.85	10.66	1.23	0.22	0.22	0.16
	Other countries	0.90	0.92	0.04	10.61	10.79	0.83	0.65	0.55	0.45
	<i>Average</i>	0.90	0.93	0.07	11.21	10.94	1.45	0.22	0.19	0.25

See Appendix B for variable definitions.

Table 3
Relation between firm performance and corporate governance^a

Panel A: Using stock returns to proxy for firm performance (OLS model)

	(1)	(2)	(3)	(4)
Board independence	-0.38** [-2.30]			-0.40** [-2.35]
Institutional ownership		-0.30*** [-3.96]		-0.31*** [-4.27]
Large shareholder			0.02 [0.65]	-0.01 [-0.36]
ADR	0.06 [0.81]	0.09 [1.13]	0.07 [0.90]	0.08 [1.04]
Leverage	-0.33 [-1.52]	-0.18 [-0.58]	-0.24 [-1.11]	-0.27 [-0.85]
Firm size	-0.04** [-2.60]	-0.03** [-2.06]	-0.04*** [-2.83]	-0.03** [-2.28]
2006 stock return	0.01 [0.07]	-0.04 [-0.21]	-0.01 [-0.05]	-0.01 [-0.07]
Industry indicators	Yes	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes	Yes
N	296	296	296	296
Adj- R^2	0.17	0.18	0.16	0.19

Panel B: Using accounting writedown to proxy for firm performance (Tobit model)

	(1)	(2)	(3)	(4)
Board independence	-0.14*** [-3.44]			-0.14*** [-3.72]
Institutional ownership		-0.03*** [-3.97]		-0.04*** [-5.11]
Large shareholder			-0.00 [-0.19]	-0.01 [-1.14]
ADR	-0.00 [-0.15]	0.01 [0.75]	0.01 [0.93]	-0.00 [-0.13]
Leverage	-0.03 [-0.91]	0.02 [0.41]	0.00 [0.12]	-0.02 [-0.62]
Firm size	-0.02*** [-6.18]	-0.02*** [-5.55]	-0.02*** [-7.19]	-0.02*** [-6.71]
2006 stock return	0.03* [1.75]	0.01 [0.72]	0.02 [1.10]	0.02 [1.62]
Industry indicators	Yes	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes	Yes
N	296	296	296	296
χ^2	160.5***	149.7***	146.4***	164.7***

^aZ-statistics based on robust standard errors clustered by country are reported in brackets.
*, **, *** indicate significance at 10%, 5%, and 1% levels (two-tailed).

See Appendix B for variable definitions.

Table 4
Corporate governance and risk-taking prior to the crisis

Panel A: Descriptive statistics on risk-taking

Variable	N	Mean	Median	Std. dev.
logEDF [December 2006]	269	-3.16	-3.26	1.25
Volatility [2004-2006]	296	0.03	0.03	0.01

Panel B: Regression of risk-taking on corporate governance (OLS model)^a

	logEDF [December 2006]	Volatility [2004-2006]
Board independence	0.51 [0.51]	0.01 [1.11]
Institutional ownership	1.28*** [4.07]	0.01*** [3.41]
Large shareholder	0.30 [1.60]	0.00** [2.31]
ADR	-0.04 [-0.22]	0.00 [0.79]
Leverage	6.01*** [2.94]	0.02* [1.95]
Firm size	-0.21*** [-3.54]	-0.00*** [-7.18]
2006 stock return	-0.73** [-2.24]	0.00 [0.57]
Industry indicators	Yes	Yes
Country indicators	Yes	Yes
N	269	296
Adj- R^2	0.32	0.42

^aZ-statistics based on robust standard errors clustered by country are reported in brackets. *, **, *** indicate significance at 10%, 5%, and 1% levels (two-tailed). See Appendix B for variable definitions.

Table 5**The impact of board independence on equity capital raisings during the crisis****Panel A: Descriptive statistics on equity capital raisings**

Variable	N	Mean	Median	Std. dev.
Firms that raised equity capital	57	1.95%	1.15%	1.82%
Overall sample	296	0.38%	0.00%	1.11%

Panel B: Market reaction during [-1, +1] event window, with day 0 being the filing date of equity offerings

	N	Mean	t-stat
Abnormal stock returns (%)	54	-2.29**	-2.42
Abnormal change in CDS spread (basis point)	54	-3.99**	-2.29

Panel C: Relation between board independence and equity capital raisings during the crisis^a

	Equity capital raising (Tobit model) (Full sample) [Q1/2007-Q3/2008] (1)	Equity capital raising (Tobit model) (Full sample) [Q1/2007-Q3/2008] (2)	Stock returns (OLS model) (Excl. capital raising firms) [Q1/2007-Q3/2008] (3)
Board independence	0.09*** [3.02]	0.08** [2.37]	-0.11 [-0.47]
Institutional ownership	0.04** [2.38]	0.03** [2.17]	-0.32*** [-3.69]
Large shareholder	0.00 [0.33]	0.00 [0.24]	0.02 [0.44]
Writedowns		-0.23** [-2.43]	
ADR	-0.01 [-1.21]	-0.01 [-1.11]	0.10 [1.04]
Leverage	-0.04 [-1.33]	-0.04 [-1.10]	-0.11 [-0.31]
Firm size	0.00** [2.59]	0.00 [1.55]	-0.01 [-0.68]
2006 stock return	0.03* [1.74]	0.03** [2.06]	-0.03 [-0.17]
Industry indicators	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes
N	296	296	239
χ^2 / Adj- R^2	128.6	136.3	0.17

^a Z-statistics based on robust standard errors clustered by country are reported in brackets. *, **, *** indicate significance at 10%, 5%, and 1% levels (two-tailed).

See Appendix B for variable definitions.

Table 6

Additional analysis examining the effect of equity capital raisings on firm survival during the crisis and firm performance over the long run

Panel A: Descriptive statistics on long run stock returns for firms that raised equity capital and firms matched on pre-capital raising performance

	N	Mean	Median	Std. dev.	p-value, diff. ^a
Delisting					
Firms that raised equity capital	57	0.02	0.00	0.13	0.05
Firms that did not raise equity capital	57	0.11	0.00	0.31	
Long term performance					
Firms that raised equity capital	57	-0.44	-0.48	0.37	0.65
Firms that did not raise equity capital	57	-0.40	-0.32	0.39	

Panel B: Regression of a dummy variable indicating delisting during the crisis or long term firm performance on equity capital raisings and control variables ^b

	Delisting (Logit Model) [Q1/2007-Q3/2008] (1)	Long term stock returns (OLS Model) [1 st day after equity capital raising -Q4/2009] (2)
Equity capital raising	-149.91* [-1.92]	-3.87 [-1.10]
ADR	1.68 [1.24]	0.11 [1.07]
Leverage	4.06 [0.69]	0.64 [1.09]
Firm size	-0.09 [-0.33]	-0.04 [-1.61]
2006 stock return	-5.86*** [-3.11]	0.00 [0.02]
Industry indicators	No	Yes
Country indicators	No	Yes
N	114	114
Pseudo R^2 / Adj- R^2	0.21	0.09

^a p -value based on a chi-square test for difference in proportion (for the delisting variable) and a t -statistic for difference in means (for the long-term performance variable).

^b Z -statistics based on robust standard errors clustered by country are reported in brackets. *, **, *** indicate significance at 10%, 5%, and 1% levels (two-tailed).

See Appendix B for variable definitions.

Table 7
Additional analysis on country-level governance

Panel A: Country-level governance variables

Country	Institutions	Antidirector rights
Australia	1.60	4
Austria	1.58	4
Belgium	1.35	2
Bermuda	1.06	.
Brazil	-0.07	5
Canada	1.62	4
Chile	1.12	5
China	-0.54	.
Cyprus	0.97	.
Denmark	1.82	4
Finland	1.92	4
France	1.21	5
Germany	1.51	4
Greece	0.66	3
Iceland	1.91	.
India	-0.11	4
Ireland	1.56	4
Italy	0.57	4
Liechtenstein	1.40	.
Luxembourg	1.73	.
Morocco	-0.25	.
Netherlands	1.62	4
Norway	1.70	4
Portugal	1.02	4
Russia	-0.74	.
Spain	0.92	6
Sweden	1.71	4
Switzerland	1.78	3
U.K.	1.55	5
U.S.	1.26	2

Table 7, continued**Panel B: Regression of stock returns during the crisis on country-level governance variables^a**

	(1)	(2)	(3)
Institutions	0.01 [0.19]		0.03 [0.51]
Antidirector rights		0.01 [0.80]	0.01 [0.83]
ADR	0.08 [1.24]	0.06 [0.78]	0.06 [0.76]
Leverage	-0.31 [-1.43]	-0.34 [-1.49]	-0.36 [-1.53]
Firm size	-0.04*** [-2.94]	-0.04*** [-3.37]	-0.04*** [-3.51]
2006 stock return	-0.00 [-0.01]	-0.05 [-0.27]	-0.04 [-0.26]
Industry indicators	Yes	Yes	Yes
Country indicators	No	No	No
N	296	282	282
Adj- R^2	0.15	0.15	0.15

^a Z-statistics based on robust standard errors clustered by country are reported in brackets.

*,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed).

See Appendix B for variable definitions.

Table 8
Sensitivity tests

Panel A: Analysis controlling for board size. Regression models with the dependent variable being stock returns from Q1/2007 to Q3/2008^{a, b}

	(1)	(2)	(3)
Board independence	-0.41** [-2.35]	-0.40** [-2.37]	-0.41** [-2.25]
Institutional ownership	-0.32*** [-4.47]	-0.32*** [-4.39]	-0.31*** [-4.13]
Large shareholder	-0.01 [-0.15]	-0.01 [-0.16]	-0.01 [-0.19]
Ln(Board size)	0.02 [0.14]		
Board size		-0.00 [-0.02]	
Board size between 7 and 11			-0.01 [-0.30]
Board size between 12 and 14			0.00 [1.36]
Board size between 15 and 31			-0.01 [-1.21]
ADR	0.09 [1.21]	0.09 [1.19]	0.06 [0.73]
Leverage	0.31** [2.08]	0.31** [2.06]	-0.26 [-0.81]
Firm size	-0.18 [-0.63]	-0.18 [-0.64]	-0.03 [-1.43]
2006 stock return	-0.03* [-1.70]	-0.03 [-1.68]	-0.03 [-0.18]
Industry indicators	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes
N	296	296	296
Adj-R ²	0.19	0.19	0.18

Table 8, continued

Panel B: Analyses controlling for additional board and ownership characteristics. Regression models with the dependent variable being stock returns from Q1/2007 to Q3-2008^b

	(1)	(2)	(3)	(4)	(5)
Board independence	-0.38** [-2.31]	-0.40** [-2.39]	-0.37** [-2.14]	-0.34** [-2.09]	-0.32* [-1.88]
Institutional ownership	-0.30*** [-4.15]	-0.29*** [-4.37]	-0.31*** [-4.18]	-0.29*** [-4.24]	-0.27*** [-4.23]
Large shareholder	-0.02 [-0.54]	-0.01 [-0.36]	-0.01 [-0.23]	-0.05 [-0.99]	-0.05 [-1.02]
Risk committee	-0.06 [-1.58]				-0.06 [-1.53]
Board financial expertise		-0.13 [-0.96]			-0.11 [-0.74]
CEO-chairman duality			0.04 [0.87]		0.03 [0.73]
Closely held shares				0.00 [0.80]	0.00 [0.76]
ADR	0.08 [1.00]	0.08 [1.04]	0.08 [1.03]	0.11 [1.62]	0.11 [1.45]
Leverage	-0.24 [-0.75]	-0.29 [-0.93]	-0.28 [-0.89]	-0.19 [-0.75]	-0.19 [-0.75]
Firm size	-0.03** [-2.28]	-0.03** [-2.18]	-0.03** [-2.20]	-0.03** [-2.45]	-0.02** [-2.17]
2006 stock return	-0.02 [-0.14]	-0.02 [-0.11]	-0.02 [-0.11]	-0.08 [-0.42]	-0.10 [-0.55]
Industry indicators	Yes	Yes	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes	Yes	Yes
N	296	296	296	280	280
Adj- R^2	0.19	0.19	0.19	0.18	0.18

Table 8, continued

Panel C: Analyses using alternative definitions of crisis periods or alternative measures of stock returns^b

	Alternative definition of crisis periods		Alternative measure of stock returns
	Stock returns [Q3/07 – Q3/08] (1)	Stock returns [Q3/07 – Q4/08] (2)	Abnormal stock returns [Q1/07 – Q3/08] (3)
Board independence	-0.31** [-2.33]	-0.44*** [-2.88]	-0.39** [-2.29]
Institutional ownership	-0.27*** [-3.64]	-0.19*** [-2.98]	-0.29*** [-3.71]
Large shareholder	-0.03 [-0.90]	-0.02 [-0.76]	-0.01 [-0.26]
ADR	0.07 [1.13]	0.07 [1.08]	0.08 [1.06]
Leverage	-0.28 [-1.10]	-0.40* [-1.91]	-0.27 [-0.86]
Firm size	-0.03** [-2.07]	-0.05*** [-5.07]	-0.03** [-2.25]
2006 stock return	0.03 [0.21]	-0.00 [-0.02]	-0.01 [-0.09]
Industry indicators	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes
N	294	294	296
Adj- R^2	0.17	0.23	0.19

^a Specification 3 in Panel A uses a spline regression based on the terciles 7-11, 12-14 and 15-31 of board size. Board size between 7 and 11 is defined to be board size if board size is between 7 and 11 and 11 otherwise. Board size between 12 and 14 is defined to be 0 if board size is between 7 and 11, board size -11 for board size between 12 and 14 and 14-11 otherwise. Board size between 15 and 31 is defined to be board size -14 if board size is between 15 and 31 and 0 otherwise.

^b Z-statistics based on robust standard errors clustered by country are reported in brackets. *, **, *** indicate significance at 10%, 5%, and 1% levels (two-tailed).

See Appendix B for variable definitions.

Appendix A
List of sample firms and countries

Company name	Country	Company name	Country
1 Areal Bank Ag	Germany	51 Banco Santander Sa	Spain
2 ABN AMRO Hldgs Nv	Netherlands	52 Bancorpsouth Inc	U.S.
3 Accredited Home Lenders Holding Co	U.S.	53 Banesto - Banco Espanol De Credito Sa	Spain
4 ACE Ltd	Switzerland	54 Bank of America Corp	U.S.
5 Adelaide Bank Ltd	Australia	55 Bank of Cyprus	Cyprus
6 Aegon Nv	Netherlands	56 Bank of Hawaii Corp	U.S.
7 Aetna Inc	U.S.	57 Bank of Ireland	Ireland
8 Aflac Inc	U.S.	58 Bank of Montreal	Canada
9 Alleanza Assicurazioni Spa	Italy	59 Bank of Nova Scotia	Canada
10 Allianz Se	Germany	60 Bank of Piraeus Sa	Greece
11 Allied Irish Banks	Ireland	61 Bank of Queensland	Australia
12 Allstate Corp	U.S.	62 Bankinter Sa	Spain
13 Alpha Bank A E	Greece	63 Bankunited Financial Corp	U.S.
14 Ambac Financial Group Inc	U.S.	64 Banque Cantonale De Geneve	Switzerland
15 American Equity Investment Life Holding	U.S.	65 Banque Nationale De Belgique	Belgium
16 American Financial Group Inc	U.S.	66 Barclays Plc	U.K.
17 American International Group (Aig) Inc	U.S.	67 Bayerische Hypo-Und Vereinsbank Ag	Germany
18 American National Insurance Co	U.S.	68 Bb&T Corp	U.S.
19 Ameriprise Financial Inc	U.S.	69 BBVA Sa	Spain
20 AMP Ltd	Australia	70 Bear Stearns Cos Inc	U.S.
21 Anglo Irish Bank Corp Plc	Ireland	71 Bendigo & Adelaide Bank Ltd	Australia
22 Aon Corp	U.S.	72 Berkshire Hathaway Inc	U.S.
23 Arch Capital Group	Bermuda	73 BHW Holding Ag	Germany
24 Associated Banc-Corp	U.S.	74 BNP Paribas	France
25 Assurances Generales De France-Agf	France	75 BOK Financial Corp	U.S.
26 Assurant Inc	U.S.	76 Canadian Imperial Bank of Commerce	Canada
27 Astoria Financial Corp	U.S.	77 Capital One Financial Corp	U.S.
28 Atebank	Greece	78 Capitalia Spa	Italy
29 Attijariwafa Bank	Morocco	79 Capitalsource Inc	U.S.
30 ANZ Group Ltd	Australia	80 Cattolica Assicurazioni Scarl	Italy
31 Aviva	U.K.	81 Challenger Financial Services Group	Australia
32 AXA	France	82 Charles Schwab Corp	U.S.
33 AXA Asia Pacific Hldgs Ltd	Australia	83 China Life Insurance Co Ltd	China
34 Axis Bank Ltd	India	84 Chubb Corp	U.S.
35 Axis Capital Holdings Ltd	Bermuda	85 Cigna Corp	U.S.
36 Baloise-Holding Ag	Switzerland	86 Cincinnati Financial Corp	U.S.
37 Banca Cr Firenze Spa	Italy	87 CIT Group Inc	U.S.
38 Banca Italease Spa	Italy	88 Citigroup Inc	U.S.
39 Banca Mps	Italy	89 Citizens Republic Bancorp Inc	U.S.
40 Banca Popolare Dell'emilia Romagna Scarl	Italy	90 City National Corp	U.S.
41 Banca Popolare Di Milano	Italy	91 CNA Financial Corp	U.S.
42 Banca Popolare Di Sondrio Scarl	Italy	92 CNP Assurances	France
43 Banco Bpi Sa	Portugal	93 Colonial Bancgroup Inc	U.S.
44 Banco Comercial Portugues Sa	Portugal	94 Comerica Inc	U.S.
45 Banco Espirito Santo Sa	Portugal	95 Commerce Bancorp Inc	U.S.
46 Banco Guipuzcoano Sa	Spain	96 Commerce Bancshares Inc	U.S.
47 Banco Pastor Sa	Spain	97 Commerzbank Ag	Germany
48 Banco Popular Espanol Sa	Spain	98 Commonwealth Bank of Australia	Australia
49 Banco Sabadell Sa	Spain	99 Compass Bancshares Inc	U.S.
50 Banco Santander Chile	Chile	100 Consecro Inc	U.S.

Appendix A, continued

Company name	Country	Company name	Country
101 Corus Bankshares Inc	U.S.	151 Hudson City Bancorp Inc	U.S.
102 Countrywide Financial Corp	U.S.	152 Humana Inc	U.S.
103 Credem - Credito Emiliano Spa	Italy	153 Huntington Bancshares Inc	U.S.
104 Credit Agricole Sa	France	154 Hypo Real Estate Holding Ag	Germany
105 Credit Industriel Et Commercial	France	155 ICAP Plc	U.K.
106 Credit Suisse Group	Switzerland	156 ICICI Bank	India
107 Credito Bergamasco Spa	Italy	157 IKB Deutsche Industriebank Ag	Germany
108 Cullen Frost Bankers Inc	U.S.	158 Ind. Alliance Ins. and Fin. Services Inc	Canada
109 Danske Bank A/S	Denmark	159 Indymac Bancorp Inc	U.S.
110 Depfa Bank Plc	Ireland	160 ING Groep Nv	Netherlands
111 Deutsche Bank Ag	Germany	161 Insurance Australia Group Ltd	Australia
112 Deutsche Postbank Ag	Germany	162 International Bancshares Corp	U.S.
113 Dexia Sa	Belgium	163 Intesa Sanpaolo Spa	Italy
114 DnB Nor ASA	Norway	164 Investec Plc	U.K.
115 Downey Financial Corp	U.S.	165 Irish Life & Permanent Group Holdings	Ireland
116 E*Trade Financial Corp	U.S.	166 Itau Unibanco Holding Sa	Brazil
117 East West Bancorp Inc	U.S.	167 Jefferies Group Inc	U.S.
118 Efg Eurobank Ergasias Sa	Greece	168 JPMorgan Chase & Co	U.S.
119 Efg International	Switzerland	169 Jyske Bank A/S	Denmark
120 Emporiki Bank of Greece Sa	Greece	170 Kaupthing Bank Hf	Iceland
121 Ergo Versicherungsgruppe Ag	Germany	171 KBC Group Nv	Belgium
122 Erste Group Bank Ag	Austria	172 Keycorp	U.S.
123 Espirito Santo Financial Group Sa	Luxembourg	173 Kolnische Ruckversich. Gesellschaft	Germany
124 EuroHypo	Germany	174 Landesbank Berlin Hldg Ag	Germany
125 Everest Re Group Ltd	Bermuda	175 Landsbanki Islands Hf	Iceland
126 Fairfax Financial Holdings Ltd	Canada	176 Laurentian Bank of Canada	Canada
127 FBL Financial Group Inc	U.S.	177 Legal & General Group Plc	U.K.
128 Federal Home Loan Mortgage Corp	U.S.	178 Lehman Brothers Holdings Inc	U.S.
129 Federal National Mortgage Association	U.S.	179 Liechtenstein Landesbank Ag	Liechtenstein
130 Fifth Third Bancorp	U.S.	180 Lincoln National Corp	U.S.
131 First Citizens Bancshares Inc	U.S.	181 Lloyds Banking Group Plc	U.K.
132 First Horizon National Corp	U.S.	182 Loews Corp	U.S.
133 Firstmerit Corp	U.S.	183 M & T Bank Corp	U.S.
134 Flagstar Bancorp	U.S.	184 Macquarie Bank Ltd	Australia
135 Fondiaria-Sai	Italy	185 Maf Bancorp Inc	U.S.
136 Fortis	Netherlands	186 Manulife Financial Corp	Canada
137 Fremont General Corp	U.S.	187 Mapfre Sa	Spain
138 Friends Provident Group Plc	U.K.	188 Marfin Popular Bank Public Co Ltd	Cyprus
139 Fulton Financial Corp	U.S.	189 Markel Corp	U.S.
140 GAM Holding Ag	Switzerland	190 Marsh & McLennan Cos Inc	U.S.
141 Generali Assicurazioni Spa	Italy	191 Marshall & Ilsley Corp	U.S.
142 Generali Deutschland Holding Ag	Germany	192 MBIA Inc	U.S.
143 Genworth Financial Inc	U.S.	193 Mediobanca Spa	Italy
144 Goldman Sachs Group Inc	U.S.	194 Mediolanum Spa	Italy
145 Great American Financial Resources Inc	U.S.	195 Mellon Financial Corp	U.S.
146 Hannover Rueckversicherungs Ag	Germany	196 Mercantile Bankshares Corp	U.S.
147 Hartford Financial Services Group Inc	U.S.	197 Merrill Lynch & Co Inc	U.S.
148 Helvetia Holding Ag	Switzerland	198 Metlife Inc	U.S.
149 HSBC Hldgs	U.K.	199 Morgan Stanley	U.S.
150 HSBC Trinkaus & Burkhardt Ag	Germany	200 Munchener Ruckversicherungs Ag	Germany

Appendix A, continued

Company name	Country	Company name	Country
201 National Australia Bank Ltd	Australia	251 Storebrand Asa	Norway
202 National Bank of Canada	Canada	252 Sun Life Financial Inc	Canada
203 National Bank of Greece Sa	Greece	253 Suncorp-Metway Ltd	Australia
204 National City Corp	U.S.	254 Suntrust Banks Inc	U.S.
205 Nationwide Financial Services Inc	U.S.	255 Svenska Handelsbanken Ab	Sweden
206 Natixis	France	256 Swedbank Ab	Sweden
207 Neue Aargauer Bank Ag	Switzerland	257 Swiss Life Holding Ag	Switzerland
208 New York Community Bancorp Inc	U.S.	258 Swiss Reinsurance Co	Switzerland
209 Nordea Bank Ab	Sweden	259 Sydbank	Denmark
210 Northern Trust Corp	U.S.	260 Synovus Financial Corp	U.S.
211 Nummerer Beteiligungs-Ag	Germany	261 TCF Financial	U.S.
212 Old Mutual Plc	U.K.	262 TD Ameritrade Holdings	U.S.
213 Old Republic International Corp	U.S.	263 TD Banknorth Inc	U.S.
214 Paragon Group of Companies Plc	U.K.	264 The Travelers Companies Inc	U.S.
215 Partnerre Ltd	Bermuda	265 Torchmark Corp	U.S.
216 Phoenix Companies Inc	U.S.	266 Toronto-Dominion Bank	Canada
217 Pnc Financial Services Group	U.S.	267 Transatlantic Hldgs Inc	U.S.
218 Power Corp of Canada	Canada	268 Tt Hellenic Postbank Sa	Greece
219 Power Financial Corp	Canada	269 Tullett Prebon Plc	U.K.
220 Principal Financial Group Inc	U.S.	270 UBS Ag	Switzerland
221 Progressive Corp	U.S.	271 Ucbh Holdings Inc	U.S.
222 Protective Life Corp	U.S.	272 Unibanco Union of Brazilian Banks Sa	Brazil
223 Prudential Financial Inc	U.S.	273 Unicredit Spa	Italy
224 Prudential Plc	U.K.	274 Union Bancal Corp	U.S.
225 QBE Insurance Group	Australia	275 Unione Di Banche Italiane Scpa	Italy
226 Raiffeisen International Bank Holding Ag	Austria	276 Unipol Gruppo Finanziario Spa	Italy
227 Raymond James Financial Inc	U.S.	277 Unitedhealth Group Inc	U.S.
228 Regions Financial Corp	U.S.	278 Unum Group	U.S.
229 Reinsurance Group of America	U.S.	279 US Bancorp	U.S.
230 Royal Bank of Canada	Canada	280 Valiant Holding Ag	Switzerland
231 Royal Bank of Scotland Group Plc	U.K.	281 Valley National Bancorp	U.S.
232 Rsa Insurance Group Plc	U.K.	282 Van Lanschot Nv	Netherlands
233 Safeco Corp	U.S.	283 Vontobel Hldgs Ag Zurich	Switzerland
234 Sampo Oyj	Finland	284 W.R. Berkley Corp	U.S.
235 Sberbank	Russia	285 Wachovia Corp	U.S.
236 SCOR	France	286 Washington Mutual Inc	U.S.
237 SCOR Holding Switzerland Ag	Switzerland	287 Webster Financial Corp	U.S.
238 Scottish Re Group Ltd	Bermuda	288 Wellpoint Inc	U.S.
239 Skandinaviska Enskilda Banken	Sweden	289 Wells Fargo & Co	U.S.
240 SLM Corp	U.S.	290 Westpac Banking Corp	Australia
241 SNS Reaal Groep Nv	Netherlands	291 White Mountains Insurance Group Ltd	U.S.
242 Societe Generale	France	292 Whitney Hldg Corp	U.S.
243 South Financial Group Inc	U.S.	293 Wilmington Trust Corp	U.S.
244 Sovereign Bancorp	U.S.	294 Wustenrot & Wurttembergische Ag	Germany
245 St George Bank Ltd	Australia	295 Zions Bancorp	U.S.
246 St. James's Place Plc	U.K.	296 Zurich Financial Services Ltd	Switzerland
247 Stancorp Financial Group	U.S.		
248 Standard Chartered Plc	U.K.		
249 Standard Life Plc	U.K.		
250 State Street Corp	U.S.		

Appendix B
Variable definitions

Variables	Definitions	Measurement period	Data sources
<i>Firm performance</i>			
Stock returns	Buy-and-hold stock returns	January 2007 to September 2008 or the date on which the firm was delisted, whichever is earlier	Datastream
Writedowns	Cumulative accounting writedowns scaled by total assets	January 2007 to September 2008	Bloomberg/Compustat
<i>Governance</i>			
Board independence	Percentage of directors whose primary affiliation is not with the firm	December 2006	BoardEx
Institutional ownership	Percentage of shares owned by institutional investors	December 2006	FacSet/ Lionshares
Large shareholder	A dummy variable equal to 1 if a firm has a large owner with direct and indirect voting rights greater than 10%, and 0 otherwise	December 2006	Bureau van Dijk
<i>Risk-taking and capital raising</i>			
EDF	Expected Default Frequency	December 2006	Moody's KMV
Volatility	Standard deviation of weekly stock returns	January 2004 to December 2006	Datastream
Equity capital raising	Equity capital raised scaled by total assets	Q1/2007 – Q3/2008	SDC
Abnormal returns around equity offering announcements	Stock returns adjusted for the return on the MSCI World index	[-1,+1] trading days with day 0 being the filing date reported in SDC	Datastream
Abnormal change in CDS spread around equity offering announcements	Change in credit default swaps (CDS) spread adjusted for the change in spread on a CDS index comprising of global universe of CDS	[-1,+1] trading days with day 0 being the filing date reported in SDC	Datastream
<i>Country-level governance</i>			
Institutions	An average of six governance indicators: (1) voice & accountability, (2) political stability & absence of violence, (3) government effectiveness, (4) regulatory quality, (5) rule of law, and (6) control of corruption	2006	Kaufmann et al. (2009)
Antidirector rights	The corrected antidirector rights index by Spamann	2005	Spamann (2010)

Appendix B, continued

Controls			
ADR	A dummy variable indicating whether a firm is cross-listed on U.S. stock exchanges	December 2006	CRSP
Leverage	Total liabilities divided by total assets	December 2006	Compustat
Firm size	Natural logarithm of total assets (in US \$million)	December 2006	Compustat
2006 stock return	Buy-and-hold stock returns	January 2006 – December 2006	Datastream
Others			
Return on assets	Net income divided by total assets	December 2006	Compustat
Asset growth	One-year growth in total assets	2005- 2006	Compustat
Delisting	A dummy variable indicating whether a firm delisted	January 2007 to September 2008	BoardEx
Board size	The number of board members	December 2006	BoardEx
Risk committee	A dummy variable indicating whether the firm has a risk committee	December 2006	BoardEx
Board financial expertise	Percentage of nonexecutive directors that either has a CFA/CPA or has worked in an accounting or finance function (e.g., CFO, fund manager, accountant, auditor)	December 2006	BoardEx
CEO–chairman duality	A dummy variable indicating whether the CEO also serves as the chairman of the board	December 2006	BoardEx
Closely held shares	Percentage of shares owned by insiders	December 2006	Worldscope
Abnormal returns	Stock returns minus expected returns based on a market model using the MSCI World index as the market index estimated over January 2004 to December 2006.	Q1/2007 – Q3/2008	Datastream
