Governance through Threat:

Does Short Selling Improve Internal Governance?

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Abstract

We explore the relationship between internal governance and the disciplining mechanisms created by the threat of short selling (i.e., "short-selling potential"). We argue that the presence of short selling increases the cost of poor governance for shareholders and incentivizes them to improve internal governance. Our stock-level tests across 23 developed countries during 2003-2009 confirm that the threat of short selling significantly enhances the quality of internal governance. This effect is stronger for short-term investors and financially constrained firms and pronounced in countries with weak institutional environments. The governance impact of short selling leads to an improvement in firms' operating performance.

Keywords: Short Selling, International Finance, Corporate Governance, Equity Incentives.

JEL Codes: G30, M41

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Introduction

The last decade has witnessed a renewed interest in the role of financial markets in disciplining managers. Blockholders may induce good managerial behavior by exiting and pushing down stock prices when bad managerial actions are taken (e.g., Admati and Pfleiderer, 2009; Edmans, 2009; Edmans and Manso, 2011). This trading-based mechanism differs from the traditional monitoring and interventional type of internal governance and represents an alternative means of aligning managerial incentives with those of shareholders (e.g., Parrino et al., 2003; Chen et al., 2007; McCahery et al., 2010). Therefore, to some extent, exit and intervention offer alternative governance mechanisms that shareholders can choose from as a function of their trade-off between benefits and costs (e.g., Edmans and Manso, 2011; Edmans et al., 2013).

Because trading disciplines managers mainly through improved price efficiency, a more general question arises as to whether enhanced price efficiency provides a substitute for internal governance.[1] This question has important implications. If the answer is yes, investors should optimally reduce their investments in internal governance (or be encouraged to do so). However, international evidence shows that firms invest more in internal governance in markets with better country-level institutions (e.g., Doidge et al., 2007; Aggarwal et al, 2009). This behavior would seem puzzling in the presence of trading-based governance: if price efficiency is already high in good institutional environments and this serves as an alternative mechanism through which to discipline managers, why would shareholders bother to invest heavily in internal governance?

In this paper, we reconcile these different perspectives of governance by proposing a novel channel through which the price efficiency of the stock market *induces* investors to invest more in internal governance, namely, short selling. Short selling is known to improve price efficiency (e.g., Bris et al., 2007; Boehmer et al., 2008; Boehmer and Wu, 2010; Saffi and Sigurdsson, 2011). Short

[1] For instance, Edmans and Manso (2011) conclude that "informed trading causes prices to more accurately reflect fundamental value, in turn inducing the manager to undertake actions that enhance value."

selling also provides a market-based disciplining mechanism that resembles "exit" – i.e., it reduces the incentives of the managers to take bad actions by punishing the stock price of their firms when such actions are taken.[2] However, as opposed to traditional "exit" mechanisms, the presence of short selling may increase the cost to *existing* shareholders of accepting poor governance because the penalty of short selling on stock prices is felt by both managers and existing investors.

To understand how short selling incentivizes shareholders to invest in internal governance, consider a situation without short selling in which a bad action taken by the managers today will only be revealed to the market and penalize the stock price in the long run. Suppose that shareholders can spend a certain amount of resources today on internal governance, such as monitoring and intervention, which prevents (with a certain probability) managers from taking the bad action. The question is, do shareholders want to do so? Because the bad action reduces benefits to long-term investors, these investors have the incentive to monitor today. By contrast, shareholders who are likely to sell before the outcome of the action is recognized by the market, i.e., short-term investors, are less willing to spend resources in monitoring (e.g., Chen et al., 2007; Gaspar et al., 2005).[3] In this context, short sellers, by allowing the outcome of the bad managerial action to be incorporated into pricing *earlier* (e.g., Karpoff and Lou, 2010; Hirshleifer et al., 2011), increase the probability that short-term investors will be affected.[4] This threat will make even the short-term investors want to invest in monitoring and increase the *overall* incentives for shareholders to invest in internal governance.

For lack of better definition, we label this hypothesis as "governance through threat" (to differentiate it from existing governance mechanisms), and we provide a stylized model for it. Our key intuition is that shareholders do not view the external short-selling disciplining mechanism as a

[2] Short sellers are motivated to attack bad firms in the market (e.g., Karpoff and Lou, 2010; Hirshleifer et al., 2011). Thus, such a mechanism can largely reduce bad managerial behavior, such as earnings manipulation (e.g., Massa et al., 2013).

[3] In practice, there are many types of large shareholders, such as activists and pension funds, corporations, individuals, private equity firms, and mutual funds, who can affect internal governance (e.g., Cronqvist and Fahlenbrach, 2009). These large shareholders differ in their investment horizons and their incentives to engage in monitoring. Shareholder heterogeneity can also be found within the same group of investors. For instance, Iliev and Lowry (2013) show that mutual funds vote more actively when they have a lower turnover ratio (Chen et al., 2007, and Gaspar et al., 2005, imply similar conclusions).

[4] Of course, other market participants may also influence the shareholders of firms in this way – but the channel through short selling is particularly powerful because short sellers are known to be good at processing negative information (e.g., Karpoff and Lou, 2010; Hirshleifer et al., 2011).

substitute for internal governance. By contrast, potential short selling is regarded as a threat, and such threat incentivizes investors to monitor managers – e.g., through an effective board – or by aligning managerial incentives with drops in the stock price through equity-based compensation. Thus, there should be a direct complementarity between short selling and internal corporate governance, as opposed to the substitutability between trading and intervention for blockholder ownership. Importantly, it is the *ex ante* threat of short selling, rather than the *ex post* actions taken by short sellers, that induces better governance.[5]

The stimulating impact of short selling on internal governance should vary along several dimensions. First, it should be more significant when the potential efficiency and impact of short selling, which we term *short-selling potential* (SSP), is greater. Second, conditioned on the same level of SSP, the effect should be more prominent when the percentage of short-term (long-term) shareholders is higher (lower). This incremental impact may extend beyond firm ownership – i.e., characteristics that make the value of firms more sensitive to short-term price drops can enhance shareholders' general willingness to invest in internal governance. Financially constrained firms that are more "dependent" on the market for financing (e.g., Baker et al., 2003), for instance, should experience a stronger impact of SSP on internal governance because a drop in the stock price will significantly increase the cost of capital for all the investors. Finally, by reconciling the governance impact of trading with that of country-level governance, we note that SSP should be more important for firms in countries with poor institutional environments – i.e., the presence of SSP should urge otherwise reluctant shareholders to press for good internal governance. These variations provide empirical restrictions that can help locate the causal impact of short selling on corporate governance.

We test these hypotheses using a unique dataset on worldwide short selling detailed at the stock level across 23 developed countries during the period 2002-2009. Our main empirical proxy for SSP is the fraction of shares available to be lent to short sellers (hereafter, *Lendable*). Compared to other potential measures, such as realized short selling, this variable provides several advantages. First, the

[5] For instance, a greater threat may lead to a more substantial improvement in governance, which *reduces* the likelihood of bad managerial behavior and the necessity for short sellers to punish it.

number of shares available to be lent is mostly determined by the supply-side conditions of short selling, which does not directly affect asset price (e.g., Cohen et al., 2007). Second, more abundant lendable shares reduce short-selling fees (Kaplan et al., 2013) and increase the price efficiency in the global market (Saffi and Sigurdsson, 2011). This relationship implies that *Lendable* is likely to be powerful in capturing the *ex ante* efficiency and potential impacts of short selling in the global market.

More importantly, shareholders eager to exercise their monitoring/intervention roles are less likely to supply lendable shares to short sellers on a large scale because doing so would transfer their voting rights and therefore limit their ability to affect governance.[6] In fact, this unique feature of the short selling market would suggest that lending shares – and therefore the ensuing ownership transfer – is orthogonal to shareholder intervention (Our later tests empirically confirm this implication). This conception allows us to focus on how lendable shares – those supplied by shareholders who do *not* have monitoring incentives – affect internal governance.

Our main proxy for corporate governance, which we refer to as the corporate governance index (CGI), comes from RiskMetrics/Institutional Shareholder Services (ISS) and is the most widely used index of governance at the firm level in the international context (e.g., Aggarwal et al., 2009; Aggarwal et al., 2011; and Doidge et al., 2007).[7] We find strong evidence that the governance index is related to SSP. This relationship is statistically significant and economically relevant. One standard deviation higher SSP is related to a 6.36% higher level of CGI.[8] This pattern holds for both the US and non-US firms and both before and during the global financial crisis. Indeed, one standard deviation higher SSP is associated with a 6.97% (13.06%) higher level of CGI in the US (rest of the world) and with a 7.45% (11.42%) higher CGI during the crisis (non-crisis) period.

[6] The lack of voting rights is known to discourage institutional investors (e.g., Li et al., 2008). Naked short selling may complicate the ownership structure of firms by creating more voting shares than the total number of shares outstanding. An analysis of naked short selling goes beyond the scope of this paper. One benefit of lendable shares is to exclude naked short selling because the normal short selling requires short sellers to "locate securities to borrow before selling." In this case, the lender of the shares receives dividends but relinquishes voting rights. The definition of ownership involving short selling is provided by the SEC: http://www.sec.gov/rules/final/34-50103.htm.

[7] The data for international firm-level governance come from Aggarwal's website: http://faculty.msb.edu/aggarwal/gov.xls.

[8] Economic significance is based on the standard deviation of the corporate governance index.

We further investigate whether the impact of short selling is stronger for a shareholder clientele with a shorter horizon and for firms that are more dependent on equity markets for financing. Following Chen et al. (2007), we construct a measure for long-term institutional ownership with monitoring incentives (LO) and complement it with a measure of short-term investors' ownership (SO), as proxied by the mass of retail investors. Following Baker et al. (2003), we define equity dependence as a higher KZ index (Kaplan and Zingales, 1997), lower levels of cash flow and cash holdings, and higher leverage. The tests involving these variables lead to two results. First, including these variables does not absorb the impact of SSP. Second, and more importantly, the interaction between SSP and these variables is significant across all specifications, with signs that are consistent with our hypotheses. This finding confirms that the impact of SSP is stronger either for shareholders with a shorter horizon or for firms that are more equity dependent.

When we consider country-level governance, we find that SSP promotes better internal governance; this is true particularly in countries with weak institutions. This finding confirms our interpretation that short selling, similar to country-level governance, has a complementary impact on internal governance. More specifically, one standard deviation higher SSP is related to a 9.78% (9.37%, 8.75%, 9.09%, and 13.81%) higher level of governance in countries regulated by civil law (poor disclosure requirements, weak securities regulation, low accounting standards, and loose anti-director rules, respectively).

Although CGI is a composite index, its components mostly focus on the "monitoring/intervention" facet of internal governance.[9] Therefore, the next step is to explore the "incentive" aspect of internal governance by focusing on the impact of short selling on equity-based executive compensation. We show that SSP has a strong positive impact on equity-based compensation. This relationship holds across different specifications and alternative samples. One standard deviation higher SSP increases the CEO equity compensation ratio by between 7.14% and 14.77%. In a series of robustness checks,

[9] CGI is based on 41 firm-level internal governance attributes. Out of 41 attributes, only the following three attributes are directly related to equity compensation incentives: (37) Directors receive all or a portion of their fees in stock; (39) Options grants align with company performance and reasonable burn rate; (40) Officers' and directors' stock ownership is at least 1% but not over 30% of total shares outstanding.

we also show that SSP increases the sensitivity of executives' total compensation with respect to firm performance. These findings suggest that SSP significantly enhances the incentive aspects of executive compensation.

Thus far, all of the tests support the hypothesis that the threat of short selling promotes corporate governance. The next question is whether such relationships imply causality. To address this endogeneity issue, we first control for firm-fixed effects to rule out the possibility that the relationship between SSP and governance is spurious because of omitted firm-level variables. Then, we address the issue of reverse causality – i.e., whether the positive relationship between SSP and internal governance exists because shareholders are eager to exert internal governance *and* supply lendable shares to short sellers. In our context, economic theory and the institutional design of the short selling market would suggest that the opposite (with respect to our working hypothesis) direction of causality is highly unlikely. Indeed, the ability to monitor requires holding shares and not lending them, even temporarily. Nevertheless, we will address this issue econometrically.

We employ the same methodology as Aggarwal et al. (2011) in conducting Granger causality tests. The tests lead to two results: 1) changes in the SSP strongly predict changes in internal governance; and 2) changes in internal governance do not predict changes in future SSP. The first result is consistent with the causality link from SSP to governance, as hypothesized. The second result confirms the conjectured institutional implication that shares to be lent are unlikely to be supplied by shareholders engaged in improving governance. This observation rejects reverse causality and is consistent with the general intuition of Khanna and Mathews (2012) that controlling blockholders, who presumably play the monitoring/intervening roles, have incentives only to trade *against* short sellers, if any, to offset their negative price impact.[10]

[10] The difference is that they examine how uninformed short-selling manipulations affect blockholders, whereas we explore the case when short sellers are informed and punish suspicious firms, following the literature (e.g., Cohen et al., 2007; Boehmer et al., 2008; Karpoff and Lou, 2010; Hirshleifer et al., 2011; Dyck et al., 2010). However, the impact of short selling on price is the same.

The Granger causality tests confirm that there must be shareholders who are not engaged in governance but who are willing to supply lendable shares to the short-selling market. The interesting question is to determine who these shareholders are. We argue that institutional investors who passively track a benchmark with no performance goals fit well into this economic role: e.g., exchange-traded funds (ETFs) or similar passive institutional investors. Indeed, on one hand, these investors are passive and typically do not engage in governance-related activities because they lack the incentives. For instance, Dyck et al. (2010) provide a list of important players that blow the whistle on corporate fraud; not surprisingly, short sellers are on the list, but ETFs are not. Our own diagnostic tests, which will be discussed shortly, also confirm that ETFs do not directly enhance internal governance. On the other hand, ETFs supply lendable shares to the short-selling market, and the astonishing growth rate of the ETF industry (40% every year from 2001 to 2010) can provide large exogenous variations to the number of shares available for short selling.[11] Indeed, univariate regressions reveal that ETF ownership might explain approximately 39% of SSP variation in the global market, which confirms that ETFs are a primary supplier of lendable shares.

These properties allow us to extend the intuition of Hirshleifer et al. (2011) and use ETFs as an instrument to proxy for the efficiency and potential impact of short selling. The main difference with respect to Hirshleifer et al. (2011) is that they use overall institutional ownership to capture the overall impact of short selling, whereas we focus on one special type of passive institutional investor to locate the supply of governance-unrelated lendable shares. We show that instrumented SSP is strongly and positively related both to CGI and to equity-based executive compensation. One standard deviation higher instrumented lendable shares is correlated to 16.86% higher quality of governance and 20.57% higher levels of equity-based compensation.

The quality of the instrument is confirmed both by statistical tests (Staiger and Stock, 1997) and by the findings that although ETFs by themselves are positively related to corporate governance in

[11] ETFs are bound by rules on securities lending similar to those governing traditional mutual funds. For instance, in Europe, ETF providers can lend up to 80% of their basket of securities to a third party to generate revenues. The 2011 IMF "Global Financial Stability Report" provides more detail about how ETFs may contribute to the short-selling market.

general, the positive relationship becomes insignificant when SSP is zero. The latter result suggests that ETFs do not monitor by themselves – instead, SSP is a channel through which ETFs affect governance. This relationship fits the requirements for a good instrument. The use of this instrument further confirms our causal interpretation of the stimulating impact of SSP on corporate governance and offers additional insights regarding the formation and evolution of the short-selling market.

Finally, we conduct two additional tests to further refine the analysis of the impact of SSP on corporate governance. First, we find that SSP improves the quality of the board structure. Because the board internally monitors management behavior for the benefit of investors, this result provides an explicit example for how short selling improves the monitoring incentives of investors and complements our general tests that use the CGI index. Second, we assess whether the disciplining effect of SSP on internal governance has any real implications for firm performance. We find that SSP increases the future ROA of a firm through its impact on CGI or on equity-based compensation. One standard deviation higher SSP-related governance (equity-based compensation), for instance, is related to a 24.99% (16.64%) higher ROA. To the extent that firms with good governance are known to have better performance, this result confirms that the complementarity impact of short selling on corporate governance achieves the same actual result.

Our results contribute to different strands in the literature. First, to the best of our knowledge, we are the first to investigate the impact of the short-selling market on corporate governance, which contributes to the literature on governance. The governance literature has considered alternative actions between “voice and exit” (Maug, 1998; Kahn and Winton, 1998; Faure-Grimaud and Gromb, 2004) and has focused on “voice” as the main disciplining device. For example, hedge fund activism has been identified as an important source of governance (e.g., Brav et al., 2008; Clifford, 2008; Greenwood and Schor, 2009; Klein and Zur, 2009, 2011). More recently, Admati and Pfleiderer (2009), Edmans (2009), and Edmans and Manso (2011) show that walking the “Wall Street Rule” is a governance mechanism. We contribute by showing that short selling improves internal governance, which enriches our understanding about the role that “trading” may play in terms of governance.

Second, we contribute to the literature on short selling. The standard short-selling literature links short-selling activities to stock returns (Senchack and Starks, 1993; Asquith and Meulbroek, 1995; Aitken et al., 1998) through their effect on the informativeness of stock prices. For example, Cohen et al. (2007) document the ability of short sellers' trades to predict future stock returns, which suggests that short sellers have access to private information and would affect stock-market liquidity and efficiency (e.g., Bris et al., 2007; Boehmer et al., 2008; Boehmer and Wu 2010; Saffi and Sigurdsson, 2011). We extend this line of research by examining the *ex ante* impact of short selling on corporate governance – based on the *ex post* observation that short sellers attack bad managerial actions (e.g., Karpoff and Lou, 2010; Hirshleifer et al., 2011). This approach provides explicit economic channels through which information efficiencies provided by the short-selling market yields a beneficial result on the corporate market.

Third, our results contribute to the literature that relates shareholder composition to firm performance (e.g., Morck et al., 1988; Himmelberg et al., 1999, Holderness et al., 1999; Franks and Mayer, 2001; Franks et al., 2001) and corporate governance (e.g., Claessens et al. 2000; La Porta et al., 2002; Claessens and Laeven, 2003; Ferreira and Matos, 2008; Aggarwal et al., 2011; Laeven and Levine, 2008; Doidge et al., 2007). Whereas the extant literature focuses primarily on large/controlling shareholders with positive stakes, we are the first to present a positive role for a party who benefits from negative information through negative stakes at a cost to existing shareholders – i.e., short sellers.

Finally, our findings provide evidence that firms shape their behaviors in response to the stock market, which suggests or confirms a feedback effect recently proposed in the literature (e.g., Chen et al., 2007; Edmans et al., 2011, 2012). Our contribution is to show that the awareness of the existence of a large group of short sellers ready to punish managerial slack can help firms to reduce slack in its beginning stages.

The remainder of the paper is organized as follows. In Section II, we lay out our main hypotheses. In Section III, we describe the data and the construction of the main variables. In Sections IV and V, we provide the main evidence about the relations between short-selling potential and the quality of

internal firm governance. Section VI contains endogeneity tests. Section VII provides additional tests related to board structures and value creation. A brief conclusion follows.

II. A Stylized Model and Hypotheses

We now outline our hypotheses. We report the model in Appendix A and consider its main thrust here. We rely on a simple extension of Admati and Pfleiderer (2009) to model the governance mechanisms of trading. In this framework, we introduce the disciplining effect of short selling following Kyle (1985) and examine its impact.

Let us consider a three-period model. In Period 0, the manager of the firm decides whether to take a "bad action" (e.g., diversion of assets) that could benefit him but damage firm value. If the bad action is not taken, the value of the firm in Period 2 is v and the manager receives a payoff of $f_0 = \omega_1 P_1 + \omega_2 P_2$, where ω_1 and ω_2 are two constants and P_1 and P_2 denote the price of the firm in Periods 1 and 2, respectively. If the bad action is taken, then the manager obtains a private benefit in addition to the normal payoff and the value of the firm is reduced by $\tilde{\delta} > 0$. The manager directly observes $\tilde{\delta}$. The managerial payoff is $f_0 = \omega_1 P_1 + \omega_2 v$ when no bad action is taken. It becomes $f_1 = \beta + \omega_1 P_1 + \omega_2 (v - \tilde{\delta})$ when the bad action is taken. When the value of the firm that is destroyed by the manager is small relative to his private benefit, the manager will prefer to take the bad action. This is the origination of the agency problem.

Appendix A shows that any mechanism that makes the price of P_1 sensitive to the implementation of the bad action disciplines the manager and reduces agency costs. This phenomenon occurs because the drop in P_1 reduces the managerial payoff, which, other things being equal, reduces the incentive for the manager to take the bad action in the first place. In other words, a market-based mechanism disciplines the manager by pushing down the stock price if bad actions are taken by the manager. This response causes the manager to suffer a loss because of the sensitivity of his payoff to the stock price

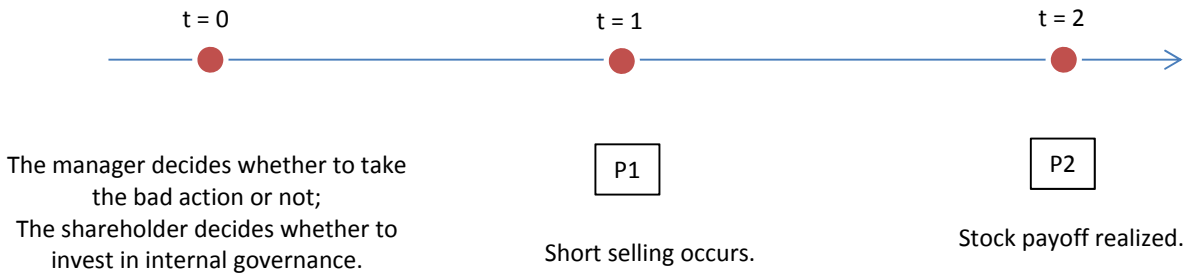
and reduces his incentive to take the bad action. Short sellers exacerbate the price drop in the presence of bad managerial actions and therefore help discipline the manager.

What is the impact of the short-selling disciplining mechanism on the internal monitoring system – i.e., internal corporate governance? It may be argued that when the market-based mechanism of short selling is effective, shareholders may simply rely on the external mechanism to discipline managers rather than acting by themselves. In this case, short selling would substitute for the internal disciplining mechanism.

Our main discovery, however, is that this is not the case. The reason is that the very fact that the external disciplining mechanism punishes managers via the market price also implies that uninformed shareholders of the firm will suffer as well. This threat will induce them to take corrective actions that reduce the probability of short selling by raising the quality of internal governance.

We illustrate this point formally by modeling both internal and short-selling governance and exploring the relationship between the two. We assume that, in Period 0, a (representative) short seller observes the managerial action and the value of $\tilde{\delta}$. Thus, unlike Khanna and Mathews (2012), we assume that the short seller is informed. Her trading punishes firms with less-reliable management (e.g., Cohen et al, 2007; Boehmer et al., 2008; Karpoff and Lou 2010; Hirshleifer et al., 2011; Dyck et al. 2010). In particular, if the manager takes the bad action, the short seller optimally shorts $\xi < 0$ shares of the stock in Period 1 at the price of P_1. The optimal shorting demand and its market impact are determined following Kyle (1985). Internal governance is modeled as follows. Initially, shareholders of the firm do not directly observe the managerial action. However, they can choose to invest some capital in internal governance (i.e., monitoring). This investment increases the probability that the bad action will not be taken. We report the time convention in Figure 1.

Figure 1: The Timeline of the Model



Based on these assumptions, our main result can be summarized in the following proposition:

Proposition 1: *The presence of short selling increases the incentives of the shareholders to improve internal governance.*

Please see Appendix A for a detailed proof; we discuss only the main thrust of the model here. There are two inferences involved. The first is discussed above, i.e., efficiency in short selling (captured by the price impact of short selling in the model) disciplines managers by pushing down the stock price in Period 1 when bad actions are taken.[12] Second, the disciplining mechanism is imperfect, and short sellers will continue to punish managers from time to time. When this occurs, short sellers also punish existing investors. Uninformed shareholders will suffer particularly when they must sell in the first period for liquidity reasons (in the second period, they suffer regardless of short sellers). This circumstance gives them incentives to invest in internal governance to prevent bad management actions from being taken – i.e., by better monitoring and intervention.

If we interpret the probability of exiting in Period 1 as a proxy for the horizon of the investor, then Proposition 1 implies that an efficient short-selling market gives strong incentives for shareholders in general – and short-term investors in particular – to invest in governance. Alternatively, we can

[12] Consistently, Massa et al. (2013) find that the presence of short selling reduces earnings manipulations.

interpret such a probability as a fraction of short-term investors in the firm. In this case, the interpretation is similar.

In addition to formal governance, shareholders may also reduce the probability of managerial misbehavior by linking managerial incentives to the drop in stock price – i.e., by increasing equity-based compensation. This concept is summarized in the following proposition:

Proposition 2: *The presence of short selling increases the incentives to have equity-based compensation.*

The implication is straightforward. Because short selling improves the sensitivity of the stock price to managerial misbehavior, an increase in equity-based compensation more effectively punishes bad managerial actions. This relationship incentivizes the shareholder to adopt equity-based managerial payoff to strengthen the disciplining mechanism of short selling for her managers.

Overall, these considerations suggest that shareholders are better off if they can establish "corrective measures" – i.e., improve governance – before short selling occurs. This activity may be undertaken either directly through better internal corporate governance or indirectly by aligning managerial incentives with the stock price. These two effects are the main predictions of the model that we will test in later sections.[13]

To further understand the empirical content of these predictions, we note that the stimulating impact of short selling on internal governance should differ as a function of various factors. First, lower efficiency and threats to short sell – e.g., because of the limited supply of lendable shares in the short-sale market – weakens its impact.

Second, firms more exposed to stock price movements – either because their shareholders have a short horizon or because the firms' financial options are more "equity dependent" – should be more affected by the disciplining effect of short selling. Indeed, negative price movements are more costly

[13] The model also predicts that short selling directly disciplines managers. This link is already explored in the literature (e.g., Massa et al., 2013). Thus, our paper mainly focuses on the implications of short selling on corporate governance.

to this type of firms – e.g., the damage of $\tilde{\delta}$ could be greater for these firms. This relationship leads to a lower stock price and investor payoff when short selling occurs.

Finally, the short-selling impact on corporate governance should be particularly strong in poor-quality institutional environments. To the extent that country-level governance complements corporate governance (e.g., Doidge et al., 2007; Aggarwal et al., 2009), the positive impact of short selling on internal governance should be more prominent in economies in which weak country-level governance has failed to promote internal governance. This concept provides additional testable restrictions that we will explore in later sections.

III. Construction of Data and Main Variables

We now describe the sources of our data and the construction of our main variables.

A. Data Sample and Sources

The sample covers the period between 2003 and 2009. We begin with all publicly listed companies for which we have accounting and stock market information from Datastream/WorldScope. We match this sample with short-selling information obtained from Data Explorers, with firm-level corporate governance and equity-based compensation information from RiskMetrics and BoardEx, and with data on institutional investors' stock holdings from FactSet/LionShares.

We obtain equity-lending data from Data Explorers, a research company that collects equity and bond lending data directly from the securities-lending desks at the world's leading banks. The data are available monthly from May 2002, weekly from August 2004, and daily from July 2006. Data Explorers provides information on lending volumes, lending fees, and the number of securities that are made available for lending. In particular, Data Explorers reports the following variables for each stock daily: lendable value in dollars, active lendable value in dollars, total balance value on loan in dollars,

and weighted average loan fee (across active contracts) in basis points.[14] A more detailed description of the data can be found in Saffi and Sigurdsson (2011) and Jain et al. (2012).

The composite corporate governance index is based on governance attributes from RiskMetrics/Institutional Shareholder Services (ISS); it is constructed by Aggarwal et al. (2011) over a five-year period from 2004 to 2008 across 23 developed markets. RiskMetrics compiles firm-level governance attributes by aggregating information from regulatory filings, annual reports, and firm websites. Following Aggarwal et al. (2011), we examine 41 governance attributes with a distribution across four governance categories, including 24 attributes for board structure, eight attributes for ownership and compensation, six attributes for anti-takeover provisions, and three attributes for audit.

Equity-based compensation and board structure information is obtained from BoardEx. The BoardEx database contains information on board structures, board remuneration, and detailed profiles of board members (such as employment history, nationality, and educational affiliations) for more than 400,000 executives and board members for over 14,500 firms, beginning in 1999 (including coverage for 6,500 international firms). BoardEx data have been used in several studies, including Cohen et al. (2008), Schmidt (2009), and Aggarwal et al. (2011).

The data on institutional investor ownership are from the FactSet/LionShares database, which provides portfolio holdings for institutional investors worldwide. FactSet compiles institutional ownership information from public filings by investors (such as 13-F filings in the US), company annual reports, stock exchanges, and regulatory agencies around the world. Institutions are defined as professional money managers, including mutual fund companies, investment advisors, pension funds, bank trusts, and insurance companies. The database has been used in several other studies investigating the investment behavior of foreign investors (Ferreira and Matos, 2007; Bartram et al., 2010; Ng et al., 2011). Because institutional ownership represents over 40% of the total world stock market capitalization during our sample period, we control for institutional ownership in all our

[14] Data Explorers applies several filters to calculate active lendable value by excluding shares that are frozen and cannot be lent.

regressions to stress the impact of short selling. We also obtain ETF ownership of stocks from this database, which we use below as a measuring instrument for lending supply in the short-selling market.

We combine Datastream data with the short-selling, corporate governance, and institutional holdings data using SEDOL and ISIN codes for non-US firms. We use CUSIP to merge the short-selling data with US security data from Datastream. The final sample includes information concerning approximately 15,450 stocks across 23 countries. As shown in Appendix B, the sample includes 3,395 non-US firms and 1,185 US firms in 2003; this number increases to 7,652 for non-US firms and 4,006 for US firms by December 2009.

After we match the beginning sample from Datastream/WorldScope with Data Explorers, the base sample covers 65,450 firm-year observations over the period from the year 2003 to 2009. The match with RiskMetrics shrinks the sample size to 20,957 firm-year observations with a short period from 2004 to 2008. For tests of equity-based compensation and board structure, we match the base sample with BoardEx and obtain a sample of 14,917 firm-year observations from 2003 to 2009.

B. Main Variables

Consistent with the literature (e.g., Aggarwal et al., 2009, 2011), we use the corporate governance index (CGI) as the main proxy for internal governance, which is constructed as the average of 41 governance attributes for each firm and year. Each individual governance attribute is a dummy variable equal to one if a firm satisfies certain standards for that attribute. Thus, the higher the CGI value, the better the quality of a firm's internal governance.

The measures of managerial incentives and, in particular, of the equity-based segment of executive compensation are those that are standard in the literature. The CEO equity-compensation ratio (*CEOEqRatio*) is the ratio of a CEO's equity, option, and long-term incentive plan (LTIP) compensation to the CEO's total compensation. Executive equity compensation ratio (*ExeEqRatio*) is the ratio of the average equity, option, and LTIP compensation of the top executives to their total

compensation. CEO equity compensation (*CEOEqCom*) is the logarithm of the value of equity, option, and LTIP compensation of the CEO during a reporting period. Executive equity compensation (*ExeEqCom*) is logarithm of the average value of equity, option, and LTIP compensation of the top executives. These variables are also applied in Adams and Ferreira (2009), Agrawal and Nasser (2010), and Armstrong at el. (2012).

Finally, to provide an explicit example of internal monitoring, we also zoom in and use measures of board size, board independence, and whether a board is busy to proxy for the quality of internal monitoring. We adopt both continuous and dummy variables. The busy board metric (*BoardBusy*) denotes the average number of both public and private firm directorships held by directors on the board. The busy board dummy (*BoardBusyD*) equals one if the average number of directorships of both public and private firms held by the directors on the board is greater than three. Board independence (*BoardInd*) is the ratio of independent directors on the board. The board independence dummy (*BoardIndD*) equals one if the ratio of independent directors on the board is greater than 50%. Board size (*BoardSize*) denotes the number of directors on the board. The board size dummy (*BoardSizeD*) equals one if the number of directors in the board is greater than five but less than 16. These same variables have been widely applied in the existing literature (e.g., Masulis et al., 2012).

We define our main measure of short-selling potential (SSP), *Lendable, as* the annual average fraction of shares of a firm available (to be lent) to short sellers. More specifically, we follow Equation (4) of Saffi and Sturgesson (2011) to compute the ratio of the value of shares supplied to the short-selling market to the market capitalization of the stock for each month; we then take the averages of the monthly ratios as the annual *Lendable* ratio. We use an annual frequency because corporate governance variables are primarily defined annually.

Our control variables include the American Depository Receipt (*ADR*) dummy, closely held ownership (*CH*), the logarithm of firm size (*Size*), financial leverage (*Leverage*), the return-on-asset ratio (*ROA*), research and development expenses (*R&D*), the logarithm of annual stock return over the prior 12 months (*Momentum*), stock return volatility defined over the prior 12 months (*STD*), and

institutional ownership (*IO*). Institutional ownership is the aggregated equity holdings of domestic and foreign institutional investors as a percentage of the total number of outstanding shares. We further follow Chen et al. (2007) to construct a measure of long-term institutional ownership with monitoring incentives (*LO*) and complement it with the measure of short-term investors' ownership (*SO*), computed as one minus the sum of institutional and closely-held ownership. We also construct ETF ownership (*ETF*) as the percentage of the total number of outstanding shares that are owned by ETFs that fully replicate benchmark indexes. A detailed definition of all these variables is provided in Appendix B.

We present the summary statistics for the main variables in Table 1. Panel A reports the number of observations (N), mean, median, standard deviation (STD), decile distribution (90% and 10%), and quartile distribution (75% and 25%) of the variables. The mean (6.3%) of *Lendable* is close to the mean (8.0%) of the lending supply variable in Saffi and Sturgesson (2011). The difference between these two values arises because firms must have valid quality of internal governance variables to be included in our sample. CGI has a mean value of 56.1%, which is similar to the sample distribution of Aggarwal et al. (2011). The mean (42.8%) of *CEOEqRatio* in our international sample is close to that (43.0%) of the equity compensation ratio in the US sample of Armstrong et al. (2012). The other control variables also have a distribution that is consistent with the literature.

Panel B reports the Pearson correlation coefficients among the main variables. The correlation coefficients provide preliminary evidence of a positive relationship between short-selling potential and corporate governance variables. For example, the correlation coefficient between CGI and *lendable* is 0.269. Whereas this relationship provides some preliminary evidence, the correlation is contemporaneous and may be spurious because of the absence of control variables. Therefore, the next step of analysis is to examine the relationship in a multivariate framework.

IV. Short Selling and Internal Governance

We now analyze the link between internal governance and SSP. We first provide the main results and then consider the role of information and financial constraints. We estimate the following panel regression as the baseline for our multivariate analysis:

$$CGI_{i,t+1} = \alpha + \beta_1 \times SSP_{i,t} + \beta_2 \times X_{i,t} + \varepsilon_{i,t}\,, \quad (1)$$

where $CGI_{i,t+1}$ denotes a firm's corporate governance index, $SSP_{i,t}$ refers to the proxy of short-selling potential, and $X_{i,t}$ is a vector that stacks a list of firm-specific characteristics such as the size of the firm (*Size*), whether the firm is closely held (*CH*) or is listed in the US (*ADR*), book leverage (*Leverage*), profitability (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), and stock characteristics such as the log of the annual stock return (*Return*) and stock return volatility (*STD*). We also control for (without reporting the coefficients in the interest of brevity) industry-, country-, and year-level fixed effects (ICY). The standard errors are adjusted for heteroskedasticity and firm-level clustering.

We report the results in Table 2. Columns (1) to (3) are based on the entire sample, whereas columns (4) and (5) consider the subsamples of firms from the US and the rest of the world, respectively. Columns (6) and (7) focus on two sample periods, namely, the crisis period – i.e., the global financial crisis (2007-2008) – and the period that excludes the crisis ("Ex.Crisis").

The results show a strong positive relationship between internal governance and SSP. This relationship holds across the different specifications and alternative samples. The effect is statistically significant and economically relevant. One standard deviation higher SSP correlates to a 6.36% higher value on the internal governance index. This pattern holds both for the US and the rest of the world (NUS) and both before and during the crisis. One standard deviation higher SSP is related to a 6.97% (13.06%) higher level of governance in the US (rest of the world) and to a 7.45% (11.42%) higher level of governance during the crisis (in the non-crisis period).

Among the control variables, the results are consistent with our expectations. Firms with high proportions of closely held ownership tend to have a lower quality of governance. This finding is

consistent with agency issues in dual-class firms (e.g., Masulis et al., 2009). Larger firms and firms with higher institutional ownership have better governance, consistent with Gillan and Starks (2003) and Aggarwal et al. (2011). Controlling for these variables stresses the role of SSP in governance independent of institutional ownership.

Next, we investigate whether the impact of short selling is stronger for a shareholder clientele with shorter horizon and for firms that are more dependent on equity for financing. To do so, we regress governance on long-term ownership (*LO*), short-term ownership (*SO*), the KZ index (*KZ, KZ4*), cash flows (*CF*), cash holdings (*Cash*), and leverage (*Leverage*), as well as the interaction between SSP and these variables.

We report the results in Table 3. These results show that the involvement of these variables does not absorb the general governance impact of SSP. A shorter horizon – i.e., higher short-term ownership and lower long-term institutional ownership with monitoring incentives – further enhances the governance impact of SSP. Similarly, the more dependent the firm is on equity for financing – i.e., the more financially constrained the firm is, the lower its cash flows and cash holdings, and the higher its leverage – the more strongly SSP is related to governance. For instance, the sensitivity of CGI with respect to the interaction between SSP and the *KZ* index is 0.030 (t-statistic of 3.08), which implies that SSP has a greater impact on corporate governance for more financially constraint firms.

Next, we test whether the positive impact of short selling on internal governance is particularly strong in countries with weak institutions. We consider several country-level governance variables, including whether the country is ruled by civil law or common law (*ComLaw*). Common law has been shown to proxy for better regulatory and institutional environments (La Porta et al., 1996). We also consider the quality of disclosure requirement rules (*DisReq*), securities regulation and protection (*SecReg*), national accounting standards (*AccSta*), and the anti-director index (*AntiDir*). These variables have been used by La Porta et al. (2006), Djankov et al. (2008), and Hail and Leuz (2006). We re-estimate the previous specifications splitting the sample as a function of these institutional characteristics.

We report the results in Table 4. We find that the positive link between governance and SSP is stronger in the case of lower-quality institutional frameworks. In particular, one standard deviation higher SSP is related to an increase of 9.78% (9.37%, 8.75%, 9.09%, and 13.81%) in the level of governance in the case of civil law countries (with lower-quality disclosure requirements, security regulation protection, accounting standards, and anti-director rules, respectively) relative to those of countries with higher-quality institutional frameworks.

These results provide evidence in favor of the hypothesis that short selling improves internal governance, particularly in the case of more market-dependent firms and firms located in countries with weaker institutional frameworks.

V. Short Selling and Executive Compensation

As we argued above, SSP should also affect executive compensation and, in particular, make it more sensitive to the stock price. Thus, we now directly test the impact of SSP on equity-based compensation. We use the following list of empirical proxies to capture the sensitivity of executive compensation with respect to the stock price: CEO equity compensation ratio (*CEOEqRatio*), CEO equity compensation (*CEOEqCom*), executive equity compensation ratio (*ExeEqRatio*), and executive equity compensation (*ExeEqCom*). We proceed in two steps.

First, we show how SSP affects the magnitude of equity-based executive compensation variables. We regress the measures of equity-based compensation on SSP with a set of control variables. The control variables and the econometric specification are the same as in the previous table. We estimate the following:

$$EC_{i,t+1} = \alpha + \beta_1 Lendable_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where $EC_{i,t+1}$ refers to the CEO equity compensation ratio (*CEOEqRatio*) in Panel A of Table 5, the log value of CEO equity compensation (*CEOEqCom*) in Panel B, the executive equity compensation

ratio (*ExeEqRatio*) in Panel C, and the log value of executive equity compensation (*ExeEqCom*) in Panel D.

The results show a strong positive relationship between equity-based compensation and SSP. This relationship holds across the different specifications and alternative samples. For example, if we focus on *CEOEqRatio*, one standard deviation higher SSP increases the *CEOEqRatio* between 7.14% and 14.77%. As in the previous cases, this holds for both US and non-US firms (NUS) and both before and during the crisis period. Indeed, one standard deviation higher SSP correlates with a 10.36% (12.43%) higher level of CEO equity-based compensation ratio in the US (rest of the world) and to an increase of 7.14% (14.77%) in the CEO equity-based compensation ratio during the crisis (in the non-crisis period).

As a robustness check, we also directly regress the total amount of executive compensation on firm performance and the interaction term between SSP and performance to determine whether short selling provides more performance-linked incentives to executives. We consider the following three measures of performance, in particular: return-on-asset ratio (*ROA*), abnormal annual stock return (*AbnReturn*), and log of annual stock return (*Return*).

We report the results in Table 6. Panels A and B tabulate the results for CEO total compensation (*CEOTotComp*) and executive total compensation (*ExeTotComp*), respectively. The results show that SSP significantly increases the sensitivity of executive compensation to firm performance. For instance, in Column (1), the interaction term between *Lendable* and *ROA* is positively significant at the 5% level with a coefficient of 2.904 and *t*-statistic of 2.36.

Finally, we also test how investor horizon, equity dependence, and country-level governance affect the impact of SSP on CEO and executive compensation. Because the results are very similar to those in Tables 3 and 4, we leave them unreported in the interests of brevity. For instance, the regression coefficient of *CEOEqRatio* on the interaction between SSP and the *KZ* index is 0.477 (t-statistic 3.04), which suggests that the impact is also higher for more financially constrained firms.

The interactions between SSP and the other variables used in Table 3 also typically have the same sign and similar t-statistics. In addition, the impact of short selling on CEO and executive equity compensation is more pronounced in economies with weaker institutional frameworks – i.e., economies ruled by civil law and weaker disclosure requirements, securities regulation, accounting standards, and anti-director rules.

VI. Endogeneity Tests

Endogeneity is a potential concern, i.e., whereas we show that SSP positively affects internal governance, could it be the case that SSP itself is actually supplied by shareholders eager to exercise governance? This reverse causality may create the same positive relationship between the two factors. In this section, we first show that, as implied by the institutional features of the short-selling market, SSP itself is not supplied by shareholders eager to exercise governance. We then complement this analysis with evidence that ETFs, which do not monitor managers by themselves, supply lendable shares to short sellers that subsequently affect the governance incentives of the rest of shareholders.

A. Potential Spurious Correlation

We first use firm-fixed effects (in addition to our standard specifications) to examine the issue of spurious correlations that might result from the omission of relevant variables that are correlated with our focus variable. The results are reported in Models (1) and (2) of Panel A and Panel B of Table 7, in which *CGI* and *CEOEqRatio* are used as dependent variables, respectively. Our main results remain significant, and one standard deviation higher SSP is related to 2.32% (11.05%) higher internal governance (equity-based compensation). In the specification based on changes, one standard deviation higher SSP is related to 1.03% (6.70%) higher governance (equity-based compensation). These results exclude the issue of spurious correlation resulting from omitted firm characteristics.

Reverse causality is a more important issue. Conceptually, a large-scale supply of lendable shares is unlikely to be issued by investors who are eager to monitor and intervene because lending shares

means giving up, at least temporarily, their voting rights. This behavior contradicts both incentives for and the ability of shareholders to exert governance. We use the same methodology of Agrawal et al. (2011) to econometrically confirm the institutional impact that the first-difference Granger causality test adequately determines the direction of causality. More specifically, we estimate the following:

$$\begin{cases} \Delta CGI_{i,t+1}\left(\Delta CEOEqRatio_{i,t+1}\right) = \alpha + \beta_1 \Delta Lendable_{i,t} + \beta_2 \Delta X_{i,t} + \varepsilon_{i,t} \\ \Delta Lendable_{i,t+1} = \alpha + \beta_1 \Delta CGI_{i,t}\left(\Delta CEOEqRatio_{i,t}\right) + \beta_2 \Delta X_{i,t} + \varepsilon_{i,t} \end{cases}, \quad (3)$$

where $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend and $X_{i,t}$ is the previously defined vector of control variables. We use industry-, country-, and year-fixed effects. The standard errors are adjusted for heteroskedasticity and firm-level clustering.

The first regression tests the causality from SSP to governance as we hypothesized and is reported in Models (3) and (4) of Table 7 (Panel A for *CGI* and Panel B for *CEOEqRatio*). The second regression explores the reverse causality. The results are tabulated in Models (5) and (6) of the same table. The results show that changes in SSP significantly predict changes in governance, which is consistent with our intuition. By contrast, changes in the governance do not lead to any change in the supply of lendable shares. Thus, as implied in the design of the short-selling market, there is no reverse causality from governance to SSP.

The results of the two regressions strongly suggest that there is a certain type of shareholders who are not interested in performing governance roles; instead, they supply lendable shares to short sellers, allowing the latter to impact governance on their behalf. The next section undertakes the task of identifying this type of ownership and its economic impact.

B. An Instrumental Variable Approach

As we argued above, exchange-traded funds (ETFs) provide a good example of passive institutional investors who supply governance-*unrelated* lendable shares to the short-selling market. First, various evidence, including that of Dyck et al. (2010) and our own evidence that will be discussed below, indicates that ETFs do not intervene in governance matters. Indeed, ETFs are known as a mutual-fund

type of investment vehicle in the market with the lowest level of fees – and the fee feature makes them the least likely candidate, among all institutional investors, to monitor firms. Simultaneously, ETFs supply lendable shares to the short-selling market, and the astonishing growth rate of the industry – 40% growth each year from 2001 to 2010, compared to the 5% annual growth rate observed in global mutual funds and equity markets over the same period – provides large exogenous variations to the amount of shares available for short selling. Indeed, the growth rate of lendable shares in the global market, as reported by Saffi and Sigurdsson (2011), is closer to that of the ETF industry than to the open-end fund industry or any other type of mutual funds in the market. These observations strongly suggest that there are sufficient amounts of governance-unrelated lendable shares in the market to be exploited by short sellers.

To lay out our empirical tests, we build on the argument of Hirshleifer et al. (2011) that institutional ownership offers a powerful instrument for short selling. However, to achieve our specific goal of identifying SSP that is unrelated to governance, we focus on the specific type of institutional ownership that is unrelated to governance, namely, ETFs. Based on the arguments made above, ETF ownership is likely to be a powerful instrument because it meets both the exclusion restriction and the inclusion restriction; as ETFs do not directly enhance governance, they make shares available to short sellers. More specifically, we estimate the following two-stage system:

$$\begin{cases} Stage\ 1: SSP_{i,t} = \alpha + \beta_1 ETF_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t} \\ Stage\ 2: CGI_{i,t+1}\left(CEOEqRatio_{i,t+1}\right) = \alpha + \beta_1 Predicted\ SSP_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t} \end{cases}, (4)$$

where $SSP_{\mathrm{i,t}}$ refers to short-selling potential and $X_{i,t}$ is the vector of control variables. Note that institutional ownership is appears in both stages to ensure that its impact is controlled for in both the first and second stage. We estimate panel specifications with industry-, country- and year-level fixed effects and we adjust the standard errors for heteroskedasticity and cluster at the firm level.

We report the results in Table 8. In Panel A, the dependent variable is *CGI*, whereas in Panel B, the dependent variable is *CEOEqRatio*. Models (1) and (2) report the two stages of regression. We observe that SSP is strongly positively related to ETF ownership in the first-stage regression. The *t*-

statistic is always above 45, which translates in an F-test to well above the threshold of weak exogeneity provided by Staiger and Stock (1997). The effect is also economically significant. ETF ownership that is one standard deviation higher correlates to a 38.75% higher short-selling potential, which confirms that ETFs are among the major suppliers of lendable shares to the short-selling market.

Moreover, the second-stage regression documents a strong positive correlation between instrumented SSP and both quality of governance (Panel A) and equity-based compensation (Panel B). A one standard deviation higher instrumented SSP is related to an increase of 16.86% in the quality of governance and an increase of 20.57% in equity-based compensation. The former measurement more than doubles the initial economic magnitude reported in Table 2 (the latter is also higher). The increase in power is not surprising, as ETFs are likely to be a very powerful instrument for governance-unrelated SSP.

Models (3) and (4) conduct a similar instrumental variable regression, although the instrumental variable is now the residual of ETF ownership from an (unreported) pre-stage regression in which we further orthogonalize ETF ownership on analysts coverage (*Analyst*), news coverage (*NewsCoverage*), and Amihud's (2002) illiquidity (*Illiquidity*). Its residual, *ETF-Res*, is then used to replace ETF ownership in the two-stage regressions above, as reported in Models (3) and (4). This orthogonalization aims to further exclude liquidity effects. Note that if liquidity reduces short-selling costs, then its impact on governance is similar to that of lendable shares. However, we use lendable shares as our main variable because its institutional design makes it more exogenous to governance-related ownership, as discussed above. By contrast, liquidity may be endogenous to governance. Of course, we expect ETF-related liquidity to be exogenous to governance also (after controlling for institutional ownership). Nonetheless, we attempt to empirically verify whether this is the case. This implication is fully supported by the data; explicitly removing liquidity does not affect the significance of the impact of instrumented SSP on governance.[15]

[15] (Unreported) results show that if we orthogonalize IO using the pre-stage regression, the results remain unchanged. Here, for consistency among all the tables, we report the results with IO as a control variable in both stages.

To validate that ETFs do not directly engage in governance, we provide certain diagnostic tests in Columns (5)-(8). From Column (5), we observe that ETF is positively related to governance in the full sample. However, Column (6) shows that when there is no SSP (i.e., *lendable*=0), ETFs have no impact on governance. This finding suggests that SSP is the necessary channel for ETF ownership to affect governance, which implies that the impact of ETF reported in Column (5) does not arise from a direct governance practice. If we ask the reverse question of whether ETF is a necessary channel for SSP to affect governance, we observe that the answer is negative because SSP remains positively related to both governance and equity-based compensation when ETF ownership is zero (Column (7)) or even when institutional ownership is zero (Column (8)). The results are not surprising because there are other shareholders who supply lendable shares to the market, which also promotes governance. The results in these two columns illustrate the power of short selling in the market and its overall impact on internal governance.

Overall, the evidence confirms the previous results regarding short-selling potential and the quality of governance. More importantly, these results allow us to provide a causal interpretation of the relationship, which suggests a channel for the impact from short-selling potential to the quality of internal governance. Thus, the increase in the short-selling potential resulting from the exogenous growth of ETF ownership helps to increase the quality of internal governance. This pattern verifies the disciplining role of short-selling potential.

VII. Robustness Checks and Additional Tests

Finally, we provide two additional tests to gain additional information regarding the economic role of short selling. First, because the board plays the pivotal role of monitoring managers internally, we should examine how short selling improves the quality of the board structure. Second, because firms with good governance are known to have better operating performance, we test whether the complementarity impact of short selling on corporate governance in general helps investors achieve the same economic result.

A. Additional Robustness Checks

We begin by investigating how short selling improves the board structure as an illustration of the enhanced monitoring incentives of investors. We report the results in Table 9. The dependent variable is busy board (*BoardBusyD* or *BoardBusy*) in Panel A, board independence (*BoardIndD* or *BoardInd*) in Panel B, and board size (*BoardSizeD* or *BoardSize*) in Panel C. We provide an analysis of the overall sample (Column (1)), the US sample (Column (2)), the non-US sample (Column (3)), the non-crisis period (Column (4)), and the crisis period (Column (5)).

In all of these cases, we find that SSP improves the quality of the board. In particular, one standard deviation higher SSP is related to a 6.23% less busy board, a 2.63% more independent board, and a board size that is 1.75% larger. These findings provide an explicit example of how improved monitoring can be achieved, which adds to the general analyses provided in the previous sections.

B. Short Selling, Internal Governance, and Value Creation

Finally, we test whether the disciplining effect of SSP on internal governance has any direct implications on firm performance. We report the results in Table 10. We begin by preliminarily regressing firm profitability (ROA) on SSP and report the results in Columns (1)-(5) and find a strongly positive link between SSP and profitability. The impact of a one standard deviation increase in the SSP is related to an increase in profitability that ranges from 2.48% for the overall sample to 2.93% (10.50%) for the US (rest of the world) and to 7.38% (2.80%) during the crisis (non-crisis period).

Next, we regress both governance and equity-based compensation to SSP and use the projected part as the main variable. This proxies for the role of either governance or equity-based compensation and is then used to explain profitability. This finding is reported in Columns (6)-(10) for governance and Columns (11)-(15) for equity-based compensation. The results show that both SSP-related governance and both governance and SSP-related equity-based compensation directly affect firm profitability. One standard deviation higher SSP-related governance (equity-based compensation) is

related to a 24.99% (16.64%) higher ROA. This result provides evidence of a direct impact of the disciplining effect of SSP on firm profitability and suggests that much of the impact of governance on firm performance is the result of short selling, which is consistent with our working hypothesis.

Conclusion

We study how "trading-based governance" affects internal governance through the channel of short selling. Using a simple model, we argue that the threat of costly short-selling attacks triggered by bad managerial actions pushes existing shareholders to better control management – either through improved internal governance or via enhanced equity compensation. Thus, short-selling-based discipline mechanisms are complementary with, instead of substituting for, internal governance.

We consistently find a significantly positive relationship between short-selling potential (our empirical proxy for the threat of short selling) and the ISS index (our empirical proxy for the quality of internal governance) in our empirical tests. The effect is stronger for investors that have a shorter horizon, for firms that are more financially constrained, and in economies with less market-oriented institutions, such as civil-law systems, lower quality financial disclosure, worse securities regulation protection, and less developed accounting standards.

In addition, short-selling potential increases the sensitivity of management compensation to performance and boosts the monitoring role of the board. All the results are robust to an instrumental variable specification in which we use ETF ownership as an instrument, which affects the number of shares available to be lent in the market but is unrelated to (bad) information that may lead directly to short selling.

Finally, we show that short-selling potential in general enhances firm profitability (ROA). More importantly, we document that the part of internal governance that is directly explainable in terms of short selling enhances firm profitability.

Our results provide evidence in favor of the beneficial effect of the short-selling market on the corporate market. The relationship between short selling and internal governance – the threat of short selling causes investors to formulate better internal governance – may help us to better understand and regulate the side-by-side development of financial markets and corporations.

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Appendix A: The Model

We consider a three-period model. In Period 0, the manager of the firm decides whether to take a "bad action" (e.g., manipulation) that might benefit him but damage shareholder value. We use variable $\tilde{a}$ to describe the decision, which takes a value of 0 if the manager decides not to take the bad action and 1 if the manager decides to take it. If the bad action is not taken, the value of the firm in Period 2 is v, and the manager receives a payoff of $f_0 = \omega_1 P_1 + \omega_2 P_2$, where ω_1 and ω_2 are two constants and P_1 and P_2 denote the price of the firm in Periods 1 and 2, respectively. If the bad action is taken, then the manager obtains a private benefit of $\beta > 0$, in addition to the normal payoff, and the value of the firm is reduced by $\tilde{\delta} > 0$. In Period 0, the manager directly observes $\tilde{\delta}$, but investors only know the distribution of $\tilde{\delta}$ and whether the bad action is taken. The effective managerial payoff is $f_0 = \omega_1 P_1 + \omega_2 v$ when $\tilde{a} = 0$. It becomes $f_1 = \beta + \omega_1 P_1 + \omega_2 (v - \tilde{\delta})$ when $\tilde{a} = 1$.

Next, we refer to the (representative) short seller as *S* and the (representative) shareholder of the firm as *L*. As discussed above, in Period 0, short seller *S* observes the private information of $\tilde{\delta}$, as do the managers. She also observes the managerial action of $\tilde{a}$. If $\tilde{a} = 1$, the short seller submits an order of $\xi < 0$ shares of the stock to the market to short sell the stock in Period 1. For tractability, we assume that $\tilde{\delta}$ is normal (i.e., $\tilde{\delta} \sim N(\delta_0, \Sigma_\delta)$, where δ_0 and Σ_δ are two constants to denote its mean and variance, respectively).[16] The short seller has a negative exponential utility function of $U(\pi) = -exp(-\pi)$, where $\pi = (v - \tilde{\delta} - P_1)\xi$ is her trading profits. The risk aversion of the utility function has been normalized to 1. We further assume that the short seller maximizes her expected utility function by her trading at P_1. Simultaneously, some retail investors must buy or sell u shares of the stock to cover their private liquidity shocks ($u \sim N(0, \sigma_u^2)$). The market observes the summation of the orders $\xi + u$.

[16] Of course normal distribution could lead to negative value. This is a common issue with rational expectation models. We avoid this problem by restricting $\tilde{\delta} \in (0, x_B]$ as the bad-action region. The unconditional value destroyed by the manager is $E[\tilde{a}\tilde{\delta}] = E[\tilde{\delta}|\tilde{a}] \times Prob[\tilde{a}] = E[\tilde{\delta}|\tilde{\delta} \in (0, x_B]\,] \times Prob[\tilde{\delta} \in (0, x_B]]$, based on the $N(\delta_0, \Sigma_\delta)$ distribution.

Moreover, the shareholder of the firm does not directly observe the managerial action. However, she may choose to invest some capital, K, in internal governance, such as (though not limited to) the effective monitoring of managers and better disclosure and transparency. Without the loss of generality, we assume that the internal governance mechanism, once invested, may lead to an unconditional probability of q to prevent the manager from taking the bad action for any $\tilde{\delta}$ value. Furthermore, the probability is an increasing and concave function of the capital invested. Finally, similar to Admati and Pfleiderer (2009), we assume that, with a probability θ, the investor may also experience a private liquidity shock, which occurs and leads her to exit in the first period. The shareholder makes a consumption of $C = \theta P_1 + (1-\theta)P_2$.

Following Admati and Pfleiderer (2009), the manager takes the bad action when $f_1 \geq f_0$. This condition is equivalent to $\tilde{\delta} \leq x_B$, where $x_B \equiv \beta/\omega_2$ is a constant. Thus, $(0, x_B]$ is the range of $\tilde{\delta}$ over which the bad action will be taken. From this perspective, x_B might be regarded as a proxy for the agency cost of the economy. We refer to $(0, x_B]$ as the "bad action" region, upon which we can define a governance mechanism as follows:

Definition: *A governance mechanism reduces the bad-action region of $\tilde{\delta}$ over which managers choose to take the bad action.*

According to this definition, the "Wall Street Walk" of Admati and Pfleiderer (2009) may be regarded as internal governance, whereas the short-selling mechanism of Massa et al. (2013) may be regarded as external governance (here, we classify any governance imposed by the "insiders" of a firm, including its existing investors and managers, as internal). In both cases, the reduction effect can be achieved by making the price of P_1 more effective, as demonstrated in the following lemma.

Lemma 1: *If a governance mechanism allows the price of P_1 to be updated to $P_1(\tilde{a} = 1)$ when the bad action is taken and $P_1(\tilde{a} = 0)$ when no bad action is taken, then*

1) it disciplines the manager of the firm if and only if $P_1(\tilde{a} = 0) - P_1(\tilde{a} = 1) > 0$; and

2) *its discipline effect can be quantified by the shrinkage of the bad-action region from* $(0, x_B]$ *to* $(0, x_B - \Delta x_B]$, *where* $\Delta x_B = \frac{\omega_1}{\omega_2} \times \left(P_1(\tilde{a} = 0) - P_1(\tilde{a} = 1)\right)$ *is a constant.*

Proof (Lemma 1): We can rewrite the condition of $f_1 \geq f_0$ as $\tilde{\delta} \leq \frac{\beta}{\omega_2} - \frac{\omega_1}{\omega_2} \times (P_1(\tilde{a} = 0) - P_1(\tilde{a} = 1)$. In this case, the range of $\tilde{\delta}$ over which bad actions will be taken becomes $(0, x_B - \Delta x_B]$. Compared to the original "bad action" region of $(0, x_B]$, managers are disciplined if and only if $\Delta x_B > 0$ or $P_1(\tilde{a} = 0) - P_1(\tilde{a} = 1) > 0$. Q.E.D.■

The implication of the lemma is that if the market mechanism pushes down the stock price of P_1 when bad actions are taken by the manager, then the manager suffers additional loss when he actually takes the bad action because of his payoff sensitivity to P_1. This threat reduces the incentive for managers to take the bad action.

To better understand the relationship between short selling and the Wall Street Walk, we first explore the following two scenarios in which the investor, *L*, is uninformed:

1) **Scenario 1** (No Governance): *L* is uninformed, and there is no short selling. We continue to refer to the stock price in Period 1 as P_1 in this scenario.
2) **Scenario 2** (Governance imposed by informed short selling only): *L* is uninformed but the informed short seller, *S*, enters the market and can freely trade. We denote the Period 1 stock price in this scenario as P_{1S}, where the subscript *S* indicates that *S* is informed.

By comparing the two scenarios described above, we can derive the utility loss of *L* when short selling occurs. This process leads to a very important implication about the relationship between short selling and internal governance of the model, which is summarized in the following proposition.

Proposition 1: *The presence of informed short selling disciplines managers. Moreover, it increases the capital the investor is willing to devote to internal governance.*

Proof (Proposition 1): 1) In Scenario 1, the bad-action region is $(0, x_B]$, where $x_B \equiv \beta/\omega_2$, as we solved before. When $\tilde{\delta} \in (0, x_B]$, the stock price is $P_1 = v - E[\tilde{a}\tilde{\delta}]$ and $P_2(\tilde{a} = 1) = v - \tilde{\delta}$, where $E[\tilde{a}\tilde{\delta}]$ is the unconditional expectation of the value to be destroyed by the manager (including the case when the bad action is not taken). Investor *L*'s consumption is $C = \theta P_1 + (1-\theta)P_2 = v - \theta E[\tilde{a}\tilde{\delta}] - (1-\theta)\tilde{\delta}$.

In Scenario 2, the bad-action region becomes $(0, x_B - \Delta x_{BS}]$ in the presence of informed short selling. Here, Δx_{BS} refers to the disciplining impact of short selling following Lemma 1, in which the subscript of *S* (again) indicates that this is the equilibrium in which *S* is informed. The value of Δx_{BS} can be solved as follows. Following Kyle (1985), the market conjectures that the value of P_{1S}, conditioned on the total order of $\xi + u$, should be

$$P_{1S} = v - E[\tilde{\delta}|\xi + u] = v - (\delta_0 - \lambda'(\xi + u)) = v - \delta_0 + \lambda'(\xi + u), \quad (A1)$$

where λ' is a constant to be solved in the equilibrium. Here, δ_0 is the unconditional expectation of the agency cost (the value destroyed by the manager). Conditioning on $\xi + u$, the updated agency cost becomes $E[\tilde{\delta}|\xi + u] = \delta_0 - \lambda'(\xi + u)$, where the negative sign before $\lambda'(\xi + u)$ indicates that stronger short-selling demand (i.e., a more negative value of $\xi + u$) implies a higher agency cost.

Because the maximization over $E[-exp(-\pi)]$ is equivalent to maximizing $E[\pi] - 1/2Var(\pi)$, the short seller's maximization problem becomes $Max_\xi \; E[(v - \tilde{\delta} - P_1)\xi] = \xi(\delta_0 - \tilde{\delta} - \lambda'\xi)$, which leads to the following first-order condition (FOC):

$$\xi = \frac{\delta_0 - \tilde{\delta}}{2\lambda'} \equiv \alpha' + \beta' \times \tilde{\delta}, \qquad (A2)$$

where $\alpha' = \frac{\delta_0}{2\lambda'}$ and $\beta' = \frac{-1}{2\lambda'}$ are two constants. This equation indicates that short sellers short sell the stock if the value to be destroyed by the manager is high. To solve out the constant λ', note that the vector of $(\tilde{\delta},\ \xi + u = \alpha' + \beta'\tilde{\delta} + u)^T$ follows a joint normal distribution with mean $(\delta_0, \alpha' + \beta'\delta_0)^T$

and the covariance matrix of $(\Sigma_\delta \ \beta'\Sigma_\delta;\ \beta'\Sigma_\delta \ \ \beta'^2\,\Sigma_\delta + \sigma_u^2)$ using public information [17] Thus, $E\left[\tilde{\delta}\middle|\xi + u\right] = \delta_0 + \frac{\beta'\Sigma_\delta}{\beta'^2\,\Sigma_\delta + \sigma_u^2}(\xi + u)$. This relationship indicates that $\lambda' = -\frac{\beta'\Sigma_\delta}{\beta'^2\,\Sigma_\delta + \sigma_u^2}$, which can be used to solve for the value of λ'. It is clear that $\lambda' = \frac{1}{2}\sqrt{\frac{\Sigma_\delta}{\sigma_u^2}}$. The parameters α' and β' can be solved based on λ'. These parameters quantify the trading equilibrium in Period 1. With informed short selling, therefore, the price becomes $P_{1S}(\tilde{a} = 0) = v - \delta_0 + \lambda' u$ and $P_{1S}(\tilde{a} = 1) = v - \frac{\delta_0 + \tilde{\delta}}{2} + \lambda' u$. This equation leads to $\Delta x_{BS} = \frac{\omega_1}{\omega_2} \times (\tilde{\delta} - \delta_0)/2$, where we have averaged the impact of liquidity shocks. Following Lemma 1, Δx_{BS} quantifies the disciplining impact of short selling.

2) When $\tilde{\delta} \in (0, x_B - \Delta x_{BS}]$, the prices in each period become $P_{1S}(\tilde{a} = 1) = v - \frac{\delta_0 + \tilde{\delta}}{2} + \lambda' u$ and $P_{2S}(\tilde{a} = 1) = P_2(\tilde{a} = 1)$. The consumption of L in Scenario 2 becomes $C_S = \theta P_{1S} + (1 - \theta)P_{2S}$. Thus, $P_{1S}(\tilde{a} = 1)$ drops below P_1 when short selling occurs, and $C_S - C \propto \theta(P_{1S} - P_1)$ is negative as long as $\theta > 0$. In other words, the short-selling attack reduces the consumption of *L* by pushing down the stock price of P_{1S}.

3) Finally, we prove that the investor actually is willing to devote more governance-enhancing capital investments, K, in the presence of more effective short selling.

We first quantify the impact of K on the probability of reducing bad managerial action as follows: $q(K = 0) = 0; q \leq 1; q'(K) \equiv \frac{\partial q}{\partial K} \geq 0; and\ q''(K) \equiv \frac{\partial^2 q}{\partial K^2} \leq 0$. The consumption of L with monitoring, denoted by C_M, becomes $C_M = (1 - q)C_S + q \times v - K$. We compare this case with Scenario 2 to understand how short selling pushes uninformed investors to invest in governance. The consumption gain with monitoring can be written as $C_M - C_S = q(v - C_S) - K$. The investor L is willing to devote effort to governance as long as $K \leq q(v - C_S)$. Because $v - C_S = \theta(v - P_{1S}) + (1 - \theta)\tilde{\delta} > 0$ if short selling occurs, in general, the devotion to governance results in positive conditioning on short selling.

[17] Note that the market only must update $\tilde{\delta}$ because the participation of the short seller reveals that $\tilde{a} = 1$. This is also the reason why the conjectured price is $P_1 = v - \delta_0 + \lambda'(\xi + u)$ instead of $P_1 = v - E\left[\tilde{a}\tilde{\delta}\right] + \lambda'(\xi + u)$.

Furthermore, $v - C_S$ is greater when $\theta(v - P_{1S})$ is more positive. This condition occurs when the short selling is more effective in terms of disciplining (i.e., when P_{1S} is more sensitive to the bad managerial action) and when θ is larger (when investors have a shorter horizon). The consumption gain of L can then be maximized by taking the optimal value of K, which solves the following FOC: $q'(K) = \frac{1}{(v - C_S)}$. Clearly, an increase in $v - C_S$ leads to a decline in $q'(K)$, which indicates an increase in K because $q''(K) \leq 0$. Thus, more effective short-selling discipline induces investors to invest more in internal governance. Q.E.D.■

In addition to investing in internal governance, the blockholder can be considered to increase the sensitivity of the overall payoff of the manager with respect to short-term equity performance (i.e., equity-based compensation) to benefit her in the presence of informed short selling:

Proposition 2*: Higher equity-based managerial compensation strictly benefits the investor in the presence of informed short selling.*

Proof (Proposition 2): Equity-based compensation is captured by the ratio of ω_1/ω_2 in this model; the higher the ratio, the more sensitive the manager is to the short-term stock price. Higher equity-based compensation reduces the agency cost, according to Lemma 1 ($i.e.,\ \Delta x_{BS} \sim \omega_1/\omega_2$). Next, the utility difference between Scenario 2 and Scenario 1 is $C_S - C \propto \theta(P_{1S} - P_1)$. If we integrate the consumption difference over all possible regions, the overall difference is $\int_0^{x_B - \Delta x_{BS}} \theta(P_{1S} - P_1) g(\tilde{\delta}) d\tilde{\delta} + \int_{x_B - \Delta x_{BS}}^{x_B} \theta(P_{1S} - P_1) g(\tilde{\delta}) d\tilde{\delta}$, where we use $g(.)$ to denote the density function of $\tilde{\delta}$. The first integration is over the bad region, in which case short selling in Scenario 2 should push the price P_{1S} lower than that in Scenario 1. Thus, $P_{1S} < P_1$ in this region. Moreover, ω_1/ω_2 affects the integration only through Δx_{BS}. Clearly, from the principle of differentiation integrations (i.e., $\frac{\partial}{\partial a}\int_a^b f(x)dx = -f(a)$ and $\frac{\partial}{\partial b}\int_a^b f(x)dx = f(b)$) and the condition of $P_{1S} - P_1 < 0$, we can derive that $\frac{\partial}{\partial \Delta x_{BS}} \int_0^{x_B - \Delta x_{BS}} \theta(P_{1S} - P_1) g(\tilde{\delta}) d\tilde{\delta} \propto \frac{\partial}{\partial b} \int_0^b \theta |P_{1S} - P_1| g(\tilde{\delta}) d\tilde{\delta} > 0$ (where $b = x_B - \Delta x_{BS}$ in the second integration). Thus, ω_1/ω_2 enhances the consumption of the shareholder. Likewise, the

second integration is over a region in which short selling has disciplined the managers, and the price with short selling is therefore higher than that without (i.e., $P_{1S} - P_1 > 0$). Differentiating the second integration again leads to $\frac{\partial}{\partial \Delta x_{BS}} \int_{x_B - \Delta x_{BS}}^{x_B} \theta(P_{1S} - P_1) g(\tilde{\delta}) d\tilde{\delta} > 0$; thus, ω_1/ω_2 enhances the consumption of the investor.

The economic implications of the above proof are as follows. Equity sensitivity, ω_1/ω_2, does not affect how short selling impacts the price of P_{1S}. Therefore, the conditional consumption impact of $\theta(P_{1S} - P_1)$ examined in Lemma 2 is irrelevant to the ratio. A higher sensitivity does, however, punish the manager if he takes the bad action. This threat reduces the bad-action region in the presence (and only in the presence) of short selling and increases firm value for the benefit of the investor. Because an increase in the equity sensitivity punishes the managers but not the investor, the presence of short selling provides incentives for investors in the firm to increase this sensitivity (or equity-based compensation). Q.E.D.□

Appendix B: Variable Definitions

Variable	Acronym	Definition	Data Source
A. Firm-level variable			
A1. Short selling variables			
Lendable shares	*Lendable*	Annual average fraction of shares of a firm available to lend.	Dataexplorers
ETF ownership	*ETF*	Annual average holdings by ETF as a percentage of total number of outstanding shares.	FactSet
A2. Corporate governance variables			
Corporate governance index	*CGI*	RiskMetrics's composite corporate governance index based on 41 firm-level governance attributes across the following four broad subcategories: board (24 attributes), audit (three attributes), anti-takeover provisions (six attributes), and compensation and ownership (eight attributes).	Aggarwal et al. (2011)
CEO equity compensation ratio	*CEOEqRatio*	Ratio of a CEO's equity, option, and LTIP compensation to the CEO's total compensation.	BoardEx
CEO equity compensation	*CEOEqCom*	Log of value of equity, option, and LTIP compensation of CEO in a reporting period.	BoardEx
Executive equity compensation ratio	*ExeEqRatio*	Ratio of top executives' average equity, option, and LTIP compensation to their total compensation.	BoardEx
Executive equity compensation	*ExeEqCom*	Log of average value of equity, option, and LTIP compensation of top executives.	BoardEx
Busy board	*BoardBusy*	Average number of directorships of both public and private firms held by directors on the board.	BoardEx
Busy board dummy	*BoardBusyD*	A dummy variable that equals one if the average number of directorships of both public and private firms held by directors on the board is greater than three.	BoardEx
Board independence	*BoardInd*	Ratio of independent directors on the board.	BoardEx
Board independence dummy	*BoardIndD*	A dummy variable that equals one if the ratio of independent directors is greater than 50%.	BoardEx
Board size	*BoardSize*	Number of directors on the board.	BoardEx
Board size dummy	*BoardSizeD*	A dummy variable that equals one if number of directors one the board is greater than five but less than 16.	BoardEx
A3. Control variables			
American Depository Receipts	*ADR*	An ADR dummy that equals one if the firm was cross-listed on a U.S. stock exchange.	Multiple sources**
Closely-held ownership	*CH*	Fraction of shares closely held by insiders and controlling shareholders.	Worldscope
Firm size	*Size*	Log of total assets in U.S. $.	Datastream
Financial leverage	*Leverage*	Ratio of total debt to total assets.	Worldscope
Return-on-equity ratio	*ROA*	Ratio of net income before extraordinary items plus interest expenses to total assets.	Worldscope
Research and development	*R&D*	Ratio of research and development expenses to total assets.	Worldscope
Institutional ownership	*IO*	Aggregate equity holdings by institutional investors relative to total number of outstanding shares.	FactSet
Annual stock return	*Return*	Log of annual stock return.	Datastream
Stock return volatility	*STD*	Annualized standard deviation of monthly stock returns.	Datastream

** The information on U.S. cross-listings is gathered from three data sources: Depository banks (such as Bank of New York), U.S. stock exchanges and Datastream.

Appendix B: Variable Definitions - Continued

Variable	Acronym	Definition	Data Source
A4. Other variables			
KZ index	*KZ*	Kaplan and Zingales' (1997) financial constraint index based on five variables: KZ=-1.002 cash flow-39.368 cash dividends-1.315 cash+3.139 leverage+0.283Q.	Worldscope
Four-variable KZ index	*KZ4*	Kaplan and Zingales' (1997) financial constraint index based on four variables: KZ=-1.002 cash flow-39.368 cash dividends-1.315 cash+3.139 leverage.	Worldscope
Cash flows	*CF*	Cash flows scaled by total assets.	Worldscope
Cash holdings	*Cash*	Cash and short-term investments scaled by total assets.	Worldscope
Retail ownership	*RO*	One minus closely-held ownership and institutional ownership.	FactSet
Long-term institutional ownership	*LO*	Aggregate equity holdings by long-term institutional investors as a percentage of total number of outstanding shares.	FactSet
Abnormal annual stock return	*AbnReturn*	Log of annual stock return adjusted by its country portfolio return.	Datastream
Number of analysts following	*Analyst*	Number of financial analysts following a firm.	IBES
News coverage	*NewsCoverage*	Log of one plus number of news releases recorded in Dow Jones Newswire.	RavenPack
Amihud's (2002) illiquidity	*Illiquidity*	Log of the average of daily Amihud's (2002) measure calculated as the absolute value of stock return divided by dollar trading volume on a given day.	Datastream
B.Country-level variable			
Common law	*ComLaw*	A dummy variable that equals one when a country has a common-law legal system.	La Porta et al. (1998)
Disclosure requirement index	*DisReq*	Disclosure is the average score of the following six sub-indexes: prospectus delivering, insider compensations, large shareholder ownership, insider ownership, contracts outside the normal course of business, and related party transactions. All these sub-indexes are dummy variables, and for each sub-index, the value of one is assigned to the index if it signifies high quality disclosure.	La Porta et al. (2006)
Securities regulation index	*SecReg*	The score of securities regulation is calculated as the average of the disclosure requirement, liability standards, and public enforcement indexes.	La Porta et al. (2006)
Accounting standard index	*AccSta*	The index examines and rates companies' 1990 annual reports on 90 items for 36 countries, covering general information, income statements, balance sheets, fund flow statements, accounting standards, stock data, and other special items.	La Porta et al. (1998)
Anti-director index	*AntiDir*	Anti-director index.	Pagano and Volpin (2005)

Appendix C: Number of Stocks by Country and Year

This table summarizes the number of our sample stocks for each country over the 2003 to 2009 sample period. The first column reports the name of the country. Column "N" reports the total number of stocks across all sample periods for each country. The rest of the columns report the number of stocks in each year.

Country	N	2003	2004	2005	2006	2007	2008	2009
Australia	1,120	163	255	333	387	552	880	784
Austria	61	17	29	30	40	50	55	51
Belgium	108	28	42	53	71	79	93	92
Canada	1,079	173	238	351	609	707	802	781
Denmark	122	22	30	42	68	93	102	97
Finland	103	31	45	64	71	88	95	91
France	553	184	221	251	305	394	460	421
Germany	584	135	164	242	361	402	471	404
Greece	57	2	22	3	4	30	34	44
Hong Kong	515	90	117	177	200	275	441	432
Ireland	51	20	23	27	27	33	40	40
Italy	303	96	136	163	199	225	250	241
Japan	2,699	1,467	1,611	1,827	2,024	2,247	2,353	2,276
Netherlands	126	57	73	76	95	98	96	91
New Zealand	59	12	19	25	28	29	45	41
Norway	178	27	44	62	87	109	128	126
Portugal	38	11	14	17	25	29	31	33
Singapore	293	51	66	94	112	145	227	238
Spain	139	57	68	82	92	108	119	116
Sweden	275	65	101	125	148	207	228	221
Switzerland	245	78	126	160	182	197	212	206
United Kingdom	1,430	609	653	652	821	906	886	826
United States	5,312	1,185	3,442	3,772	3,994	3,956	4,088	4,006
All	15,450	4,580	7,539	8,628	9,950	10,959	12,136	11,658

Table 1: Summary Statistics

This table presents the summary statistics and Pearson correlation coefficients of the main variables used in this study. The variables are corporate governance index (*CGI*), CEO equity compensation ratio (*CEOEqRatio*), lendable shares (*Lendable*), American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). Panel A reports the number of observations (N), mean, median, standard deviation (STD), and deciles (90% and 10%) and quartiles (75% and 25%) distribution of the variables. Panel B reports the correlation coefficients among the variables above. The sample is between 2003 and 2009. All the variables are defined in Appendix A.

Panel A: Summary Statistics

Variable	N	Mean	STD	90%	75%	Median	25%	10%
CGI	20,957	0.561	0.132	0.732	0.659	0.561	0.463	0.366
CEOEqRatio	14,917	0.428	0.328	0.849	0.729	0.470	0.000	0.000
Lendable	65,450	0.063	0.090	0.198	0.083	0.022	0.004	0.000
ADR	65,450	0.033	0.179	0.000	0.000	0.000	0.000	0.000
CH	65,450	0.303	0.244	0.654	0.487	0.268	0.089	0.001
Size	65,277	13.366	2.068	16.114	14.596	13.247	11.990	10.813
Leverage	65,231	0.207	0.192	0.477	0.329	0.171	0.030	0.000
ROA	64,051	0.026	0.146	0.136	0.083	0.041	0.009	-0.085
R&D	65,424	0.024	0.065	0.073	0.015	0.000	0.000	0.000
IO	64,923	0.257	0.291	0.767	0.393	0.133	0.029	0.000
Return	62,999	-0.039	0.632	0.576	0.313	0.057	-0.290	-0.818
STD	65,262	0.408	0.301	0.716	0.501	0.334	0.230	0.167

Table 1: Summary Statistics – Continued

Panel B: Correlation Coefficients											
Variable	*CGI*	*CEOEqRatio*	*Lendable*	*ADR*	*CH*	*Size*	*Leverage*	*ROA*	*R&D*	*IO*	*Return*
CEOEqRatio	0.411										
Lendable	0.269	0.169									
ADR	-0.076	-0.087	0.103								
CH	-0.331	-0.297	-0.240	-0.082							
Size	-0.056	0.213	0.263	0.185	-0.064						
Leverage	0.012	0.037	0.042	0.010	0.013	0.298					
ROA	0.035	0.019	0.093	-0.005	0.059	0.209	0.030				
R&D	0.038	0.063	0.013	0.026	-0.068	-0.240	-0.183	-0.358			
IO	0.563	0.440	0.432	-0.029	-0.275	0.213	0.023	0.087	0.070		
Return	-0.053	-0.018	-0.017	-0.006	0.041	0.039	-0.010	0.217	-0.083	-0.008	
STD	0.021	-0.073	-0.106	-0.012	-0.007	-0.361	-0.073	-0.268	0.178	-0.064	0.037

Table 2: Short Selling and Corporate Governance

This table presents a panel regression of a firm's corporate governance index (*CGI*) on lendable shares (*Lendable*), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY) on the full samples and different subsamples. The regression model is

$$CGI_{i,t+1} = \alpha + \beta_1 Lendable_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t},$$

where $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend and $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The construction of these variables is detailed in Appendix A. NUS refers to firms from non-US countries. Crisis refers to the global financial crisis period from 2007 to 2008, whereas Ex.Crisis excludes the global financial crisis period. *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period is from 2004 to 2008.

				US	NUS	Ex. Crisis	Crisis
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Lendable	**0.381**	**0.093**	**0.013**	**0.102**	**0.191**	**0.167**	**0.109**
	(30.73)	**(8.03)**	**(2.19)**	**(6.81)**	**(6.25)**	**(5.99)**	**(5.91)**
Lagged CGI			0.820				
			(146.64)				
ADR		-0.001	0.001		0.019	-0.002	0.001
		(-0.17)	(0.55)		(4.72)	(-0.54)	(0.26)
CH		-0.047	-0.007	-0.055	-0.021	-0.051	-0.039
		(-9.72)	(-3.99)	(-8.27)	(-3.77)	(-9.64)	(-6.60)
Size		0.016	0.002	0.020	0.003	0.016	0.014
		(23.34)	(10.01)	(23.28)	(3.74)	(22.03)	(18.33)
Leverage		0.006	-0.001	0.011	-0.001	0.008	0.003
		(1.02)	(-0.35)	(1.36)	(-0.21)	(1.24)	(0.52)
ROA		0.018	0.003	0.007	0.033	0.020	0.011
		(2.32)	(0.87)	(0.80)	(2.25)	(2.28)	(1.09)
R&D		0.026	-0.000	0.035	0.032	0.014	0.029
		(1.40)	(-0.04)	(1.84)	(0.64)	(0.66)	(1.32)
IO		0.043	0.010	0.035	0.013	0.037	0.046
		(9.36)	(5.95)	(7.13)	(1.08)	(7.69)	(7.14)
Return		-0.007	-0.002	-0.007	-0.002	-0.007	-0.004
		(-4.23)	(-1.53)	(-3.55)	(-0.81)	(-3.62)	(-1.68)
STD		-0.003	0.007	0.007	-0.006	-0.010	0.014
		(-0.66)	(2.72)	(1.66)	(-0.93)	(-2.10)	(2.42)
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY	ICY
Obs	20,957	20,407	16,028	13,781	6,626	11,908	8,499
AdjRsq	60.8%	67.1%	89.5%	33.8%	73.9%	66.1%	67.4%

Table 3: Horizon, Equity-market Dependence, and Impact of SSP on Corporate Governance

This table presents a panel regression of a firm's corporate governance index (*CGI*) on lendable shares (*Lendable*), its interaction with investor horizon (equity-market dependence), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY). The regression model is

$$CGI_{i,t+1} = \alpha + \beta_1 Lendable_{i,t} \times Horizon_{i,t} + \beta_2 Lendable_{i,t} + \beta_3 Horizon_{i,t} + \beta_4 X_{i,t} + \varepsilon_{i,t},$$

where $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend; $Horizon_{i,t}$ refers to short-term ownership (*SO*) and long-term institutional ownership (*LO*) in the first two models, and equity-market dependence or investment horizon proxied by KZ index (*KZ*), four-variable KZ index (*KZ4*), cash flows (*CF*), cash holdings (*Cash*), and financial leverage (*Leverage*) in the next columns; and $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The construction of these variables is detailed in Appendix A. *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period is from 2004 to 2008.

	SO	*LO*	*KZ*	*KZ4*	*CF*	*Cash*	*Leverage*
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (7)	Model (8)
Lendable	**0.093**	**0.156**	**0.047**	**0.060**	**0.107**	**0.085**	**0.071**
	(8.09)	**(5.94)**	**(3.11)**	**(4.75)**	**(7.76)**	**(6.49)**	**(5.09)**
*Lendable*Horizon*	**0.071**	**-0.086**	**0.030**	**0.030**	**-0.138**	**-0.097**	**0.105**
	(3.01)	**(-2.79)**	**(3.08)**	**(3.29)**	**(-1.98)**	**(-2.67)**	**(2.96)**
Horizon	0.041	-0.020	0.012	0.005	0.054	-0.004	-0.003
	(7.79)	(-0.96)	(4.49)	(1.08)	(2.64)	(-0.51)	(-0.45)
ADR	-0.001	-0.001	-0.003	-0.002	-0.001	-0.002	-0.001
	(-0.24)	(-0.24)	(-0.62)	(-0.47)	(-0.26)	(-0.47)	(-0.20)
CH		-0.045	-0.059	-0.059	-0.047	-0.059	-0.047
		(-9.20)	(-11.57)	(-11.67)	(-9.78)	(-11.61)	(-9.75)
Size	0.015	0.015	0.017	0.017	0.016	0.017	0.016
	(22.43)	(21.68)	(22.66)	(21.68)	(23.37)	(21.73)	(23.41)
Leverage	0.007	0.007	-0.059	-0.040	0.007	-0.017	
	(1.14)	(1.17)	(-5.67)	(-2.22)	(1.28)	(-2.63)	
ROA	0.017	0.017	0.009	0.015	-0.015	0.006	0.019
	(2.19)	(2.14)	(1.16)	(1.72)	(-0.83)	(0.79)	(2.38)
R&D	0.024	0.023	0.024	0.033	-0.003	0.021	0.026
	(1.33)	(1.27)	(1.28)	(1.63)	(-0.14)	(1.11)	(1.40)
IO	0.089	0.063	0.027	0.028	0.042	0.029	0.043
	(13.83)	(3.76)	(5.56)	(5.86)	(9.25)	(5.96)	(9.32)
Return	-0.007	-0.006	-0.011	-0.007	-0.007	-0.007	-0.007
	(-4.23)	(-4.08)	(-6.21)	(-4.26)	(-4.26)	(-4.35)	(-4.19)
STD	-0.003	-0.003	-0.011	-0.011	-0.004	-0.009	-0.003
	(-0.68)	(-0.68)	(-2.66)	(-2.51)	(-1.01)	(-2.13)	(-0.70)
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY	ICY
Obs	20,407	20,407	17,526	17,535	20,326	17,616	20,407
AdjRsq	67.1%	67.1%	69.3%	69.1%	67.3%	69.0%	67.1%

Table 4: Institutions, Short Selling, and Corporate Governance

This table presents a panel regression of a firm's corporate governance index (*CGI*) on lendable shares (*Lendable*), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY) by splitting countries into high or low institutions. The regression model is

$$CGI_{i,t+1} = \alpha + \beta_1 Lendable_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t},$$

where $Lendable_{i,t}$ refers to fraction of shares of a firm available to lend and $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The sample is split into the following subsamples by using institution variables: common law (*ComLaw*), disclosure requirement index (*DisReq*), securities regulation index (*SecReg*), accounting standard index (*AccSta*), and anti-director index (*AntiDir*).The construction of these variables is detailed in Appendix A. *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period is from 2004 to 2008.

	ComLaw		*DisReq*		*SecReg*		*AccSta*		*AntiDir*	
	Yes	No	High	Low	High	Low	High	Low	High	Low
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)
Lendable	**0.099**	**0.242**	**0.094**	**0.231**	**0.097**	**0.225**	**0.098**	**0.231**	**0.095**	**0.297**
	(7.26)	**(5.05)**	**(7.91)**	**(2.53)**	**(7.35)**	**(5.10)**	**(7.41)**	**(4.28)**	**(7.91)**	**(3.99)**
Diff in Lendable	**0.143**		**0.137**		**0.128**		**0.133**		**0.202**	
[p-value]	**[0.004]**		**[0.133]**		**[0.005]**		**[0.017]**		**[0.007]**	
ADR	-0.005	0.025	-0.007	0.035	-0.002	0.022	-0.001	0.030	-0.010	0.025
	(-0.66)	(5.35)	(-1.54)	(3.96)	(-0.26)	(4.09)	(-0.22)	(5.60)	(-1.97)	(3.87)
CH	-0.056	-0.006	-0.047	-0.012	-0.056	0.001	-0.056	-0.000	-0.049	-0.009
	(-9.42)	(-1.05)	(-9.06)	(-0.98)	(-9.86)	(0.19)	(-9.82)	(-0.01)	(-9.06)	(-0.88)
Size	0.019	0.002	0.017	0.005	0.018	0.001	0.018	-0.000	0.017	0.006
	(23.90)	(1.91)	(23.24)	(2.56)	(24.31)	(0.55)	(24.35)	(-0.13)	(23.33)	(3.53)
Leverage	0.012	-0.003	0.006	0.005	0.012	-0.002	0.012	-0.001	0.005	0.003
	(1.64)	(-0.57)	(0.95)	(0.32)	(1.73)	(-0.32)	(1.65)	(-0.19)	(0.86)	(0.20)
ROA	0.012	0.022	0.014	0.049	0.016	0.007	0.014	0.003	0.013	0.040
	(1.43)	(1.21)	(1.77)	(2.00)	(1.88)	(0.38)	(1.73)	(0.18)	(1.58)	(1.67)
R&D	0.034	0.033	0.018	0.123	0.035	0.025	0.035	0.002	0.019	0.106
	(1.81)	(0.66)	(0.98)	(1.92)	(1.89)	(0.46)	(1.89)	(0.04)	(1.07)	(1.55)
IO	0.037	0.010	0.042	0.021	0.037	0.007	0.037	0.002	0.041	0.008
	(7.75)	(0.60)	(9.02)	(0.92)	(7.92)	(0.39)	(7.87)	(0.12)	(8.93)	(0.35)
Return	-0.006	-0.006	-0.007	-0.004	-0.006	-0.005	-0.006	-0.004	-0.006	-0.012
	(-3.33)	(-2.55)	(-4.09)	(-0.77)	(-3.53)	(-2.18)	(-3.58)	(-1.62)	(-3.85)	(-2.10)
STD	0.005	0.001	-0.001	0.021	0.005	-0.011	0.005	-0.006	0.000	0.009
	(1.16)	(0.12)	(-0.35)	(1.34)	(1.13)	(-1.56)	(1.11)	(-0.83)	(0.11)	(0.60)
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY
Obs	15,550	4,857	18,988	1,419	16,268	4,139	16,199	4,208	18,462	1,945
AdjRsq	43.1%	52.7%	65.6%	49.7%	48.6%	56.4%	47.8%	55.1%	65.1%	49.1%

Table 5: Short Selling and Managerial Equity Compensation

This table presents a panel regression of a firm's managerial equity compensation (*MEC*) on lendable shares (*Lendable*), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY) on the full samples and different subsamples. The regression model is

$$MEC_{i,t+1} = \alpha + \beta_1 Lendable_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t},$$

where $MEC_{i,t+1}$ refers to CEO equity compensation ratio (*CEOEqRatio*) in Panel A, log value of CEO equity compensation (*CEOEqCom*) in Panel B, executive equity compensation ratio (*ExeEqRatio*) in Panel C, and log value of executive equity compensation (*ExeEqCom*) in Panel D, $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend; and $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The construction of these variables is detailed in Appendix A. NUS refers to firms from non-US countries. Crisis refers to the global financial crisis period from 2007 to 2008, whereas Ex.Crisis excludes the global financial crisis period. *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period is from 2003 to 2009.

Panel A: CEO Equity Compensation Ratio (*CEOEqRatio*)

			US	NUS	Ex. Crisis	Crisis
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Lendable	**0.499**	**0.325**	**0.376**	**0.451**	**0.536**	**0.259**
	(12.10)	**(11.08)**	**(4.79)**	**(6.20)**	**(5.45)**	**(4.48)**
Lagged CEOEqRatio		0.382				
		(32.13)				
ADR	0.028	0.017		0.046	0.018	0.045
	(1.82)	(1.59)		(2.93)	(1.01)	(1.81)
CH	-0.116	-0.065	-0.157	-0.075	-0.118	-0.130
	(-6.77)	(-5.33)	(-5.78)	(-3.75)	(-6.12)	(-5.65)
Size	0.027	0.016	0.028	0.024	0.028	0.024
	(11.57)	(9.64)	(8.03)	(7.89)	(10.74)	(7.82)
Leverage	0.016	0.012	0.037	-0.019	0.012	0.024
	(0.84)	(0.87)	(1.44)	(-0.72)	(0.58)	(0.93)
ROA	-0.018	0.002	-0.009	-0.027	-0.030	0.021
	(-0.68)	(0.10)	(-0.22)	(-0.75)	(-0.87)	(0.50)
R&D	0.293	0.182	0.360	0.200	0.292	0.306
	(4.56)	(3.94)	(3.90)	(2.23)	(3.79)	(3.47)
IO	0.067	0.042	0.063	0.080	0.057	0.122
	(4.73)	(4.26)	(4.04)	(2.43)	(3.92)	(4.73)
Return	0.038	0.022	0.035	0.040	0.027	0.062
	(6.27)	(3.47)	(3.72)	(5.24)	(3.49)	(6.60)
STD	-0.009	-0.012	-0.042	0.019	0.010	-0.057
	(-0.63)	(-0.98)	(-1.73)	(1.02)	(0.62)	(-2.70)
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY
Obs	14,523	13,729	9,087	5,436	9,313	5,210
AdjRsq	42.6%	51.0%	14.6%	24.3%	34.6%	54.5%

Table 5: Short Selling and Managerial Equity Compensation - Continued

Panel B: CEO Equity Compensation (*CEOEqCom*)						
			US	NUS	Ex. Crisis	Crisis
Variable	Model	Model	Model	Model	Model	Model
	(1)	(2)	(3)	(4)	(5)	(6)
Lendable	**1.127**	**0.944**	**1.786**	**2.363**	**2.622**	**0.922**
	(4.90)	**(5.53)**	**(5.49)**	**(4.16)**	**(5.40)**	**(2.86)**
Lagged CEOEqCom		0.480				
		(27.17)				
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY
Obs	10,837	9,218	8,052	2,785	6,868	3,969
AdjRsq	39.3%	53.2%	25.7%	33.2%	38.2%	42.1%

Panel C: Executive Equity Compensation Ratio (*ExeEqRatio*)						
			US	NUS	Ex. Crisis	Crisis
Variable	Model	Model	Model	Model	Model	Model
	(1)	(2)	(3)	(4)	(5)	(6)
Lendable	**0.266**	**0.152**	**0.289**	**0.102**	**0.143**	**0.016**
	(8.28)	**(6.70)**	**(4.00)**	**(2.20)**	**(2.45)**	**(0.32)**
Lagged ExeEqRatio		0.426				
		(37.82)				
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY
Obs	17,462	16,708	9,368	8,094	11,113	6,349
AdjRsq	52.0%	60.7%	14.5%	18.0%	45.8%	61.8%

Panel D: Executive Equity Compensation (*ExeEqCom*)						
			US	NUS	Ex. Crisis	Crisis
Variable	Model	Model	Model	Model	Model	Model
	(1)	(2)	(3)	(4)	(5)	(6)
Lendable	**0.814**	**0.712**	**1.940**	**1.653**	**1.562**	**0.635**
	(3.59)	**(4.28)**	**(5.79)**	**(3.12)**	**(3.20)**	**(2.02)**
Lagged ExeEqCom		0.479				
		(30.97)				
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY
Obs	12,057	10,419	8,437	3,620	7,649	4,408
AdjRsq	43.6%	56.9%	26.9%	32.1%	42.5%	46.2%

Table 6: Firm Performance, Short Selling, and Managerial Compensation

This table presents a panel regression of a firm's total managerial compensation (*MC*) on lendable shares (*Lendable*), its interaction with firm performance (*PF*), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY). The regression model is

$$MC_{i,t+1} = \alpha + \beta_1 Lendable_{i,t} + \beta_2 Lendable_{i,t} \times PF_{i,t} + \beta_3 PF_{i,t} + \beta_4 X_{i,t} + \varepsilon_{i,t},$$

where $MC_{i,t+1}$ refers to the log value of CEO's total compensation (*CEOTotCom*) in Panel A and the log value of executives' total compensation (*ExeTotCom*) in Panel B; $PF_{i,t}$ includes return-on-asset ratio (*ROA*), abnormal annual stock return (*AbnReturn*), and log of annual stock return (*Return*), $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend; and $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The construction of these variables is detailed in Appendix A. *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period is from 2003 to 2009.

	Panel A: *CEOTotCom*			**Panel B: *ExeTotCom***		
	ROA	*AbnReturn*	*Return*	*ROA*	*AbnReturn*	*Return*
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Lendable	**0.232**	**0.438**	**0.388**	**-0.115**	**0.108**	**0.071**
	(1.63)	**(3.41)**	**(3.08)**	**(-0.76)**	**(0.77)**	**(0.51)**
*Lendable*PF*	**2.094**	**0.590**	**0.719**	**2.723**	**0.449**	**0.503**
	(2.36)	**(3.55)**	**(4.60)**	**(3.07)**	**(2.79)**	**(3.25)**
PF	0.382	0.161	0.150	0.326	0.132	0.127
	(3.60)	(6.67)	(6.33)	(2.91)	(5.34)	(5.25)
ADR	0.119	0.118	0.118	0.159	0.158	0.158
	(1.87)	(1.86)	(1.85)	(2.52)	(2.51)	(2.50)
CH	-0.362	-0.361	-0.358	-0.373	-0.375	-0.374
	(-5.81)	(-5.76)	(-5.72)	(-5.98)	(-6.00)	(-5.97)
Size	0.331	0.330	0.329	0.334	0.334	0.333
	(38.54)	(38.47)	(38.43)	(39.30)	(39.21)	(39.21)
Leverage	-0.021	-0.022	-0.021	-0.066	-0.069	-0.068
	(-0.31)	(-0.33)	(-0.31)	(-0.93)	(-0.97)	(-0.96)
ROA		0.525	0.525		0.505	0.505
		(5.68)	(5.69)		(5.27)	(5.26)
R&D	1.113	1.126	1.121	0.964	0.986	0.984
	(5.91)	(5.97)	(5.96)	(4.74)	(4.85)	(4.84)
IO	0.362	0.357	0.356	0.357	0.352	0.351
	(8.19)	(8.06)	(8.05)	(7.44)	(7.34)	(7.33)
Return	0.206			0.163		
	(10.69)			(8.25)		
STD	-0.009	0.008	0.011	0.033	0.047	0.048
	(-0.22)	(0.18)	(0.26)	(0.85)	(1.21)	(1.24)
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY
Obs	14,666	14,666	14,666	17,646	17,646	17,646
AdjRsq	48.8%	48.8%	48.9%	55.7%	55.6%	55.6%

Table 7: Alternative Specifications on Short Selling and Corporate Governance

This table addresses the endogeneity problem and presents a panel regression of a firm's corporate governance index (*CGI*) in Panel A and CEO equity compensation ratio (*CEOEqRatio*) in Panel B on lendable shares (*Lendable*), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY) on a variation of the following models:

$$CGI_{i,t+1}\left(CEOEqRatio_{i,t+1}\right) = \alpha + \beta_1 Lendable_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t},$$
$$\Delta CGI_{i,t+1}\left(\Delta CEOEqRatio_{i,t+1}\right) = \alpha + \beta_1 \Delta Lendable_{i,t} + \beta_2 \Delta X_{i,t} + \varepsilon_{i,t},$$
$$\Delta Lendable_{i,t+1} = \alpha + \beta_1 \Delta CGI_{i,t}\left(\Delta CEOEqRatio_{i,t}\right) + \beta_2 \Delta X_{i,t} + \varepsilon_{i,t},$$

where $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend and $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The construction of these variables is detailed in Appendix A. Models (1) and (2) regress *CGI* (*CEOEqRatio*) on *Lendable* with firm-fixed effects *as* controls. Models (3) and (4) regress Δ*CGI* (Δ*CEOEqRatio*) on Δ*Lendable*. Models (5) and (6) regress Δ*Lendable* on Δ*CGI* (Δ*CEOEqRatio*). *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period in Panel A is from 2004 to 2008, and the sample period in Panel B is from 2003 to 2009.

Panel A: Corporate Governance Index (*CGI*)

	CGI, Firm FE			*ΔCGI*			*ΔLendable*	
Variable	Model (1)	Model (2)	Variable	Model (3)	Model (4)	Variable	Model (5)	Model (6)
Lendable	**0.034**	**0.018**	*ΔLendable*	**0.015**	**0.098**	*ΔCGI*	**0.007**	**0.007**
	(3.70)	**(2.06)**		**(1.64)**	**(9.89)**		**(0.86)**	**(0.88)**
Lagged CGI		0.135	*Lagged CGI*		-0.151	*Lagged Lendable*		-0.023
		(9.96)			(-29.86)			(-6.35)
ADR	0.011	0.014	*ΔADR*	0.024	0.022	*ΔADR*	-0.015	-0.015
	(0.35)	(0.39)		(1.29)	(1.20)		(-2.96)	(-2.99)
CH	-0.011	-0.004	*ΔCH*	-0.009	-0.007	*ΔCH*	-0.013	-0.013
	(-2.15)	(-0.80)		(-2.37)	(-1.92)		(-3.74)	(-3.76)
Size	0.002	0.000	*ΔSize*	-0.001	-0.003	*ΔSize*	0.012	0.012
	(1.11)	(0.00)		(-0.63)	(-1.90)		(6.15)	(6.07)
Leverage	0.004	0.002	*ΔLeverage*	0.005	0.007	*ΔLeverage*	-0.026	-0.025
	(0.51)	(0.29)		(0.85)	(1.45)		(-4.73)	(-4.65)
ROA	0.014	0.004	*ΔROA*	0.007	0.006	*ΔROA*	0.008	0.008
	(2.26)	(0.54)		(1.47)	(1.43)		(2.10)	(1.98)
R&D	0.006	-0.002	*ΔR&D*	-0.004	-0.004	*ΔR&D*	0.014	0.013
	(0.34)	(-0.13)		(-0.27)	(-0.33)		(1.03)	(0.91)
IO	0.026	0.015	*ΔIO*	0.009	0.005	*ΔIO*	0.129	0.130
	(3.72)	(2.03)		(1.65)	(1.08)		(21.44)	(21.54)
Return	-0.003	-0.001	*ΔReturn*	-0.002	0.000	*ΔReturn*	0.013	0.013
	(-2.44)	(-1.02)		(-1.81)	(0.04)		(18.98)	(18.99)
STD	-0.004	-0.001	*ΔSTD*	-0.002	0.000	*ΔSTD*	-0.009	-0.008
	(-1.24)	(-0.18)		(-1.07)	(0.11)		(-3.87)	(-3.47)
Fixed Effects	FY	FY	Fixed Effects	ICY	ICY	Fixed Effects	ICY	ICY
Obs	20,407	16,028	Obs	15,078	15,078	Obs	15,298	15,298
AdjRsq	91.3%	93.4%	AdjRsq	8.8%	16.1%	AdjRsq	45.4%	45.6%

Table 7: Alternative Specifications on Short Selling and Corporate Governance - Continued

Panel B: CEO Equity Compensation Ratio (*CEOEqRatio*)								
	CEOEqRatio, Firm FE			*ΔCEOEqRatio*			*ΔLendable*	
Variable	Model (1)	Model (2)	Variable	Model (3)	Model (4)	Variable	Model (5)	Model (6)
Lendable	**0.401**	**0.400**	*ΔLendable*	**0.194**	**0.665**	*ΔCEOEqRatio*	**0.002**	**0.002**
	(8.20)	**(7.46)**		**(3.25)**	**(10.75)**		**(1.51)**	**(1.81)**
Lagged		-0.049	*Lagged*		-0.554	*Lagged*		-0.058
CEOEqRatio		(-3.62)	*CEOEqRatio*		(-44.03)	*Lendable*		(-12.27)
ADR	0.037	0.045	*ΔADR*	-0.007	-0.049	*ΔADR*	-0.005	-0.005
	(0.85)	(0.88)		(-0.25)	(-1.80)		(-0.96)	(-0.90)
CH	0.011	-0.001	*ΔCH*	0.036	0.022	*ΔCH*	-0.007	-0.007
	(0.43)	(-0.02)		(1.36)	(1.08)		(-1.89)	(-2.05)
Size	-0.014	-0.017	*ΔSize*	-0.015	-0.001	*ΔSize*	0.010	0.008
	(-1.29)	(-1.39)		(-1.17)	(-0.06)		(5.78)	(4.97)
Leverage	-0.041	-0.046	*ΔLeverage*	-0.012	0.006	*ΔLeverage*	-0.019	-0.018
	(-1.10)	(-1.17)		(-0.31)	(0.19)		(-4.25)	(-4.17)
ROA	-0.036	-0.035	*ΔROA*	0.015	0.042	*ΔROA*	0.003	0.002
	(-0.91)	(-0.84)		(0.37)	(1.41)		(0.70)	(0.43)
R&D	0.101	0.091	*ΔR&D*	0.107	0.059	*ΔR&D*	0.021	0.017
	(0.97)	(0.81)		(1.32)	(0.88)		(1.75)	(1.46)
IO	0.072	0.085	*ΔIO*	-0.069	-0.026	*ΔIO*	0.085	0.085
	(1.72)	(1.97)		(-1.59)	(-0.74)		(14.53)	(14.77)
Return	0.020	0.021	*ΔReturn*	0.010	0.022	*ΔReturn*	0.007	0.007
	(2.80)	(2.90)		(1.48)	(4.18)		(10.90)	(11.40)
STD	-0.015	-0.013	*ΔSTD*	-0.022	-0.023	*ΔSTD*	-0.004	-0.003
	(-0.81)	(-0.66)		(-1.15)	(-1.60)		(-2.15)	(-1.56)
Fixed Effects	FY	FY	Fixed Effects	ICY	ICY	Fixed Effects	ICY	ICY
Obs	14,523	13,729	Obs	10,822	10,822	Obs	14,944	14,944
AdjRsq	61.6%	61.2%	AdjRsq	4.0%	32.5%	AdjRsq	49.1%	49.7%

Table 8: ETFs, Short Selling, and Corporate Governance

This table addresses the endogeneity problem using ETF ownership (*ETF*) as an instrument variable and presents a panel regression of a firm's corporate governance index (*CGI*) in Panel A and CEO equity compensation ratio (*CEOEqRatio*) in Panel B on ETF ownership (ETF), predicted shares on lendable shares (*Lendable*), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY) on the variation of the following models

$$The\ first\ stage: Lendable_{i,t} = \alpha + \beta_1 ETF_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t},$$
$$The\ second\ stage: CGI_{i,t+1}(CEOEqRatio_{i,t+1}) = \alpha + \beta_1 Predicted\ lendable\ on\ ETF_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t},$$

where $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend, $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The construction of these variables is detailed in Appendix A. Model (1) regresses *lendable* on ETF ownership. Model (2) regresses *CGI* (*CEOEqRatio*) on predicted *lendable*. Models (3) and (4) conduct a similar instrumental variable regression, except that the instrument variable is now the residuals of ETF ownership from the following pre-stage regression:

$$The\ pre\text{-}stage: ETF_{i,t} = \alpha + \beta_0 M_{i,t} + e_{i,t},$$

where $M_{i,t}$ includes attention and liquidity variables such as the number of analysts following (*Analyst*), news coverage (*NewsCoverage*), and Amihud's (2002) illiquidity (*Illiquidity*). The pre-stage regression is unreported. Its residual, *ETF-Res*, is used to replace ETF ownership in the above two-stage regressions. Models (5) to (8) provide the diagnostic analyses on the impact of ETF ownership (*ETF*) and institutional ownership (*IO*) on *CGI (CEOEqRatio)*. Model (5) provides the entire sample regression between *CGI (CEOEqRatio)* and *ETF*. Model (6) examines the regression between *CGI (CEOEqRatio)* and *ETF* on the subsample of the stocks for which *Lendable*=0. Models (7) and (8) explore the reverse constraint by regressing *CGI (CEOEqRatio)* on *lendable* on the sample of stocks whose *ETF*=0 or *IO*=0. *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period in Panel A is from 2004 to 2008, and the sample period in Panel B is from 2003 to 2009.

Panel A: Corporate Governance Index (*CGI*)								
	ETF Ownership as an Instrumental Variable				Diagnostics on *ETF/IO* Ownership			
	Lendable	*CGI*	*Lendable*	*CGI*	*CGI*			
	(1st Stage)	(2nd Stage)	(1st Stage)	(2nd Stage)	Full Sample	*Lendable*=0	*ETF*=0	*IO*=0
Variable	Model	Model	Model	Model	Model	Model	Model	Model
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ETF	**2.320**				**0.645**	**-0.561**		
	(45.92)				**(8.40)**	**(-0.80)**		
Lendable-Pre		**0.278**						
		(8.40)						
ETF-Res			**2.202**					
			(39.21)					
Lendable-ResPre				**0.165**				
				(4.41)				
Lendable							**0.189**	**0.173**
							(6.77)	**(3.09)**
ADR	0.006	-0.002	0.006	-0.002	-0.000	0.007	0.004	0.007
	(2.77)	(-0.43)	(2.57)	(-0.52)	(-0.03)	(0.25)	(0.43)	(0.53)
CH	-0.030	-0.042	-0.042	-0.049	-0.051	-0.019	-0.042	-0.042
	(-11.86)	(-8.24)	(-16.17)	(-9.36)	(-10.38)	(-1.01)	(-4.92)	(-3.30)
Size	0.005	0.015	0.012	0.016	0.016	0.009	0.017	0.016
	(16.34)	(20.05)	(37.34)	(20.83)	(24.46)	(2.03)	(12.56)	(7.41)
Leverage	0.004	0.004	0.001	0.003	0.005	0.016	0.048	0.019
	(1.60)	(0.68)	(0.31)	(0.60)	(0.89)	(0.61)	(4.46)	(1.15)
ROA	0.028	0.013	0.046	0.017	0.020	-0.029	-0.000	-0.013
	(7.01)	(1.58)	(10.51)	(2.06)	(2.59)	(-1.21)	(-0.00)	(-0.69)
R&D	0.000	0.026	0.025	0.028	0.026	-0.075	0.007	-0.058
	(0.04)	(1.39)	(2.83)	(1.49)	(1.40)	(-1.09)	(0.22)	(-1.27)
IO	0.086	0.032	0.093	0.038	0.056	0.019	0.037	
	(26.58)	(6.58)	(27.26)	(7.62)	(11.37)	(0.67)	(4.38)	
Return	-0.007	-0.006	-0.008	-0.006	-0.008	-0.004	-0.005	-0.001
	(-6.15)	(-3.54)	(-6.55)	(-3.93)	(-4.80)	(-0.44)	(-1.80)	(-0.25)
STD	0.008	-0.004	0.011	-0.004	-0.002	-0.004	-0.001	-0.019
	(3.63)	(-1.03)	(4.43)	(-0.91)	(-0.46)	(-0.50)	(-0.12)	(-1.70)
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY
Obs	20,387	20,387	20,157	20,157	20,387	540	4,620	1,959
AdjRsq	68.7%	67.0%	66.9%	66.7%	67.0%	17.0%	54.9%	51.3%

Table 8: ETFs, Short Selling, and Corporate Governance – Continued

Panel B: CEO Equity Compensation Ratio (*CEOEqRatio*)								
	ETF ownership as an instrumental variable				Diagnostics on *ETF/IO* Ownership			
	Lendable	*CEOEqRatio*	*Lendable*	*CEOEqRatio*	*CEOEqRatio*			
	(1st Stage)	(2nd Stage)	(1st Stage)	(2nd Stage)	Full Sample	*Lendable*=0	*ETF*=0	*IO*=0
Variable	Model	Model	Model	Model	Model	Model	Model	Model
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ETF	**1.999**				**1.568**	**-4.866**		
	(29.66)				**(6.26)**	**(-1.08)**		
Lendable-Pre		**0.785**						
		(6.26)						
ETF-Res			**1.939**					
			(28.54)					
Lendable-ResPre				**0.752**				
				(5.73)				
Lendable							**0.477**	**0.590**
							(5.95)	**(3.72)**
ADR	0.020	0.024	0.024	0.028	0.040	-0.144	0.069	0.028
	(6.52)	(1.50)	(6.98)	(1.61)	(2.54)	(-1.43)	(3.10)	(0.78)
CH	-0.053	-0.101	-0.052	-0.106	-0.142	-0.361	-0.100	-0.116
	(-15.26)	(-5.40)	(-14.76)	(-5.57)	(-8.45)	(-3.53)	(-4.30)	(-2.93)
Size	0.007	0.025	0.007	0.025	0.030	0.030	0.027	0.034
	(14.25)	(9.79)	(14.88)	(9.78)	(12.83)	(0.86)	(8.11)	(5.94)
Leverage	0.020	0.009	0.020	0.008	0.025	-0.196	-0.062	-0.019
	(4.83)	(0.48)	(4.70)	(0.39)	(1.32)	(-1.17)	(-2.08)	(-0.38)
ROA	0.033	-0.029	0.034	-0.028	-0.003	-0.235	-0.063	-0.087
	(5.27)	(-1.02)	(5.40)	(-0.99)	(-0.11)	(-1.35)	(-1.73)	(-1.38)
R&D	0.008	0.294	0.009	0.297	0.300	-0.144	0.127	0.326
	(0.75)	(4.56)	(0.79)	(4.58)	(4.66)	(-0.44)	(1.52)	(2.31)
IO	0.051	0.062	0.050	0.064	0.102	0.048	0.039	
	(13.28)	(4.28)	(13.17)	(4.36)	(6.69)	(0.30)	(1.81)	
Return	-0.006	0.038	-0.006	0.038	0.034	-0.006	0.031	0.045
	(-4.13)	(6.29)	(-4.03)	(6.18)	(5.54)	(-0.16)	(3.67)	(2.91)
STD	-0.004	-0.009	-0.003	-0.010	-0.012	0.176	0.007	0.016
	(-1.19)	(-0.64)	(-0.94)	(-0.65)	(-0.84)	(1.58)	(0.42)	(0.43)
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY
Obs	14,494	14,494	14,077	14,077	14,494	134	5,471	1,745
AdjRsq	66.7%	41.7%	66.2%	41.1%	41.7%	23.3%	39.7%	34.8%

Table 9: Short Selling and Board Characteristics

This table presents a panel regression of a firm's board characteristics (*Board*) on lendable shares (*Lendable*), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY) on the full samples and different subsamples. The regression model is

$$Board_{i,t+1} = \alpha + \beta_1 Lendable_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t},$$

where $Board_{i,t+1}$ refers to busy board (*BoardBusyD* or *BoardBusy*) in Panel A, board independence (*BoardIndD* or *BoardInd*) in Panel B, board size (*BoardSizeD* or *BoardSize*) in Panel C; $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend and $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The construction of these variables is detailed in Appendix A. NUS refers to firms from non-US countries. Crisis refers to the global financial crisis period from 2007 to 2008, whereas Ex.Crisis excludes the global financial crisis period. *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period is from 2003 to 2009.

Panel A: Busy Board (*BoardBusyD* or *BoardBusy*)

	BoardBusyD					*BoardBusy*
		US	NUS	Ex. Crisis	Crisis	
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Lendable	**-0.975**	**-0.997**	**-0.796**	**-0.848**	**-1.358**	**-1.414**
	(-6.40)	**(-4.96)**	**(-2.26)**	**(-5.20)**	**(-5.50)**	**(-4.66)**
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY
Obs	34,831	21,155	13,676	23,008	11,823	34,831
AdjRsq	16.7%	10.5%	16.6%	16.9%	16.5%	23.5%

Panel B: Board Independence (*BoardIndD* or *BoardInd*)

	BoardIndD					*BoardInd*
		US	NUS	Ex. Crisis	Crisis	
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Lendable	**1.031**	**-0.247**	**1.547**	**0.937**	**1.266**	**0.044**
	(3.09)	**(-0.42)**	**(3.70)**	**(2.51)**	**(2.53)**	**(3.50)**
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY
Obs	34,001	20,308	12,846	22,466	11,422	34,831
AdjRsq	41.1%	15.2%	25.9%	41.9%	39.9%	-84.5%

Panel C: Board Size (*BoardSizeD* or *BoardSize*)

	BoardSizeD					*BoardSize*
		US	NUS	Ex. Crisis	Crisis	
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Lendable	**1.580**	**1.298**	**3.279**	**1.718**	**1.747**	**0.688**
	(7.56)	**(4.81)**	**(7.24)**	**(7.30)**	**(5.47)**	**(2.75)**
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY
Obs	34,804	21,155	13,649	22,986	11,807	34,831
AdjRsq	10.5%	9.3%	8.1%	10.8%	10.7%	52.7%

Table 10: Short Selling and Firm Performance

This table presents a panel regression of a firm's return-on-asset ratio (*ROA*) on lendable shares (*Lendable*) in Models (1) to (5), predicted corporate governance index (*CGI*) instrumented on lendable shares (*Lendable*) in Models (6) to (10), predicted CEO equity compensation ratio (*CEOEqRatio*) instrumented on lendable shares (*Lendable*) in Models (11) to (15), and firm-level control variables (*X*) in addition to unreported industry-, country-, and year-fixed effects (ICY) on the full samples and different subsamples. The regression model is

$$ROA_{i,t+1} = \alpha + \beta_1 Lendable_{i,t}(CGI - Pre_{i,t}, CEOEqRatio - Pre_{i,t}) + \beta_2 X_{i,t} + \varepsilon_{i,t},$$

where $Lendable_{i,t}$ refers to the fraction of shares of a firm available to lend, $CGI - Pre_{i,t}$ is the predicted corporate governance index instrumented on *Lendable*, $CEOEqRatio - Pre_{i,t}$ is predicted CEO equity compensation ratio instrumented on *lendable*; and $X_{i,t}$ includes American Depository Receipts (*ADR*), closely-held ownership (*CH*), log of firm size (*Size*), financial leverage (*Leverage*), return-on-asset ratio (*ROA*), research and development expenses (*R&D*), institutional ownership (*IO*), log of annual stock return (*Return*), and stock return volatility (*STD*). The construction of these variables is detailed in Appendix A. NUS refers to firms from non-US countries. Crisis refers to the global financial crisis period from 2007 to 2008, whereas Ex.Crisis excludes the global financial crisis period. *t*-statistics shown in parentheses are based on standard errors adjusted for heteroskedasticity and firm-level clustering. Obs denotes the number of firm-year observations, and AdjRsq is adjusted R^2. The sample period is from 2003 to 2009, while from 2004 to 2008 for Models (6) to (10).

	Lendable					*CGI* Instrumented on *Lendable*					*CEOEqRatio* Instrumented on *Lendable*				
		US	NUS	Ex. Crisis	Crisis		US	NUS	Ex. Crisis	Crisis		US	NUS	Ex. Crisis	Crisis
Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)
Lendable	**0.039**	**0.046**	**0.165**	**0.044**	**0.116**										
	(3.78)	**(2.74)**	**(7.77)**	**(3.77)**	**(5.64)**										
CGI-Pre						**0.134**	**0.162**	**0.183**	**0.227**	**0.179**					
						(3.05)	**(2.57)**	**(3.85)**	**(3.28)**	**(3.01)**					
CEOEqRatio-Pre											**0.097**	**-0.192**	**0.237**	**0.157**	**0.091**
											(3.22)	**(-3.01)**	**(4.84)**	**(4.17)**	**(2.27)**
ADR	-0.007		-0.010	-0.010	-0.004	0.008		0.009	0.008	0.010	0.012		0.009	0.016	0.002
	(-1.48)		(-2.02)	(-1.94)	(-0.60)	(1.45)		(1.63)	(1.37)	(1.68)	(1.50)		(1.08)	(1.71)	(0.16)
CH	0.030	0.022	0.043	0.031	0.034	0.032	0.034	0.048	0.045	0.036	0.019	-0.033	0.078	0.031	0.015
	(9.00)	(2.98)	(11.41)	(8.68)	(6.94)	(3.92)	(2.85)	(5.52)	(4.19)	(3.18)	(2.26)	(-2.69)	(5.22)	(3.12)	(1.27)
Size	0.006	0.004	0.004	0.005	0.004	-0.005	-0.004	-0.011	-0.009	-0.006	-0.002	0.002	-0.006	-0.006	0.001
	(10.18)	(4.08)	(5.75)	(8.82)	(4.95)	(-2.45)	(-1.36)	(-4.62)	(-2.74)	(-2.89)	(-1.49)	(1.01)	(-2.32)	(-3.95)	(0.66)
Leverage	0.003	0.002	0.009	-0.002	0.019	-0.018	-0.008	-0.036	-0.033	0.005	-0.027	-0.032	-0.009	-0.038	-0.007
	(0.92)	(0.29)	(2.10)	(-0.53)	(3.51)	(-2.91)	(-0.98)	(-4.67)	(-4.24)	(0.60)	(-3.75)	(-3.40)	(-0.77)	(-4.36)	(-0.69)
R&D	-0.544	-0.603	-0.454	-0.513	-0.596	-0.563	-0.569	-0.294	-0.517	-0.607	-0.577	-0.493	-0.649	-0.594	-0.578
	(-19.83)	(-16.29)	(-11.00)	(-16.57)	(-15.69)	(-13.16)	(-12.53)	(-1.82)	(-9.33)	(-11.29)	(-11.55)	(-7.29)	(-8.45)	(-10.51)	(-7.94)
IO	0.040	0.026	0.101	0.043	0.021	0.020	0.010	0.049	0.012	0.011	0.015	0.035	0.052	0.013	0.017
	(9.02)	(5.26)	(10.41)	(9.49)	(2.64)	(2.60)	(0.95)	(3.00)	(1.15)	(0.94)	(2.58)	(4.69)	(2.59)	(2.04)	(1.53)
Return	0.063	0.075	0.058	0.064	0.085	0.085	0.094	0.053	0.080	0.097	0.072	0.086	0.056	0.059	0.091
	(40.14)	(25.98)	(30.95)	(34.40)	(24.86)	(22.58)	(20.22)	(13.01)	(16.64)	(15.76)	(19.14)	(18.14)	(9.40)	(13.57)	(13.08)
STD	-0.088	-0.096	-0.084	-0.078	-0.113	-0.107	-0.105	-0.072	-0.101	-0.119	-0.101	-0.116	-0.083	-0.105	-0.096
	(-17.74)	(-11.86)	(-13.51)	(-13.65)	(-11.88)	(-10.08)	(-8.67)	(-6.07)	(-8.08)	(-6.93)	(-7.52)	(-7.94)	(-3.99)	(-8.00)	(-3.53)
Fixed Effects	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY	ICY
Obs	62,100	23,066	39,034	40,578	21,522	20,429	13,789	6,640	11,919	8,510	14,542	9,092	5,450	9,317	5,225
AdjRsq	22.8%	26.3%	21.2%	23.8%	23.4%	23.9%	25.3%	19.8%	22.6%	25.3%	24.0%	24.4%	25.4%	26.0%	22.3%