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

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Abstract

This paper investigates the role of corporate governance in the 2007-2008 credit crisis, using a unique dataset of 306 financial firms from 31 countries that were at the center of the crisis. We find that firms with more independent boards and greater institutional ownership were not only more likely to replace their CEO for poor performance, but also performed worse during the crisis period. A potential explanation for the latter finding is that before the crisis boards and shareholders have encouraged managers to increase shareholder returns through aggressive risk-taking. However, we find little support for this explanation. Instead, we find evidence consistent with boards inadvertently encouraging aggressive risk-taking by the compensation contracts that they endorsed. In particular, we find that firms with CEO compensation contracts that focus on annual bonuses as opposed to long-term compensation performed worse during the crisis. Overall, our results suggest that a lack of understanding about firms' investment policies among independent board members, combined with executive compensation contracts that focused too much on short-term results has contributed to the financial crisis.

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1. Introduction

An unprecedented large number of financial institutions have collapsed or were bailed out by governments worldwide since the onset of the global financial crisis in 2007.[1] Many observers attribute these events to lax oversight by boards and investors (Kirkpatrick 2008, Schapiro, 2009). However, while governance reforms are being considered to restore the stability of global financial systems, there is little empirical evidence on the role that corporate governance has played in the financial crisis.[2] The purpose of this paper is to provide this empirical evidence.

We investigate the role of corporate governance in the financial crisis using a unique dataset comprising of 306 of the world's largest financial firms across 31 countries, for which we collect data on CEOs, board characteristics, ownership structure, firm performance, and risk-taking. An intriguing finding of our empirical examination is that while boards and shareholders have executed their monitoring role by replacing poorly performing CEOs during the crisis, they also seem to have encouraged investments in subprime mortgage related assets that led to large losses during the crisis. In particular, we find that firms with more independent boards and greater institutional ownership were not only more likely to replace their CEO for poor performance, but also experienced greater writedowns and worse stock returns during the crisis period.

A potential explanation for the latter finding is that boards and shareholders have encouraged managers to increase shareholder returns through aggressive risk-taking. We find mixed support for this explanation. In particular, we find that while institutional ownership is positively associated with both pre-crisis performance and risk-taking, board independence is positively

[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).

[2] See "SEC to examine boards' role in financial crisis" (*Washington Post*, February 20, 2009), "Fed chief calls for scrutiny of executive pay policies" (*New York Times*, March 21, 2009)

associated with pre-crisis performance, but negatively associated with pre-crisis risk-taking. Thus, our findings are inconsistent with boards actively encouraging managers to take more risk in their investment policies, but consistent with the view that boards have pushed managers for higher shareholder returns without questioning why such higher returns were possible for supposedly safe investment strategies (Schapiro, 2009).

Although our findings are not consistent with boards actively encouraging managers to take more risk, it is possible that they inadvertently encouraged aggressive risk-taking by the compensation contracts that they endorsed. Critics of pay practices at financial institutions have argued that executive compensation contracts with an emphasis on annual bonuses have encouraged managers to focus on short-term results and ignore the potential long-term consequences of their investment strategies.[3] Consistent with this view, we find that firms with CEO compensation contracts that focus on annual bonuses as opposed to long-term compensation (e.g., LTIP plans, stock options) performed worse during the crisis.

We also examine whether losses during the crisis had negative repercussions for independent board members. Consistent with independent directors being held accountable for the losses, we find that independent directors at firms that experienced larger losses were more likely to leave their boards, especially when they were responsible for overseeing risk management. In addition, consistent with institutional investors playing a disciplinary role in director turnover, we find that the director turnover-performance sensitivity is higher for firms with greater institutional ownership.

Our paper adds to the current debate on the regulatory reform of financial institutions and contributes to the literature on corporate governance. First, we contribute to the current debate

[3] See "The bonus racket" (*Economist*, January 29, 2009) and "Reforming remuneration practices in financial services" (Financial Service Authority, 2009)

by providing a timely and comprehensive investigation of the 2007-2008 financial crisis. To our knowledge, our study is the first that examines the role of corporate boards, institutional investors, and CEO pay structures in the financial crisis using a global sample. Furthermore, we take a broader view on the role of corporate governance in the financial crisis than other concurrent papers by investigating various aspects of the crisis including CEO turnover and shareholder losses during the crisis, and performance and risk-taking prior to the crisis. For example, Beltratti and Stulz (2009) use a sample of 98 banks from 20 countries, but examine only how governance indices and bank regulation relate to bank performance during the crisis. While some of our findings have been documented in prior studies, such as the effect of board independence on turnover-performance sensitivity, it is unclear whether the existing evidence can be applied to a crisis environment spanning the entire globe.[4] Given that the crisis is a momentous economic event of great public interest (Gorton, 2008), it is important to provide a comprehensive analysis on the role of corporate governance.

Second, our study adds to prior studies on the influence of corporate governance on risk-taking. Prior literature has examined the impact of large shareholders and managerial ownership on risk-taking by banks (Laeven and Levine, 2008). We complement this literature by finding that independent boards and institutional investors also significantly affect risk-taking by financial institutions. In addition, prior studies have examined how compensation contracts can serve as a commitment device to minimize the agency costs of debt (Houston and James, 1993; Hubbard and Palia, 1994; John, Sounders, and Senbet, 2000; John and Qian, 2003). These studies find that the optimal compensation structure in highly leveraged firms has lower pay-

[4] There is a wide variation in CEO turnover rates across countries during the crisis. Examples of CEO turnover include Citigroup, Merrill Lynch, and Wachovia (in the U.S.), UBS (in Switzerland), and IKB Deutsche Industriebank (in Germany). However, CEOs of many other firms suffering substantial losses maintained their positions. See Hall of shame" (*The Economist*, August 7, 2008).

performance sensitivity to restrain risk-shifting incentives of managers. We add to these studies by providing evidence suggesting that a lack of understanding among independent board members of a firm's investment opportunity set combined with compensation contracts with a heavy focus on short-term bonuses induces managers to maximize short-term results through aggressive risk-taking.

The remainder of the study proceeds as follows. Section 2 describes our data. Section 3 presents our main results. Section 4 extends our main results. Section 5 provides additional analyses, and section 6 concludes our study.

2. Sample and Data Description

2.1 Time line

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 were initiated from October 2008 onwards, therefore we examine CEO turnover over the prior period in which it is driven mostly by internal corporate governance mechanisms.[5] (2) In October 2008, changes in the International Financial Reporting Standards (IFRS) allowed financial institutions to avoid recognizing asset writedowns.[6] (3) At

[5] For example, the Troubled Asset Relief Program (TARP) was signed in October 2008. In some cases, governments insist on changes in top management as a condition for a company to receive a government bailout. See "RBS chiefs to be forced out under bailout deal" (*Telegraph*, October 8, 2008).

[6] 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.

the end of the third quarter of 2008, regulators in several countries imposed short-selling bans on the stocks of many financial institutions.

2.2 Sample of financial firms

Our sample consists of 306 publicly-listed financial firms (banks, brokerage firms, and insurance companies) that were publicly listed at the end of December 2006 across 31 countries. We use the following criteria to compile our sample. First, we require firms to be covered in the *Compustat/CRSP (North America)* or *Compustat Global* databases and have data on total assets, total shareholder's equity, earnings, and stock returns. Second, we limit our sample to firms that are covered by the *BoardEx* database. Third, we restrict our sample to financial industries (e.g., banks, insurance companies) for which Bloomberg collected data on writedowns and capital raisings during the crisis period. Fourth, we restrict our sample to firms with total assets greater than US $10 billion because most of the debate focuses on large global financial institutions.[7]

2.3 Main variables

Measuring CEO turnover

We use biographic information on individual executives from *BoardEx* to determine the identity of the CEO for each firm. *BoardEx* contains detailed biographic information on individual executives and board members of approximately 12,000 publicly listed firms in nearly 50 countries and its coverage for international firms is unparalleled by any other data provider. Following DeFond and Hung (2004) and Fernandes, Ferreira, Matos, and Murphy (2008), we use the term "CEO" (Chief Executive Officer) to refer to the top executive of financial institutions, even though firms in some countries tend to use other titles (such as "managing director" or "chairman of the management board"). To ensure that we selected the top executive for each

[7] This restriction also ensures that we do not miscode small firms with material writedowns as not having writedowns because Bloomberg limits its coverage to firms with cumulative writedowns exceeding US $100 million.

firm, we verified the data in *BoardEx* using annual reports and other company reports obtained from *Mergent Online*.

We code a firm as having experienced CEO turnover if the top executive left the firm during the period January 2007 to December 2008.[8,9] We exclude 21 cases in which the CEO remained at the firm until the firm delisted, because it is not clear whether these observations should be coded as turnover or non-turnover cases. Thus our final sample for the CEO turnover tests consists of 285 financial firms.

Figure 1 plots the CEO turnover rates for financial versus non-financial firms from 2004-2008 worldwide. It shows that financial firms exhibited higher CEO turnover rates than those of non-financial firms in the 2007-2008 crisis period, while in the 2004-2006 period the pattern was the opposite. While not tabulated, our data also suggest a wide cross-country variation in CEO turnover rates. For example, six CEOs of the top ten financial firms (in terms of assets) in the U.S. were replaced during the sample period – namely, the CEOs of Citigroup, AIG, Fannie Mae, Merrill Lynch, Freddie Mac, and Wachovia. In contrast, there is no recorded CEO turnover among the top ten firms in France during this period.

Measuring shareholder losses

A unique feature of our setting is that shareholder losses of financial firms are well publicized during the crisis period. We use three variables to capture losses: (1) cumulative writedowns scaled by total assets, (2) capital raisings, a dummy variable that equals 1 when a firm raised new capital (including both equity and debt securities), and 0 otherwise, and (3) cumulative stock returns. For the CEO turnover analysis, we measure these variables from the

[8] We extend the period in which we measure CEO replacements to the end of 2008 because there may be a lag between the announcement of accounting writedowns and CEO turnover.

[9] We use executive departures as an indicator of CEO turnover, instead of CEO role changes, because we believe this to be a less ambiguous measure of forced turnover. In fact, 73% of the executives that lost the top positions also left the firm during our measurement period.

first quarter of 2007 until the earlier of the quarter in which the CEO leaves the firm, or the third quarter of 2008. For the test on shareholder losses, we measure these variables from the first quarter of 2007 until the third quarter of 2008. Our data source for writedowns and capital raisings is the Bloomberg WDCI menu and it covers financial firms, namely banks, brokers, insurance companies, and government sponsored entities (Freddie Mac and Fannie Mae). Bloomberg collects the writedown data from regulatory filings, news articles, and company press releases (such as quarterly earnings announcements). We measure writedowns as negative figures so that the coefficients on this variable in our regressions can be compared to those on stock returns. Data on stock returns are from *Compustat Global* and *CRSP*.

Figure 2 plots the magnitude of writedowns (in US $billions) per quarter for all financial firms covered in Bloomberg. We break down 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).[10] 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 investment in other firms (such as in Lehman Brothers or in Icelandic banks). It also shows a steady increase in

[10] 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 third 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 2, 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 2 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.

credit losses related to loan portfolios from the second quarter of 2007 to the third quarter of 2008.

There are advantages and disadvantages to the use of each of the loss measures. Writedowns are potentially a direct measure of how severe the crisis has impacted firms, but is imperfect, because managers have discretion over how much they recognize in a period. Stock returns are a better measure in this respect as they capture the full extent to which the market believes the crisis has impacted shareholders. Unfortunately, stock returns have the disadvantage that they include expectations of future events (such as government intervention) that may disguise the true cost of the crisis. Capital raisings are a good proxy for the extent of losses, in that the firm had a need to raise distressed capital. However, for these security issues to be successful new investors need to have confidence in a firm and therefore only firms with good prospects will successfully raise capital. Consequently, capital raisings could be a sign of limited (but not insurmountable) losses. Given the pros and cons of each measure we conduct our analysis using all three measures.

Measuring corporate governance

We focus in 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).

For boards of directors, we focus on board independence because this is one of the most extensively studied board characteristics (Weisbach, 1988; Denis and McConnell, 2003).[11] We define *Board independence* as the percentage of independent directors. Using *BoardEx* data, we

[11] While board size is another commonly studied board characteristic, we do not focus on this measure because board sizes differ considerably for regulatory reasons around the world. For example, board sizes are generally larger in Germany because firms are required to have a two-tiered board structure.

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 insider ownership because prior studies suggest that they serve important disciplining and monitoring roles (Denis and McConnell, 2003; 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 *FactSet/Lionshares* (Ferreira and Matos, 2008). We measure *Insider ownership* as the percentage of "closely held" shares in the hands of shareholders who hold over 5% of shares using *Datastream/Worldscope* (Dahlquist, Pinkowitz, Stulz, and Williamson, 2003).

2.4 Summary statistics

Table 1 presents summary descriptive statistics by country. It shows that the sample of 306 firms is relatively balanced between U.S. (125) and European (137) firms, and also reports a few firms from other regions. In addition, the panel reports the frequency of CEO and director turnover, as well as average shareholder losses during the crisis period for our full sample. It shows that approximately 24% of our sample firms experienced CEO turnover. It also reports that both U.S. and European firms were significantly affected by writedowns, although the average losses were substantially higher in the U.S. (at 4% of assets) than in Europe (only 1% of assets, on average). In addition, Table 1 shows that firms in both regions had to resort to capital raisings and that a large decrease in share prices affected financial firms in the U.S. (-32%) and Europe (-33%). Finally, the table presents sample averages of the governance variables per country. Consistent with Adams and Mehran (2003) and Adams (2009), 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. In Europe, board independence is generally lower. The table also shows that while U.S. and Canadian firms tend to have high institutional ownership and low insider ownership, continental European firms tend to have low institutional ownership and high insider ownership.

Panel A of Table 2 shows descriptive statistics for variables used in our main analysis. Panel B of Table 2 reports the correlation matrix. The panel shows that our three proxies of shareholder losses are all significantly correlated with each other. For example, stock returns are positively associated with writedowns and negatively associated with the need to raise capital during the crisis period. Panel C of Table 2 provides univariate tests of differences in average shareholder losses between financial firms that experienced CEO turnover and those that did not. Although there is no difference in average stock returns, firms with CEO turnover have more writedowns and capital raising activities than firms without CEO turnover. This finding is consistent with prior literature that finds an inverse relation between performance and CEO turnover (Barro and Barro, 1990; Houston and James, 1995; Hubbard and Palia, 1995).

3. Main Analysis

3.1 Corporate governance and the termination of poorly performing CEOs during the crisis period

We start our analysis by examining the influence of corporate governance on CEO turnover during the crisis, because the most striking action that boards can take is the decision to remove a poorly performing CEO, and therefore CEO turnover is an important indicator of the extent to which corporate boards and shareholders have performed their monitoring role during the crisis period (Weisbach, 1988). Based on prior literature we estimate the following logit model to

examine the influence of corporate governance on CEO turnover (Weisbach, 1988; Lel and Miller, 2008):

$$\begin{aligned} \textit{CEO turnover} = {} & \alpha_0 + \beta_1 (\textit{Shareholder losses}) + \beta_2 (\textit{Corporate governance}) + \\ & \beta_3 (\textit{Shareholder losses} * \textit{Corporate governance}) + \\ & \beta_4 (\textit{Firm size}) + \beta_5 (\textit{Age dummy}) + \varepsilon \end{aligned} \qquad (1)$$

The dependent variable is a dummy variable equal to 1 if the CEO left the firm from January 2007 to December 2008 (i.e. during the crisis period). We use three variables to proxy for shareholder losses: cumulative writedowns, capital raisings, and cumulative stock returns. These are all measured from the first quarter of 2007 until the earlier of the quarter of the CEO's departure or the third quarter of 2008 (the end of the sample period).[12] We measure the corporate governance factors as of December 2006, i.e. just prior to the start of our sample period. We include controls for firm size (natural log of total assets) and CEO age (a dummy variable equal to 1 when the executive is 60 years and older, and 0 otherwise). In addition, we include dummy variables indicating country and industry membership (3-digit SIC) to ensure that our results are not driven by unobservable country and industry fixed effects. Finally, we use robust standard errors clustered by country in all our regression specifications.

Our main variables of interest are the interactions between shareholder losses and corporate governance. Because of the problems with interpreting interaction terms in non-linear models described by Ai and Norton (2003), we compute the corrected marginal effect for every observation and then report the average interactive effect and its significance.

[12] We use a different accumulation window for shareholder losses for each firm with CEO turnover because using the same accumulation window across all firms (from January 2007 to September 2008) would bias our results towards finding support for the prediction that corporate governance helps discipline poorly performing CEOs. This is because incoming CEOs are likely to be more aggressive with recognizing writedowns, right after they assume their new position.

Prior literature finds that CEO turnover is more sensitive to performance for firms with greater board independence (Weisbach, 1988) and larger institutional ownership (Parrino, Sias and Starks, 2003), but less sensitive to performance for firms with larger insider ownership (Volpin, 2002). This is because independent boards and institutional investors should focus on shareholder returns and be more willing to challenge the CEO in light of company losses, and remove the CEO if necessary. Institutional investors can exercise their influence on corporate decisions through direct activism (Gillan and Starks, 2007) or indirect discipline by "voting with their feet" (Parrino, Sias and Starks, 2003). In contrast, insider blockholders likely enjoy large private benefits of control, participate in management, or make top managers more entrenched (LaPorta, Lopez-de-Silanes, and Shleifer, 1999; Denis and McConnell, 2003). For example, Volpin (2002) finds that top management turnover-performance sensitivity is the lowest when control is in the hands of one shareholder.

If boards and shareholders failed to perform their monitoring role, as suggested by some observers, we expect to find that board independence and institutional ownership have no influence on the relation between CEO turnover and performance. Thus in this case we would expect the average interactive effects to be insignificant. However, if corporate governance was not broken at these institutions, we expect that the turnover-performance sensitivity is higher for firms with more independent boards and higher institutional ownership (Weisbach, 1988; Parrino, Sias and Starks, 2003).

Table 3 presents the results on the CEO turnover-performance analysis. For the sake of clarity, we include the predicted signs of the interactive effects between losses and corporate governance based on prior literature. Columns (1)-(3) show the baseline regression without interaction terms between shareholder losses and the governance factors. The results show that

out of our three shareholder loss measures only the writedown measure is associated with an increased probability of CEO turnover. This suggests that writedowns were linked to CEO dismissals irrespective of the corporate governance mechanisms in place.

Columns (4)-(6) show the regression models including interaction terms between shareholder losses and board independence. The average interactive effects between shareholder losses and board independence in columns (5) and (6) are significant and in the predicted direction, suggesting that more outsider-dominated boards fulfilled their duty of replacing management for poor performance as measured by the need to raise external capital and the loss in market value during the crisis.

We next examine the role of ownership. Columns (7)-(9) of Table 3 show the regression models including interaction terms between shareholder losses and institutional ownership, whereas columns (10)-(12) show the models with interaction terms between shareholder losses and insider ownership. The average interactive effect is negative and significant in column (9), suggesting that CEO turnover is more sensitive to stock returns for firms with larger institutional ownership. In contrast, the average interactive effect is positive and significant in column (10), suggesting that CEO turnover is less sensitive to writedowns for firms with larger insider ownership.

In summary, our CEO turnover analysis finds results consistent with boards and shareholders performing their monitoring role with respect to the replacement of poorly performing CEOs during the crisis period. These findings are in line with prior studies using different samples and based on non-crisis periods – such as Weisbach (1988) for the U.S., Renneboog (2000) for Belgium, and Dahya, McConnell, and Travlos (2002) for the U.K. Thus our CEO turnover

results are inconsistent with the view that corporate governance was broken at financial institutions.

3.2 Governance factors and the level of losses during the crisis

We examine whether firms with strong external monitoring performed better or worse during the crisis by estimating the following OLS model:

$$Shareholder\ losses = \alpha_0 + \beta_1(Corporate\ governance) + \beta_2(Firm\ size) + \varepsilon \qquad (2)$$

We use two proxies for the shareholder losses during the crisis period: (1) writedowns, and (2) stock returns.[13] In contrast to our CEO turnover tests, we now measure cumulative shareholder losses from the first quarter of 2007 until the third quarter of 2008 for all firms in our sample. As in our previous analysis, we control for firm size and include country and industry dummies.

Table 4 shows the results of regressing losses incurred during the crisis on the corporate governance factors. Inconsistent with a lack of monitoring by boards and shareholders having contributed to the crisis, we find that board independence and institutional ownership are associated with larger shareholder losses during the crisis, for both in terms of larger writedowns and for institutional investors also in terms of stock returns. Therefore, not only our turnover results, but also our results with respect to losses incurred during the crisis do not support the view that boards and shareholders at financial institutions have insufficiently monitored management. However, it remains unclear why firms subject to stronger external monitoring performed worse during the crisis. Next, we explore this issue further.

[13] We do not include capital raisings as a measure of shareholder losses in this test because the effect is ambiguous. While the need to raise capital is an indication of significant shareholder losses during the crisis period, a significantly positive coefficient on corporate governance can also be interpreted as boards or investors providing a monitoring role by pushing firms to line up financing to prepare for the credit crunch.

4. Exploring Causes of Shareholder Losses during Crisis

4.1. Performance and risk-taking before the crisis

Finding that shareholder losses are larger for firms with more independent boards and institutional ownership could suggest that boards and shareholders encouraged managers to increase shareholder returns by taking more risk. 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 2008). One implication from this literature is that external monitoring by boards and shareholders will alleviate this problem and increase risk-taking.[14]

If shareholders and boards have encouraged managers to increase shareholder returns through aggressive risk-taking, we expect firms with stronger external monitoring by boards and shareholders to not only have performed better before the onset of the crisis, but also to have taken more observable risk before the crisis.

We examine this conjecture by examining the association between our corporate governance factors and measures of performance and risk-taking before the crisis. We use the following two measures of performance: (1) a firm's average return on assets (ROA) over the period 2004-2006, and (2) cumulative stock returns over the period 2004-2006.

We use the following two proxies of risk-taking: equity-to-assets ratio and expected default frequency, both measured as of December 2006 (i.e., prior to the crisis period). Our first measure, equity-to-assets ratio, is inversely related to leverage and equals book value of equity divided by total assets. This measure represents for banks the capital adequacy ratio, which is regulated and has been used by Laeven and Levine (2008) and others to capture banks' risk-

[14] 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)

taking. It is also a key issue in the current debate on regulatory reform of financial institutions and is relatively easy for independent directors and outside investors to monitor.[15] Our second measure of risk-taking, a firm's default probability (Expected Default Frequency or EDF), was computed by Moody's KMV CreditMonitor implementation of Merton's (1974) structural model. This measure uses equity market information to estimate the probability that a firm will default within one year, which in Moody's KMV scale by construction ranges from 0.01% to 35%.[16] Following Covitz and Downing (2007), we use the log of EDF in our analysis. EDF is a forward looking measure but it is subject to the criticism that the market may have underestimated the extent of mortgage and subprime risks taken by financial firms before the crisis as evidenced by the sharp market correction that took place in 2007-2008.

Panel A of Table 5 presents the descriptive statistics on additional variables used in this analysis (i.e., pre-crisis performance and risk-taking). Panel B of Table 5 shows the results of regressing firm performance and risk-taking before the crisis on corporate governance. The results in Panel B are generally consistent with a push for shareholder value maximization by boards and shareholders having encouraged managers to invest in subprime mortgage related assets. In particular, we find that both board independence and institutional ownership are positively associated with a firm's average ROA over the period 2004-2006, and that board independence is also positively associated with cumulative stock returns over the period 2004-2006. However, with respect to risk-taking our results are mixed. In particular, we find that firms with more independent boards had a higher equity-to-assets ratio before the crisis, and firms with higher institutional ownership had higher EDF.

[15] The equity-to-assets ratio may not reflect real business risk. Kashyap, Rajan, and Stein (2008) illustrate this argument with the case of traders that have incentives to write insurance on infrequent events, taking on what is termed "tail" risk, and treating the insurance premium as income, but not setting aside reserves for eventual payouts.

[16] We thank Shisheng Qu at Moody's KMV for providing us the EDF data.

In summary, our results are consistent with a push for shareholder value maximization by boards and shareholders having encouraged managers to invest in subprime mortgage related assets. However, our results are inconsistent with boards encouraging aggressive risk-taking in order to increase shareholder returns. Instead our results are consistent with the view that boards have pushed managers for higher shareholder returns without questioning why such higher returns were possible for supposedly safe investment strategies (Schapiro, 2009).

4.2. Influence of CEO compensation on losses

Although our findings are inconsistent with boards actively encouraging managers to invest in risky assets, board may have inadvertently encouraged aggressive risk-taking through the design of CEO compensation contracts. In particular, regulators have argued that compensation packages with an emphasis on annual bonuses have encouraged managers to focus on short-term results and take aggressive risks (e.g., Financial Services Authority, 2009). To test this assertion we collect data on CEO compensation contracts and examine the relation between CEO pay structure and the losses incurred during the crisis.

We gather information on compensation structure for fiscal year 2006 from SEC filings for U.S. firms and *BoardEx* for non-U.S. firms. *BoardEx* provides detailed compensation data – including salaries, bonuses, payouts from long-term incentives plans, and option grants – for top executives in companies where such data are publicly disclosed. We supplement these data by manual collection from the annual reports as used in Fernandes, Ferreira, Matos, and Murphy (2008).

We construct two variables to capture CEOs' compensation structure: (1) *Bonus*, defined as bonus scaled by the sum of salary and other annual compensation,[17] and (2) *Equity*

[17] In 2006, executive compensation disclosures changed for U.S. firms. Since the new disclosure rule does not require firms to disclose annual cash bonuses in a separate column of the executive compensation table, bonuses in

Compensation, defined as the sum of options, long-term incentive plans (LTIP), and restricted shares scaled by the sum of salary and other annual compensation.[18]

If compensation packages with an emphasis on annual bonuses have encouraged managers to focus on short-term results and take aggressive risks, we expect firms that use compensation packages with an emphasis on annual bonus compensation to have performed worse during the crisis, and firms with compensation packages with an emphasis on long-term compensation (e.g., equity compensation) to have performed better.

Panel A of Table 6 presents the descriptive statistics on additional variables used in this analysis. Panel B of Table 6 shows the results of regressing shareholder losses during the crisis on compensation structure. Consistent with this prediction, Table 6 shows that bonus compensation is associated with lower stock returns, and long-term compensation is associated with lower writedowns and higher stock returns. Thus the results of this test are consistent with flawed executive compensation practices having contributed to the financial crisis.

5. Turnover of Independent Directors

This section examines whether losses during the crisis had negative repercussions for outside board members. The large losses at financial firms could have been perceived by investors as being caused by a lack of oversight by directors, and therefore could have repercussions for these directors, especially if they were responsible for overseeing risk management.[19] While some

2006 data can include deferred compensation such as restricted shares, and long-term incentive plan payouts. To ensure that our bonus variable captures annual cash incentives (as is the case for most international firms), we examine the footnotes to the compensation tables for U.S. firms and classify bonus payouts in the form of deferred compensation (e.g., restricted shares) as equity compensation.

[18] Similar to stock options and restricted shares, LTIP plans are long-term oriented regardless of whether the payout is in cash or stock. Thus, we do not make a distinction between LTIP plans that pay out in cash and stocks, as in Fernandes, Ferreira, Matos, and Murphy (2008).

[19] The SEC recently announced plans to investigate the performance of boards of financial firms leading up to the crisis ("SEC to Examine Board's Role in Financial Crisis", *Washington Post* February 20, 2009).

prior studies find that director turnover increases around corporate failure events (Gilson, 1990, Srinivasan, 2005), some do not find such an association (Agrawal, Jaffe, and Karpoff, 1999). If investors attribute the loss to a lack of oversight from outside directors, we expect that outside directors are more likely to leave boards of firms that experienced larger losses during the crisis, especially if they oversaw risk management. However, if investors attribute the losses to bad managerial decisions and view the role of directors as confined to replacing poorly performing CEOs, we do not expect such an association. Thus, it is an empirical question whether director turnover is related to the losses.

For director turnover, we use the data from *BoardEx* on board composition for the 306 financial firms in our sample. We concentrate on turnover of independent directors (i.e. not full-time employees) because their primary function is to discipline and monitor managers.

We run a logit model of independent board member turnover on shareholder losses, ownership structure and risk committee membership, and focus again on the interactive effect.[20] We estimate the following logit model:

$$\begin{aligned} \textit{Independent director turnover} = {} & \alpha_0 + \beta_1 (\textit{Shareholder losses}) + \\ & \beta_2 (\textit{Ownership structure}) + \beta_3 (\textit{Risk committee member}) + \\ & \beta_4 (\textit{Shareholder losses} * \textit{Ownership structure/Risk committee member}) + \\ & \beta_5 (\textit{Firm size}) + \beta_6 (\textit{Age dummy 1}) + \beta_7 (\textit{Age dummy 2}) + \varepsilon \qquad (3) \end{aligned}$$

The dependent variable is a dummy variable that equals 1 if an independent board member left the firm from January 2007 to December 2008.[21] Risk committee member is a dummy variable that equals 1 if a board member was a member of a board committee with a name that is suggestive of a responsibility related to the monitoring of risk (e.g., risk committee, investment

[20] Some members of risk committees were among first board members to be replaced during the crisis. For example, Citigroup replaced its audit and risk committee chair following a shareholder campaign ("Citigroup Names New Board Committee Chairs", *RiskMetrics Group*, July 25, 2008).

[21] Similar to our CEO turnover analysis, we drop observations when directors remain on the board until their firm delists.

committee).[22] We control for firm size and the age of directors (with a dummy variable that equals 1 if the age of a director is between 65-70 years old, and another dummy variable that equals 1 if the age of a director is greater than 70). As in prior analyses, we also include country and industry dummies.

Table 5 presents the results on director turnover. Columns (1) to (3) show that independent directors are more likely to leave firms that experienced large shareholder losses. In addition, we find that director turnover is more sensitive to shareholder losses, as captured by stock returns, for firms with higher institutional ownership (column (6)) and less insider ownership (column (9)). These findings are consistent with institutional investors, as opposed to insiders, holding directors accountable for poor performance during the crisis. Finally, column (10) shows that the average interactive effect of *Member of risk committee* and writedowns is significantly negative, consistent with risk committee members being held more accountable for the losses.

6. Conclusions

This paper investigates the role of corporate governance in the financial crisis at 306 of the world's largest financial firms. A key finding of our paper is that firms with more independent boards and institutional ownership were not only more likely to replace their CEOs for poor performance during the crisis period, but also suffered larger losses. Thus, although boards and shareholders appear to have executed their monitoring role as measured by replacing poorly performing CEOs, they also have encouraged investments in subprime mortgage related assets that led to significant losses during the crisis period.

[22] We include committees with names containing words such as "risk" and "investment," but not "audit," because audit committees' primary responsibility is to oversee financial reporting.

Further exploration of the latter result finds evidence consistent with boards and shareholders having pushed managers into maximizing shareholder value, but inconsistent with boards having actively encouraged managers to take more risk. Specifically, we find that board independence is positively associated with pre-crisis performance, but negatively associated with pre-crisis risk-taking. In addition, we explore whether boards inadvertently encouraged aggressive risk-taking through the compensation contracts they endorsed. Consistent with the view that executive compensation contracts with an emphasis on annual bonuses have encouraged managers to focus on short-term results, we find that firms with CEO compensation packages that rely more on annual bonuses, and less on long-term compensation (e.g., LTIP plans, stock options) experienced larger losses during the crisis period.

Overall our findings show that boards and shareholders have not failed to perform their monitoring role with respect to the replacement of poorly performing CEOs and the push towards shareholder maximization. However, our results suggest that a lack of understanding about firms' investment policies among independent board members, combined with executive compensation contracts that focused too much on short-term results has contributed to the financial crisis.

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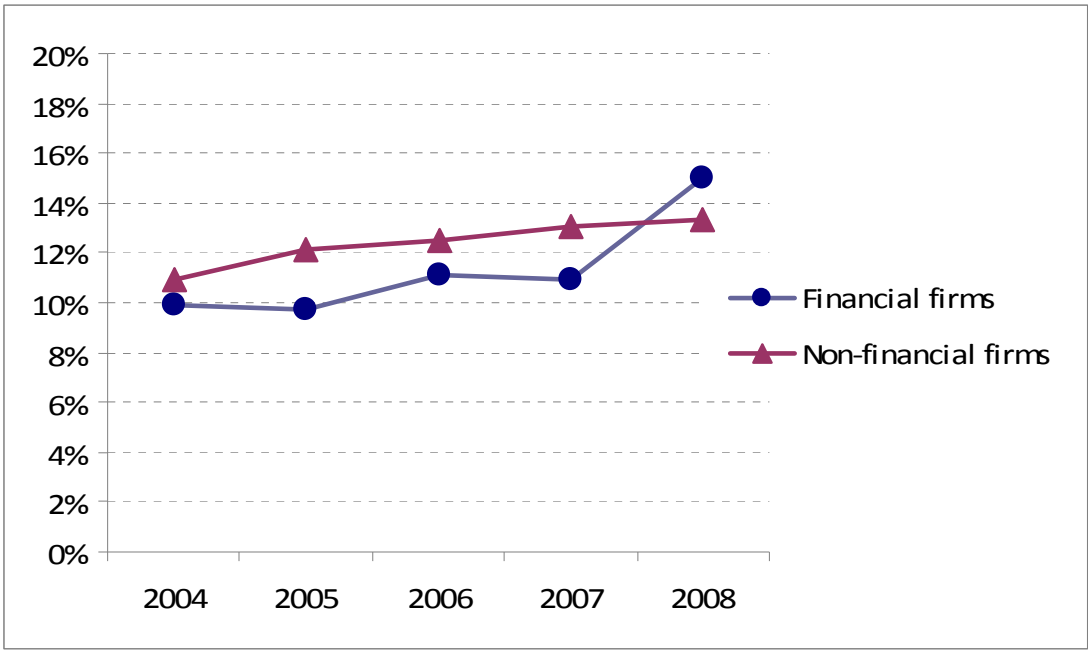
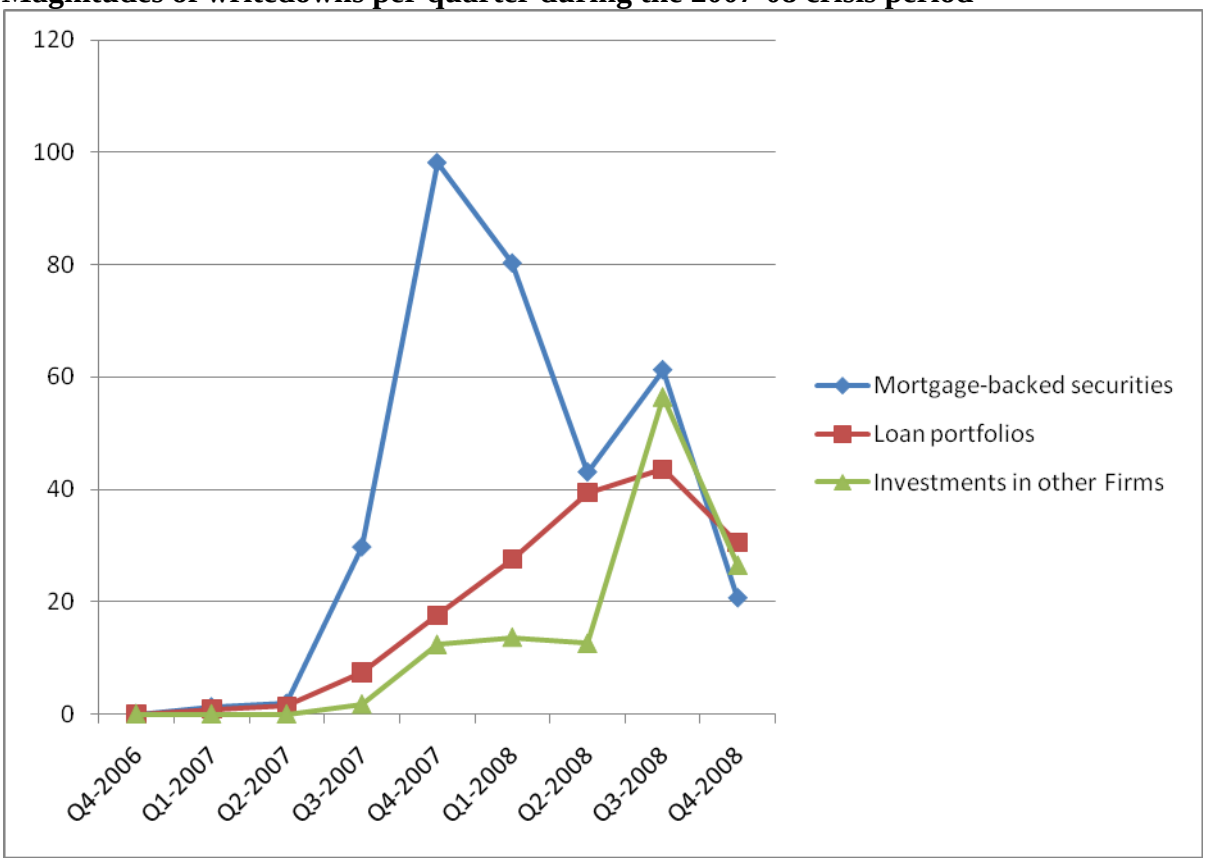
Figure 1
CEO turnover rates for financial versus non-financial firms from 2004-2008



This figure presents CEO turnover rates for financial and non-financial firms worldwide, based on data from all firms in *BoardEx* with market capitalizations greater than US $100 million. Financial firms are defined as in our main sample. We classify a firm as having experienced turnover during a year when its top executive at the end of the year is different from the previous year.

Figure 2
Magnitudes of writedowns per quarter during the 2007-08 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/OCI").

Table 1
Summary descriptive statistics by country

				Q1/2007-Q3/2008			December 2006		
Region	**Country**	**N of firms**	**% CEO turnover**	**Avg writedown**	**N of capital raising**	**Avg stock return**	**Avg board independence**	**Avg institutional ownership**	**Avg insider ownership**
America	United States	125	25%	-4%	26	-32%	85%	73%	13%
	Canada	13	8%	-1%	3	0%	87%	54%	8%
	Other America	9	13%	-4%	1	-32%	82%	.	18%
	Sub-total America	*147*	*23%*	*-4%*	*30*	*-29%*	*85%*	*71%*	*13%*
Europe	United Kingdom	23	39%	-1%	6	-45%	63%	25%	9%
	Germany	19	28%	-3%	3	-27%	71%	17%	63%
	Italy	19	22%	-0%	1	-31%	82%	11%	29%
	Switzerland	15	27%	-1%	3	-15%	92%	17%	33%
	France	9	0%	-0%	3	-29%	85%	23%	44%
	Spain	9	11%	-0%	1	-30%	75%	10%	36%
	Greece	7	14%	NA	0	-38%	71%	13%	42%
	Netherlands	6	50%	-1%	3	-26%	68%	28%	20%
	Ireland	5	25%	-0%	0	-56%	68%	25%	4%
	Sweden	4	0%	-0%	0	-36%	90%	37%	24%
	Belgium	3	0%	-0%	1	-37%	78%	13%	48%
	Denmark	3	0%	-0%	0	-41%	83%	24%	18%
	Portugal	3	33%	NA	0	-48%	71%	9%	44%
	Other Europe	12	18%	-0%	0	-38%	77%	24%	45%
	Sub-total Europe	*137*	*23%*	*-1%*	*21*	*-33%*	*76%*	*19%*	*33%*
Other	Australia	15	36%	-2%	2	-10%	85%	11%	22%
	Other countries	7	29%	-0%	0	9%	84%	28%	58%
	Total	***306***	***24%***	***-3%***	***53***	***-29%***	***81%***	***44%***	***24%***

See Appendix A for variable definitions.

Table 2
Descriptive statistics and univariate analyses
Panel A: Descriptive statistics

Variable		N	Mean	Median	Std. dev.
Discipline	CEO turnover	285	24%	0%	43%
Losses	Writedown	306	-1%	0%	4%
	Capital raising	306	17%	0%	38%
	Stock returns	306	-29%	-28%	35%
Governance	Board independence	306	81%	85%	13%
	Institutional ownership	285	44%	33%	35%
	Insider ownership	274	24%	12%	27%
Controls	Firm size	306	11.20	10.94	1.44
	Age dummy	306	34%	0%	47%

Panel B: Spearman correlation coefficients with p-values in parentheses

Variable	CEO Turnover	Writedown	Capital raising	Stock returns	Board independence	Institutional ownership	Insider ownership	Firm size
Writedown	-0.23							
	(0.00)							
Capital raising	0.20	-0.65						
	(0.00)	(0.00)						
Stock returns	-0.21	0.31	-0.32					
	(0.00)	(0.00)	(0.00)					
Board independence	-0.04	-0.14	(0.07)	(0.11)				
	(0.46)	(0.01)	(0.25)	(0.05)				
Institutional ownership	0.03	-0.30	0.19	-0.17	(0.20)			
	(0.66)	(0.00)	(0.00)	(0.00)	(0.00)			
Insider ownership	-0.04	0.30	-0.26	0.10	-(0.11)	-0.37		
	(0.54)	(0.00)	(0.00)	(0.10)	(0.07)	(0.00)		
Firm size	0.13	-0.49	0.43	-0.17	-(0.04)	-0.02	-0.18	
	(0.02)	(0.00)	(0.00)	(0.00)	(0.47)	(0.78)	(0.00)	
Age dummy	0.05	0.09	-0.02	0.07	-(0.04)	-0.07	0.05	-0.01
	(0.41)	(0.13)	(0.79)	(0.21)	(0.53)	(0.21)	(0.38)	(0.85)

Table 2 (continued)
Panel C: Test of differences in shareholder losses between firms with and without CEO turnover

Variable	N	Mean	Std. dev.	Median	*p-value*[a]
Writedown$_{-turnover}$					
CEO turnover		-2%	6%	0%	*0.00*
No CEO turnover	217	-0%	1%	0%	
Capital raising$_{-turnover}$					
CEO turnover	68	24%	43%	0%	*0.04*
No CEO turnover	217	13%	34%	0%	
Stock returns$_{-turnover}$					
CEO turnover	68	-26%	40%	-17%	*0.85*
No CEO turnover	217	-27%	31%	-26%	

[a] p-values based on t-tests in mean for the continuous variables and chi-squared test in proportion for the dummy variable. See Appendix A for variable definitions.

Table 3
Logit regression of CEO turnover in financial firms on shareholder losses and corporate governance[a]

	Baseline regressions			**Gov=Board independence**			**Gov=Institutional ownership**			**Gov=Insider ownership**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Losses												
Writedowns	-19.14***			-117.36			19.12			-60.36***		
	(-4.57)			(-1.27)			(0.57)			(-7.31)		
Capital raisings		0.45			-7.88***			-1.68			-0.93	
		(0.74)			(-2.09)			(-1.12)			(-1.33)	
Stock returns			-0.05			10.87***			3.02			-0.51
			(-0.05)			(3.44)			(3.24)			(-0.47)
Governance				1.67	0.56	-2.34	0.98	1.13	-0.07	0.10	-0.36	0.30
				(0.97)	(0.39)	(-1.09)	(1.30)	(1.32)	(-0.06)	(0.08)	(-0.37)	(0.23)
Losses*governance				125.30	9.30**	-13.19***	-30.35	2.58	-4.97	274.13***	6.19	4.91*
				(1.18)	(2.09)	(-3.34)	(-0.88)	(1.36)	(-4.85)	(6.60)	(1.34)	(1.84)
Firm size	0.17	0.13	0.19*	0.24*	0.34***	0.31**	0.25*	0.26**	0.30	0.07	0.34**	0.20
	(1.42)	(1.39)	(1.71)	(1.67)	(2.69)	(2.50)	(1.76)	(1.98)	(2.06)	(0.39)	(2.24)	(1.07)
Age dummy	0.29	0.28	0.26	0.58***	0.57***	0.59***	0.55**	0.51**	0.38	0.50*	0.44*	0.33
	(1.53)	(1.45)	(1.27)	(3.01)	(2.92)	(2.91)	(2.51)	(2.17)	(1.94)	(1.82)	(1.75)	(1.40)
Country fixed effects	no	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed effects	no	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	285	285	285	223	223	223	207	207	207	197	197	197
Pseudo R-squared	0.05	0.02	0.02	0.12	0.13	0.14	0.14	0.15	0.17	0.17	0.15	0.15
Predicted sign				**-**	**+**	**-**	**-**	**+**	**-**	**+**	**-**	**+**
Average interactive effect				**19.81**	**1.35***	**-2.08****	**-4.76**	**0.32**	**-0.75*****	**45.02*****	**0.94**	**0.82**
				(1.05)	**(1.76)**	**(-2.49)**	**(-1.09)**	**(1.24)**	**(-2.87)**	**(3.97)**	**(1.21)**	**(1.43)**

[a]Z-statistics based on robust standard errors clustered by country are reported in parentheses. *,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed).
See Appendix A for variable definitions.

Table 4
Regression of shareholder losses during crisis period on corporate governance[a]

	Shareholder losses [Q1/2007-Q3/2008]	
	Writedowns	**Stock returns**
	(1)	**(2)**
Board independence	-0.05*	-0.09
	(-1.76)	(-0.55)
Institutional ownership	-0.01**	-0.32***
	(-2.75)	(-6.28)
Insider ownership	0.00	0.08
	(0.60)	(0.82)
Firm size	-0.00	-0.02
	(-1.29)	(-1.52)
Country fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
N	268	268
Adjusted-R^2	0.25	0.24

[a]Z-statistics based on robust standard errors clustered by country are reported in parentheses.
*,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed).
See Appendix A for variable definitions.

Table 5
Pre-crisis performance and risk-taking

Panel A: Descriptive statistics on pre-crisis performance and risk-taking

Variable		N	Mean	Median	Std. dev.
Performance [2004-2006]	ROA	306	1%	1%	1%
	Stock returns	306	84%	68%	121%
Risk-taking [December 2006]	Equity-to-assets	306	9%	7%	7%
	EDF	278	0.18%	0.04%	0.69%

Panel B: Regression of corporate governance on pre-crisis performance and risk-taking[a]

	Performance [2004-2006]		Risk-taking [December 2006]	
	ROA	Stock returns	Equity-to-assets	EDF
	(1)	(2)	(3)	(4)
Board independence	0.01**	0.79**	0.08**	-0.15
	(2.33)	(1.99)	(2.49)	(-0.12)
Institutional ownership	0.00**	0.26	-0.01	0.69**
	(2.33)	(1.33)	(-0.61)	(2.62)
Insider ownership	0.00	-0.01	-0.00	0.56
	(0.06)	(-0.03)	(-0.27)	(1.54)
Firm size	-0.00***	-0.02	0.01***	-0.19**
	(-4.68)	(-0.49)	(-4.15)	(-2.64)
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
N	268	268	268	246
Adjusted-R^2	0.38	0.35	0.55	0.17

[a] Z-statistics based on robust standard errors clustered by country are reported in parentheses. *,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed).
See Appendix A for variable definitions.

Table 6
CEO compensation and shareholder losses during crisis

Panel A: Descriptive statistics CEO compensation structure

Variable	N	Mean	Median	Std. dev.
Bonus	235	185%	86%	410%
Equity compensation	199	441%	138%	1,766%

Panel B: Regression of shareholder losses during crisis on CEO compensation structure [a]

	Shareholder losses [Q1/2007-Q3/2008]	
	Writedowns	**Stock return**
	(1)	**(2)**
Bonus	0.00	-0.01***
	(0.97)	(-5.88)
Equity compensation	0.00***	0.00**
	(5.80)	(2.37)
Firm size	-0.01***	-0.03**
	(-3.85)	(-3.45)
Country fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
N	199	199
Adjusted-R^2	0.31	0.17

[a] Z-statistics based on robust standard errors clustered by country are reported in parentheses.
*,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed).
See Appendix A for variable definitions.

Table 7
Logit model regressing turnover of independent board members on shareholder losses, ownership, and risk committee membership[a]

	Baseline regressions			**Gov=Institutional ownership**			**Gov=Insider ownership**			**Risk committee member**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Losses												
Writedowns	-5.22***			-6.65***			-5.00***			-5.96***		
	(-2.85)			(-3.94)			(-3.54)			(-5.81)		
Capital raisings		0.24*			-0.04			0.10			0.44**	
		(1.68)			(-0.10)			(0.34)			(2.28)	
Stock returns_			-0.85***			0.68			-0.96			-0.35
			(-2.86)			(1.11)			(-1.16)			(-0.66)
Ownership				-0.43	-0.52*	-1.25***	0.57	0.52	1.05			
				(-1.29)	(-1.68)	(-3.35)	(1.17)	(1.03)	(1.42)			
Losses*ownership				1.54	0.79*	-2.39***	-2.09	1.18	2.08**			
				(0.51)	(1.82)	(-3.55)	(-0.52)	(1.12)	(2.20)			
Risk committee member										0.17	0.33**	0.11
										(1.25)	(2.21)	(0.57)
Losses*risk committee member										-12.41***	-0.07	-0.51
										(-3.01)	(-0.22)	(-1.21)
Firm size	0.13*	0.09	0.10	0.13***	0.07	0.13***	0.16**	0.13	0.14**	0.07	0.03	0.09*
	(1.76)	(1.14)	(1.43)	(2.68)	(1.64)	(2.84)	(2.07)	(1.60)	(2.01)	(1.59)	(0.60)	(1.76)
Age dummy 1	0.18	0.20	0.23	0.33**	0.35**	0.37**	0.31*	0.32**	0.34**	0.32**	0.32**	0.32**
	(1.10)	(1.25)	(1.42)	(1.98)	(2.21)	(2.22)	(1.85)	(2.02)	(2.09)	(2.07)	(2.17)	(2.09)
Age dummy 2	0.94***	0.93***	0.97***	1.10***	1.11***	1.10***	1.06***	1.05***	1.07***	1.15***	1.12***	1.13***
	(5.47)	(5.38)	(4.95)	(5.08)	(5.06)	(4.70)	(4.71)	(4.66)	(4.14)	(5.04)	(5.06)	(4.71)
Country fixed effects	no	no	no	yes	yes	yes	Yes	yes	yes	yes	yes	yes
Industry fixed effects	no	no	no	yes	yes	yes	Yes	yes	yes	yes	yes	yes
N	3,107	3,107	3,107	2,914	2,914	2,914	2,783	2,783	2.783	3,080	3,080	3,080
Pseudo R-squared	0.03	0.02	0.03	0.08	0.07	0.08	0.08	0.08	0.08	0.09	0.08	0.08
Average interactive effect				**0.44**	**0.13**	**-0.37****	**-0.58**	**0.23**	**0.33****	**-2.21*****	**-0.00**	**-0.10**
				(1.36)	**(1.63)**	**(-2.80)**	**(-0.78)**	**(1.24)**	**(2.23)**	**(-3.28)**	**(-0.05)**	**(-1.37)**

[a] Z-statistics based on robust standard errors clustered by country are reported in parentheses. *,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed).
See Appendix A for variable definitions.

Appendix A
Variable definitions

Variables	Definitions	Measurement period	Data sources
Discipline			
CEO turnover	A dummy variable equal to 1 if a CEO departs the firm, and 0 otherwise	January 2007 – December 2008	BoardEx
Director turnover	A dummy variable equal to 1 if a independent board member departs the firm, and 0 otherwise	January 2007 – December 2008	BoardEx
Losses			
Writedown	Cumulative accounting writedowns scaled by total assets	January 2007 - September 2008	Bloomberg/ Compustat
Capital raising	A dummy variable equal to 1 if a firm raises capital, and 0 otherwise	January 2007 - September 2008	Bloomberg
Stock returns	Cumulative stock returns	January 2007 - September 2008	Compustat/ CRSP
$\text{Writedown}_{\text{\_turnover}}$	Cumulative accounting writedowns scaled by total assets	1Q/ 2007 until the earlier of the quarter of the CEO's departure or the end of the sample period (3Q/ 2008)	Bloomberg/ Compustat
$\text{Capital raising}_{\text{\_turnover}}$	A dummy variable equal to 1 if a firm raises capital, and 0 otherwise	1Q/ 2007 until the earlier of the quarter of the CEO's departure or the end of the sample period (3Q/ 2008)	Bloomberg
$\text{Stock returns}_{\text{\_turnover}}$	Cumulative stock returns	1Q/ 2007 until the earlier of the quarter of the CEO's departure or the end of the sample period (3Q/ 2008)	Compustat/ CRSP
Governance			
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
Insider ownership	Percentage of shares owned by insiders	December 2006	Worldscope

Appendix A (continued)

Variables	Definitions	Measurement period	Data sources
Pre-crisis risk-taking			
Equity-to-assets	Book value of equity scaled by total assets	December 2006	Compustat
EDF	Expected Default Frequency	December 2006	Moody's KMV
Pre-crisis performance			
ROA	Average income before extraordinary item scaled by total assets	2004-2006	Compustat
Stock returns	Cumulative stock returns	2004-2006	Compustat/ CRSP
CEO compensation			
Bonus	Annual bonus (excluding restricted shares) scaled by the sum of salary and other compensation	December 2006	BoardEx/ SEC
Equity compensation	Sum of options, LTIP, and restricted shares scaled by the sum of salary and other compensation	December 2006	BoardEx/ SEC
Controls			
Firm size	Natural logarithm of total assets (in US $million)	December 2006	Compustat
Age dummy	A dummy variable equal to 1 when the CEO is 60 years or older, and 0 otherwise	December 2006	BoardEx
Age dummy 1	A dummy variable equal to 1 when the director's age is larger than 65 but smaller than 70, and 0 otherwise	December 2006	BoardEx
Age dummy 2	A dummy variable equal to 1 when the director is 70 years or older, and 0 otherwise	December 2006	BoardEx