Busy Directors: Strategic Interaction and Monitoring Synergies

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Keywords: Boards of Directors, Busy Directors, Monitoring

JEL Classifications: G34

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1 Introduction

"Busy" directors—individuals who serve on multiple boards—continue to be the subject of debate. Proxy advisory firms such as ISI and investor advocates such as the Council of Institutional Investors recommend limiting the number of boards a director can serve on simultaneously, out of a concern that multiple directorships engender overload and inattention and so contribute to poor corporate governance. In recent years, many firms listed in the U.S. have adopted guidelines restricting multiple directorships.[1] This trend is seemingly backed up by a sizeable body of academic research, though the evidence is far from conclusive, perhaps owing to a selection effect: as Adams et al. (2010) note, it is presumably particularly talented individuals who are invited to serve on multiple boards.

In this paper, we ask under what circumstances having a busy director on the board is beneficial to shareholders and when it is likely to instead harm their interests. We propose that two factors jointly determine whether a busy board is beneficial or harmful: (a) the existence of monitoring synergies across firms when directors serve on multiple boards, and (b) strategic interaction among directors on a firm's board. The policy debate implicitly assumes negative monitoring synergies: time constraints prevent busy directors from effectively monitoring all the firms on whose boards they serve. Our model nests this received wisdom but also allows for the possibility that a director with multiple board seats may experience positive monitoring synergies across firms. Positive synergies arise when the information or expertise acquired in monitoring one firm is transferable across firms.

Surprisingly, positive monitoring synergies are neither necessary nor sufficient for shareholders to benefit from the presence of busy directors, and similarly, negative synergies are neither necessary nor sufficient for shareholders to be harmed by busy directors. What is also important is the way directors interact with each other. We borrow the notion of strategic interaction among a group of agents carrying out a set of tasks from the literatures on personnel economics and organization economics. Adapted to the board setting, strategic interaction implies that each director's incentive to monitor the firm depends on her expectation of the other directors' monitoring efforts. Monitoring efforts can be strategic complements or strategic substitutes. With strategic substitutability, increased monitoring by one director reduces the other directors' incentives to monitor. With strategic

[1] In 2016, 74% of S&P500 companies limited the number of other directorships their board members could hold, up from 27% in 2006. Firms either impose a numerical cap or require prior approval from the chairman of the board. Source: 2016 Spencer Stuart Board Index, available at `https://www.spencerstuart.com/~/media/pdf%20files/research%20and%20insight%20pdfs/spencer-stuart-us-board-index-2016_1mar2017.pdf`.

complementarity, directors benefit from each others' efforts, so that more monitoring by one director increases the other directors' incentives to monitor.

Strategic interaction among members of a team can arise for a variety of reasons. The personnel- and organization-economics literatures focus on social pressure, image concerns, and technology. Ichino and Maggi (2000), Kandel and Lazear (1992), and Mas and Moretti (2009) argue that social pressure or image concerns can lead to strategic complementarity. Applied to our setting, the argument is that a director may step up her monitoring effort if she expects her co-directors to devote more effort to monitoring, in order to avoid the stigma of shirking or the resentment of her peers. Benabou and Tirole (2006) argue that social pressure or image concerns give rise to strategic substitutability instead: if individuals seek distinction, more effort by other team members may weaken incentives because it limits the opportunity to stand out from the crowd. Applied to our setting, better attendance by other directors may reduce a director's incentive to attend board meetings because the reputational value of a good attendance record may be low if co-directors also have good attendance records. Grossman and Maggi (2000) and Gould and Winter (2009) argue that strategic interaction can arise for technological reasons, reflecting the nature of the team's tasks. Applied to our setting, the task of investigating managerial misconduct or accounting fraud, for example, can lead to strategic complementarities because an individual director's effort to curb such behavior may be more effective if other directors devote effort to this task as well.

Taking into account monitoring synergies and strategic interaction, our model examines how shocks to a director's level of busyness affect directors' equilibrium monitoring choices and firm value. Consider a "busy" director who serves on the boards of two firms, A and B. An exogenous shock that forces the director to monitor firm A more closely has both a direct and an indirect effect on board monitoring at firm B. First, depending on the nature of the monitoring synergies, the busy director will devote more or less attention to firm B after the shock. In addition, her adjustment at firm B will cause her co-directors at firm B to adjust their monitoring behavior in turn. Depending on the mode of strategic interaction, firm B's non-shocked directors will either step up or reduce their monitoring efforts. For example, if the busy director reduces her effort at firm B, other directors at firm B increase their monitoring efforts if there is strategic substitutability.

The model generates novel, and surprising, insights. Contrary to received wisdom, firm B's shareholders may benefit if the busy director monitors firm A more closely. If monitoring synergies are positive, the busy director will then also monitor firm B more closely. This positive effect on firm B is most pronounced with strategic complementarity, in which case increased monitoring by the busy director will crowd in monitoring effort by firm B's other directors. But firm B's expected value may increase even if synergies are negative, such that the busy director shifts monitoring effort from firm B to firm A. The reason is that strategic interaction may trigger overcompensating reactions by firm B's other directors. This occurs when there is strategic substitutability and the busy director has *low* skill relative to her co-directors: as the busy director reduces her monitoring effort at firm B (due to negative synergies), her co-directors increase their monitoring efforts (due to strategic substitutability), and if their ability is greater than the busy director's, collective monitoring intensity at firm B increases. Interestingly, this result contrasts with the received wisdom in the board literature, which holds that busy directors are beneficial when they have *high* skill.[2]

Our empirical analysis is designed to shed light on when having a busy director on the board is harmful or beneficial to the shareholders of U.S. companies. To do so, we combine an empirical measure of the likely sign of monitoring synergies with a series of exogenous shocks to how busy a director with multiple board appointments is on one board and examine how this distraction spills over to the director's other boards. The shocks occurred as result of a natural experiment first proposed by Kelly and Ljungqvist (2012). Between 2000 and 2008, 43 brokers closed their research operations owing to adverse changes to the economics of sell-side research. The brokerage closures led to over 4,000 analyst coverage terminations among stock market listed U.S. firms. Kelly and Ljungqvist demonstrate that the closures were unrelated to individual firms' future prospects and so are plausibly exogenous at the level of the affected stocks. They then show that when a stock loses (some) analyst coverage following a brokerage closure, information asymmetry among investors increases, retail investors sell the stock, and its share price falls.

We conjecture that the directors of the affected firms, when faced with a reduction in external monitoring by analysts and by other parties that rely on analyst research, step up their own internal monitoring. The data strongly support this conjecture. In other words, the directors of firm A become busier, as conjectured. We then test how directors who also serve on other boards (besides firm A's) adjust their monitoring efforts on their other boards. On average, we find a reduction in their monitoring at spillover firms, consistent with negative monitoring synergies being predominant

[2] See the Adams et al. (2010) survey of the boards literature for a sketch of a model that trades off a lack of time against high ability.

in the data. This reduction masks interesting heterogeneity: among pairs of shocked and spillover firms that plausibly enjoy positive monitoring synergies (such as firms operating in related industries or those whose fundamentals help predict each other's financial performance), we find that busy directors increase their monitoring efforts at both firms, consistent with the model's predictions.

Next, we examine the response of the spillover firm's other directors to the adjustment the common director makes to her monitoring effort. While the average shock to firm A is too small to affect the other directors' monitoring choices at firm B, once we focus on economically meaningful shocks, we find that monitoring adjusts at firm B. On average, the mode of interaction is best described by strategic complementarity, both when monitoring synergies are positive and when they are negative. The exception, in our data, occurs when a firm is in a crisis situation, in which case the efforts of the non-shocked directors and the shocked director move in opposite directions, consistent with strategic substitutability.

In light of the predominance of strategic complementarity, our model suggests that having a busy director on the board is typically only going to be harmful when the firms on whose boards she serves have so little in common informationally that tight time constraints result in negative monitoring synergies. Firms linked by positive monitoring synergies, on the other hand, are going to benefit from sharing directors. We confirm these predictions using an event study of spillover firms' abnormal returns to the announcement of a (meaningfully large) exogenous reduction in research coverage at another firm to which they are linked through a shared director.

The literature on busy directors is entirely empirical and to date inconclusive. On the one hand, several recent studies show that busyness hurts shareholder value. Falato et al. (2014) use sudden deaths of directors and CEOs as shocks to director busyness and document a negative effect of having busy directors.[3] Similarly, Core et al. (1999), Fich and Shivdasani (2006), Stein and Zhao (2016), and Masulis and Zhang (2017) find that busy boards are associated with poor performance and less effective monitoring on average. On the other hand, Field et al. (2013) show that busy directors may be beneficial: while they may be less effective monitors, they may increase firm value through their advisory activities. Similarly, Elyasiani and Zhang (2015) focus on banks and find that busy directors are associated with better bank performance and lower risk. Ferris et al. (2003) document

[3]For our purposes, the brokerage-closure experiment is preferable to sudden deaths. The reason is that sudden deaths shock not just director attention but also board size (which shrinks, until a new director is elected or appointed). The brokerage-closure experiment, in contrast, isolates a shock to attention that is unconfounded by changes in board structure.

a neutral effect of busyness on firm performance while Larcker et al. (2007) show that busyness is unrelated to accounting manipulations.

Our study contributes to the literature on busy directors in two ways. First, ours is the first formal model of busy directors. We identify two novel factors that jointly determine the costs and benefits of having a busy director on the board: cross-firm monitoring synergies and strategic interaction on a firm's board. Neither factor is necessary or sufficient on its own; instead, it is the interplay between them which determines whether busy directors add or subtract value. When directors interact in strategic complements, a busy director is beneficial as long as synergies are positive. But when directors interact in strategic substitutes, a busy director can be beneficial even if synergies are negative. This occurs when her ability is lower than that of her co-directors.

Second, our empirical findings lend nuance to the view expressed in the policy debate and in part of the board literature that busy directors are generally harmful. In our data, this view only finds support when busy director serve on the boards of companies that have so little in common that they give rise to negative monitoring synergies. When this is not the case, we find the opposite: busy directors can be quite beneficial. This duality suggests that the role of busy directors is nuanced and that one-size-fits-all approaches to regulating director busyness run the risk of harming some firms.

Our empirical findings relate to a strand of the personnel- and organization-economics literatures which, like us, focuses on strategic interdependencies among team members. Whether interaction takes the form of substitutes or complements depends on the details of the setting considered. For example, Gould and Winter (2009) focus on baseball players. Whether a given player's performance has a positive or negative effect on his team mates depends on the team's "technology," as the different roles assigned to players create natural substitutabilities or complementarities. Ichino and Maggi (2000) examine shirking behavior at a large Italian bank and show that regional differences in absenteeism and misconduct can partially be explained by strategic complementarities among employees. Mas and Moretti (2009) examine the productivity of supermarket clerks and show that a clerk's effort is positively related to the productivity of her co-workers, consistent with complementarities.

Our analysis differs from this body of work, both in its focus on a high-stakes setting (the board of directors) and in its reliance on large-sample evidence derived from a natural experiment rather than field or case studies. In this way, we hope to contribute to the personnel- and organization-economics literatures. In addition, our study is, to the best of our knowledge, the first to introduce the notion of strategic interaction from the personnel- and organization-economics literatures to the analysis of boards. This allows us to shed new light on the inner workings of boards, by showing that strategic considerations influence directors' monitoring behavior, which traditionally has been studied in the context of monetary incentives, reputation, and career concerns (see, for example, Adams and Ferreira (2008) and Masulis and Mobbs (2014)).[4]

2 The Model

2.1 Setup

We consider a setting with two firms, A and B, and two directors, 1 and 2. Director 1 serves on the boards of both firms and so is a "busy" director. Director 2 only serves on firm B's board.[5] Figure 1 provides an illustration. We are interested in the conditions under which having a busy director on its board is harmful to firm B's shareholders and when it is beneficial.

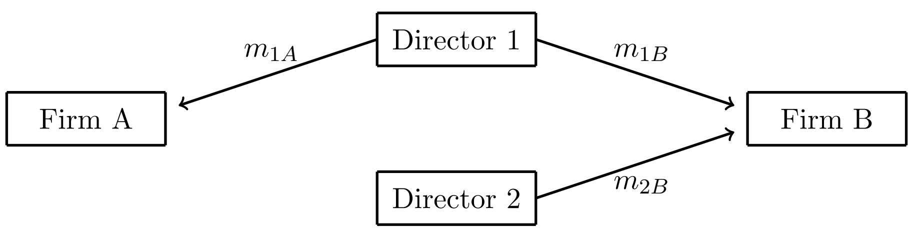

Figure 1: Model Setup: Two Firms and Two Directors.

Each firm's value depends on the activity of its board and on the underlying state of the firm. Let $a_k \in \mathbb{R}$ denote the action of firm k's board, for $k = A, B$. The state of firm k, $s_k \in \mathbb{R}$, is a priori unknown. Everyone holds the common prior belief that the distribution of s_k is $N(0, \xi_k^{-1})$. We abstract from direct technological links between the firms' fundamentals and assume that the states s_A and s_B are independently distributed. As we will see, an indirect link between the firms arises when the common director (director 1) experiences either positive or negative monitoring synergies across the two firms. If firm k's board chooses action a_k, the value of the firm is given by

[4] A rare exception is Adams and Ferreira (2009), who document that male directors have fewer attendance problems the more gender-diverse the board is. This suggests that factors other than incentives, however broadly defined, can influence directors' monitoring behavior.

[5] Allowing director 2 to serve on both boards complicates the analysis somewhat without changing our results.

$V_k = \pi_{0,k} - (a_k - s_k)^2$. With perfect information, firm value is maximized if the action equals the state ($a_k = s_k$), which implies a firm value of $\pi_{0,k}$.

2.2 Timeline

The two boards move sequentially.[6] First, firm A's board monitors and chooses an action, then firm B's board moves. Before choosing an action, firm k's board can devote resources to gathering information about the state s_k, a task we label monitoring. Let m_{1A} and m_{1B} denote the efforts that director 1 devotes to monitoring firm A and firm B, respectively, and let m_{2B} denote director 2's monitoring effort at firm B.

With probability $p_k \in [0, 1]$, to be derived shortly, monitoring is successful and firm k's board receives a set of K_k signals, denoted $(\sigma_{1k}, ..., \sigma_{Kk})$. Each signal is normally distributed with $N(s_k, v_k)$. That is, its mean is equal to the state s_k. Conditional on the true state, signals are independently distributed with variance v_k. With probability $1 - p_k$, monitoring fails and nothing new is learned about the state. Firm k's expected value before the monitoring uncertainty is resolved equals

$$\Pi_k = p_k \bar{V}_k + (1 - p_k)\underline{V}_k = p_k \Delta V_k + \underline{V}_k,$$

where $\bar{V}_k$ denotes firm k's expected value if monitoring is successful and $\underline{V}_k$ denotes firm k's expected value if monitoring fails. ($\bar{V}_k$ and $\underline{V}_k$ are defined precisely in Section 2.5.)

Figure 2 presents the sequence of events in the model, using firm B to illustrate.

Figure 2: Timeline for Firm B.

2.3 Monitoring Technology

We impose the following structure on the monitoring technology. First, directors can differ in their monitoring abilities. Let $\alpha_1 \leq 1$ and $\alpha_2 \leq 1$ denote the abilities of directors 1 and 2, respectively.

[6]We can also solve the game with simultaneous moves, at the cost of a slight reduction in transparency.

Second, directors face monetary and reputational incentives to engage in monitoring, and these incentives can differ both across and within firms. Let λ_{1A} denote director 1's incentives at firm A, and let λ_{1B} and λ_{2B} denote the incentives of directors 1 and 2 at firm B, respectively.[7] The λ parameters measure the extent to which a director aims to maximize firm value and so can be understood as an inverse measure of the extent of the agency conflict between directors and shareholders at either firm and of the severity of any free-rider problems between the two directors on firm B's board. We assume that directors only partially internalize the returns to monitoring ($\lambda < 1$).

Third, gathering information is costly for the directors. Monitoring costs can be interpreted as opportunity costs. For example, working on a board may limit a director's ability to generate income from other sources. Let $C_{1A}(m_{1A}) = 1/2m_{1A}^2$ denote director 1's cost of monitoring firm A, and let C_{1B} and C_{2B} denote the monitoring costs of directors 1 and 2 at firm B, respectively.

Our two main departures from the literature are to allow for monitoring synergies across the two firms and for strategic interaction among firm B's directors. We incorporate these as follows:

- Monitoring synergies can be positive or negative, and both can potentially exist at the same time. Positive synergies arise if the information or expertise acquired in monitoring one firm is transferable to the other firm. Let $p_B = \alpha_1 m_{1B} + \alpha_2 m_{2B}$ denote the probability that the board at firm B monitors successfully. To formalize positive synergies, we assume that the common director's ability to monitor firm B, $\alpha_1(m_{1A})$, depends on her prior monitoring effort at firm A, with $\frac{\partial \alpha_1(m_{1A})}{\partial m_{1A}} > 0$ capturing the presence of positive synergies and $\frac{\partial \alpha_1(m_{1A})}{\partial m_{1A}} = 0$ capturing the absence of positive synergies. To keep the analysis tractable, we assume $\frac{\partial^2 \alpha_1}{\partial m_{1A}^2} = 0$.[8] (The success probability at firm A is simply equal to $p_A = m_{1A}$.)

- Negative synergies arise if the cost of monitoring at one firm increases in the intensity with which the common director monitors at the other firm, in the manner of a time constraint. We capture such negative synergies by allowing the common director's total and marginal cost of effort at firm B to increase in her monitoring effort at firm A: $\frac{\partial C_{1B}}{\partial m_{1A}} > 0$ and $\frac{\partial^2 C_{1B}}{\partial m_{1B} \partial m_{1A}} > 0$.

- Strategic interaction can be either in the form of strategic complements (the two directors' monitoring efforts augment each other) or strategic substitutes (the two directors' monitoring

[7] Incentives are endogenous, but we treat them as exogenous to simplify the analysis. For a recent model that endogenizes the strength of directors' reputational concerns, see Levit and Malenko (2016).

[8] To economize on notation, we suppress the argument (m_{1A}) and write α_1 in the remainder of the paper.

efforts are in conflict with each other). We capture strategic interaction by allowing director i's total and marginal cost of effort at firm B to depend on both directors' effort choices: $\frac{\partial C_{iB}}{\partial m_{jB}} \neq 0$ and $\frac{\partial^2 C_{iB}}{\partial m_{iB} \partial m_{jB}} \neq 0$.

Allowing for synergies and strategic interactions yields the following cost functions for the two directors at firm B:

$$C_{1B}(m_{1B}, m_{1A}, m_{2B}) = 1/2 m_{1B}^2 - \gamma m_{1B} m_{2B} + \tau m_{1A} m_{1B};$$

$$C_2(m_{2B}, m_{1B}) = 1/2 m_{2B}^2 - \gamma m_{2B} m_{1B}.$$

The τ term in the common director's cost function formalizes negative synergies. If $\tau > 0$ (as we assume from now on), monitoring activities are in conflict with each other: greater effort at firm A increases the director's marginal cost of monitoring at firm B, for example due to overload or a lack of time.[9] More monitoring at firm A may then lead to inattentiveness at firm B. Positive synergies, if present, may or may not be sufficiently large to outweigh these negative synergies.

The γ term in each director's cost function formalizes strategic interaction: each director's marginal cost of monitoring (and hence her optimal monitoring choice) depends not only on her own effort, but also on the effort exerted by the other director. To understand why, it is helpful to consider the two directors' expected payoffs. The common director's expected payoff at firm A is

$$U_{1A} = \lambda_{1A} \Pi_A - C_{1A}(m_{1A}) = \lambda_{1A}[p_A \bar{V}_A + (1 - p_A) \underline{V}_A] - \frac{1}{2} m_{1A}^2.$$

Her expected payoff at firm B is

$$U_{1B} = \lambda_{1B} \Pi_B - C_{1B}(m_{1B}, m_{1A}, m_{2B}) =$$
$$\lambda_{1B}[p_B \bar{V}_B + (1 - p_B) \underline{V}_B] - \frac{1}{2} m_{1B}^2 + \gamma m_{1B} m_{2B} - \tau m_{1A} m_{1B},$$

while director 2's expected payoff at firm B is

$$U_{2B} = \lambda_{2B} \Pi_B - C_{2B}(m_{2B}, m_{1B}) = \lambda_{2B}[p_B \bar{V}_B + (1 - p_B) \underline{V}_B] - \frac{1}{2} m_{2B}^2 + \gamma m_{2B} m_{1B}.$$

[9] While we focus on a setting with two firms, in reality some directors serve on more than two boards. A reduced-form way of capturing such situations is to think of τ as increasing in the number of directorships.

Thus, each director's marginal utility of monitoring at firm B depends on the effort exerted by the other director: $\partial^2 U_{iB}/\partial m_{iB}\partial m_{jB} = -\partial^2 C_{iB}/\partial m_{iB}\partial m_{jB} = \gamma$. Whether closer monitoring by one director at firm B increases or reduces the other director's effort choice at firm B depends on the sign of this cross-partial derivative, i.e., on γ:

- When γ is positive, the two directors' monitoring choices at firm B reinforce each other: greater monitoring effort by one director increases the other director's expected marginal payoff to monitoring (or equivalently, it reduces the other director's marginal cost of monitoring). Formally, the two directors' reaction functions are upward-sloping and their interaction takes the form of strategic complements. In this case, an increase in γ increases equilibrium monitoring levels.

- When γ is negative, the two directors' monitoring choices at firm B are in conflict with each other: greater monitoring effort by one director reduces the other director's expected marginal payoff to monitoring (or equivalently, it increases the other director's marginal cost of monitoring). Formally, the two directors' reaction functions are downward-sloping and their interaction takes the form of strategic substitutes. In this case, an increase in the absolute value of γ reduces equilibrium monitoring levels.

- When $\gamma = 0$, we have the usual case considered in the literature, which ignores strategic interaction.

2.4 Microfounding Strategic Interaction

To motivate how strategic interaction among board directors might arise, we turn to the personnel- and organization-economics literatures. The personnel economics literature argues that peer pressure, image concerns, or mutual monitoring by team members can give rise to strategic complementarities (Ichino and Maggi (2000), Kandel and Lazear (1992), and Mas and Moretti (2009)). Applied to our setting, a director may exert more effort when her fellow directors monitor intensively, in order to avoid shame or the resentment of her peers. Strategic substitutability, on the other hand, can arise if an individual's social or image concerns are based on a pursuit of distinction relative to others (Benabou and Tirole (2006)). For example, if other directors have poor attendance records, the reputational value of a good attendance record may be particularly high.

The literature on organization economics suggests that strategic interaction may arise for technological reasons. Strategic complementarities can arise when team output depends on various individual tasks and successful completion of one task facilitates completion of another task (Grossman and Maggi (2000), Kremer (1993)). For example, a director's attempt to control accounting practices or detect fraud may be more effective if other directors devote significant effort to these tasks as well. The work of the audit committee may hence be a good example of activities that give rise to strategic complementarity. In contrast, creative tasks or search activities, which require a team to come up with a solution to a problem or "brilliant" idea, are typically considered to give rise to strategic substitutability (Grossman and Maggi (2000)). The intuition is that the marginal cost to an agent of providing valuable advice may be much higher, and the marginal return to her much lower, if another agent has already come up with a "brilliant" idea. In the board context, the search for a new CEO or for a new strategy may fit this characterization.

Appendix A sketches out ways to microfound the strategic interaction parameter γ in our setup.

2.5 Equilibrium Monitoring Choices

We solve the game backwards. Directors at each firm choose the value-maximizing action a given all available information. After the outcome of monitoring has been determined at firm k, the board's posterior distribution of s_k is normal with posterior mean $\hat{s}_k$ and posterior variance $\hat{\xi}_k^{-1}$. If firm k's board monitors successfully and obtains K_k signals, the posterior mean and variance are

$$\hat{s}_k = \frac{\frac{K_k}{v_k}\bar{s}_k}{\xi_k + \frac{K_k}{v_k}} \quad \text{and} \quad \hat{\xi}_k^{-1} = \frac{1}{\xi_k + \frac{K_k}{v_k}}, \tag{1}$$

respectively. Here, $\bar{s}_k$ is the average of the K_k signals. More information (as measured by a larger number of signals, K_k) reduces the posterior variance $\hat{\xi}_k^{-1}$. If monitoring fails, the board's posterior distribution corresponds to the prior one ($\hat{s}_k = 0$ and $\hat{\xi}_k^{-1} = \xi_k^{-1}$).

It can easily be seen that firm k's expected value is maximized by setting the action equal to the firm's expected state given all available signals. Hence, the optimal action is $a_k^* = \hat{s}_k$. Under the posterior distribution $N(\hat{s}_k, \hat{\xi}_k^{-1})$, firm k's expected value is given by

$$E[V_k|\hat{s}_k, \hat{\xi}_k^{-1}] = E[\pi_{0k} - (a_k^* - s_k)^2|\hat{s}_k, \hat{\xi}_k^{-1}] = \pi_{0k} - \hat{\xi}_k^{-1}. \tag{2}$$

Equation (2) states that firm k's expected value conditional on the posterior distribution equals π_{0k} minus the posterior variance. Hence, reducing uncertainty about the true state of the firm by way of monitoring adds value. Let $\bar{V}_k$ denote expected firm value if monitoring is successful and the posterior distribution is given in (1), and let $\underline{V}_k$ denote expected firm value if monitoring fails and the posterior distribution corresponds to the prior one. Then the marginal benefit of monitoring at firm k is $\Delta V_k \equiv \bar{V}_k - \underline{V}_k$.

We now derive the Nash equilibrium at firm B, in which the directors move simultaneously and non-cooperatively. Given her expectation of the other director's monitoring choice, director i chooses her effort to maximize her expected payoff U_{iB}. Both directors take m_{1A} as predetermined in the previous stage. The following first-order conditions must hold in an interior Nash equilibrium:

$$\begin{aligned}\frac{\partial U_{1B}}{\partial m_{1B}} =& \alpha_1\lambda_{1B}\Delta V_B - \frac{\partial C_{1B}}{\partial m_{1B}} = 0 \Leftrightarrow \\ & \alpha_1\lambda_{1B}\Delta V_B - m_{1B} + \gamma m_{2B} - \tau m_{1A} = 0, \\ \frac{\partial U_{2B}}{\partial m_{2B}} =& \alpha_2\lambda_{2B}\Delta V_B - \frac{\partial C_{2B}}{\partial m_{2B}} = 0 \Leftrightarrow \\ & \alpha_2\lambda_{2B}\Delta V_B - m_{2B} + \gamma m_{1B} = 0.\end{aligned} \tag{3}$$

The equilibrium (m^*_{1B}, m^*_{2B}) implied by the first-order conditions in equation system (3) is assumed to be stable. Hence, the determinant of the Jacobian matrix is positive. This is ensured by assuming that $\gamma \in (-1, 1/2)$. To ensure a unique interior equilibrium, we assume that $\Delta V_B < 1/4$.

The best-response functions implied by the Nash first-order conditions show that each director's marginal utility of monitoring depends on the effort exerted by the other director. Whether closer monitoring by one director at firm B increases or reduces the other director's effort choice depends on the mode of the strategic interaction, which is determined by the sign of γ. If γ is negative, there is strategic substitutability and closer monitoring by one director reduces the effort of the other. If γ is positive, there is strategic complementarity. Moreover, the busy director's marginal cost and marginal benefit of monitoring depend on her previous monitoring activity at firm A.[10]

The common director's initial monitoring choice at firm A maximizes $U_{1A} + U_{1B}$ and satisfies the

[10] Each director's monitoring effort has an external effect that may give rise to free-riding behavior. This externality arises because a director's effort directly increases expected firm value, Π_B, and therefore benefits all shareholders and directors jointly. The first-order conditions for m_{1B} and m_{2B} in equation (3) show that director i's private benefit from monitoring falls short of the social benefit since $\lambda_{iB} < 1$: because each director only considers her private benefit from increasing firm value when choosing her monitoring effort, she tends to undersupply monitoring effort in equilibrium. While strategic complementarity mitigates this free-rider problem, strategic substitutability amplifies it.

first-order condition $d(U_{1A}+U_{1B})/dm_{1A}=0$, which can be rewritten as:

$$\frac{\partial U_{1A}}{\partial m_{1A}}+\frac{\partial U_{1B}}{\partial m_{1A}}+\frac{\partial U_{1B}}{\partial m_{1B}^*}\frac{dm_{1B}^*}{dm_{1A}}+\frac{\partial U_{1B}}{\partial m_{2B}^*}\frac{dm_{2B}^*}{dm_{1A}}=0. \tag{4}$$

The first summand on the left-hand side, $\frac{\partial U_{1A}}{\partial m_{1A}}$, is the common director's marginal payoff at firm A from monitoring that firm more closely. In addition, closer monitoring at firm A affects the common director's payoff at firm B, which is reflected in the remaining three summands on the left-hand side. The effect on firm B operates through the following two channels.

The first channel, $\frac{\partial U_{1B}}{\partial m_{1A}}$, is due to the fact that m_{1A} directly affects the common director's costs and benefits of monitoring firm B. A higher m_{1A} raises the marginal benefit of monitoring firm B by $\lambda_{1B}\Delta V_B\frac{\partial \alpha_1}{\partial m_{1A}}\geq 0$ due to the possible transferability of information. At the same time, the marginal cost of monitoring firm B increases by τ due to time constraints or overload. The sum of the two effects determines the net cross-firm synergies, defined as

$$S\equiv\lambda_{1B}\Delta V_B\frac{\partial \alpha_1}{\partial m_{1A}}-\tau. \tag{5}$$

Depending on whether the loss of attention due to time constraints or the benefits from the transferability of information dominate, the net cross-firm synergies are negative or positive. The strength of the net cross-firm synergies is captured by the absolute value $|S|$.

The second channel arises because both directors adjust their equilibrium behavior at firm B after a change in m_{1A}. A marginal change in effort at firm A has a negligible effect on the common director's reoptimization at firm B, by the envelope theorem. That is, the term $\frac{\partial U_{1B}}{\partial m_{1B}^*}\frac{dm_{1B}^*}{dm_{1A}}$ in equation (4) is zero. However, a marginal change in effort m_{1A} also causes a reoptimization by director 2 at firm B, which has a first-order effect on the common director's utility. The sign of $\frac{\partial U_{1B}}{\partial m_{2B}^*}\frac{dm_{2B}^*}{dm_{1A}}$ in equation (4) depends on the mode of strategic interaction between the two directors at firm B.

Based on this discussion, we can rewrite the first-order condition in equation (4) as follows:

$$\frac{d(U_{1A}+U_{1B})}{dm_{1A}}=\lambda_{1A}\Delta V_A-m_{1A}+m_{1B}^*S+\frac{dm_{2B}^*}{dm_{1A}}[\lambda_{1B}\alpha_2\Delta V_B+\gamma m_{1B}^*]=0. \tag{6}$$

2.6 When Are Busy Directors Harmful?

To derive the conditions under which busy directors are harmful, consider a shock that causes the common director to increase her monitoring effort at firm A. Specifically, suppose that firm A's information environment deteriorates, as reflected in a higher prior variance ξ_A^{-1}. (The empirical counterpart to this, considered in Section 3, will be an exogenous reduction in the number of analysts covering firm A's stock.) It can be shown that such a shock increases director 1's optimal monitoring effort at firm A $\left(\partial m_{1A}^*/\partial \xi_A^{-1} > 0\right)$. In this section, we consider how the two directors adjust their monitoring efforts at the spillover firm B, and how these adjustments in turn affect firm B's value.[11]

2.6.1 Director 1's Optimal Effort Adjustment at Firm B

How does the shock to director 1's monitoring at firm A affect her optimal monitoring level at the other firm, m_{1B}^*? The spillover effect on m_{1B}^* is the product of two components, namely the common director's effort adjustment at firm A and a factor that reflects the cross-firm synergies:

$$\frac{\partial m_{1B}^*}{\partial \xi_A^{-1}} = \left(\frac{\partial m_{1A}^*}{\partial \xi_A^{-1}}\right)\left(\frac{S}{1-\gamma^2}\right). \tag{7}$$

The following proposition describes the common director's equilibrium monitoring adjustment at firm B. Part (i) deals with the sign of the adjustment, while parts (ii) and (iii) deal with its magnitude.

Proposition 1. *Suppose that a shock to firm A's information environment increases director 1's optimal monitoring effort at firm A. That is, $\partial m_{1A}^*/\partial \xi_A^{-1} > 0$ in equation (7).*
(i) If the net monitoring synergies S across the two firms are negative (positive), the shock reduces (increases) director 1's equilibrium monitoring effort at firm B, m_{1B}^*.
(ii) Larger prior uncertainty or stronger incentives at firm A strengthen director 1's effort reduction (effort increase) at firm B if the net synergies are negative (positive).
(iii) With negative (positive) net synergies, director 1's effort reduction (increase) at firm B is stronger if prior uncertainty at firm B is low (high) or incentives at firm B are weak (strong).

Proof. See Appendix B. □

[11] We take the size of firm B's board as given and thus focus on the board's response to the shock on the intensive rather than the extensive margin. In practice, for the kinds of shocks that we consider in our empirical analysis, we do not expect board size to be changed.

The direction of the spillover effect in part (i) depends on whether monitoring synergies are on balance positive or negative. If negative synergies due to overload or lack of time dominate ($S < 0$), the common director shifts attention from firm B to firm A after an adverse shock to firm A. If positive synergies from transferring information dominate ($S > 0$), the shock at firm A causes director 1 to monitor both firms more closely.

Parts (ii) and (iii) consider how the magnitude of the spillover effect depends on prior uncertainty and incentives at firms A and B, respectively. To understand the intuition for part (ii), first note that the common director's monitoring adjustment at firm A is stronger the higher is firm A's prior uncertainty or the stronger are her incentives at firm A: $\partial m_{1A}^{*}/\partial \xi_A^{-1}$ in equation (7) increases with ξ_A^{-1} or λ_{1A}. The spillover effect on firm B is, in turn, proportional to director 1's initial adjustment at firm A. Hence, higher prior uncertainty or stronger incentives at firm A always amplify the spillover effect on firm B.

Conditions at firm B, captured in part (iii), behave differently. Higher prior uncertainty or stronger incentives at firm B amplify or dampen the spillover effect, depending on whether the common director experiences positive or negative synergies between the two firms. With low prior uncertainty or weak incentives at firm B, the common director is less concerned about being inattentive at firm B. As a result, she will reduce her effort at firm B more aggressively if synergies are negative (an amplifying effect) or not increase her effort at firm B much if synergies are positive (a dampening effect). Conversely, with high uncertainty or strong incentives at firm B, the common director cares more about taking a well-informed decision at firm B to begin with. As a result, she will not reduce her effort at firm B much if synergies are negative (a dampening effect) or increase her effort at firm B more aggressively if synergies are positive (an amplifying effect).

An interesting feature of Proposition 1 is that parts (ii) and (iii) are independent of each other. This means that the *relative* magnitude of uncertainty or incentives at firms A and B plays no role in determining the common director's effort allocation across the two firms. Indeed, with positive synergies, we have the result that the common director's effort increase at firm B is stronger if prior uncertainty or incentives are high at *either* firm A *or* firm B *or both*.

2.6.2 Director 2's Optimal Response to Director 1's Effort Adjustment at Firm B

When director 1 re-optimizes after a shock to firm A, she influences director 2's monitoring incentives at firm B:

$$\frac{\partial m_{2B}^*}{\partial \xi_A^{-1}} = \gamma \frac{\partial m_{1B}^*}{\partial \xi_A^{-1}} = \gamma \left(\frac{\partial m_{1A}^*}{\partial \xi_A^{-1}} \right) \left(\frac{S}{1-\gamma^2} \right). \tag{8}$$

Whether director 2 exerts more or less effort depends on (i) whether the common director experiences positive or negative monitoring synergies across firms and (ii) whether the two directors consider their efforts at firm B to be strategic complements or strategic substitutes. While the synergies determine whether m_{1B} falls or increases, the mode of strategic interaction determines whether director 2's marginal benefit of monitoring co-varies positively or negatively with director 1's effort. The following proposition summarizes the effects of an adverse shock that makes director 1 busier at firm A on director 2's optimal monitoring choice at firm B.

Proposition 2. *The sign of the equilibrium monitoring response by director* 2 *at firm B to a change in director* 1*'s monitoring effort at firm B resulting from a shock to the optimal monitoring level at firm A depends on the nature of the monitoring synergies across the two firms and on the mode of strategic interaction between the two directors, as follows:*

	Positive net synergies *(Increase in m_{1B})*	*Negative net synergies* *(Reduction in m_{1B})*
Strategic substitutes	-	+
Strategic complements	+	-

Proof. See Appendix B. □

For example, a shock that causes director 1 to monitor more intensively at firm A leads to more monitoring by director 2 at firm B if synergies are negative on net and monitoring efforts are strategic substitutes. In this case, the shock to firm A causes director 1 to devote less effort to firm B, which in turn increases director 2's marginal benefit of monitoring at firm B, leading to more monitoring effort by director 2.

2.6.3 Effects on Firm B's Expected Value

How does firm B's expected value change when director 1 becomes busier at firm A? Extant work on directors with multiple board appointments emphasizes the concern that busy directors are unable to effectively monitor all the firms on whose boards they serve, due to a lack of time. The following proposition summarizes the conditions under which firm B is indeed harmed when director 1 becomes busier elsewhere as well as the conditions under which firm B benefits.

Proposition 3. *Suppose that cross-firm synergies are sufficiently strong ($|S| > \hat{S}$). Then the sign of the effect on firm B's expected value of a shock that leads director 1 to monitor firm A more intensively depends on the nature of the monitoring synergies across the two firms and on the mode of strategic interaction between the two directors at firm B:*

	Positive net synergies (Increase in m_{1B})	*Negative net synergies (Reduction in m_{1B})*
No strategic interaction	+	-
Strategic complements	+	-
Strategic substitutability and $\alpha_2 < \bar{\alpha_2}$	+	-
Strategic substitutability and $\alpha_2 \geq \bar{\alpha_2}$	-	+

Proof. See Appendix B. □

As Proposition 3 shows, there are just as many cases in which a busy director is beneficial as there are cases in which a busy director is harmful. Interestingly, it is not simply the case that positive cross-firm monitoring synergies automatically make a busy director beneficial: whether it does also depends on the mode of the directors' strategic interaction and on the directors' relative abilities.

How greater busyness at firm A affects firm B's value depends on how it affects collective monitoring at firm B, as captured by the success probability $p_B = \alpha_1 m_{1B} + \alpha_2 m_{2B}$. Following a deterioration in firm A's information environment, this probability changes by

$$\frac{\partial p_B}{\partial \xi_A^{-1}} = \alpha_1 \frac{\partial m_{1B}^*}{\partial \xi_A^{-1}} + \alpha_2 \frac{\partial m_{2B}^*}{\partial \xi_A^{-1}} + \frac{\partial \alpha_1}{\partial m_{1A}^*} \frac{\partial m_{1A}^*}{\partial \xi_A^{-1}} m_{1B}^*.$$

Greater busyness at firm A affects monitoring success at firm B through two channels. The first channel is due to the adjustments the two directors make to their equilibrium monitoring efforts at firm B, captured by the first two summands on the right hand side above. As explored in Propositions 1 and 2, the signs of the individual effort changes depend on the nature of the net synergies between the two firms and on the mode of strategic interaction between the directors. Moreover, the sum of the two effort changes depends on the directors' abilities, α_1 and α_2. The second channel is due to the fact that the busy director's effort increase at firm A *directly* raises her ability to monitor firm B. This direct effect, reflected in the third summand above, is always (weakly) positive, *irrespective of the sign of the net synergies.* Intuitively, closer monitoring at firm A raises the success probability p_B due to the ability to recycle information ($\frac{\partial \alpha_1}{\partial m_{1A}} \geq 0$). Using equation (8) to simplify the above expression, it can easily be seen that the sign of the joint effect of the two channels on firm B's expected value is

$$sign\left(\frac{\partial p_B}{\partial \xi_A^{-1}}\right) = sign\left(\alpha_1 S + \alpha_2 \gamma S + \frac{\partial \alpha_1}{\partial m_{1A}^*} m_{1B}^* (1-\gamma^2)\right). \tag{9}$$

The magnitudes of the directors' effort adjustments at firm B, $\alpha_1 S + \alpha_2 \gamma S$, increase in the strength of the net synergies $|S|$. Unless synergies are sufficiently strong, as Proposition 3 assumes they are, the first channel is moot because the spillover effect is too insignificant for the directors' responses at firm B to have a noticeable effect on monitoring success. In that case, we obtain the trivial result that a shock that causes director 1 to monitor firm A more intensively always benefits firm B, due to recycling of information.

Under the maintained assumption that $|S| > \hat{S}$, the sign of the effect of a shock at firm A on firm B's expected value is determined by the first channel, which we now discuss in more detail. We first consider the conditions under which the comparative statics results in Proposition 3 are in line with the view that busyness at firm A hurts the shareholders of firm B. If monitoring synergies are negative, the common director shifts attention away from firm B when she gets busier at firm A. In the absence of strategic interaction, or with strategic complementarity, this shift always reduces collective monitoring at firm B: without strategic interaction, m_{2B} does not change after a shock, whereas with strategic complementarity, director 2 also reduces her effort. Either way, greater busyness at firm A reduces firm B's expected value. With strategic substitutability, a monitoring shock at firm A moves the equilibrium monitoring levels of the two directors at firm B in opposite directions. As long as director 2's ability is relatively low, her countervailing equilibrium response will be too small to offset the common director's effort reduction at firm B and so firm B's expected value declines. Finally, even if the common director monitors both firms more closely after a shock, as a result of positive synergies, greater busyness may have a negative effect on firm B. This occurs when monitoring efforts are strategic substitutes and director 2's ability, α_2, is relatively high. In this case, director 2's effort reduction in equilibrium more than offsets the common director's effort increase, which leads to a fall in the success probability, p_B, and hence in firm B's value. Thus, contrary to received wisdom, high-ability busy directors can be harmful rather than beneficial.[12]

We next consider the conditions under which the comparative statics results in Proposition 3 are in line with the view that busyness at firm A benefits firm B's shareholders. First, with positive monitoring synergies, a shock that causes director 1 to monitor firm A more closely will also lead her to monitor firm B more closely. This spillover effect increases firm B's expected value, unless there is strategic substitutability and director 2's countervailing equilibrium response (a reduction in monitoring) more than offsets the common director's increased monitoring. Moreover, firm B may benefit from having a busy director even if monitoring synergies are negative. This can occur with strategic substitutability as long as director 2's ability, α_2, is relatively high. While the common director reduces her monitoring effort at firm B when she is distracted by events at firm A, director 2's equilibrium response in this case more than offsets the common director's effort reduction, resulting in an overall increase in monitoring and hence a higher expected value for firm B.

3 Empirical Strategy

Our model shows that having a busy director on a board need not be harmful to shareholders. Whether it is harmful or beneficial depends on the sign of the monitoring synergies across the busy director's firms in conjunction with the mode of strategic interaction between the busy director and her fellow board members. Testing the model requires three building blocks: an exogenous shock to a director's busyness, a measure of each director's monitoring effort, and a way of signing the monitoring synergies between any pair of firms linked by a common director. We discuss each building block in detail below.

[12] This result contrasts with informal arguments in parts of the board literature suggesting that a busy director can add value if her high ability offsets her lack of time. Our model shows that it is the *relative* ability of the two directors that matters, and that busyness is least harmful when the busy director has relatively *low* ability, given strategic substitutes and negative synergies.

Our empirical strategy proceeds in four steps. The first step establishes that our exogenous shock indeed makes director 1 busier at firm A. This implies that the shock passes the relevance test necessary for identification. The second step examines how director 1 adjusts her monitoring effort at firm B when getting busier at firm A and how this adjustment varies with the sign of the cross-firm synergies. The third step focuses on the response of director 2 on firm B's board to the adjustment director 1 makes to her monitoring at firm B. This allows us to test whether directors interact strategically on a board, and if so, whether the mode of their interaction is best described by strategic substitutability or strategic complementarity. The final step estimates the change in firm B's value when one of its directors finds herself monitoring another firm A more intensively.

Our empirical results are in line with the predictions of the model. When monitoring synergies are negative, as the public debate typically assumes, common directors reduce their monitoring effort at firm B when getting busier at firm A. On the other hand, when monitoring synergies are positive, they do the opposite. We find strong evidence of strategic interaction among directors, and the interaction typically takes the form of strategic complements: when the busy director adjusts her monitoring effort at firm B as a result of a shock at firm A, her fellow directors on firm B's board adjust their own monitoring efforts in the same direction. The exception, in our data, is when a firm finds itself facing a crisis: in this case, the fellow directors compensate for the busy director's reduced monitoring by increasing their own monitoring, in the manner of strategic substitutes.

Given that strategic complementarity predominates in our data, our model predicts that busy directors are harmful to shareholders' interests only when monitoring synergies are negative. When synergies are instead positive, shareholders benefit from having a busy director on the board. We confirm this prediction in an event study: when one of its directors experiences a meaningful shock to the attention she needs to devote to monitoring another firm A, firm B's share price falls when the synergies between firms A and B are negative and increases when the synergies are positive.

3.1 Building Block 1: A Shock to Director Busyness

To shock a director's busyness, we use a set of natural experiments first proposed by Kelly and Ljungqvist (2012, henceforth KL). Between 2000 Q2 and 2008 Q1, 43 U.S. brokerage firms closed down their research departments. These closures led to 4,429 coverage terminations among 2,180 U.S. firms. As KL show, such reductions in analyst coverage constitute shocks to firms' external information environments: when a stock loses (some) analyst coverage in the wake of a brokerage closure, various measures of information asymmetry among investors increase, retail investors sell the stock, and the average treated firm's share price falls by between 1.12% and 2.61%, depending on the benchmark used.

Balakrishnan et al. (2014) show that firms view these shocks to their information environments as sufficiently material to elicit a corporate response in the form of an increase in (costly) voluntary disclosure. We conjecture that directors similarly view these shocks as sufficiently material to require an increase in their monitoring efforts: when losing an external source of information about the firm they are tasked to monitor, directors substitute by increasing their own internal information gathering, especially if the departing analyst was regarded as well informed. Ljungqvist and Raff (2017) provide evidence that such substitution is widespread. If so, we can use KL's brokerage closures as a shock to a director's busyness.

A key advantage of KL's approach is that brokerage closures are plausibly exogenous at the level of the affected stocks. While firms routinely lose analyst coverage (often because analysts prefer to suspend coverage rather than expressing a negative opinion that could upset management), coverage terminations that result from brokerage closures are not selective: closures result in *every* stock in a brokerage firm's research portfolio losing coverage. Moreover, KL show that brokerage firms did not close down their research departments for reasons related to the future prospects of the firms their analysts covered but instead responded to adverse changes in the economics of sell-side research.

Our main identification assumption is that KL's coverage terminations do not coincide with other shocks that would independently trigger changes in the affected board's monitoring efforts. The chief identification concern is hence that the brokerage closures systematically coincide with corporate governance reforms that affect directors' behavior directly, resulting in a spurious correlation between the closures and changes in monitoring efforts at affected firms. Two features of our empirical design mitigate this concern. First, KL's 43 brokerage closures are spread out over the nine-year interval from 2000 to 2008 in a way that suggests no clustering around major governance reforms (such as the 2002 Sarbanes-Oxley Act and its subsequent implementation milestones). Second, because each closure affects only a subset of firms at a time (i.e., those losing coverage), we are left with rich sets of control firms that are subject to the same extraneous shocks as the treated firms (such as governance reforms) but that do not suffer any systematic shocks to their external information environments.

This allows us to difference away contemporaneous confounds and thus isolate the effects of a shock to director 1's level of busyness at firm A using a difference-in-differences design.

When we consider how a shock to firm A's information environment affects how directors interact on firm B's board, the main identification assumption is that the brokerage closure hitting firm A does not *directly* affect firm B. The intuition is similar to the familiar "exclusion restriction" assumed in instrumental-variables approaches (though ours is a diff-in-diff design): we need to be able to rule out that monitoring choices on firm B's board are correlated because of exposure to a common shock rather than because of strategic interaction among B's directors. Most versions of this identification challenge are straightforward to rule out, given (i) the economic rationale for the brokerage closures, (ii) the once-removed nature of a coverage shock to firm A indirectly hitting firms otherwise unrelated to the brokerage houses that closed down their research departments, and (iii) the staggered diff-in-diff research design. For example, brokerage closures were neither motivated by the future prospects of firms that happen to share a director with a firm whose coverage is dropped, nor did they coincide systematically with other extraneous shocks to these other firms' governance arrangements.

This leaves the possibility that the initial coverage shock affects *both* firms' information environments. For example, the lost analyst signal might have contained industry-level information of relevance to both firms, the loss of which then triggers an increase in monitoring at both firms. The model imposes structure on the data which allows us to empirically test for this identification challenge. Specifically, Proposition 2 predicts that if directors interact strategically, director 2 will optimally *reduce* her monitoring effort in two cases: if there are positive monitoring synergies between the two firms and directors on firm B's board interact in the manner of strategic substitutes; or if there are negative monitoring synergies and their interaction is characterized by strategic complementarity. An empirical finding of a reduction in director 2's monitoring effort in these two cases would thus be inconsistent with the hypothesis that a common shock drives our results.

3.2 Building Block 2: A Proxy for Monitoring Effort

Following the board literature (e.g., Adams and Ferreira (2009) and Masulis et al. (2012)), we proxy for monitoring effort using data on a director's attendance record. Specifically, item 407(b) of Regulation S-K requires firms to disclose the names of directors who attend fewer than 75% of board and committee meetings in a given fiscal year. To gauge how many meetings would typically be missed by a director whose attendance falls below the 75% threshold, we use hand-collected data for 5,000 directors for whom firms voluntarily disclose precise attendance figures in their annual proxy statements. Conditional on failing the 75% attendance standard, the average (median) director attends 62.5% (67%) of her board and committee meetings. Conditional on satisfying the 75% attendance standard, the average (median) director attends 99.1% (100%) of her board and committee meetings. We estimate that the average (median) director has 16.6 (13) meetings to attend per year. Thus, failure to meet the 75% attendance standard implies that the average (median) director misses 6.2 (4.3) meetings per year, which seems like a meaningful reduction in monitoring effort.

3.3 Building Block 3: Signing Cross-Firm Monitoring Synergies

We follow two approaches to classify, for each director who holds multiple board appointments, whether her particular pair of firms A and B are likely to be subject to positive or negative synergies. The first approach is based on the conjecture that monitoring two firms is more valuable if the firms operate in related industries. This conjecture would hold if, for example, information learned while monitoring contains both a firm-specific component and an industry component. The second approach captures informational links across firms. Hameed et al. (2015) argue that two stocks are informationally linked if variation in one firm's earnings helps explain the other firm's earnings after controlling for market- and industry-wide trends in earnings.[13]

3.4 Sample, Data, and Regression Specifications

Our sample combines data from CRSP and Compustat with board data from The Corporate Library's Board Analyst database.[14] From the CRSP-Compustat merged annual database, we extract share prices, shares outstanding, share codes, and historical industry codes. From Board Analyst, we extract data on the composition of each company's board along with biographical information for each director, such as date of joining and leaving a board, age, independence, and membership of

[13]To construct the Hameed et al. measure, we first regress firm B's quarterly ROA over a five-year window on market ROA (the value-weighted average ROA of all NYSE, NASDAQ, and AMEX listed firms, excluding firms A and B themselves) and industry ROA (the value-weighted average ROA in firm B's Fama-French 48 industry, again excluding firms A and B themselves). Next, we add to this regression firm A's ROA. The measure of firm A's contribution to explaining firm B's fundamentals is given by the (scaled) increase in R^2 between the two regressions. We compute this metric for each pair of shocked and spillover firms in our sample and code a common director as serving on the boards of two informationally related firms if the metric exceeds the sample median.

[14]The Corporate Library, LLC was acquired by GovernanceMetrics International, Inc. in 2010 and no longer exists as a stand-alone data vendor.

major board committees.

The unit of observation in KL's various event studies is a firm-day. Most of our tests instead use annual data (except when we estimate the effect of increased busyness on firm value). The reason is that U.S. firms report on their board activities only once a year, in their annual proxy statements sent to shareholders ahead of the annual meeting. The unit of analysis in our tests of individual directors' monitoring choices is therefore a director-firm-fiscal year triplet. We track each director associated with each sample firm from fiscal year 2000 (or the first year the firm and director appear in the Board Analyst database) through fiscal year 2008 (or the last year the firm and director appear in the Board Analyst database). After excluding firms with share codes greater than 12 (mutual funds and so on) and those not listed on a major exchange (i.e., the NYSE, NASDAQ, or AMEX), the sample contains 188,541 observations for 4,057 unique firms and 34,823 unique directors.

Of the 4,057 unique sample firms, 1,419 experience one or more closure-related coverage terminations while in our sample.[15] We will refer to these as "shocked firms;" they correspond to firm A in the model. Reflecting the fact that a firm can experience coverage terminations in multiple fiscal years, the total number of shocked firm-years in our sample is 2,472. In addition, some firms experience multiple coverage terminations over the course of a given fiscal year.[16] In total, we capture 3,153 of KL's 4,429 coverage terminations (71.2%).

Of the 4,057 unique sample firms, 2,131 are exposed, through a shared director, to another firm's coverage shock. We will refer to these firms as "spillover firms;" they correspond to firm B in the model. Allowing for spillover firms to be exposed multiple times during our sample period gives 4,805 firm-years with spillovers. In the average spillover firm-year, 1.6 directors experience coverage shocks at another firm whose board they serve on.

The nature of our empirical design is such that the sample contains four types of directors:

- directors who serve on the board of a firm experiencing a closure-related coverage termination (referred to as "shocked" directors);

[15] This is fewer than KL's count of 2,180, owing to gaps in The Corporate Library's Board Analyst database. In particular, The Corporate Library (like its various competitors) oversamples larger firms. To illustrate, KL's Table 1 reports an average market capitalization of \$6.2 billion in the universe of stocks with analyst coverage in 2004. The corresponding number in the Board Analyst database is \$8.1 billion. To the extent that a reduction in analyst coverage is a larger hit to a smaller firm's information environment than it is to a larger firm's information environment, our estimates are conservative.

[16] The average number of terminations, conditional on experiencing at least one in a given year, is 1.29 per year, with a range from 1 to 6.

- those shocked directors who serve on multiple boards at the time of the shock to firm A's information environment and so potentially transmit a coverage shock from firm A to firm B (corresponding to director 1, using the language of the model, and referred to as "common" directors);

- directors who serve on firm B's board without themselves experiencing a coverage termination at another firm at the time (corresponding to director 2, using the language of the model); and

- directors on the boards of firms that experience neither a direct coverage shock nor an indirect spillover shock transmitted through a common director.

The first three types are in one way or another treated; the last type serves as a source of controls. Our primary focus is on the interaction of common directors (who form a subset of the shocked directors) and their co-directors on firm B's board.

Of the 34,823 unique directors in the sample, 13,289 suffer neither a shock nor a spillover. Bearing in mind that the remaining directors could, at different times, feature in multiple treatment groups, our sample contains 11,964 shocked directors, 3,740 common directors, and 19,034 directors who are affected by a spillover. Of the 188,541 director-firm-fiscal year observations, 23,897 involve a shocked director experiencing a coverage termination, 9,069 involve a common director transmitting a spillover shock to another firm, and 40,492 involve a director serving on the board of a spillover firm when a shock is transmitted through a common director. The remaining 115,083 director-firm-fiscal-years serve as controls. Table 1 reports summary statistics for the whole sample and for each of these four groups of observations.

Using these data, we estimate panel diff-in-diff regressions. The dependent variable is an indicator set equal to 1 if a director attends at least 75% of board and committee meetings in a given fiscal year. All specifications are estimated as linear probability models using OLS. Our models include spell fixed effects (i.e., fixed effects for each director at a given firm), allowing us to test whether a given director changes her behavior at that firm as a result of the exogenous shocks she is directly or indirectly subjected to.

We control for a variety of other determinants of board attendance identified in prior work (e.g., Falato et al. (2014) and Masulis and Mobbs (2014)). These include whether the director serves on multiple boards, and if so, whether this is her largest or smallest directorship, whether the director is independent, and whether she serves on a major board committee. To proxy for ability and experience, we include the director's tenure (the time since joining the board in log years) and age (in log years). We also control for board size (in logs), firm size (in logs), and a set of fiscal year fixed effects. For variable definitions and details of their construction see Appendix C.

We cluster standard errors by firm. This allows for serial correlation within a firm over time and, importantly, for arbitrary correlations of the error term across directors serving together on a firm's board in any given year as well as over time.

4 Empirical Results

4.1 Making Busy Directors Busier

Step one in our empirical strategy is to validate the premise that analyst coverage reductions resulting from brokerage closures make the directors of the shocked firm busier. Figure 3 plots changes in the likelihood that a director meets the 75% attendance standard (our proxy for monitoring effort) in the five years surrounding such a coverage termination. The coefficients plotted in the figure are obtained from a panel regression of the met-attendance indicator on a set of shock indicators dated $t-2$ to $t+2$ as well as director-spell and year fixed effects. A positive (negative) coefficient means that directors become more (less) likely to meet the 75% attendance standard, on average.

As Figure 3 shows, there is no tendency, in the two years before a coverage termination, for the directors of to-be shocked firms A to behave any differently than the directors of control firms. This supports the parallel-trends assumption necessary for identification in a diff-in-diff setting. During the fiscal year in which a firm loses coverage, attendance continues to be no different among treated directors and their controls. It is only over the course of the next year (in year $t+1$) that shocked directors show a response. The average response is positive, meaning that shocked directors become *more* likely to meet the attendance standard when firm A loses analyst coverage, consistent with an increase in monitoring effort. The effect is both statistically significant ($p < 0.001$) and economically sizeable: the likelihood of 75%+ attendance increases by an average 0.46 percentage points, relative to control directors. In other words, analyst coverage reductions resulting from brokerage closures do indeed make the directors of the shocked firm busier. This implies that coverage shocks pass the relevance test necessary for identification. One year later (in year $t = 2$), shocked directors' board

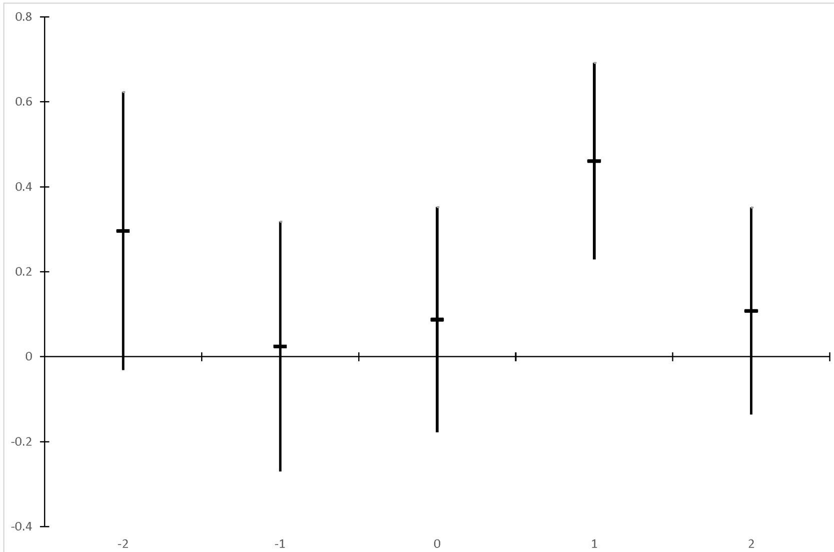

Figure 3: Board Attendance Around Closure-Related Coverage Terminations.
The figure plots the coefficients from a difference-in-differences regression of the effect on board attendance of losing (some) analyst coverage as a result of a brokerage-firm closure. The regression includes director-spell and year fixed effects. The dependent variable is an indicator set equal to one when a director attends at least 75% of board and committee meetings in a fiscal year. Time is along the horizontal axis, with year 0 being the fiscal year of the coverage termination. The units on the vertical axis are in percent. The vertical bars represent 95% confidence intervals; the short horizontal bar is the coefficient estimate, which captures the average difference in board attendance between treated directors (those experiencing a coverage termination) and control directors (all others). A positive coefficient means that a treated director is more likely to meet the 75% attendance standard than is normal for that director at that firm and when compared to control directors.

attendance at firm A converges to that of control directors.[17]

Table 2 tests more formally whether coverage terminations make the directors of the shocked firms busier, by controlling for the other potential determinants of board attendance left out in the construction of Figure 3. The specification shown in column 1 includes all sample observations. Treated directors are those experiencing a coverage termination in fiscal year $t-1$, regardless of whether they also serve on other boards. All other director-firm-years serve as controls, regardless of whether they share any directors with shocked firms. The point estimate for the treatment indicator is 0.265 percentage points ($p = 0.018$), confirming the result shown in Figure 3 that directors become more likely to attend at least 75% of their board and committee meetings, and so presumably monitor more, when firm A sees a reduction in its analyst coverage.[18] Column 2 restricts the set of controls

[17]Given the dynamics revealed in Figure 3, our panel regression tests will focus on the effects of a one-year-lagged treatment throughout.

[18]We do not investigate potential mechanisms that bring about this increase in monitoring. Some readers have

to firms that do not have any directors in common with a shocked firm during our sample period ("not firm B" in the language of the model). This makes little difference to the magnitude of the treatment effect.

Neither Figure 3 nor the first two columns of Table 2 distinguish between treated directors with a single board appointment ("shocked" directors, in our terminology) and treated directors with multiple board appointments ("common" directors, in our terminology). Columns 3 and 4 of Table 2 allow these two groups of directors to differ in their responses to a coverage termination hitting firm A. (Column 3 uses the full sample of control observations while column 4 uses the restricted sample of "not firm Bs" as controls.) This reveals that common directors respond just as strongly to a coverage termination as do shocked directors, all else equal. The p-values testing for a difference in average responses are around 0.9 in the two specifications.

The key take-away from Table 2 is that coverage terminations do indeed make busy directors (those with multiple board appointments) busier still. We next investigate the consequences of this exogenous shock to busyness for the intensity with which busy directors monitor at their other firms.

4.2 Spillover Effects from Firm A to Firm B

Our model predicts that the common director ("director 1") reduces her monitoring effort at firm B when getting busier at firm A whenever she experiences negative monitoring synergies between the two firms, and that she increases her monitoring effort at firm B whenever she enjoys positive monitoring synergies. The sign of the monitoring synergies, in combination with the mode of strategic interaction among firm B's directors, in turn determines whether busy directors are harmful or beneficial to firm B's shareholders.

4.2.1 The Common Director's Adjustment on Firm B's Board

Table 3 begins by estimating the common director's average response, ignoring for the moment the sign of the synergies. The treatment group includes the common directors on firm B's board who experienced a monitoring shock at firm A in fiscal year $t-1$. The control group includes all directors at firms that are not themselves shocked ("not firm A" in the language of the model). The

suggested that shocked firms might increase director compensation to elicit greater effort. Owing to the sparsity of compensation data in The Corporate Library, we cannot confirm this suggestion, though we note that the validity of our analysis of the resulting spillover effects at firm B holds regardless of the precise mechanism triggering the effort adjustment at firm A.

negative treatment effect estimated in column 1 implies that the common director, on average, reduces monitoring effort at the spillover firm B when her other firm A demands more of her attention. The point estimate is economically large, at -0.37 percentage points, but only marginally statistically significant ($p = 0.075$). The same is true in column 2, which takes into account that the common director could experience shocks to her busyness at multiple interlocked firms in the same fiscal year. There, the point estimate suggests that monitoring effort at firm B decreases in the number of shocks the common director suffers at her various other firms ($p = 0.071$).

According to Proposition 1(i), the common director's monitoring effort at firm B should increase if monitoring synergies are positive and decrease if they are negative. Columns 1 and 2 pool these cases. The remainder of Table 3 attempts to distinguish between common directors whose board assignments give rise to positive and negative monitoring synergies. Columns 3 through 5 of Table 3 focus on horizontal relatedness, coding the shocked and the spillover firm for a given interlocked director as operating in a related industry if they share the same two-digit SIC code (column 3), the same six-digit GICS code (column 4), or the same Hoberg-Phillips (2010) FIC50 code (column 5), respectively. Columns 6 and 7 focus on vertical relatedness, coding the shocked and the spillover firm for a given interlocked director as being vertically related if any of their business segments operate in industries that buy or supply a minimum of 10% (column 6) or 20% (column 7) of their output by value from or to each other. We then let the common director's response at firm B to a coverage shock that makes her busier at firm A differ depending on whether her particular pair of firms A and B are related according to these measures.

In each of these five specifications, we find that a common director's monitoring effort at firm B declines significantly when the shocked and the spillover firms operate in unrelated industries. This is consistent with time constraints determining the common director's effort allocation across the two firms when the firms are unlikely to give rise to opportunities for the recycling of signals. For firms operating in related industries, on the other hand, the treatment effect flips sign—the common director's board attendance at firm B improves after an informational shock that makes her busier at firm A. In each specification, the related-industry and unrelated-industry point estimates are statistically significantly different from each other.

One problem with using industry measures of relatedness is that it is relatively rare for directors to serve on the boards of two firms that operate in the same industry.[19] This reduces the power of our tests for firms classified as related based on their industry codes. Perhaps not surprisingly, therefore, the point estimates for related industries in Table 3, though economically large, are not statistically significantly different from zero at conventional levels.[20]

As an alternative to using industry measures of relatedness, we next allow the common director's change in monitoring at firm B to vary with Hameed et al.'s (2015) indicator for whether her particular pair of firms A and B are informationally related. The results, reported in column 8, strongly support Proposition 1(i). When firms A and B are informationally related and so are conjectured to give rise to positive monitoring synergies, the likelihood that the common director meets the 75% attendance standard at firm B improves by 0.65 percentage points on average ($p = 0.003$) when she gets busier at firm A. When the two firms are informationally unrelated, and so are conjectured to give rise to negative monitoring synergies, the likelihood that the common director meets the 75% standard at firm B falls by 0.86 percentage points ($p = 0.008$). The two effects are highly statistically significantly different from each other ($p < 0.001$).[21]

In summary, the findings in Table 3 show that common directors, when they get busier at firm A, reduce monitoring effort at firm B if the firms operate in unrelated industries or are informationally unrelated, and increase monitoring effort at firm B if the firms operate in related industries or are informationally related. These patterns are consistent with Proposition 1(i) to the extent that we believe that our proxies capture the sign of cross-firm monitoring synergies. Unconditionally, we find a reduction in effort at firm B, suggesting that negative synergies predominate in our sample. The fact that both types of monitoring synergies apparently co-exist in the data suggests that busy directors need not be either uniformly harmful or uniformly beneficial to shareholders' interests.

[19] Under the Clayton Act, a director cannot serve on the boards of two companies that are "by virtue of their business and location of operation, competitors, so that the elimination of competition by agreement between them would constitute a violation of any of the antitrust laws."

[20] Another likely reason for the larger standard errors for the related-industries coefficients than for the unrelated-industries coefficients is that τ can be strictly positive in both settings. In unrelated industries, $\tau > 0$ unambiguously implies that net synergies $S < 0$. In related industries, S can be positive or negative depending on whether τ is less than or greater than $\lambda_{1B}\Delta V_B \frac{\partial \alpha_1}{\partial m_{1A}}$, which is unobserved. This means that the related-industries coefficients are estimated with more noise.

[21] These findings are not sensitive to using the median to code informationally related and unrelated industries. If we allow the common director's attendance on firm B's board to vary continuously with the estimated degree of informational relatedness, we find an economically large coefficient of 0.035 ($p = 0.023$), indicating that the common director increases her attendance on firm B's board more, the more firms A and B are informationally related.

4.2.2 Comparative Statics

The comparative statics in parts (ii) and (iii) of Proposition 1 relate the magnitude of the common director's monitoring response at firm B to the degree of prior uncertainty and the strength of incentives at firms A and B, respectively. We test each in turn.

Table 4 focuses on part (ii), which links the strength of the common director's effort adjustment at firm B, following an exogenous shock to firm A's external information environment, to the prior uncertainty and incentives the director faces at firm A. The testable prediction is that the spillover effect on the common director's monitoring effort at firm B is larger (in absolute value) the higher firm A's prior uncertainty and the stronger the common director's incentives at firm A. The sign, in turn, depends on the direction of the monitoring synergies.

We use the complexity measure of Coles et al. (2008) to proxy for prior uncertainty and follow Guo and Masulis (2015) in using firm size to proxy for the monetary and reputational benefits a director can expect to receive for her board service. We then interact each of these proxies with the spillover indicator, or put differently, we replace the zero/one spillover indicator with continuous treatment variables that capture the magnitude of the spillover shock to director 1's monitoring effort at firm B as amplified by firm A's prior uncertainty and incentives. We allow each of these continuous treatment variables to have a differential effect depending on the direction of the cross-firm monitoring synergies between firms A and B. To sign the direction, we use the informational-relatedness measure from Table 3.[22]

The estimated treatment effects line up well with the predictions in Proposition 1(ii). When synergies are positive, the common director increases her monitoring effort at firm B more, the higher the prior uncertainty about firm A ($p = 0.028$) and the stronger incentives at firm A ($p = 0.002$). When synergies are negative, the common director reduces her monitoring effort at firm B more, the higher firm A's uncertainty ($p = 0.012$) and the stronger her incentives at firm A ($p = 0.007$).

Table 5 focuses on part (iii) of Proposition 1, which links the strength of the common director's effort adjustment at firm B, following an exogenous shock to firm A's external information environment, to the prior uncertainty and incentives the director faces at firm B. The predicted effects depend on the direction of the monitoring synergies. When monitoring synergies are positive, the

[22] We do not use Table 3's industrial relatedness measures, owing to the relatively small number of cases involving a shocked director serving on the boards of firms that operate in related industries.

common director's monitoring increase at firm B should be amplified by high prior uncertainty or strong incentives at firm B. When monitoring synergies are negative, the common director's monitoring reduction at firm B should be dampened by high prior uncertainty or strong incentives at firm B. To test these predictions, we create a set of interactions involving the spillover indicator, an indicator capturing the sign of the synergies between this particular director's firms A and B, and either firm B's complexity or its size.

Consistent with part (i) of Proposition 1, Table 5 shows that the common director reduces her monitoring effort at firm B significantly when monitoring synergies are negative, and consistent with part (iii), this effort reduction is significantly attenuated the more complex ($p = 0.040$ in column 1) or large ($p = 0.057$ in column 2) firm B is. Also consistent with part (iii), greater complexity at firm B amplifies the common director's effort increase when monitoring synergies are instead positive ($p = 0.032$). The effect of firm size, on the other, is not significantly positive in this case, contrary to part (iii).

4.3 The Non-Shocked Directors' Response at Firm B

We next test the mechanism at the heart of our model: do directors on a board interact strategically with each other? The main identification challenge is that directors' effort choices may be correlated not because their actions influence each other but because they respond to a common shock. An obvious common shock that could confound our tests is the deterioration in firm A's information environment. As we explained in Section 3.1, this shock could potentially affect the behavior of firm B's directors directly, to the extent that the two firms have overlapping information environments. Proposition 2 imposes structure that allows us to test for common shocks of this kind. Specifically, while the common-shock confound would lead to director 2 always increasing her monitoring effort, regardless of director 1's effort choice at firm B, Proposition 2 sets out testable conditions under which director 2 will instead reduce her monitoring effort. This happens when monitoring synergies are positive and directors' efforts are strategic substitutes, and when monitoring synergies are negative and directors' efforts are strategic complements.

Methodologically, we use the common director's monitoring adjustment at firm B (which is exogenously triggered by the coverage shock at firm A and reflects the sign of the cross-firm monitoring synergies and the mode of strategic interaction at firm B) as a treatment to which firm B's other directors can either respond in the same direction (indicating strategic complements) or in the opposite direction (indicating strategic substitutes). This approach has some superficial similarities with "peer-effects" models, which ask how an individual's choices are affected by the choices of her peers. However, peer-effects models rarely have an exogenous shock to peers' choices and so have neither a before/after that allows the identification of changes in behavior nor a way of identifying a set of controls with which to remove common trends in outcomes.[23]

As we saw in Tables 3, 4, and 5, the common director increases effort at firm B if monitoring synergies are positive and reduces effort if synergies are negative. Given the nature of the monitoring data available to us, we only systematically observe reductions in effort (i.e., failure to meet the 75% attendance standard), so our empirical modeling focuses on the monitoring response of director 2 to the common director 1 reducing her effort at firm B. As in Tables 3, 4, and 5, treated firms (firm B) are those with a common director who finds herself getting busier on the board of another firm as a result of a coverage termination in year $t-1$ (firm A). Control firms are all firms that are not themselves shocked ("not firm A" in the language of the model).

Table 6 reports the results. Column 1 models director 2's unconditional response to a fellow director's attention being shocked elsewhere, by adding to the specification shown in the final column of Table 3 an indicator for firm B's non-shocked directors. This reveals that unconditionally, the non-shocked directors make no adjustments to their monitoring efforts: the coefficient of the indicator variable is close to zero and statistically insignificant ($p = 0.572$). At the same time, director 1 increases monitoring at firm B if synergies are positive ($p = 0.005$) and reduces monitoring if synergies are negative ($p = 0.007$), just as in Table 3. The main take-away from this specification is that the shock to firm A's information environment does not directly affect the monitoring choices of firm B's solo directors. This absence of a direct effect is a first indication that coverage terminations are not a common shock to both firms, supporting our main identifying assumption.

To get at strategic interaction, columns 2 through 6 focus on director 2's conditional response, specifically to director 1 failing the 75% attendance standard at firm B when she gets busier at firm

[23]Peer-effects models usually proceed by regressing individual j's choice on the average choice of j's peers. A prominent example from the literature is obesity: are children whose peers are overweight more likely to be overweight themselves? As Manski (1993) and Angrist (2014) discuss, identification of peer effects is challenging. Angrist notes that identification is helped if there is a clear a priori distinction between peers and the subjects of the peer effect, which is the case in our setting. (Directors 1 and 2 are a priori economically distinguishable from each other.) Angrist also emphasizes the need to isolate exogenous variation in the peer effect, which our shock-based set-up goes a long way towards providing. We discuss how we deal with the endogeneity of director 1's response to the shock shortly.

A. To provide a baseline, column 2 takes the treatment to be exogenous. This naive specification points to strategic complementarity: when director 1's board attendance at firm B falls below 75%, the likelihood of director 2's board attendance exceeding 75% falls by an economically modest (but statistically significant) 1.1 percentage points ($p = 0.004$). Of course, this point estimate needs to be interpreted cautiously, given that the treatment is anything but exogenous: if our model is correct, director 1's observed decision to fail the attendance standard at firm B incorporates her expectation of director 2's equilibrium response. By ignoring this simultaneity, column 2 may not uncover the causal relation we are after.

To make progress, we follow a standard approach from the peer-effects literature (see Gaviria and Raphael (2001), Lundborg (2006), and Fletcher (2010), among many others). This involves instrumenting the peer-effect treatment (here: "director 1 fails the attendance standard") with peers' (here: director 1's) average background characteristics. The background characteristic of interest is director 1's prior history of failing attendance standards (at any of her boards).[24] The relevance condition for the instrument to be valid requires persistence: a director with a history of poor attendance is more likely to reduce attendance when her attention is diverted at another firm. This is easily satisfied in our sample: the first-stage coefficient has a t-statistic of 6.04.[25] Validity further requires that director 1's history of poor attendance does not affect director 2's monitoring choice *directly* (the exclusion restriction): it is only when director 1 *actually* fails the 75% standard that director 2 responds. By explicitly modeling the dynamics of the interaction among directors, our diff-in-diff setup makes it more likely that the exclusion restriction will hold.[26]

The instrumented estimates, reported in column 3, confirm that director 2 responds to director 1's effort reduction by reducing her own effort. Compared to the naive point estimate in column 2, the magnitude of the response is considerably larger: in the (empirically rare) event that director 1 fails the attendance standard at firm B, her fellow directors become around 13 percentage points less likely to meet the attendance standard themselves ($p < 0.001$). The large increase in the point

[24] This echoes Gould and Winter (2009), who use teammates' lifetime batting average as an instrument for teammates' current batting average in their analysis of strategic interaction in baseball teams.

[25] The associated weak-instrument test statistic of 36.5 easily exceeds the Stock-Yogo critical values, suggesting the instrument is strong.

[26] On a technical note, the second stage includes each director's *own* prior history of poor attendance. At first glance, this may seem to violate standard IV procedure, but it is necessary in peer-effects models to ensure that the treatment effect is estimated consistently (Hinke et al. (2015)). Intuitively, recall that under the relevance condition, an individual's prior history is related to her current behavior, so it cannot be omitted from the second stage. Of course, the instrument for the treatment the non-shocked directors receive (i.e., the *common* director's prior history) is omitted from the second stage in the usual way.

estimate compared to the OLS specification in column 2 deserves comment. While large differences between OLS and 2SLS estimates can sometimes be a sign of invalid instruments, there is a simple (and, we believe, plausible) explanation in our setting: measurement error. Our proxy for monitoring effort is without a doubt measured with error. That is not a big concern when monitoring is the dependent variable (as in previous tables), but when monitoring is the treatment variable (as in column 2), we expect attenuation toward zero in OLS. Since instruments help correct measurement error, and the measurement error is likely severe in our case, a large difference between the OLS and 2SLS point estimates is to be expected.

The negative sign of director 2's response in both the naive and 2SLS models has two important implications. First, it implies that for the average treated spillover firm in our sample, the mode of interaction among directors is strategic complementarity. Under strategic complementarity, less monitoring by director 1 increases the marginal cost of director 2's monitoring, so if director 1 reduces her monitoring effort at firm B, so does director 2. Intuitively, director 2's monitoring job becomes increasingly more difficult the less monitoring effort director 1 supplies, and director 2 adjusts her monitoring effort down accordingly. Second, the negative sign implies that the primary identification challenge we have to deal with in this section—the possibility that the shock to firm A affects firm B *directly*—is unlikely to be severe in practice. A common shock would have caused director 2 to *increase* her monitoring effort at firm B (just as director 1 increases her monitoring effort at firm A), which is not what we observe.

While our empirical findings so far suggest that director interactions on the *average* board are characterized by strategic complementarity, it is worth investigating special cases for evidence of strategic substitutability. We conjecture that the mode of director interaction may change when a firm finds itself in a crisis. In crisis situations, the utility cost to directors of a monitoring shortfall is likely particularly large, such that a reduction in one director's monitoring effort raises the need for the other directors to optimally exert more effort to compensate. In other words, monitoring in crisis situations may be characterized by strategic substitutability.

To test this conjecture, we allow director 2's response to the common director's reduction in monitoring effort at firm B to differ in three types of crisis situations: firm B being targeted by an activist hedge fund (column 4), firm B's share price falling by 25% or more over the course of the fiscal year (column 5), or firm B writing off goodwill to the tune of 25% or more of lagged total assets (column 6).[27] As in column 3, we instrument the common director's decision to fail the 75% attendance standard at firm B with her average background characteristics.

The estimated treatment effects are consistent with our conjecture. Column 4 shows that when firm B is targeted by an activist hedge fund, its non-shocked directors do *not* engage in their "normal" practice of reducing attendance as the common director reduces attendance in the wake of an exogenous shock to her attention at firm A. Instead, they become 3.6 percentage points *more* likely to meet the attendance standard (summing the main and interaction effects in column 4; the p-value of this estimate is 0.047). In other words, when targeted by an activist hedge fund, directors' mode of strategic interaction switches from substitutes to complements. The results for the other two types of "crises" are economically similar: when director 1 reduces monitoring despite the firm experiencing a large share price fall or a material goodwill impairment, the non-shocked directors compensate by doing the opposite.

Overall, our findings are consistent with directors' monitoring efforts typically being strategic complements, but in special cases switching to being strategic substitutes.[28] The predominance of strategic complementarity in our data is a key finding. Interpreted through the lens of our model, it implies that a busy director is typically only harmful to firm B's shareholders when the firms on whose boards she serves have so little in common that monitoring synergies across the firms are negative (Proposition 3). Firms linked by positive monitoring synergies, on the other hand, benefit from sharing directors. In other words, our empirical findings imply the existence of busy directors who are beneficial to shareholders, by virtue of positive cross-firm monitoring synergies, even (and perhaps counterintuitively) when they become busier at another firm. In this case, the additional monitoring effort busy directors devote to the other firm benefits the shareholders of both firms. We test this implication of the model in the next section. Finally, in the special cases characterized by strategic substitutability, making a busy director busier elsewhere can be beneficial to firm B, namely when the busy director's reduction in monitoring at firm B elicits a more than offsetting increase in monitoring by firm B's other directors.

[27] Under FAS 142, listed firms in the U.S. are required to compare the fair value of each reporting unit (based on discounted cash flows) to its carrying value (book value of assets plus goodwill minus liabilities) on an annual basis. If the fair value is below the carrying value, the asset is impaired and the goodwill value has to be reduced accordingly. An impairment charge is hence an admission that the firm overpaid for an acquisition in the past. Prominent examples include Time Warner's $45.5 billion impairment charge in 2002, writing down the value of its acquisition of AOL.

[28] Of course, we do not mean to suggest that such a switch *only* occurs in crisis situations. Having said that, we have found no evidence of a similar switch in more favorable situations, such as when a firm expands capital expenditures or engages in large-scale M&A activities.

4.4 The Effect of Busy Directors on Firm Value

We conclude our empirical analysis by estimating the effect of busy directors on firm value. Proposition 3 predicts that when cross-firm monitoring synergies are sufficiently large, firm B's expected value falls (increases) following a shock that causes one of its directors to monitor another firm A more closely, as long as synergies are negative (positive) and the mode of interaction on firm B's board is anything other than strategic substitutability involving high-ability directors.

To test Proposition 3, we conduct an event study, using for identification exogenous coverage shocks to the attention that busy directors pay to their other board assignments. We estimate announcement returns following Kelly and Ljungqvist (2012), except that we focus on the returns of the spillover firms (firm B) rather than the returns of the firms losing analyst coverage (firm A).[29] There are 7,877 unique spillover events in our sample. Taking a simple average of the announcement returns shows that the average spillover firm is unaffected by monitoring shocks that hit other firms to which it is linked through shared directors: the mean is -2.6 basis points with a p-value of 0.573. Conditioning on the sign of the monitoring synergies, using as before the informational-relatedness measure from Table 3, similarly yields small and insignificant announcement returns, averaging 2.1 basis points in the case of negative synergies and -7.4 basis points in the case of positive synergies.

These preliminary findings suggest that the average spillover shock is not material enough to affect firm B's value. To identify large shocks to monitoring at firm A that firm B's shareholders can reasonably expect to result in a material change in monitoring at firm B, we restrict the sample based on either the number of shocked directors at firm B or on the remaining number of analysts who cover firm A. (This approach follows Kelly and Ljungqvist 2012 and Balakrishnan et al. 2014.) We expect firm B to be more strongly affected by a coverage reduction at firm A the larger the number of busy directors on its board who experience monitoring shocks elsewhere.[30] Similarly, we expect firm B to be more strongly affected if the shock leaves firm A with little analyst coverage and so triggers a larger monitoring response by the common director at firm B.[31]

Table 7 reports announcement returns for different cutoffs of the number of shocked common

[29] Specifically, we estimate Fama-French three-factor abnormal returns measured from firm B's closing price on the day before a director on firm B's board experiences a brokerage-closure related coverage termination at firm A, to firm B's closing price on the day after the termination event.

[30] As mentioned in Section 3.4, the average number of shocked common directors on firm B's board is 1.6 in our sample. The 1st and 99th percentiles are 1 and 7, respectively.

[31] For example, losing one analyst is, presumably, a larger informational shock when there were only two analysts following the firm than when there were a dozen analysts following the firm.

directors at firm B or analyst coverage at firm A. For each cutoff, we find that firm B's value falls when cross-firm monitoring synergies are negative and increases when synergies are positive. Moreover, firm B's announcement returns generally become larger (in absolute value) the more material firm A's monitoring shock. For example, coverage shocks at other firms that affect five or more of firm B's directors lead to a 116.7 basis point fall in firm B's value when synergies are negative ($p = 0.098$) and to a 73.6 basis point increase when synergies are positive ($p = 0.002$). The difference between these conditional averages is statistically significant with a p-value of 0.005. When two or more of firm B's directors are affected, on the other hand, the announcement returns are smaller, at -37.7 and 14.1 basis points, respectively, though the difference remains statistically significant ($p = 0.027$). Results conditioning on firm A's remaining analyst coverage look similar, though they are generally more noisily estimated.

In light of our earlier finding that strategic complements predominate in our data, we interpret the results in Table 7 as supporting Proposition 3: when cross-firm monitoring synergies are positive, making a common director busier elsewhere is beneficial to firm B's shareholders, since the director's increased monitoring effort at the other firm augments her monitoring effort at firm B and (given complementarity) B's other directors increase their monitoring efforts as well. Conversely, when synergies are negative, distracting a busy director elsewhere harms firm B's shareholders, since the distraction results in the common director cutting back her monitoring effort at firm B and (given complementarity) B's other directors do likewise. Investors seem to understand these monitoring linkages across firms: they adjust not only the shocked firm's share price in response to a brokerage closure (as we know from Kelly and Ljungqvist (2012)), but also revalue the shares of firms to which the shocked firm is linked through shared directors, and they do so in the direction implied by the sign of the informational cross-firm linkages that our proxy for monitoring synergies indicates.

5 Conclusions

We examine when having a busy director on the board is harmful to shareholders and when it is beneficial. Our model identifies two key determinants of the costs and benefits of busy directors: whether directors regard their effort choices as strategic substitutes or complements and whether busy directors experience positive or negative synergies across firms. The interplay between these two factors can give rise to seemingly counterintuitive results that challenge the received wisdom that busy directors are harmful. Shareholders may benefit if an attention shock causes a busy director to monitor another firm more closely, for two reasons: either there are positive cross-firm monitoring synergies and the shocked director becomes more effective at monitoring non-shocked firms as well; or, in the case of negative synergies, less attention by the busy director may trigger overcompensating reactions by the other directors due to strategic substitutability.

Our empirical analysis exploits a natural experiment, first explored in Kelly and Ljungqvist (2012), that amounts to a plausibly exogenous negative shock to how busy a director with multiple board appointments is on one board. We examine how such a shock spills over to the director's other boards. We have three main empirical findings. The first two establish how monitoring synergies determine a busy director's effort choices on the boards she serves on and how directors interact strategically with a busy director:

- After a negative attention shock at one firm, directors with multiple board appointments improve their monitoring efforts at interlocked firms that are informationally related to the shocked firm (positive monitoring synergies) and reduce their monitoring efforts at interlocked firms that are informationally unrelated (negative synergies).

- On average, directors' effort choices exhibit strategic complementarity: the non-shocked directors reduce their own monitoring efforts in response to a shocked director withdrawing effort from the interlocked firm. Strategic complementarity is predominant in the data, but we also identify special cases in which directors interact in a way that is consistent with strategic substitutes: when a firm is in crisis mode, directors step up their monitoring effort when a busy director reduces hers.

In light of these empirical findings, our model suggests that having a busy director on the board is only going to be harmful when the firms on whose boards she serves have little in common so that monitoring synergies are negative. Firms linked by positive monitoring synergies, on the other hand, are going to benefit from sharing directors, especially when their common directors become busier on another of their boards. Our third empirical finding confirms these predictions:

- When the shock to the busy director's attention at firm A is especially large (and only then), the value of firm B's shares increases (by around twenty basis points) when monitoring synergies are positive and falls (by around half a percentage point) when monitoring synergies are negative.

Beyond the debate surrounding busy directors, our finding that directors interact strategically can help inform the debate on optimal board design. Existing work in team theory shows that the mode of strategic interaction among team members determines the optimal composition of a team. Specifically, Prat (2002) argues that the optimal team is homogeneous with strategic complementarity and diverse with strategic substitutability. Applied to our setting, and in light of our empirical findings, Prat's model suggests that homogeneous boards may be preferable to diverse boards for the average firm, while a diverse board is optimal in crisis situations.

Appendix A. Sources of Strategic Interaction

In Section 2.4, we propose two sources of strategic interaction among directors. First, strategic interaction (as captured by the term $\gamma m_{1B} m_{2B}$) may reflect characteristics that inhere in the board's monitoring technology. Second, strategic interaction may result from directors' social concerns or their susceptibility to peer pressure. Along these two lines, we briefly sketch specific approaches to modeling strategic interaction on a board and provide additional interpretations.

Monitoring technology: The following specific monitoring technologies could, to an extent, be folded into our model. Information gathering by directors may refer to the number of signals or to the precision of signals that are available to the board. Suppose that each director i exerts effort to collect a set of signals K_i. Collectively, the board observes all the signals. Strategic substitutability may arise in case of wasteful duplication of monitoring effort. Additional pieces of information may simply duplicate signals gathered by the co-director and may thus fail to improve decision-making. For example, if the directors' signals are perfectly correlated, it suffices if one director incurs the cost of information gathering. If one director produces signals, the cost to the other director of producing additional decision-relevant information is infinite.

In contrast, strategic complementarity may arise if signals provide more information as a bundle than in isolation. Having multiple sources of information may be useful because one set of signals facilitates the interpretation or processing of another set of signals. For example, suppose that each director either produces a set of informative signals or pure noise. Moreover, suppose that directors do not know whether their signals are informative or not (as in Scharfstein and Stein (1990)). If informative signals are perfectly correlated across directors whereas uninformative signals are not ("great minds think alike"), strategic complementarity obtains. Directors can compare their signals and establish their informativeness based on their correlation. Then each director's incentive to collect signals is greater if she expects the other director to do likewise, due to the informational gain from comparing signals.

We next consider the case when information gathering determines the precision, rather than the number, of signals. Suppose firm B's board observes a noisy signal: $z_i = s_B + D(m_{1B}, m_{2B})\epsilon$, where ϵ is signal noise. Directors choose the precision of the signal through their attendance or monitoring choice. If $D(m_{1B}, m_{2B}) = 0$, the signal is perfect and reveals the state of the firm. If $D(m_{1B}, m_{2B}) = \infty$, the signal is unobserved or uninformative. Strategic interaction can be captured by the D-function in straightforward ways. For example, suppose that $D = v_1 v_2$. If director i's effort is successful (which occurs with probability m_{iB}), then $v_i = 0$. If director i's effort fails (which occurs with probability $1 - m_{iB}$), then $v_i = \infty$. As a consequence, directors' efforts are strategic substitutes. Successful effort by one director suffices to ensure an informative signal. In contrast, if $D = v_1 + v_2$, strategic complementarity obtains: unless both directors' monitoring efforts are successful, the board observes pure noise.

Social concerns or peer pressure: This view of strategic interaction simply amounts to a reinterpretation of the term $\gamma m_{1B} m_{2B}$, which can be viewed as a director's private (dis)utility resulting from social concerns or peer pressure. For example, a positive γ (strategic complementarity) may reflect a director's exposure to peer pressure. If her co-director monitors more closely, the director enjoys a greater reputational benefit from exerting monitoring effort herself. Similarly, a negative γ (strategic substitutability) may capture the image-spoiling effect of closer monitoring by the co-director: it becomes more difficult to distinguish oneself through high effort and obtain reputational gains if the co-director also exerts high effort.

Appendix B. Mathematical Proofs

Proof of Proposition 1:
(i) The Nash equilibrium at firm B is determined by the two first-order conditions in equation (3) in Section 2.5. We can solve these conditions for m^*_{1B}:

$$m^*_{1B} = \frac{\Delta V_B(\alpha_1\lambda_{1B} + \alpha_2\gamma\lambda_{2B})}{1-\gamma^2} - m^*_{1A}\frac{\tau}{1-\gamma^2}.$$

Using the first-order condition with respect to m_{1A} in equation (4) and applying the implicit function theorem yields equation (7):

$$\frac{\partial m^*_{1B}}{\partial \xi_A^{-1}} = \left(\frac{\lambda_{1A}\frac{\partial \Delta V_A}{\partial \xi_A^{-1}}}{1-\left(\frac{\lambda_{1B}\frac{\partial \alpha_1}{\partial m^*_{1A}}\Delta V_B - \tau}{1-\gamma^2}\right)^2}\right)\left(\frac{\lambda_{1B}\frac{\partial \alpha_1}{\partial m^*_{1A}}\Delta V_B - \tau}{1-\gamma^2}\right) = \frac{\partial m^*_{1A}}{\partial \xi_A^{-1}}\frac{S}{1-\gamma^2}.$$

It can easily be checked that $\frac{\partial m^*_{1A}}{\partial \xi_A^{-1}}$ is positive: an interior solution for m^*_{1A} requires that $|S| < (1-\gamma^2)$, which implies that the denominator of $\frac{\partial m^*_{1A}}{\partial \xi_A^{-1}}$ is positive. Moreover, $\lambda_{1A}\frac{\partial \Delta V_A}{\partial \xi_A^{-1}}$ is also positive. Hence, the sign of $\frac{\partial m^*_{1B}}{\partial \xi_A^{-1}}$ equals the sign of S.
(ii) The proposition claims that both $\frac{\partial^2 m^*_{1B}}{\partial \xi_A^{-1}\partial \lambda_{1A}}$ and $\frac{\partial^2 m^*_{1B}}{\partial \xi_A^{-1}\partial \xi_A^{-1}}$ are negative (positive) if S is negative (positive). By assumption, $\frac{\partial^2 \alpha_1}{\partial m_{1A}\partial m_{1A}} = 0$. Hence, $\frac{\partial^2 m^*_{1B}}{\partial \xi_A^{-1}\partial \lambda_{1A}} = \frac{\partial^2 m^*_{1A}}{\partial \xi_A^{-1}\partial \lambda_{1A}}\frac{S}{1-\gamma^2}$ and $\frac{\partial^2 m^*_{1B}}{\partial \xi_A^{-1}\partial \xi_A^{-1}} = \frac{\partial^2 m^*_{1A}}{\partial \xi_A^{-1}\partial \xi_A^{-1}}\frac{S}{1-\gamma^2}$. It can easily be checked that both $\frac{\partial^2 m^*_{1A}}{\partial \xi_A^{-1}\partial \lambda_{1A}}$ and $\frac{\partial^2 m^*_{1A}}{\partial \xi_A^{-1}\partial \xi_A^{-1}}$ are positive, which implies that $\frac{\partial^2 m^*_{1B}}{\partial \xi_A^{-1}\partial \lambda_{1A}}$ and $\frac{\partial^2 m^*_{1B}}{\partial \xi_A^{-1}\partial \xi_A^{-1}}$ have the same sign as S.
(iii) The proposition claims that both $\frac{\partial^2 m^*_{1B}}{\partial \xi_A^{-1}\partial \lambda_{1B}}$ and $\frac{\partial^2 m^*_{1B}}{\partial \xi_A^{-1}\partial \xi_B^{-1}}$ are positive, irrespective of the sign of S. This is true if $[(1-\gamma^2)/S] - [S/(1-\gamma^2)]$ is decreasing in both λ_{1B} and ξ_B^{-1}, which can easily be verified.

Proof of Proposition 2:
The proposition claims that the sign of $\frac{\partial m^*_{2B}}{\partial \xi_A^{-1}}$ corresponds to the sign of γS. The equilibrium monitoring level of director 2 at firm B is determined by the two first-order conditions in equation (3) in Section 2.5. Solving the two conditions for m^*_{2B} yields

$$m^*_{2B} = \alpha_2\lambda_{2B}\Delta V_B + \gamma\left(\frac{\Delta V_B(\alpha_1\lambda_{1B} + \alpha_2\gamma\lambda_{2B})}{1-\gamma^2} - m^*_{1A}\frac{\tau}{1-\gamma^2}\right).$$

Hence,

$$\frac{\partial m^*_{2B}}{\partial \xi_A^{-1}} = \gamma\frac{\partial m^*_{1B}}{\partial \xi_A^{-1}} = \gamma\frac{\partial m^*_{1A}}{\partial \xi_A^{-1}}\left(\frac{\lambda_{1B}\frac{\partial \alpha_1}{\partial m_{1A}}\Delta V_B - \tau}{1-\gamma^2}\right) = \gamma\frac{\partial m^*_{1A}}{\partial \xi_A^{-1}}\left(\frac{S}{1-\gamma^2}\right),$$

which implies that the sign of $\frac{\partial m^*_{2B}}{\partial \xi_A^{-1}}$ is equal to the sign of γS.

Proof of Proposition 3:
We first consider the case of positive net synergies ($S > 0$). Proposition 3 distinguishes four subcases. It is immediately apparent from equation (9) that a shock at firm A that increases m_{1B} always has a positive effect on firm B's expected value if $\gamma \geq 0$. If $\gamma < 0$, then expression (9) is decreasing in α_2 and there exists a threshold level $\bar{\alpha}_2$ such that

$$\alpha_1 S + \bar{\alpha}_2 \gamma S + \frac{\partial \alpha_1}{\partial m_{1A}^*} m_{1B}^* (1 - \gamma^2) = 0,$$

with m_{1B}^* evaluated at $\bar{\alpha}_2$. If α_2 is higher (lower) than $\bar{\alpha}_2$, then a shock at firm A that increases m_{1B}^* reduces (increases) the expected value of firm B.

Next, suppose that net synergies are negative ($S < 0$). Again, Proposition 3 distinguishes four subcases. Suppose that $\gamma \geq 0$. Then expression (9) is increasing in $\lambda_{1B} \Delta V_B \frac{\partial \alpha_1}{\partial m_{1A}^*}$ and decreasing in τ. Hence, there exists a threshold level $\hat{S}$ such that a shock at firm A that reduces m_{1B}^* has a negative effect on firm B's expected value as long as $|S| > \hat{S}$. Finally, suppose that $\gamma < 0$ and $|S| > \hat{S}$. Then expression (9) is increasing in α_2 and there exists a threshold level $\bar{\alpha}_2$ such that a shock at firm A that decreases m_{1B}^* increases (reduces) firm B's expected value if α_2 is higher (lower) than $\bar{\alpha}_2$.

Appendix C. Variable Definitions

Outcome variable

Met attendance standard is a director/year-level indicator variable set equal to one if, in a given fiscal year, the director attends at least 75% of the aggregate of: (i) the total number of meetings of the board held during the period in which she was a director, and (ii) the total number of meetings held by all committees of the board on which she served. Disclosure of each director's compliance with the 75% attendance standard is mandatory under Item 407(b) of Regulation S-K. We obtain attendance data from The Corporate Library's Board Analyst database, which we supplement with manual searches of firms' annual proxy statements accessed through EDGAR. In total, we manually inspect more than 9,500 proxy statements covering more than 93,000 director-firm-fiscal-year observations (around half the total sample).

Treatments

Coverage termination is a firm/year-level indicator set equal to one in a given fiscal year if a sample firm experiences a reduction in sellside analyst coverage as a result of one (or more) of the 43 closures of brokerage firms that occurred in the U.S. between 2000 Q2 and 2008 Q1. For details of these brokerage closures, see Kelly and Ljungqvist (2012) and in particular their Appendix B.

A director is ***shocked*** in fiscal year t if the firm whose board she serves on experiences a ***coverage termination*** that year. A director is a ***common (or interlocked) director*** in fiscal year t if she serves on ***shocked*** firm A's board as well as on non-shocked firm B's board that year. A director is the victim of a ***spillover*** in fiscal year t if she serves on the board of non-shocked firm B and firm B is exposed to firm A's coverage shock through a common director.

Spillover is a director/year-level indicator set equal to one in a given fiscal year for each ***common director*** on firm B's board who experiences a ***coverage termination*** at another firm A that year. It is synonymous with being a ***common director***. A ***spillover firm*** is a firm with one or more ***common directors*** on its board that fiscal year.

Control variables

Busy director is an indicator set equal to one if the director holds directorships at multiple firms in that fiscal year.

Largest directorship is an indicator set equal to one in a given fiscal year if this firm is the largest (by beginning-of-fiscal-year equity market capitalization) of the firms whose boards the director serves on that year.

Smallest directorship is an indicator set equal to one in a given fiscal year if this firm is the smallest (by beginning-of-fiscal-year equity market capitalization) of the firms whose boards the director serves on that year.

Independent director is an indicator set equal to one in a given fiscal year if the director's status is recorded as "outside" (rather than "inside" or "outside-related") in The Corporate Library's Board Analyst database.

Major committee is an indicator set equal to one in a given fiscal year if the director serves on the audit, compensation, nominating, or governance committee that year, as reported in The Corporate Library's Board Analyst database.

Tenure is the number of days (expressed in years) between the director's date of joining the board in question and the first day of the fiscal year in question. Data on join and leave dates are obtained from The Corporate Library's Board Analyst database. We replace missing or clearly erroneous data points using data manually extracted from proxy statements accessed through EDGAR.

Director age is the director's biological age as reported in the firm's proxy statement. Biographical data are obtained from The Corporate Library's Board Analyst database. We replace missing or clearly erroneous data points using data manually extracted from proxy statements accessed through EDGAR.

Board size is the number of directors serving on a firm's board, as counted at the end of a fiscal year.

Firm size (or ***equity market capitalization***) is defined as the share price (CRSP variable *prc*) times the number of shares outstanding (CRSP variable *shrout*), both measured on the last trading day of the firm's previous fiscal year.

Post-SOX is an indicator set equal to one for all fiscal years after 2002, when the provisions of the Sarbanes-Oxley Act began to be implemented.

Conditioning variables (Table 3)

Horizontally (un)related industry is a firm/year-level indicator set equal to one if the shocked firm and the spillover firm for a given common director (do not) operate in the same horizontal industry that year. We use three alternative industry classifications: two-digit SIC codes (using CRSP historical SIC codes), six-digit GICS codes (using data item *gind* from the CRSP-Compustat Merged files), and Hoberg and Phillips' (2010) FIC50 classification (which groups firms into 50 industries based on a textual analysis of their product descriptions reported in their 10-K filings). We do not use NAICS codes, as firms differ in the level of detail at which they report their NAICS code.[32]

Vertically related industry is a firm/year-level indicator set equal to one if the shocked firm and the spillover firm for a given common director have one or more business segments that are vertically related. We code two firms' business segments as vertically related if they operate in Bureau of Economic Analysis (BEA) "detail-level" industries that buy from each other or supply to each other a minimum of $X\%$ of their output by value. (In Table 5, we consider two alternative values for X: 10% and 20%.) To assign each sample firm's various business segments to one of the BEA's 389 detail-level industry groups, we use the crosswalk available at `https://www.bea.gov/industry/xls/io-annual/CxI_DR_2007_detail.xlsx`. To measure the percentage value of shipments between every pair of BEA industry groups, we use the BEA's input-output matrix (or "use" table) for 2007 (the only year for which statistics prepared at the 389-industry level of aggregation are available).

Informationally related firm is a firm/year-level indicator set equal to one if the shocked firm and the spillover firm for a given common director are informationally related. To code two stocks' informational relatedness, we follow Hameed et al. (2015). Specifically, we first regress spillover

[32]Some firms report only at the two-digit level (equivalent to a business sector), some at the three-digit level (equivalent to a subsector), some at the four-digit level (equivalent to an industry group), some at the five-digit level (equivalent to an industry), and some at the maximum six-digit level. By contrast, every firm in CRSP/Compustat reports a four-digit SIC code or six-digit GICS code.

firm B's quarterly return on assets (ROA) over a five-year window on market ROA (the value-weighted average ROA of all NYSE, NASDAQ, and AMEX listed firms, excluding firm A and firm B themselves) and industry ROA (the value-weighted average ROA in firm B's Fama-French 48 industry, excluding firm A and firm B themselves), requiring a minimum of 12 non-missing quarterly observations in the five-year estimation window. Next, we add to this regression shocked firm A's ROA. The measure of firm A's contribution to explaining firm B's fundamentals is given by the increase in R^2 between the two regressions, which Hameed et al. compute as $IC = (R^2_{regression2} - R^2_{regression1})/(1 - R^2_{regression1})$. We compute this metric for each pair of shocked and spillover firms in our sample and code a common director as serving on the boards of two informationally related firms if their IC exceeds the sample median.

Conditioning variables (Tables 4 and 5)

Complexity is measured as in Coles et al. (2008). Specifically, for each firm/fiscal-year observation, we compute a factor score based on the number of business segments (from the Compustat segments database), log annual sales (Compustat item *sale*), and book leverage (Compustat item *dltt* divided by Compustat item *at*). The factor score for a firm/fiscal-year observation is a linear combination of the transformed-to-standard-normal values of these three variables.

Firm size is defined as the share price (CRSP variable *prc*) times the number of shares outstanding (CRSP variable *shrout*), both measured on the last trading day of the firm's previous fiscal year.

Instrumental variable (Table 6)

Prior history of failing the 75% attendance standard equals the average number of times per year that director 1 failed the attendance standard at any of her boards, measured over all available years prior to the year in question.

Conditioning variables (Table 6)

Activist HF campaign is an indicator set equal to one if the firm becomes the target of an activist hedge fund campaign over the period from the last quarter of the previous fiscal year to the third quarter of the current fiscal year. We adopt this timing convention to give directors an opportunity to adjust their full-year board attendance.[33] Data on activist hedge fund campaigns were generously provided by Alon Brav. See Brav et al. (2010) for further details.
Share price fall is an indicator set equal to one if the firm's split-adjusted share price falls by 25% or more over the course of a fiscal year. Split-adjusted share prices are constructed using data taken from CRSP (CRSP variable *prc* divided by CRSP variable *cfacpr*).

Goodwill impairment is an indicator set equal to one if the firm writes off goodwill from acquisitions amounting to 25% or more of lagged total assets during the fiscal year. Data on goodwill impairments come from Compustat (item *gdwlip* divided by one-year lagged item *at*).

[33]Consider an activist campaign that begins in the final week of the fiscal year. Such a campaign should have little effect on a director's full-year attendance choices. Results are similar economically but noisier statistically if we change the variable definition to coincide with the firm's fiscal year.

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Table 1. Summary Statistics.

The unit of observation in most of our empirical analysis is a director-firm-fiscal-year triplet. From The Corporate Library's Board Analyst database, we obtain data on the composition of each available company's board along with biographical information for each director as well as a proxy for monitoring effort: an indicator set equal to 1 if a director attends at least 75% of board and committee meetings in a given fiscal year. The sample covers fiscal years 2000 through 2008 and contains 34,823 unique directors at 4,057 unique stock market listed firms. We proxy for shocks to a director's attention on a board using Kelly and Ljungqvist's (2012) data set of 4,429 exogenous sellside analyst coverage terminations resulting from 43 closures of brokerage firms between 2000 Q2 and 2008 Q1. We distinguish between four types of directors: shocked directors (those who experience one or more closure-related coverage terminations while in our sample), common directors (those shocked directors who serve on more than one firm's board at the time of a shock and so can transmit a spillover shock to another firm), directors at spillover firms (to whom a shock is transmitted by a common director and who do not themselves experience a coverage termination at another firm at the time), and controls (all others who experience neither a coverage termination nor a spillover shock). For variable definitions and details of their construction see Appendix C.

		Full sample	Shocked directors	Common directors	Directors at spillover firms	Controls
Monitoring intensity						
met attendance standard	fraction	0.982	0.981	0.975	0.982	0.983
failed attendance standard	fraction	0.018	0.019	0.025	0.018	0.017
Treatments						
coverage termination	fraction	0.127	1.000	0.000	0.000	0.000
spillover	fraction	0.075	0.211	1.000	0.000	0.000
Director characteristics						
sole directorship	fraction	0.644	0.561	0.011	0.627	0.717
largest directorship	fraction	0.143	0.222	0.218	0.176	0.110
smallest directorship	fraction	0.149	0.126	0.498	0.138	0.131
independent director	fraction	0.700	0.716	0.813	0.700	0.688
major committee	fraction	0.632	0.536	0.692	0.601	0.658
male	fraction	0.899	0.889	0.865	0.888	0.908
tenure (years)	mean	7.6	7.7	6.9	7.3	7.8
	st.dev.	7.9	7.4	6.6	7.8	8.1
	median	5.1	5.7	5.0	5.0	5.3
director age (years)	mean	59.8	59.9	61.2	59.7	59.8
	st.dev.	9.1	8.5	7.3	8.9	9.4
	median	60.0	60.0	62.0	60.0	60.0
Firm characteristics						
board size	mean	9.9	10.5	10.4	10.4	9.5
	st.dev.	3.1	3.1	3.1	3.1	3.1
	median	10.0	10.0	10.0	10.0	10.0
log firm size	mean	7.365	8.482	7.975	7.784	6.938
	st.dev.	1.642	1.693	1.701	1.629	1.459
	median	7.174	8.500	7.866	7.644	6.767
analyst coverage	mean	5.8	9.9	6.6	6.2	4.7
	st.dev.	5.3	6.3	5.0	5.0	4.6
	median	4.3	9.0	5.5	5.0	3.3
Number of obs.		188,541	23,897	9,069	40,492	115,083

Table 2. Making (Busy) Directors Busier.

This table tests whether directors on firm *A*'s board respond to an exogenous reduction in the number of analysts covering their company by increasing their monitoring intensity. We use Kelly and Ljungqvist's (2012) sample of exogenous sellside analyst coverage terminations resulting from closures of brokerage firms. To proxy for monitoring intensity, we use an indicator set equal to 1 if a director attends at least 75% of board and committee meetings in fiscal year *t*. Treated firms are those that experience a coverage termination in year *t*–1 ("firm *A*" in the language of the model). In columns 1 and 3, control firms are all other firms. In columns 2 and 4, control firms are those firms that have no director interlocks with any shocked firm during our sample period 2000-2009 ("not firm *B*" in the language of the model). For variable definitions and details of their construction see Appendix C. All specifications are estimated as linear probability models using OLS. Treatment effects are scaled such that coefficients should be interpreted as percentages. Heteroskedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Dep. var.: Met attendance standard			
	(1)	(2)	(3)	(4)
Treatment effects				
=1 if termination at t = –1	0.265**	0.291**	0.278**	0.299**
	0.112	*0.116*	*0.137*	*0.141*
x busy director			-0.031	-0.018
			0.200	*0.204*
Director characteristics				
=1 if busy director	0.000	0.002	0.000	0.002
	0.002	*0.003*	*0.002*	*0.003*
=1 if largest directorship	0.000	0.002	0.000	0.002
	0.002	*0.003*	*0.002*	*0.003*
=1 if smallest directorship	0.000	0.001	0.000	0.001
	0.002	*0.003*	*0.002*	*0.003*
=1 if independent director	0.000	0.002	0.000	0.002
	0.002	*0.002*	*0.002*	*0.002*
=1 if major committee	0.002	0.000	0.002	0.000
	0.001	*0.002*	*0.001*	*0.002*
log director tenure	0.005***	0.006***	0.005***	0.006***
	0.002	*0.002*	*0.002*	*0.002*
log director age	-0.028*	-0.042*	-0.028*	-0.042*
	0.014	*0.025*	*0.014*	*0.025*
Firm characteristics				
log board size	-0.010***	-0.005	-0.010***	-0.005
	0.003	*0.004*	*0.003*	*0.004*
log firm size	0.003***	0.001	0.003***	0.001
	0.001	*0.001*	*0.001*	*0.001*
analyst coverage	0.014	0.017	0.014	0.017
	0.009	*0.013*	*0.009*	*0.013*
=1 if post-SOX	0.265**	0.291**	0.278**	0.299**
	0.112	*0.116*	*0.137*	*0.141*
Fixed effects				
Spell FE?	Y	Y	Y	Y
Diagnostics				
R^2	21.5%	20.5%	21.5%	20.5%
No. of directors	34,823	26,870	34,823	26,870
No. of firms	4,057	2,818	4,057	2,818
No. of observations	188,541	133,081	188,541	133,081

Table 3. Positive vs. Negative Monitoring Synergies: The Common Director's Response at the Spillover Firm.

This table focuses on the common director's monitoring response at firm *B* when faced with a shock that makes her busier on firm *A*'s board. Treated firms ("firm *B*") are those with an interlocked director who served on the board of another firm that experienced a coverage termination in year *t*–1 ("firm *A*"). Control firms are all firms that are not themselves shocked ("not firm *A*" in the language of the model). Column 1 estimates the common director's average response. Column 2 takes into account that the common director could experience monitoring shocks at multiple interlocked firms simultaneously. Columns 3 through 8 test part (i) of Proposition 1, which predicts that the common director responds to an exogenous reduction in the number of public signals at firm *A* by increasing (reducing) monitoring at the spillover firm *B* if there are positive (negative) monitoring synergies between the two firms. We conjecture that firms operating in related industries are more likely to give rise to positive monitoring synergies across firms than firms operating in different industries. Columns 3 through 5 focus on horizontal relatedness, coding the shocked and the spillover firm for a given interlocked director as operating in a "related" industry if they share the same two-digit SIC code (column 3), the same six-digit GICS code (column 4), or the same FIC50 code (column 5), respectively. Columns 6 and 7 focus on vertical relatedness, coding the shocked and the spillover firm for a given interlocked director as being "vertically related" if any of their business segments operate in industries that buy or supply a minimum of 10% (column 6) or 20% (column 7) of their output by value from or to each other, based on the BEA's input-output matrix for 2007. As an alternative to these industry measures of relatedness, column 8 allows the common director's response to vary with an indicator for whether firm *A* and firm *B* are informationally related. To code two stocks' informational relatedness, we follow Hameed et al. (2015). Specifically, we first regress firm *B*'s quarterly ROA over a five-year window on market ROA (the value-weighted average ROA of all NYSE, NASDAQ, and AMEX listed firms, excluding firm *A* and firm *B* themselves) and industry ROA (the value-weighted average ROA in firm *B*'s Fama-French 48 industry, excluding firm *A* and firm *B* themselves). Next, we add to this regression firm *A*'s ROA. The measure of firm *A*'s contribution to explaining firm *B*'s fundamentals is given by the increase in R^2 between the two regressions, which Hameed et al. compute as $IC = (R^2_{regression\ 2} - R^2_{regression\ 1})/(1 - R^2_{regression\ 1})$. We compute this metric for each pair of shocked and spillover firms in our sample and code a common director as serving on the boards of two informationally related firms if their *IC* exceeds the sample median. For variable definitions and details of their construction see Appendix C. All specifications are estimated as linear probability models using OLS with spell (i.e., director by firm) fixed effects and time fixed effects. They include the same control variables as in Table 2 (not shown for brevity). Treatment effects are scaled such that coefficients should be interpreted as percentages. Heteroskedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

Table 3. Continued.

	Predicted	Dep. var.: Met attendance standard							
	sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment effects									
=1 if spillover at $t = -1$	?	-0.373*							
		0.209							
log number of shocks at $t = -1$	?		-0.425*						
			0.235						
=1 if spillover at $t = -1$									
x horizontally related industry	+			0.259	0.538	0.710			
				0.401	*0.580*	*0.602*			
x horizontally unrelated industry	−			-0.561**	-0.471**	-0.522**			
				0.234	*0.218*	*0.215*			
x vertically related industry	+						0.817	0.797	
							0.561	*0.552*	
x vertically unrelated industry	−						-0.423**	-0.384*	
							0.215	*0.211*	
x informationally related firms	+								0.654***
									0.217
x informationally unrelated firms	−								-0.859***
									0.325
Diagnostics									
R^2		22.7%	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%	22.9%
F-test: larger response?				3.35**	2.79**	3.94**	4.47**	3.93**	16.34***
No. of directors		34,385	34,385	34,385	34,385	34,385	34,385	34,385	34,385
No. of firms		4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043
No. of observations		163,346	163,346	163,346	163,346	163,346	163,346	163,346	163,346

Table 4. Monitoring Spillovers: The Effects of Uncertainty and Incentives at Firm *A*.

This table tests part (ii) of Proposition 1, which links the strength of the common director's effort adjustment at the spillover firm ("*B*") to prior uncertainty and incentives at the shocked firm ("*A*"). Part (ii) predicts that the spillover effect on the common director's monitoring intensity at firm *B* is larger (in absolute value), the more strongly the common director responds to an exogenous reduction in the number of public signals at firm *A*. The response at firm *A*, in turn, increases in firm *A*'s prior uncertainty and the common director's incentives at firm *A*. We use Coles et al.'s (2008) complexity measure to proxy for prior uncertainty and follow Guo and Masulis (2015) in using firm size to proxy for incentives. To sign the direction of the cross-firm monitoring synergies, we use the informational-relatedness measure from Table 3. The estimation sample of treated and control firms is constructed as in Table 2. For variable definitions and details of their construction see Appendix C. All specifications are estimated as linear probability models using OLS with spell (i.e., director by firm) fixed effects and time fixed effects. They include the same control variables as in Table 2 (not shown for brevity). Treatment effects are scaled such that coefficients should be interpreted as percentages. Heteroskedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Predicted sign	Dep. var.: Met attendance standard (1)	(2)
Treatment effects			
=1 if spillover at $t = -1$			
x firm *A*'s complexity x negative synergies	−	-0.499**	
		0.199	
x firm *A*'s complexity x positive synergies	+	0.283**	
		0.129	
x log(size of firm *A*) x negative synergies	−		-0.053***
			0.020
x log(size of firm *A*) x positive synergies	+		0.041***
			0.013
Diagnostics			
R^2		22.9%	23.0%
No. of directors		34,385	34,385
No. of firms		4,043	4,043
No. of observations		163,346	163,346

Table 5. Monitoring Spillovers: The Effects of Uncertainty and Incentives at Firm *B*.
This table tests part (iii) of Proposition 1, which links the strength of the common director's effort adjustment at the spillover firm ("*B*") to prior uncertainty and incentives at firm *B*. When monitoring synergies are positive, the common director's monitoring increase at firm *B* should be amplified by high prior uncertainty or strong incentives at firm *B*. When monitoring synergies are negative, the common director's monitoring reduction at firm *B* should be dampened by high prior uncertainty or strong incentives at firm *B*. As in Table 4, we use Coles et al.'s (2008) complexity measure to proxy for prior uncertainty and follow Guo and Masulis (2015) in using firm size to proxy for incentives. To sign the direction of the cross-firm monitoring synergies, we use the informational-relatedness measure from Table 3. The estimation sample of treated and control firms is constructed as in Table 2. For variable definitions and details of their construction see Appendix C. All specifications are estimated as linear probability models using OLS with spell (i.e., director by firm) fixed effects and time fixed effects. They include the same control variables as in Table 2 (not shown for brevity). Treatment effects are scaled such that coefficients should be interpreted as percentages. Heteroskedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Predicted sign	Dep. var.: Met attendance standard (1)	(2)
Treatment effects			
=1 if spillover at $t = -1$			
x negative synergies	−	-1.374***	
		0.467	
x firm *B*'s complexity x negative synergies	+	1.197**	
		0.582	
x positive synergies	+	0.278	
		0.291	
x firm *B*'s complexity x positive synergies	+	0.842**	
		0.393	
x negative synergies	−		-1.067***
			0.255
x log(size of firm *B*) x negative synergies	+		0.253*
			0.133
x positive synergies	+		0.754***
			0.257
x log(size of firm *B*) x positive synergies	+		-0.086
			0.125
Diagnostics			
R^2		23.0%	23.0%
No. of directors		34,385	34,385
No. of firms		4,043	4,043
No. of observations		163,346	163,346

Table 6. Strategic Interaction: Substitutes vs. Complements.

This table tests Proposition 2, which predicts that director 2 should respond to the common director's change in monitoring effort at firm *B* in the same direction if monitoring efforts are strategic complements and in the opposite direction if they are strategic substitutes. Column 1 models director 2's unconditional response. Columns 2 through 6 focus on director 2's response to director 1 failing the 75% attendance standard at firm *B* when she gets busier at firm *A*. Column 2 treats director 1's attendance choice at firm *B* as exogenous. Columns 3 through 6 instrument this choice using director 1's prior history of failing the 75% attendance standard at any firms on whose boards she serves. (The prior history is the average number of times per year that director 1 failed the attendance standard, measured over all available prior years.) We report a Kleibergen-Paap weak-instrument test statistic. Note that we include director 2's prior history in the second stage (not shown). As von Hinke, Leckie, and Nicoletti (2015) demonstrate, this is required to ensure consistent estimates are obtained. Columns 4 through 6 allow director 2's response to differ in three types of "crisis situations" likely to be characterized by strategic substitutability: being targeted by an activist hedge fund (column 4), a share price fall of 25% or more over the course of the fiscal year (column 5), and a goodwill write-off of 25% of more of lagged total assets (column 6). The estimation sample of treated and control firms is constructed as in Tables 3, 4, and 5. All specifications are estimated as linear probability models using OLS with spell (i.e., director by firm) fixed effects and time fixed effects. They include the same control variables as in Table 2 (not shown for brevity). Where necessary, main effects are included alongside interaction effects (not shown for brevity). For variable definitions and details of their construction see Appendix C. Treatment effects are scaled such that coefficients should be interpreted as percentages. Heteroskedasticity consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Dep. var.: Met attendance standard					
				Crisis mode		
				Activist HF campaign	Share price fall	Goodwill impairment
	(1)	(2)	(3)	(4)	(5)	(6)
Attendance at spillover firm (firm *B*)						
Director 2 at firm *B*	-0.062	-0.018	0.455***	0.450***	0.462***	0.457***
	0.109	*0.108*	*0.157*	*0.156*	*0.170*	*0.157*
x director 1 fails attendance standard at firm *B*		-1.090**	-13.445***	-13.501***	-16.775***	-13.608***
		0.529	*3.061*	*3.074*	*4.492*	*3.104*
x crisis mode				16.643***	16.158***	12.935***
				3.553	*4.190*	*3.077*
Director 1 at firm *B*						
x positive synergies	0.622***	0.621***	0.238	0.237	0.276	0.237
	0.224	*0.224*	*0.218*	*0.218*	*0.217*	*0.218*
x negative synergies	-0.891***	-0.893***	-1.412***	-1.408***	-1.377***	-1.411***
	0.329	*0.329*	*0.331*	*0.331*	*0.331*	*0.331*
Diagnostics						
R^2	22.9%	23.0%	n.a.	n.a.	n.a.	n.a.
Weak instrument test (*F*)	n.a.	n.a.	36.5***	23.8***	26.4***	35.7***
No. of directors	34,385	34,385	34,385	34,385	34,385	34,385
No. of firms	4,043	4,043	4,043	4,043	4,043	4,043
No. of observations	163,346	163,346	163,346	163,346	163,346	163,346

Table 7. The Net Benefit of Busy Directors.

This table tests Proposition 3, which predicts that firm *B*'s expected value falls (increases) following a shock that forces one of its directors to monitor another firm more closely, as long as cross-firm monitoring synergies are negative (positive) and the mode of strategic interaction on firm *B*'s board is anything other than strategic substitutability among high-ability directors. The table reports Fama-French three-factor abnormal returns measured from firm *B*'s closing price on the day before a director on firm *B*'s board experiences a brokerage-closure related coverage termination at firm *A*, to firm *B*'s closing price on the day after the termination. To compute abnormal returns, we use a six-month estimation window ending 50 trading days before the termination day and require a minimum of 70 valid returns. Abnormal returns are reported in percent. The unit of observation in the table is a spillover-firm/brokerage-closure event pair, and there are a total of 7,877 unique event pairs in the full sample. (The same firm can experience multiple spillovers over time, potentially even within the same fiscal year, as a result of exposure to a sequence of brokerage closures; the same spillover firm can also experience multiple spillovers at the same time, as a result of having more than one director exposed to coverage terminations on interlinked boards.) To sign the cross-firm monitoring synergies, we use the informational-relatedness measure from Table 3 and sort spillover firms based on whether the informational-relatedness measure for the shocked director is above or below the sample median. To identify large shocks at firm *A* that are likely to be material to firm *B*'s shareholders, we condition on either the number of shocked directors on firm *B*'s board or on the remaining number of analysts who cover firm *A*. We expect firm *B* to be more strongly affected by a coverage termination at firm *A*, if many of firm *B*'s directors are exposed to the shock or if the shock leaves firm *A* with little analyst coverage.

		Synergies		pos. > neg.?
		negative	positive	(*p*-value)
Full sample of spillover firms (N = 7,877)	mean (%)	0.021	-0.074	0.847
	std. dev.	*4.403*	*3.814*	
Conditional on number of shocked directors at firm *B*				
≥ 2 directors (N = 1,125)	mean (%)	-0.377	0.141	0.027
	std. dev.	*5.145*	*3.758*	
≥ 3 directors (N = 598)	mean (%)	-0.564	0.132	0.026
	std. dev.	*5.229*	*3.324*	
≥ 4 directors (N = 327)	mean (%)	-0.787	0.216	0.018
	std. dev.	*5.471*	*2.741*	
≥ 5 directors (N = 186)	mean (%)	-1.167	0.736	0.005
	std. dev.	*6.727*	*2.240*	
Conditional on firm *A*'s analyst coverage				
≤ 1 analyst (N = 295)	mean (%)	-0.656	0.157	0.141
	std. dev.	*7.599*	*5.135*	
≤ 2 analysts (N = 507)	mean (%)	-0.701	0.270	0.032
	std. dev.	*6.988*	*4.525*	
≤ 3 analysts (N = 834)	mean (%)	-0.490	0.098	0.045
	std. dev.	*5.831*	*3.977*	
≤ 4 analysts (N = 1,236)	mean (%)	-0.228	0.174	0.066
	std. dev.	*5.268*	*4.025*	
≤ 5 analysts (N = 1,672)	mean (%)	-0.214	0.105	0.074
	std. dev.	*4.962*	*3.984*	

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