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Shareholder Short-termism, Corporate Control and Voluntary Disclosure*

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Abstract

This paper examines how a manager uses voluntary disclosure to influence corporate control by a short-term shareholder. Since a short-term shareholder intervenes excessively, the manager's disclosure strategy is determined by the trade-off between excessive and insufficient intervention. In equilibrium, when shareholder short-termism is not too high, the manager discloses both good and bad news, and withholds intermediate news. Alternatively, when shareholder short-termism is high, the manager only discloses good news and withholds bad news. In both equilibria, withholding information is value-enhancing for the nondisclosing firms. We also show that the likelihood of disclosure weakly decreases as the shareholder is more short-term oriented. Moreover, nondisclosing firms are more likely to face shareholder intervention than disclosing firms.

Keywords: Active shareholder, Shareholder Short-termism, Intervention, Voluntary disclosure, Managerial myopia.

1 Introduction

Over the past few years, fights by shareholders for control over corporate decisions have become increasingly prominent. To maintain control, managers often try to influence shareholders' beliefs with voluntary disclosure, including information released via the media, letters to shareholders, or costly road shows (Bourveau and Schoenfeld, 2017; Khurana et al., 2018; Kumar et al., 2012). As indicated by Healy and Palepu (2001) and Beyer et al. (2010), such a corporate control role for voluntary disclosure has received limited attention in the literature. In this paper, we study this issue by examining how a manager's disclosure strategy influences shareholder control over corporate decisions.

While prior literature has largely focused on the positive effects of shareholder control (e.g., Brav et al., 2009; Kumar et al., 2012), firms have frequently expressed concerns about shareholders' short-term incentive.[1] A common complaint against active shareholders and institutional investors is that they sometimes force firms to adopt strategies that deliver a short-term boost to the stock price at the expense of long-term firm value (e.g., Borochin and Yang, 2017; Derrien et al., 2013). This represents a key downside of shareholder activism that has been under-explored in the literature. We contribute to the literature by considering a parsimonious setting that incorporates the short-term incentive of a controlling shareholder and show that the withholding of information by a firm's manager can be optimal for the firm's long-term value.

Our model features a manager who privately observes the value from implementing a current strategy and a controlling shareholder who privately observes the value from implementing an alternative strategy. We refer to the former value as current firm value and the latter as alternative firm value. The shareholder decides whether to let the manager implement the current strategy or

[1]For instance, the 2016 NYSE Governance Services/Evercore/Spencer Stuart Survey report indicates that 85% of directors consider active shareholders to be too focused on short-term performance. See https://www.spencerstuart.com/research-and-insight/the-effect-of-shareholder-activism-on-corporate-strategy. Also, the evidence of Borochin and Yang (2017) shows that the fraction of short-term institutional investors to total institutional investors has increased over time, to around 30% in 2013. Similarly, empirical evidence by Brav et al. (2009) suggests that the median and average holding periods of an active hedge fund are 266 days and 376 days, respectively.

to intervene and implement the alternative strategy. Before intervention, the manager can disclose information about current firm value to influence intervention. The shareholder cares about a weighted average of short-term stock price and long-term firm value. To focus on how the incentive problem of the shareholder affects voluntary disclosure, we first analyze a setting with a long-term manager who maximizes the firm's liquidation value. We then extend the model and consider a manager who cares about a weighted average of short-term stock price and long-term firm value. Our implications remain qualitatively the same with this extension.

If the shareholder only cares about the long-term firm value, intervention will always improve firm value. With short-term benefits tied to the stock price, however, the shareholder sometimes intervenes even when it decreases the long-term firm value, that is, when the alternative firm value is lower than the expected current firm value. This happens due to the signaling role of intervention. In the presence of information asymmetry about the alternative firm value, after an intervention, the market infers that the alternative firm value is high. This induces the shareholder to intervene excessively to improve the short-term stock price at the expense of the long-term firm value.

The manager, in turn, uses voluntary disclosure as a tool to convince the short-term shareholder to intervene efficiently. In general, our analysis highlights that the corporate control role of voluntary disclosure critically depends on the incentive misalignment of the shareholder. When the shareholder is sufficiently long-term oriented, the intervention is likely to be efficient. Then the manager prefers to disclose both high realizations of current firm value to deter intervention and low realizations of current firm value to promote intervention. When the shareholder is sufficiently short-term oriented, the shareholder is likely to intervene excessively. Hence the manager only discloses a high current firm value to deter intervention.

The above disclosure strategy is driven by a trade-off between excessive and insufficient intervention by the short-term shareholder. When the manager does not disclose the current firm value, the shareholder intervenes based on her expectation of the current firm value. If the actual current firm value is sufficiently low, a shareholder who could have improved the liquidation value might not intervene. Hence, the manager, by not disclosing, expects insufficient intervention. On the other hand, if the manager discloses, the shareholder intervenes excessively. The manager who observes a low current firm value trades off excessive intervention from disclosure against insufficient intervention from no disclosure. Which force dominates depends on the extent of shareholder short-termism. When the shareholder is sufficiently long-term oriented, the shareholder is more likely to intervene efficiently, which reduces the manager's concern about excessive intervention. Therefore the manager will disclose a low current firm value to promote efficient intervention. But when shareholder short-termism is high, the shareholder is more likely to intervene excessively. This makes the concern of excessive intervention from disclosure dominate the concern of insufficient intervention from no disclosure. The manager therefore prefers to withhold information about low current firm value to deter excessive intervention.

The voluntary disclosure literature has largely focused on the valuation implication of voluntary disclosure, where no disclosure typically arises because it can lead to a higher stock price. In our setting, even though the manager's only objective is to improve the firm value, the manager still sometimes chooses to not disclose. We thus highlight a new determinant of a manager's disclosure decision, i.e. mitigating inefficient intervention by a short-term shareholder.

We also consider two extensions of our main model. First, besides credible voluntary disclosure, we allow the manager to send a message to the shareholder - similar to the "cheap-talk" message in Crawford and Sobel (1982). Although such communication does not qualitatively change the disclosure equilibria, we find that, when the current firm value is low, the manager prefers private communication with the shareholder over public disclosure. Compared to public disclosure, the privately communicated message does not directly influence the market's belief about the current firm value and hence, reduces the shareholder's incentive to intervene excessively. However, compared to making no disclosure, privately communicating a low firm value reduces insufficient intervention.

This result highlights the role of different communication channels in the manager-shareholder interaction. Second, we consider a myopic manager who cares about a weighted average of the short-term stock price and the long-term firm value. Managerial myopia introduces an additional force in the manager's disclosure trade-off: the manager prefers a higher stock price, which weakens the incentive to disclose a low current firm value. Hence, when the manager is sufficiently myopic, the manager only discloses good news about the current firm value regardless of whether he is facing a short-term or long-term shareholder. We also find that managerial myopia and shareholder short-termism both lower the likelihood of disclosure. However, whereas the expected probability of intervention increases in shareholder short-termism, it is unaffected by managerial myopia.

Our theory generates several empirical implications on how voluntary disclosure influences shareholder intervention, besides illuminating the role of shareholder short-termism and managerial myopia in shaping this relation. The results also offer predictions related to market reaction to intervention. We discuss these implications in Section 7.

1.1 Related literature

This paper contributes to two main streams of literature. First, it contributes to the literature that examines the consequences of investor horizon on firms' policies (e.g., Bushee, 1998; Gigler et al., 2014). The literature has shown that the short-term incentive of investors not only affects the market response to disclosures (e.g., Bushee, 1998; Hotchkiss and Strickland, 2003), but also influences firms' payout policies, financing decisions, and investment strategies (e.g., Derrien et al., 2013; Gaspar et al., 2012). In this paper, we study how the threat of intervention by a short-term shareholder affects the voluntary disclosure of a firm.

While some studies on shareholder activism have explored how and when shareholder intervention can change firm value (e.g., Aslan and Kumar, 2016; Bebchuk et al., 2015; Brav et al., 2015), a few studies have also investigated the impact of shareholder intervention on the manager's incentive (e.g., Baldenius and Meng, 2010; Edmans and Manso, 2010; Keusch, 2018). This study focuses on a key concern with active shareholders: their short-term incentive. A recent study by Strobl and Zeng (2016) also examines the short-term incentive of an active shareholder. The authors find that a short-term shareholder can still improve firm value by disciplining managerial efforts. In contrast, this paper focuses on managerial disclosure and highlights that voluntary disclosure can play a key role in influencing corporate control and mitigating inefficiencies from shareholder short-termism.

Second, our paper also contributes to the literature on voluntary disclosure. The literature has largely focused on the valuation implication of voluntary disclosure, where partial disclosure is mainly driven by capital market incentives. In our setting, without capital market pressure, the manager still sometimes withhold information because it can improve intervention efficiency and thus firm value. We, thereby, highlight a new determinant of managers' disclosure decision, i.e. mitigating inefficient intervention by an incentive misaligned shareholder.

We also add to the literature on the real effects of voluntary disclosure. The literature has established that voluntary disclosure can affect the firm's financing and investment decisions (Beyer and Guttman, 2012) as well as alter information acquisition by analysts and managers (Einhorn and Ziv, 2007; Langberg and Sivaramakrishnan, 2008). We extend this literature by examining how disclosure changes the shareholder's intervention. Our results indicate that more disclosure and better price efficiency do not necessarily lead to more efficient intervention (Bond et al., 2012).

To the best of our knowledge, the only other paper that has modeled how the presence of an active shareholder affects the manager's voluntary disclosure is Kumar et al. (2012). Both models study voluntary disclosures in the presence of a controlling shareholder. Key differences exist in the information and incentive of the shareholder. While Kumar et al. (2012) considers a value-maximizing shareholder without private information, our setting assumes a myopic shareholder who privately observes an alternative firm value. The differences have important implications for the value of voluntary disclosure: in Kumar et al. (2012), nondisclosure always reduces the firm's liquidation value whereas in our setting, nondisclosure results in less inefficient intervention and

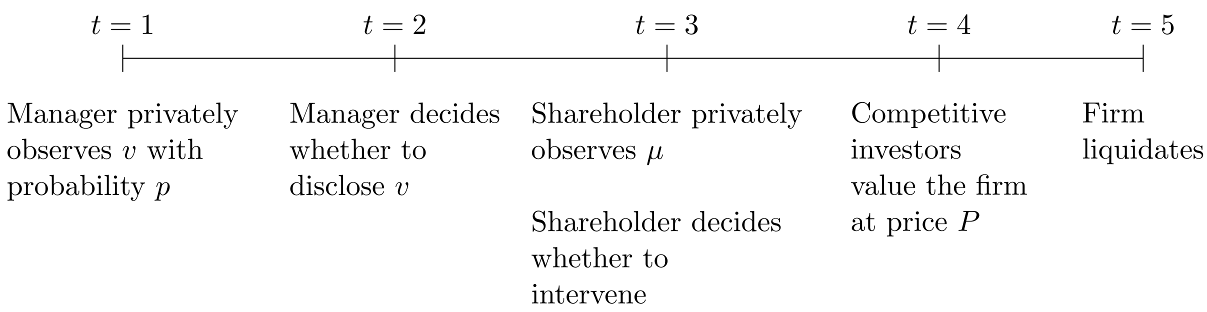


Figure 1: Sequence of events

thus improves the firm's liquidation value.

2 Model

We build a parsimonious model to study how a manager uses voluntary disclosure to influence the intervention decision of a shareholder. We consider a firm with three types of risk-neutral agents: a manager, a shareholder, and competitive investors. We refer to the manager as he and refer to the shareholder as she. The shareholder decides whether to intervene in the firm's operation, while competitive investors value the firm and reflect this value in the stock price. We use subscript M, S, and I to denote the manager, the shareholder, and competitive investors, respectively.

The model contains five dates. At $t = 1$, with probability p, the manager privately observes firm value v from implementing current strategy. At $t = 2$, the manager decides whether to voluntarily disclose v to the market. At $t = 3$, the shareholder privately observes the firm value μ from an alternative strategy and decides whether to let the manager continue with the current strategy or intervene and implement the alternative strategy. At $t = 4$, competitive investors price the firm. Payoff V from firm liquidation is realized at $t = 5$. Figure 1 shows the sequence of events, and each stage of the model is explained below.

At $t = 1$, with probability p, the manager privately observes the firm value v from implementing the current strategy. v is the realization of a random variable $\tilde{v}$ uniformly distributed over $[\underline{v}, \bar{v}]$.

At $t = 2$, the manager decides whether to voluntarily disclose v to the market. Following

Dye (1985) and Jung and Kwon (1988), we assume that, if the manager does not receive private information, he cannot disclose and cannot credibly reveal that he is uninformed. If the manager privately observes v and chooses to disclose, he has to disclose v truthfully. We denote an informed manager's disclosure strategy by $d(v)$ and his disclosure decision by $d \in \{v, ND\}$, where v represents truthful disclosure of v and ND represents no disclosure.

At $t = 3$, the shareholder privately observes firm value from implementing an alternative strategy μ. In what follows, we refer to v as current firm value and μ as alternative firm value. The manager and competitive investors know that μ is uniformly distributed over $[\underline{\mu}, \bar{\mu}]$. Without loss of generality, we set $\underline{\mu}$ to 0.[2] The information advantage of the shareholder can arise from her expertise about the industry or economy. We consider the shareholder's knowledge about μ as soft information that cannot be credibly disclosed. As will be explained in Section 3, information advantage of the shareholder is critical for shareholder short-termism to play a role in our model.

To make the intervention decision a nontrivial issue, we add the following constraint.

Assumption 1: $\frac{\bar{\mu}}{2} < \underline{v} < \bar{v} < \bar{\mu}$.

Briefly, Assumption 1 ensures that there is a nonzero probability of intervention for all realizations of the current firm value v. We explain Assumption 1 in detail in Section 3.

Based on the manager's disclosure decision d and her private information μ, the shareholder makes her intervention decision. Denote the shareholder's intervention strategy by $a(\mu, d)$ and her intervention decision by $a \in \{0, 1\}$, with $a = 0$ if the shareholder does not intervene and $a = 1$ if the shareholder intervenes. We assume that the shareholder's intervention decision a is publicly observable. If the shareholder intervenes, she implements the alternative strategy.[3] Then the firm's

[2]One can also model the shareholder's information advantage about the alternative firm value in the following manner. Specifically, one can assume that with probability α, the alternative firm value μ will be $\bar{\mu} > 0$; with probability $1 - \alpha$, the alternative firm value μ will be $\underline{\mu} = 0$. The potential values $\bar{\mu}$ and 0 are common knowledge but only the shareholder privately observes the value of the probability α. The manager and competitive investors know that α is uniformly distributed over $[0, 1]$. One can interpret α as the shareholder's private information about her ability to implement the alternative strategy. Our results remain the same with this alternative modeling approach.

[3]An alternative interpretation of our setting is that if the shareholder intervenes, the manager implements the alternative strategy by following the shareholder's guidance.

liquidation value V becomes the alternative firm value μ. If the shareholder does not intervene and lets the manager implement the current strategy, the liquidation value V equals the current firm value v.[4] Hence we can write the liquidation value V as

$$V = a \cdot \mu + (1 - a) \cdot v. \tag{1}$$

After shareholder intervention but before liquidation, risk-neutral investors price the firm at $t = 4$. The stock price P equals the expected liquidation value, that is,

$$P = E[V|d, a]. \tag{2}$$

The shareholder chooses her intervention strategy $a(\mu, d)$ to maximize her utility

$$U_S(a) = \eta P + (1 - \eta)V, \tag{3}$$

where $\eta \in [0, 1]$ is exogenous and reflects the horizon of the shareholder. It represents the extent to which the shareholder cares about the short-term stock price versus the long-term liquidation value. Such an objective function captures the fact that the shareholder may not stay in the firm long enough to internalize the full consequences of her intervention. One can interpret η either as the probability that the shareholder faces a liquidity shock and has to sell the whole firm or as the exogenously given fraction of shares sold by the controlling shareholder to competitive investors.[5]

To maintain our focus on how the short-term incentive of the shareholder affects the manager's voluntary disclosure strategy, in our main analysis, we assume that the manager maximizes the liquidation value V. Specifically, the manager chooses disclosure strategy $d(v)$ to maximize

$$U_M(d) = V. \tag{4}$$

Such an objective function abstracts away from a manager's myopic incentive. It allows us to clearly demonstrate the impact of the shareholder's short-term incentive on the manager's disclosure strategy. We extend the model and assume that the manager cares about both the stock price and

[4]In our setting, without shareholder intervention, the manager has no incentive to implement the alternative strategy. This is because no intervention implies that $E[\mu|a = 0] < \frac{\bar{\mu}}{2}$. Then Assumption 1 implies that the expected alternative firm value given no intervention is always lower than the current firm value, that is, $E[\mu|a = 0] < \frac{\bar{\mu}}{2} < \underline{v}$.

[5]The short-term incentive is exogenous in the main model. We illustrate how shareholder trading endogenously gives rise to the short-term incentive in the Online Appendix. Our results and implications hold qualitatively when we endogenize the shareholder's short-term incentive.

the liquidation value in Section 6.2. Our results remain qualitatively the same with a myopic manager.

Before proceeding to the equilibrium analysis, we would like to elaborate on our setting and a few assumptions of the model. First, in our model, the shareholder is a controlling party who can influence the firm's decisions. Examples include activist shareholders sitting on the board and large blockholders, who can monitor and exercise control over the manager's actions.[6] Second, our model studies the impact of voluntary disclosure on shareholder intervention. In practice, the manager might also privately communicate with a controlling shareholder. In Section 6.1, we allow the manager to privately communicate with the shareholder and find that our disclosure equilibrium remains qualitatively the same although informative private communication can also occur.

We study a perfect Bayesian equilibrium, which consists of the manager's disclosure strategy $d(v)$, the shareholder's intervention strategy $a(\mu, d)$ and the pricing function $P(d, a)$. In equilibrium, all beliefs are rational, including how competitive investors price the firm based on the manager's disclosure decision and the shareholder's intervention decision.

3 Shareholder intervention

Solving the model by backward induction, we start with the intervention decision of the shareholder.

3.1 Shareholder's intervention strategy

Taking the manager's disclosure strategy as given, we first solve for the shareholder's intervention strategy. The shareholder chooses $a(\mu, d)$ to maximize her expected utility

$$E[U_S(a)|\mu, d, a] = \eta E[P|d, a] + (1 - \eta)E[V|\mu, d, a].$$

[6]In practice, activists do not always successfully intervene in firms. Our results stay the same if we assume that the shareholder's intervention only succeeds with a certain probability. Alternatively, the shareholder may only invest part of the firm's assets in the alternative strategy. Our results stay the same no matter whether the fraction of the firm's assets moved into the alternative strategy is exogenous or allowed to be chosen endogenously. An endogenous continuous intervention choice does not arise in our setting because the signaling cost is not sufficient to sustain a fully separating equilibrium. Hence, the the shareholder cannot perfectly reveal the alternative firm value through a continuous intervention choice. We thank an anonymous reviewer for suggesting this alternative setting. Detailed analyses are available from the authors upon request.

Both the stock price P and the liquidation value V depend on the manager's disclosure decision d and the shareholder's intervention decision a.

Given the manager's disclosure decision d, if the shareholder allows the manager to implement the current strategy, the liquidation value V is determined by the current firm value v. As competitive investors publicly observe that the shareholder does not intervene, they will rationally price the firm at $E[v|d]$. The shareholder's expected utility thus equals

$$E[U_S(a=0)|\mu,d,a=0] = \eta E[P|d,a=0] + (1-\eta)E[v|d] = E[v|d].$$

If the shareholder intervenes and implements the alternative strategy, the liquidation value will be determined by the alternative firm value μ. Whereas the shareholder privately observes μ, competitive investors do not observe μ but only observe the manager's disclosure decision d and the shareholder's intervention decision $a = 1$. Their beliefs about μ equal $E[\mu|d, a = 1]$. In this case, the shareholder's expected utility from intervention equals

$$E[U_S(a=1)|\mu,d,a=1] = \eta E[P|d,a=1] + (1-\eta)\mu = \eta E[\mu|d,a=1] + (1-\eta)\mu.$$

The shareholder intervenes if and only if her expected utility is greater after intervention, that is,

$$\eta E[\mu|d,a=1] + (1-\eta)\mu \geq E[v|d].$$

As the left-hand-side of the above inequality is increasing in μ, while the right-hand-side is independent of μ, the shareholder's intervention strategy will be of a threshold type, where the shareholder intervenes if and only if μ is larger than a threshold; otherwise, she does not intervene. We denote the intervention threshold as $\mu^*(d)$. At $\mu^*(d)$, the shareholder is indifferent between intervention and no intervention, that is

$$\eta E[\mu|d,a=1] + (1-\eta)\mu^*(d) = \eta E[\mu|d,\mu \geq \mu^*(d)] + (1-\eta)\mu^*(d) = E[v|d].$$

Rewriting this indifference condition yields $\mu^*(d) = \frac{2E[v|d]-\eta\bar{\mu}}{2-\eta}$. To simplify notation and analysis, we define

$$\lambda = \frac{\eta}{2-\eta}$$

as a measure of shareholder short-termism,[7] with

$$\mu^*(d) = \frac{2E[v|d]-\eta\bar{\mu}}{2-\eta} = (1+\lambda)E[v|d] - \lambda\bar{\mu}. \quad (5)$$

Lemma 1 *(Intervention strategy) Given the manager's disclosure decision d, the shareholder does not intervene when $\mu \in [0, \mu^*(d))$, whereas the shareholder intervenes when $\mu \in [\mu^*(d), \bar{\mu}]$, with $\mu^*(d) = (1+\lambda)E[v|d] - \lambda\bar{\mu}$.*

We make a few observations about the intervention threshold $\mu^*(d)$. First, the intervention threshold depends on $\bar{\mu}$, the maximum value that can be achieved by shareholder intervention. If $\bar{\mu}$ is so low that the shareholder's expected utility from intervention is always lower than no intervention, the shareholder will never choose to intervene. Alternatively, if $\bar{\mu}$ is so high that the shareholder's expected utility from intervention is always higher than no intervention for all values of v, the shareholder will always intervene, irrespective of the manager's disclosure decision. In this case, the manager is indifferent between disclosure and no disclosure, because the stock price and the liquidation value are always determined by μ and are independent of the current firm value v.

Since we are interested in the effect of shareholder intervention on the manager's disclosure strategy, we make Assumption 1 about $\bar{\mu}$ to ensure that a positive probability of intervention exists for all values of v and λ, that is, $0 < \mu^*(d) < \bar{\mu}$ for all values of v and λ. Equation (5) suggests that $\mu^*(d)$ increases with $E[v|d]$. Therefore we assume that, for all values of λ, $\mu^*(d) > 0$ when $v = \underline{v}$ and $\mu^*(d) < \bar{\mu}$ when $v = \bar{v}$. Rewriting yields Assumption 1.

Second, the shareholder's intervention strategy depends on her short-term incentive λ. When $\lambda = 0$, the shareholder maximizes the expected liquidation value. Thus she only intervenes when she can improve the expected liquidation value, i.e., when $\mu \geq \mu^*(d) = E[v|d]$. When $\lambda > 0$, the shareholder might intervene to increase the stock price rather than the liquidation value.

Importantly, λ affects the intervention strategy *only* when the shareholder has an information advantage regarding the value of μ. If competitive investors and the shareholder have the same

[7] Note that λ is a monotone transformation of η. When $\eta = 0$, $\lambda = 0$, whereas when $\eta = 1$, $\lambda = 1$.

information about μ, then the stock price, which reflects competitive investors' beliefs about μ, will be the same as the shareholder's belief about the liquidation value after intervention. Then λ will not affect the shareholder's intervention strategy, as her objective will be equivalent to maximizing the firm's expected liquidation value. Therefore the shareholder's information advantage about μ is critical for studying the role of shareholder short-termism in her intervention decision.

With information asymmetry about μ, given intervention, the stock price can differ from the shareholder's private information μ. When competitive investors observe an intervention, they rationally conjecture that $\mu \geq \mu^*(d)$, that is, the shareholder's intervention signals her private information about μ. Due to this signaling role of intervention, the shareholder can intervene excessively to improve the market's perception about the alternative firm value μ. Lacking further information about μ, competitive investors can only set the stock price at the expected value $E[\mu|\mu \geq \mu^*(d)]$, which is always higher than the intervention threshold $\mu^*(d)$. To the extent that the shareholder cares about the stock price, she might intervene when $\mu < E[v|d]$, if the reduced expected liquidation value from intervention is compensated by the higher stock price. The extent of such value decreasing intervention increases with the shareholder's short-term incentive λ. The stronger the short-term incentive, the more likely the short-term shareholder will intervene to benefit from the stock price at the expense of the liquidation value.

3.2 Disclosure and intervention efficiency

The intervention threshold $\mu^*(d)$ also depends on the manager's disclosure decision, because disclosure can influence the shareholder's belief about v. Regardless of the disclosure decision, intervention can either increase or decrease the liquidation value. But the efficiency of intervention differs. We consider intervention as efficient if the shareholder intervenes when $\mu \geq v$, and does not intervene when $\mu < v$. This means that inefficient intervention can take two forms. One is that intervention occurs when it decreases the liquidation value. We name this form of inefficiency as excessive intervention. The other one is that intervention does not occur when it can increase

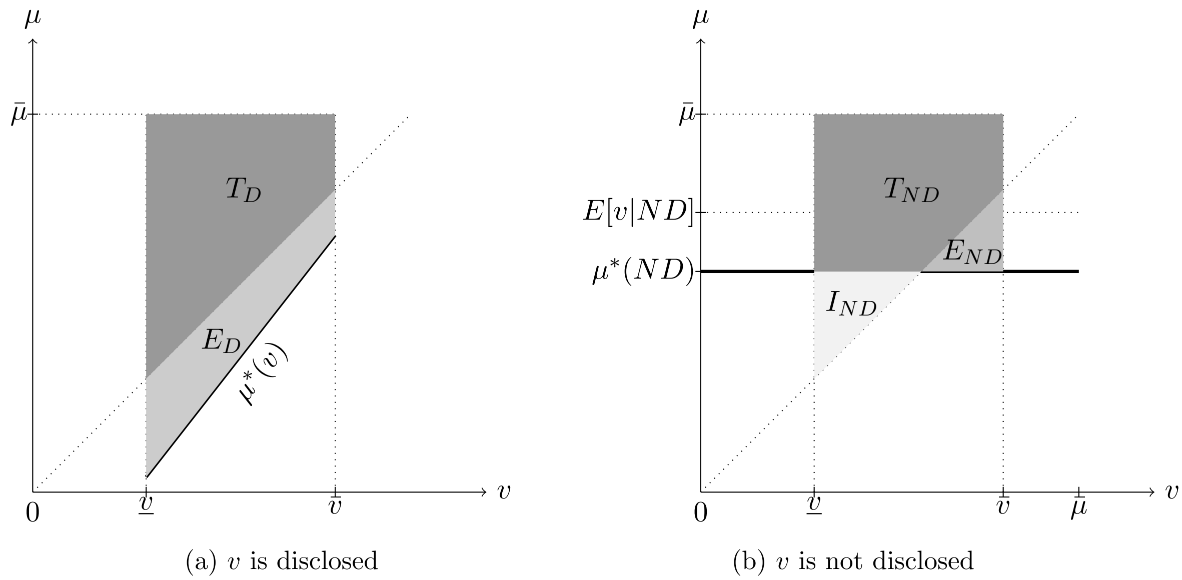


Figure 2: Intervention efficiency if v is always disclosed (Panel a), and if v is never disclosed (Panel b). In Panel (a), regions T_D and E_D represent efficient intervention and excessive intervention, respectively, when v is always disclosed. In Panel (b), regions T_{ND}, E_{ND} and I_{ND} represent efficient intervention, excessive intervention and insufficient intervention, respectively, when v is never disclosed.

the liquidation value. We name this form of inefficiency as insufficient intervention. To be more precise, we define intervention efficiency as

$$IE = [a - (1 - a)](\mu - v). \tag{6}$$

Given intervention, i.e., $a = 1$, intervention is efficient when $\mu \geq v$ and excessive intervention occurs when $\mu < v$. Given no intervention, i.e., $a = 0$, it is efficient when $\mu \leq v$ and insufficient intervention occurs when $\mu > v$.

Figure 2 shows how intervention efficiency changes with v for an exogenously specified disclosure choice. Panel (a) demonstrates intervention efficiency if v is always disclosed. The shareholder intervenes when $\mu \geq \mu^*(v)$ and does not intervene when $\mu < \mu^*(v)$, with

$$\mu^*(v) = (1 + \lambda)v - \lambda\bar{\mu}.$$

The intervention threshold $\mu^*(v)$ increases with v, but is always lower than v. This is because the short-term incentive of the shareholder can lead to intervention that decreases the liquidation value. Overall, given disclosure, there can be either efficient intervention or excessive intervention.

If $\mu > v$, intervention is efficient and increases the firm's liquidation value. This is captured by region T_D of Panel (a). If $v > \mu \geq \mu^*(v)$, excessive intervention occurs, as it decreases the firm's liquidation value. This is captured by region E_D of Panel (a).

Panel (b) shows the intervention efficiency if v is never disclosed by the manager. The shareholder intervenes when $\mu \geq \mu^*(ND)$ and does not intervene otherwise. The intervention threshold $\mu^*(ND)$ equals

$$\mu^*(ND) = (1 + \lambda)E[v|ND] - \lambda\bar{\mu}.$$

$\mu^*(ND)$ is a constant and only depends on the shareholder's expectation about v given no disclosure. The intervention threshold is always lower than $E[v|ND]$ because of the shareholder's short-term incentive. Efficient intervention that increases the firm's liquidation value is captured by region T_{ND} of Panel (b). Given no disclosure, the shareholder's lack of information about v gives rise to both excessive intervention and insufficient intervention. For high values of v, the intervention threshold can be lower than v, leading to excessive intervention, captured by region E_{ND} of Panel (b). For low values of v, depending on the shareholder's belief about $E[v|ND]$, the intervention threshold $\mu^*(ND)$ can be larger than v. Hence there is insufficient intervention, as the shareholder who can improve the liquidation value chooses not to intervene. This is captured by region I_{ND} of Panel (b).

To summarize, irrespective of the manager's disclosure decision, both efficient and inefficient intervention can arise in the presence of a short-term shareholder. However, the extent of inefficient intervention varies with the manager's disclosure decision. Given disclosure, inefficient intervention only features excessive intervention. Whereas given no disclosure, inefficient intervention can be either excessive or insufficient.

Anticipating the shareholder's intervention strategy, the manager determines his disclosure strategy. We now move on to derive the disclosure equilibrium.

4 Disclosure equilibrium

4.1 Manager's disclosure strategy

When the manager is not informed about v, he cannot disclose. When the manager is informed about v, his expected utility depends on both the value of v and his disclosure decision d, i.e., $E[U_M(d)|v,d]$. In deciding whether to disclose, the manager anticipates how disclosure influences shareholder intervention. When the manager discloses v to the market, his expected utility equals

$$E[U_M(v)|v,v] = E\left[a \cdot \mu + (1-a) \cdot v|v,v\right].$$

If the shareholder intervenes, the liquidation value V is determined by μ. Therefore the manager's expected utility given intervention is

$$E[U_M(v)|v,v,a=1] = E[\mu|v,v,a=1].$$

If the shareholder does not intervene, the liquidation value depends on the current firm value v, and so does the manager's expected utility, i.e.,

$$E[U_M(v)|v,v,a=0] = v.$$

Considering the probability of intervention, an informed manager's expected utility from disclosure is

$$E[U_M(v)|v,v] = Pr(\mu \geq \mu^*(v))E[\mu|v,v,a=1] + Pr(\mu < \mu^*(v))v, \tag{7}$$

with $\mu^*(v) = (1+\lambda)v - \lambda\bar{\mu}$.

The same idea applies if the informed manager chooses not to disclose, in which case his expected utility is

$$E[U_M(ND)|v,ND] = Pr(\mu \geq \mu^*(ND))E[\mu|ND,a=1] + Pr(\mu < \mu^*(ND))v. \tag{8}$$

As disclosure affects shareholder intervention, both the liquidation value V and its distribution are functions of the manager's disclosure decision. Therefore the manager's disclosure strategy can change his utility in two ways: it affects the probability of intervention ($Pr(\mu \geq \mu^*(d))$) as well as the expected liquidation value given intervention ($E[\mu|v,d,a=1]$). Given no disclosure, the shareholder can only infer the current firm value as $E[v|ND]$. Both the probability of intervention and the expected value after intervention are independent of v. v only determines the liquidation value given no intervention. The manager chooses his disclosure strategy, considering how disclosure affects both the probability of intervention and the expected liquidation value after intervention. In the following analysis, we assume that a manager who is indifferent between disclosure and no disclosure will choose to disclose. We present the disclosure equilibrium in the section below.

4.2 Voluntary disclosure equilibrium

Before discussing the disclosure equilibrium, we first consider a benchmark case where the shareholder only cares about the liquidation value.

Benchmark: $\lambda = 0$. Both the manager and the shareholder maximize the liquidation value. When $\lambda = 0$, $\mu^*(v) = v$ and $\mu^*(ND) = E[v|ND]$. The shareholder intervenes if and only if she expects the alternative firm value μ is higher than the current firm value $E[v|d]$. In this case, an informed manager always discloses v to the market. Specifically, the manager discloses if and only if

$$\frac{1}{2}(v - E[v|ND])^2 > 0.$$

Given our assumption that a manager who is indifferent between disclosure and no disclosure chooses to disclose, the above condition indicates that the manager always discloses whenever he observes v, to ensure that the shareholder can efficiently intervene and improve the liquidation value.

General case: $\lambda \in (0, 1]$. Now we move on to the disclosure equilibrium with $\lambda \in (0, 1]$. Note that the short-term incentive of the shareholder can lead to inefficient intervention only when the shareholder also has private information. As explained in Section 3, without information asymmetry about μ, a short-term shareholder's objective is equivalent to maximizing the firm's liquidation value. Hence the disclosure equilibrium is the same as the benchmark case where $\lambda = 0$, that is, an informed manager always discloses v. To sum up, in our model, partial disclosure arises only if the shareholder has private information as well as short-term incentive.

In the presence of both short-term incentive and private information of the shareholder, if the manager discloses v, the intervention threshold $\mu^*(v)$ is lower than v so that there exists excessive intervention that decreases the liquidation value. In contrast, if the manager does not disclose v, the intervention threshold $\mu^*(ND)$ can be either higher or lower than the current firm value v. When the current firm value is high so that $v \geq \mu^*(ND)$, the firm faces excessive intervention. When the current firm value is low so that $v < \mu^*(ND)$, there exists insufficient intervention. Recall that this is because the shareholder perceives the current firm value as $E[v|ND]$, which is higher than v.

Inefficient intervention will reduce the firm's expected liquidation value and thus the manager's expected utility. The manager will disclose v if and only if his expected utility given disclosure is higher than no disclosure. This trade-off differs between a manager who observes a high v and a manager who observes a low v.

To illustrate, first consider a manager who observes a high v, with $v > E[v|ND]$. Irrespective of the manager's disclosure strategy, there exists excessive intervention that decreases the expected liquidation value. Compared to no disclosure, revealing the high value of v can raise the intervention threshold, reduce excessive intervention, and thus improve the expected liquidation value. Hence, the manager will prefer disclosure.

Next, consider a manager who observes an extremely low value of v. In this case, if the manager discloses v, there is excessive intervention by the shareholder. If the manager does not disclose v, there is insufficient intervention. The manager trades off these two inefficiencies in his disclosure decision. Which inefficiency is lower depends on the extent of shareholder short-termism λ. Note that as shown in equation (5), the intervention threshold decreases with shareholder short-termism λ. This implies that for low values of λ, the intervention threshold given the manager's disclosure decision d is relatively high. Then the extent of excessive intervention after disclosure will be low and the extent of insufficient intervention after no disclosure will be relatively high. Therefore, the manager observing a low value of v is better off disclosing.

In contrast, when λ is high, the intervention thresholds, given disclosure and given no disclosure, both decrease. This gives rise to more excessive intervention when the manager discloses and less insufficient intervention when the manager does not. Therefore, for high values of λ, excessive intervention from disclosure decreases the expected liquidation value more than insufficient intervention from no disclosure, making the manager with a low value of v prefer not to disclose.

We can now characterize the disclosure equilibrium below.

Proposition 1 *(Equilibrium) When the manager maximizes the liquidation value V, there exists a threshold value of shareholder short-termism λ denoted by λ^* such that*

1. *when $\lambda = 0$, an informed manager always discloses the current firm value v;*

2. *when $\lambda \in (0, \lambda^*]$, for $v \in ND = (v_1, v_2)$, an informed manager does not disclose the current firm value v; for $v \in [\underline{v}, v_1] \cup [v_2, \bar{v}]$, the informed manager discloses the current firm value v, with*

$$v_1 = \tfrac{1+\lambda}{1-\lambda} v_2 - \tfrac{2\lambda}{1-\lambda}\bar{\mu}, \tag{9}$$

$$v_2 = E[v|ND]; \tag{10}$$

3. *when $\lambda \in (\lambda^*, 1]$, for $v \in ND = [\underline{v}, v')$, the informed manager does not disclose v; for $v \in [v', \bar{v}]$, the informed manager discloses v, with $v' = E[v|ND]$;*

4. *for a given nondisclosure region ND, the market's and the shareholder's beliefs about v equal*

$$E[v|ND] = \tfrac{pPr(v \in ND)E[v|v \in ND]}{pPr(v \in ND)+1-p} + \tfrac{(1-p)E[v]}{pPr(v \in ND)+1-p}; \tag{11}$$

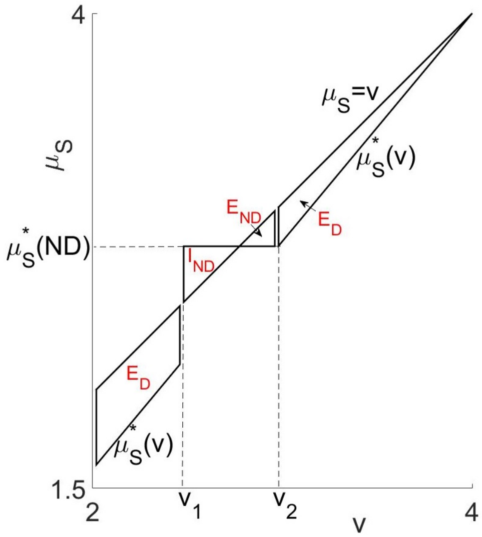
5. *the shareholder's intervention strategy $a(\mu, d)$ is as described in Lemma 1.*

The above result shows how the manager uses his voluntary disclosure strategy to convince a short-term shareholder to intervene efficiently. When the shareholder is sufficiently long-term oriented, the manager follows a two-tailed disclosure strategy whereby he discloses both extremely low realizations of the current firm value v to promote intervention and discloses extremely high realizations of v to deter excessive intervention. When the shareholder is sufficiently short-term oriented, the disclosure strategy is a standard upper-tailed one. The manager only discloses high values of v to deter intervention.

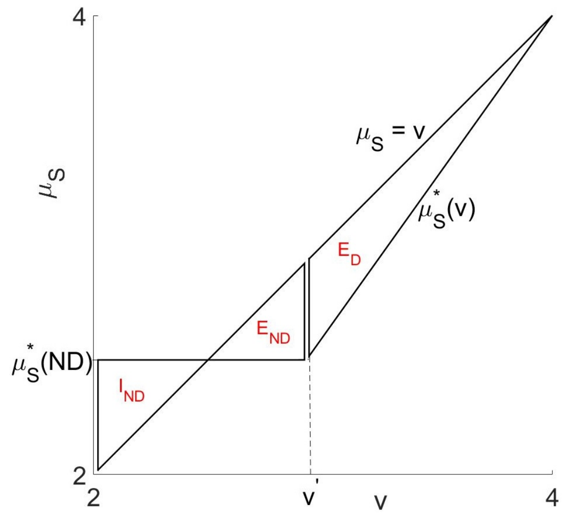
Examples of the above two equilibria are shown in Figure 3, with analysis based on parameter values $\underline{v} = 2$, $\bar{v} = 4$, $\bar{\mu} = 4$, $p = 0.25$, $\lambda = 0.2$ in Panel (a) and $\lambda = 0.4$ in Panel (b). Panel (a) is one instance of the two-tailed disclosure equilibrium. Region E_D reflects excessive intervention in the disclosure region. While disclosure results in excessive intervention in a firm, nondisclosure can lead to either excessive or insufficient intervention, depending on the value of v. For relatively high values of v, the intervention threshold given no disclosure $\mu^*(ND)$ is lower than v, resulting in excessive intervention, as depicted by region E_{ND} of Panel (a). On the other hand, nondisclosing firms with relatively low values of v face insufficient intervention in equilibrium, depicted by region I_{ND}. One instance of the upper-tailed disclosure equilibrium is shown in Panel (b). In the figure, E_D shows equilibrium excessive intervention for disclosing firms, whereas E_{ND} is excessive intervention for nondisclosing firms, and I_{ND} is insufficient intervention for nondisclosing firms.

Moreover, for the two-tailed disclosure equilibrium, at both v_1 and v_2, the manager is indifferent between disclosure and no disclosure. However, the trade-off the manager faces differs at the two disclosure thresholds. Specifically, at $v = v_1$, there is excessive intervention if the manager discloses v and insufficient intervention if the manager remains silent. The manager is indifferent because the expected reduction in value from excessive intervention given disclosure is the same as the expected reduction in value from insufficient intervention given no disclosure. At v_2, since $v_2 = E[v|ND]$, the manager faces the same extent of excessive intervention both with and without disclosure, and is thus indifferent.

Note that the expected current firm value given no disclosure $E[v|ND]$ equals the disclosure threshold. This is a standard result with probabilistic information endowment when the disclosure strategy is upper-tailed. We will see why this is also the case when the disclosure strategy is two-



(a) A two-tailed disclosure equilibrium



(b) An upper-tailed disclosure equilibrium

Figure 3: Equilibrium intervention inefficiencies in a two-tailed disclosure equilibrium (Panel a), and in an upper-tailed disclosure equilibrium (Panel b). Numerical analysis is based on the following parameter values: $\underline{v} = 2$, $\bar{v} = 4$, $\bar{\mu} = 4$, $p = 0.25$, $\lambda = 0.2$ in Panel (a), and $\lambda = 0.4$ in Panel (b). In both panels, regions E_D and E_{ND} denote excessive intervention given disclosure and given no disclosure, respectively; region I_{ND} denotes insufficient intervention given no disclosure.

tailed, that is, why $v_2 = E[v|ND]$ in the two-tailed disclosure equilibrium. To illustrate, suppose $v_2 > E[v|ND]$. Then both disclosure and no disclosure result in excessive intervention. The manager would strictly prefer disclosure to no disclosure at v_2 as disclosure leads to less excessive intervention than no disclosure. Therefore $v_2 > E[v|ND]$ cannot hold in a two-tailed disclosure equilibrium. Alternatively, suppose $v_2 < E[v|ND]$, then there should exist a higher value of v such that for $v = E[v|ND] > v_2$, the manager is indifferent between disclosure and no disclosure. This contradicts the disclosure equilibrium that for all $v > v_2$, the manager strictly prefers disclosure over no disclosure. Hence, for a given value of λ, we have $v_2 = E[v|ND]$ in the two-tailed disclosure equilibrium.

An immediate implication of the disclosure equilibrium is that, when a firm faces a short-term oriented shareholder, withholding information from the shareholder sometimes can improve firm value. Note that inefficient intervention exists both given disclosure and given no disclosure.

However, no disclosure can reduce the extent of inefficient intervention.

Proposition 2 *(Nondisclosure and liquidation value) For a firm facing intervention by a short-term oriented shareholder, when shareholder short-termism is low, with $\lambda \in (0, \lambda^*]$, no disclosure increases the firm's expected liquidation value for current firm value $v \in ND = (v_1, v_2)$; when shareholder short-termism is high, with $\lambda \in (\lambda^*, 1]$, no disclosure increases the firm's expected liquidation value for current firm value $v \in ND = [\underline{v}, v')$, where v_1, v_2 and v' are as defined in Proposition 1.*

The voluntary disclosure literature has largely focused on the valuation implication of voluntary disclosure, where no disclosure typically arises because it can lead to a higher stock price. In our setting, the manager's objective is to solely improve the firm's liquidation value. Given our assumption that a manager indifferent between disclosure and no disclosure will disclose his private information, one might expect an unraveling result, where an informed manager always discloses his private information. Interestingly, we find that no disclosure arises in equilibrium even when the manager only cares about the liquidation value. The reason is that no disclosure can reduce inefficient intervention and thus improve the liquidation value. The above result extends the disclosure literature by showing that managers who do not care about the stock price might also have incentives to strategically disclose.

The disclosure equilibrium in our paper bears resemblance to that of Kumar et al. (2012), in that there exists either an upper-tailed or a two-tailed disclosure equilibrium. However, the incentives to disclose and the implications of nondisclosure for firm value differ considerably. In Kumar et al. (2012), since the manager is myopic, nondisclosure is always chosen to obtain a higher stock price at the expense of a lower liquidation value. However, in our model, the manager only cares about the liquidation value and nondisclosure is always chosen to obtain a higher liquidation value.

5 Comparative analysis

Based on the equilibrium results, we now perform several comparative analyses.

5.1 Disclosure and shareholder intervention

To provide testable empirical implications on how voluntary disclosure influences shareholder intervention, we compare the probability of intervention for disclosing and nondisclosing firms. For each firm, the probability of intervention equals $Pr(\mu \geq \mu^*(d))$. The average probability of intervention for a disclosing firm and a nondisclosing one depends on the manager's equilibrium disclosure strategy. Detailed expressions can be found in the appendix.

Corollary 1 *(Disclosure and probability of intervention) Shareholder intervention is more likely to occur for a nondisclosing firm than for a disclosing firm.*

On average, the probability of intervention is lower for disclosing firms than for nondisclosing ones, irrespective of which disclosure equilibrium arises.[8] This is because the expected current firm value among disclosing firms is no lower than that among nondisclosing firms,[9] leading to a higher intervention threshold for a disclosing firm and hence a lower probability of intervention. Empirical research showing that active shareholders are less likely to intervene in firms that disclose more information is consistent with this prediction (e.g., Bourveau and Schoenfeld, 2017).

Result in Corollary 1, together with Proposition 2, also highlights that a high probability of intervention does not necessarily indicate a low liquidation value. Even though nondisclosing firms on average have a higher probability of intervention than disclosing firms, withholding information remains a better strategy for expected liquidation value. This is because no disclosure makes these firms more likely to have efficient intervention that can increase the firm's liquidation value.

We also analyse how the expected value from intervention affects the manager's disclosure decision. The expected alternative firm value from intervention equals $\frac{\bar{\mu}}{2}$. We find that, in the

[8]This result relies on our assumption that the firm has a positive probability of intervention by the shareholder.

[9]In the upper-tailed disclosure equilibrium, the expected current firm value given disclosure is always higher than the expected current firm value given no disclosure because an informed manager discloses if $v > v' = E[v|ND]$. In the two-tailed disclosure equilibrium, this relation continues to be true. The intuition is as follows. With probabilistic managerial information endowment, given no disclosure, investors always lower their beliefs about the current firm value, that is, $E[v] > E[v|d = ND]$. This is because no disclosure might arise from an informed manager withholding information about v. This then implies that $E[v|d = v] > E[v] > E[v|d = ND]$.

two-tailed disclosure equilibrium, an informed manager is less likely to disclose when $\bar{\mu}$ increases.

Corollary 2 *(Disclosure and value from intervention) When shareholder short-termism is low, that is, $\lambda \in (0, \lambda^*]$, the likelihood of disclosure decreases with the expected alternative firm value. When shareholder short-termism is high, that is, $\lambda \in (\lambda^*, 1]$, the likelihood of disclosure is independent of the expected alternative firm value.*

In the upper-tailed disclosure equilibrium, the likelihood of disclosure is independent of the expected alternative firm value $\frac{\bar{\mu}}{2}$ as the disclosure threshold is independent of $\bar{\mu}$. For the two-tailed disclosure equilibrium, the result in Corollary 2 arises because as $\bar{\mu}$ increases, the intervention threshold decreases. Intuitively, when the market expects more value from intervention, the price after intervention goes up, inducing the shareholder to intervene more. A lower intervention threshold implies that a firm faces more excessive intervention from disclosure and less insufficient intervention from no disclosure. The manager, therefore, responds by reducing disclosure.

5.2 Role of shareholder short-termism

Shareholder short-termism λ determines the intervention strategy. Irrespective of the manager's disclosure strategy, greater shareholder short-termism always decreases the intervention threshold and thus increases the probability of intervention. This is because a short-term oriented shareholder is more likely to intervene to benefit from the stock price mispricing.

Corollary 3 *(Shareholder short-termism and expected probability of intervention) The expected probability of intervention increases with shareholder short-termism λ.*

The above impact of λ on shareholder intervention in turn changes the manager's disclosure strategy. The specific effect depends on which disclosure equilibrium arises. When λ is high, the upper-tailed disclosure equilibrium arises and only good news about v is disclosed. In this case, the disclosure threshold is independent of λ. Therefore λ has no impact on the manager's disclosure strategy and the likelihood of disclosure. In contrast, when λ is low, a two-tailed disclosure equilibrium arises where the manager discloses both extremely bad and extremely good news about v. In this case, λ changes the manager's disclosure strategy, as summarized below.

Corollary 4 *(Shareholder short-termism and likelihood of disclosure) When shareholder short-termism is low, that is, $\lambda \in (0, \lambda^*]$, both disclosure thresholds v_1 and v_2 decrease with λ. The likelihood of disclosure also decreases with λ. When shareholder short-termism is high, that is, $\lambda \in (\lambda^*, 1]$, the disclosure threshold v' and the likelihood of disclosure are independent of λ. v_1, v_2 and v' are as defined in Proposition 1.*

To explain the effects of λ on the disclosure thresholds in the two-tailed disclosure equilibrium, we first consider the lower disclosure threshold v_1. For a given value of λ, a manager observing v_1 is indifferent between disclosure and no disclosure, because excessive intervention from disclosure and insufficient intervention from no disclosure result in the same reduction of the expected liquidation value. As λ increases, excessive intervention from disclosure increases while insufficient intervention from no disclosure decreases. Therefore the manager with v_1 now strictly prefers no disclosure, leading to a decrease of the lower disclosure threshold.

Recall that the upper disclosure threshold v_2 equals $E[v|ND]$. The reduced lower disclosure threshold v_1 decreases $E[v|ND]$, making the original upper disclosure threshold v_2 higher than $E[v|ND]$. This implies that the manager observing v_2 strictly prefers disclosure over no disclosure now, as disclosure leads to a lower extent of excessive intervention than no disclosure. Hence the upper disclosure threshold v_2 also decreases with λ, which further lowers $E[v|ND]$.

Finally, we find that the likelihood of disclosure decreases with λ in the two-tailed disclosure equilibrium. This is because the net benefit of disclosure decreases at a faster rate at v_1 than at v_2 so that the lower disclosure threshold v_1 decreases at a faster rate than the upper disclosure threshold v_2. To illustrate, we consider inefficient intervention from disclosure as the cost of disclosure and consider inefficient intervention from no disclosure as the benefit. Recall that, at v_2, the firm has excessive intervention under both disclosure and no disclosure. Excessive intervention from disclosure rises with λ, increasing the cost of disclosure. At the same time, excessive intervention from no disclosure also increases with λ, yielding a higher benefit of disclosure. As both the cost and benefit of disclosure rise with λ, the impact on net benefit is relatively small. In contrast, at v_1, the firm has excessive intervention from disclosure, but insufficient intervention from no disclosure. While a higher λ increases excessive intervention from disclosure, and thus the cost of disclosure, a higher λ reduces insufficient intervention from no disclosure, and thus reduces the benefit of disclosure. Therefore the net benefit of disclosure decreases with λ at a faster rate at v_1 than at v_2, making the likelihood of disclosure decrease with λ.

5.3 Role of probabilistic information endowment

The manager's probabilistic information endowment p determines his disclosure strategy, which in turn can influence the shareholder's intervention strategy. Interestingly, we find that p has no influence on the expected probability of intervention. The reason is as follows. The shareholder's intervention depends on her belief about the current firm value. Hence, the expected probability of intervention depends on the expected current firm value $E[v]$. The managerial information endowment p only changes the manager's disclosure strategy but not the expected current firm value, and hence, has no impact on the expected probability of intervention.

Corollary 5 *(Managerial information endowment and expected probability of intervention) The expected probability of intervention is independent of the managerial probabilistic information endowment p.*

5.4 Market reaction to intervention

We also analyze how stock returns to shareholder intervention depend on the manager's disclosure decision. We examine both the short-term market reaction to the intervention as well as the long-term stock returns following intervention. To enable the analysis, we assume that another stock price $P(d)$ is formed after the manager's disclosure but before the shareholder intervention, where d denotes the manager's disclosure decision.[10] The short-term market reaction to intervention is then defined as the difference between the stock price after the shareholder intervention and the stock price after the manager's disclosure decision, that is,

$$P(d, a = 1) - P(d) = Pr(\mu < \mu^*(d))(E[\mu|\mu \geq \mu^*(d)] - E[v|d]).$$

We compare market reaction to intervention for disclosing and nondisclosing firms. This comparison depends on two determinants of market reaction: the probability of not having intervention ($Pr(\mu < \mu^*(d))$) and the expected added value from intervention ($E[\mu|\mu \geq \mu^*(d)] - E[v|d]$). On the one hand, Corollary 1 shows that the probability of intervention is lower for disclosing firms relative to nondisclosing firms. The market, therefore, reacts more strongly to the news of intervention in a disclosing firm. On the other hand, compared to disclosing firms, the expected current firm value is lower for nondisclosing firms. Hence the market expects intervention to add more value to nondisclosing firms, implying a stronger market reaction to intervention in a nondisclosing firm. Depending on which one of the two forces dominates, the market reaction to intervention can be higher or lower for a disclosing firm relative to a nondisclosing firm. As the market reaction to intervention in a disclosing firm depends on the value v, which is not directly observed, we compare the expected market reaction between disclosing firms and nondisclosing firms by taking expectation of v given the firm's disclosure decision.

Corollary 6 *(Disclosure and short-term market reaction to intervention) There exist two thresholds of shareholder short-termism λ_1 and λ_2 ($\lambda_1 < \lambda_2$) such that for $\lambda \in [0, \lambda_1]$, the market reaction to intervention is higher for nondisclosing firms than for disclosing firms; for $\lambda \in [\lambda_2, 1]$, the market reaction to intervention is higher for disclosing firms than for nondisclosing firms.*

When shareholder short-termism is low, the expected value added by intervention is sufficiently higher for nondisclosing firms relative to disclosing firms. Hence, even though the market anticipates

[10] This stock price is not considered in our main analysis. Note that adding this stock price to the manager's objective function would not change his disclosure strategy because he receives no information about the shareholder intervention at this point in time.

that nondisclosing firms are more likely to have intervention, these firms still experience more positive returns after shareholder intervention. When λ is sufficiently high so that the expected value added by intervention is low, the market reaction to intervention is driven by the expected likelihood of intervention. Since disclosing firms are less likely to have shareholder intervention, these firms then experience a stronger market reaction after an intervention.

We also consider the long-term stock returns following intervention, defined as the difference between the liquidation value and the stock price when intervention occurs, that is,

$$\mu - P(d, a = 1).$$

Whether a firm experiences a positive stock return after intervention depends on whether the intervention is efficient or not. It is straightforward to see that efficient intervention improves the liquidation value and thus results in a positive long-run return. In contrast, inefficient intervention decreases the liquidation value, which then leads to a negative long-run return. We compare how the long-run return differs between disclosing and nondisclosing firms below.

Corollary 7 *(Disclosure and long-term stock returns after intervention) When shareholder intervention is efficient, nondisclosing firms have higher long-term stock returns than disclosing firms; when shareholder intervention is inefficient, nondisclosing firms have lower long-term stock returns than disclosing firms.*

Corollary 7 shows that nondisclosing firms experience more volatile stock returns after intervention than disclosing firms. When the shareholder intervention is efficient, nondisclosing firms have more positive long-term stock returns than disclosing firms. This happens because nondisclosing firms on average have lower current firm value and benefit more from efficient intervention than disclosing firms. When shareholder intervention is inefficient, nondisclosing firms experience more negative long-term stock returns than disclosing firms. This happens because nondisclosing firms on average have lower current firm value, which leads to more excessive intervention in these firms.

6 Extensions

We consider two extensions of our main model. In the first extension, we assume that, besides the voluntary public disclosure, the manager can also directly communicate with the shareholder. In the second extension, we study a setting with a myopic manager, who cares about a weighted average of the short-term stock price and the long-term liquidation value.

6.1 Communication between manager and shareholder

The base model only allows the manager to communicate through a credible public disclosure. In this section, we extend the model to allow the manager to privately communicate with the shareholder at $t = 2$.[11] This communication is modeled as cheap-talk akin to Crawford and Sobel (1982), that is, the manager does not necessarily truthfully communicate the current firm value v and an uninformed manager can also choose to communicate. Both the message and whether communication occurs are not observed by the market. We briefly discuss our findings below. Detailed analyses and results are presented in the Online Appendix.

Our analyses show that informative private communication can be sustained in equilibrium. Interestingly, the manager's disclosure and private communication strategies indicate that for firms with low current firm values, private communication can be a better information sharing channel to improve intervention efficiency than public disclosure. The key difference between the two information sharing channels is that the private message does not directly influence the market's belief about the current firm value v. When the v communicated to the shareholder is sufficiently lower than the market's expectation given no disclosure, the market conjectures less added value from intervention when there is private communication rather than public disclosure. This reduces the shareholder's incentive to engage in excessive intervention to benefit from the stock price. Also, privately communicating a low firm value to the shareholder reduces insufficient intervention.

[11] Note that the manager can privately communicate to the shareholder when the communication pertains to nonmaterial information that is not made public. If their communication involves material information and the shareholder intends to trade on it, the communication is subject to Reg FD requirements and must be made public. We discuss public communication in the Online Appendix.

Hence, the private message allows the manager to both communicate a low current firm value to avoid insufficient intervention without being exposed to high excessive intervention from the short-term shareholder.

We also find that as shareholder short-termism increases, private communication is less likely to occur. When shareholder short-termism is sufficiently high, there is no informative private communication. Moreover, allowing private communication does not qualitatively change our disclosure equilibria. Numerical analyses show that, for low values of shareholder short-termism, there exists a two-tailed disclosure equilibrium with informative private communication; for intermediate values of shareholder short-termism, there exists an upper-tailed disclosure equilibrium with informative private communication; whereas for high values of shareholder short-termism, there exists an upper-tailed disclosure equilibrium without informative private communication.

6.2 Myopic manager

We now extend the model and consider a manager who cares about a weighted average of the stock price P and the liquidation value V, with utility

$$U_M = \gamma P + (1 - \gamma)V. \tag{12}$$

$\gamma \in [0, 1]$ indicates the extent to which the manager cares about the stock price P; therefore it reflects managerial myopia. We first analyze the model with $\gamma \in [0, 1]$ and show that the implications from our prior analyses continue to hold. Then we examine how managerial myopia affects the disclosure strategy and shareholder intervention.

6.2.1 Disclosure equilibrium

With $\gamma \in [0, 1]$, given the manager's disclosure decision, the shareholder's intervention strategy is the same as described in Lemma 1. The manager makes his disclosure decision to maximize his expected utility, which equals

$$E[U_M(d)|v, d] = Pr(\mu \geq \mu^*(d))E[\mu|v, d, a = 1] + Pr(\mu < \mu^*(d))\left(\gamma E[v|d] + (1 - \gamma)v\right). \tag{13}$$

For a long-term oriented manager, i.e., $\gamma = 0$, disclosure changes his expected utility through influencing the probability of intervention $Pr(\mu \geq \mu^*(d))$ and the expected liquidation value after intervention ($E[\mu|v, d, a = 1]$). For a myopic manager, besides these two forces, disclosure also affects his expected utility through influencing the stock price given no intervention as captured by the component $\gamma E[v|d]$ in equation (13). When the manager discloses, the stock price given no intervention equals v. The manager's myopic objective thus reduces his incentive to disclose bad news about v. We summarize the disclosure equilibrium in detail below.

Proposition 3 *(Equilibrium) When the manager has myopic incentives, there exists a threshold value of managerial myopia γ denoted by γ' and a threshold value of shareholder short-termism λ dentoed by λ' such that*

1. *when $\gamma \in (0, \gamma']$ and $\lambda \in [0, \lambda']$, for the current firm value $v \in ND = (v_1^\gamma, v_2^\gamma)$, the informed manager does not disclose the current firm value v; for $v \in [\underline{v}, v_1^\gamma] \cup [v_2^\gamma, \bar{v}]$, the informed manager discloses v, with v_1^γ and v_2^γ defined in Appendix;*
2. *otherwise, for $v \in ND = \left[\underline{v}, v'_\gamma\right)$, the informed manager does not disclose v; for $v \in \left[v'_\gamma, \bar{v}\right]$, the informed manager discloses v, with $v'_\gamma = E[v|ND]$ and $E[v|ND]$ is as defined in equation (11) in Proposition 1*
3. *the shareholder's intervention strategy $a(\mu, d)$ is as described in Lemma 1.*

Similar to the setting with a long-term manager, the disclosure equilibrium with managerial myopia can be either a two-tailed disclosure equilibrium or an upper-tailed disclosure equilibrium. The key difference from our main setting is that, with a myopic manager, which equilibrium arises not only depends on shareholder short-termism, λ, but also depends on managerial myopia γ. As a myopic manager also uses his disclosure strategy to influence the stock price, the myopic incentive motivates the manager to disclose good news about v but withhold bad news about v. Therefore, for high values of v, a myopic manager discloses v to increase the stock price. For extremely low values of v, however, managerial myopia can reduce the manager's incentive to disclose, due to his concern that disclosure can significantly reduce the stock price if intervention does not occur. Hence when managerial myopia is sufficiently high, bad news about v is withheld from the market.

Note that, in our setting, when the manager is myopic and the shareholder is either long-term oriented with private information or myopic but without private information about μ, the trade-off faced by the manager is the same as in the work of Kumar et al. (2012). This is because without either a short horizon or private information, the shareholder always intervenes to maximize the firm's expected liquidation value. Then the manager discloses only when the cost from having a lower short-term stock price under-weights the benefit from having a higher expected liquidation value. In that case, the disclosure thresholds will resemble those in Kumar et al. (2012).

6.2.2 Role of managerial myopia

With $\gamma \in [0,1]$, our prior results continue to hold.[12] Detailed proofs are included in the Appendix. In addition, we also examine how managerial myopia affects the likelihood of disclosure and the expected probability of shareholder intervention.

How managerial myopia γ affects the disclosure strategy depends on which disclosure equilibrium arises. While γ decreases the likelihood of disclosure in the two-tailed disclosure equilibrium, it does not change the likelihood of disclosure in the upper-tailed disclosure equilibrium.

Corollary 8 *(Managerial myopia and likelihood of disclosure) When both shareholder short-termism and managerial myopia are low, that is,* $\lambda \in [0, \lambda']$ *and* $\gamma \in (0, \gamma']$*, both disclosure thresholds* v_1^γ *and* v_2^γ *decrease with* γ*. The likelihood of disclosure also decreases with* γ*. For all the other cases, the likelihood of disclosure is independent of* γ*.* v_1^γ *and* v_2^γ *are as defined in Proposition 3.*

[12] For Proposition 2, with $\gamma \in [0,1]$, the implication continues to hold for relatively high values of v in the nondisclosure region, as nondisclosure remains to be driven by the manager's incentive to improve intervention efficiency. For low values of v in the nondisclosure region, however, the manager's incentive is driven by withholding bad news about v to increase the stock price, rather than improving intervention efficiency. Specifically, as shown by Corollary 8, it holds that $v_1 > v_1^\gamma$ and $v_2 > v_2^\gamma$. Therefore, with $\gamma \in (0,1]$, nondisclosure improves the firm's expected liquidation value for $v \in [v_1, v_2^\gamma)$, whereas nondisclosure for $v \in (v_1^\gamma, v_1)$ is driven by the manager's incentive to increase the stock price when there is no intervention.

Interestingly, in the two-tailed disclosure equilibrium, the more the manager cares about the short-term stock price, the less likely the manager is to disclose. This is counterintuitive in that we might expect a more myopic manager to have greater incentives to disclose. Our result is driven by the countervailing effects of an increase in γ on the incentive to disclose good and bad news. Whereas an increase in γ increases the incentive of the manager with good news to disclose and boost the stock price, it decreases the incentive of the manager with bad news to disclose and improve firm value. In equilibrium, as γ increases, the latter effect dominates, resulting in a reduced likelihood of disclosure. In the upper-tailed disclosure equilibrium, γ has no impact on the manager's disclosure strategy, because the disclosure threshold is independent of managerial incentives.

For the effect of managerial myopia on the expected probability of intervention, even though managerial myopia can affect the probability of intervention through its impact on the disclosure strategy, we find that the expected probability of intervention is always independent of γ.

Corollary 9 *(Managerial myopia and expected probability of intervention) The expected probability of intervention is independent of managerial myopia, γ, for $\lambda \in [0, 1]$.*

The driving force of the above result is that the expected probability of intervention depends on the expected current firm value. Although managerial myopia influences the disclosure strategy, it does not affect the expected current firm value and thus the expected probability of intervention.

7 Empirical Implications

Our paper generates several empirical implications on how voluntary disclosure influences intervention by an activist shareholder. In our setting, key features of the shareholder include having private information about firm value, an ability to influence the firm's strategy and an interest in the firm's stock price. These features are consistent with hedge fund activists and certain types of blockholders. Hedge fund activists have shown to intervene and change a firm's strategic direction, capital structure and corporate governance practices (Gantchev, 2013). As the majority of these active hedge funds only hold their shares for less than a year, their payoffs are determined by changes in the stock price rather than the long-term firm value (Brav et al., 2009). Similar issues also apply to certain types of blockholders, such as mutual funds, who normally influence firms' strategies through voice and exit. The following empirical implications can thus be operationalized in settings with data on active hedge funds' and mutual fund blockholders' holding periods.

Our paper provides implications on the relation between voluntary disclosure and shareholder intervention. First, we find that the manager is less likely to provide voluntary disclosure when dealing with activists. Without potential intervention from an activist, a manager who only cares about firm value always discloses his private information. In the presence of a short-term activist, however, the manager withholds information to reduce inefficient intervention. This result is consistent with the finding of Chen and Jung (2016), which shows that firms are more likely to stop providing financial guidance after active hedge funds increase ownership in the firm. Second, we show that disclosing firms on average are less likely to face intervention than nondisclosing firms. This relation is consistent with the empirical evidence in Bourveau and Schoenfeld (2017), which shows that an active shareholder is less likely to intervene in a firm that discloses more. Third, we predict that managerial probability of information endowment has no impact on the expected probability of intervention, indicating that the quality of firms' information system is unlikely to be a firm characteristic targeted by hedge fund activists. Lastly, we find that an increase in shareholder short-termism increases the expected probability of intervention. This implies that intervention campaigns are more likely to be started by hedge funds that have a shorter investment horizon than by pension funds that have a longer investment horizon.

Our paper also generates implications for the relation between shareholder horizon and voluntary disclosures. First, we predict a relation between shareholder horizon and the type of news that firms disclose. When interacting with a long-term shareholder, firms will disclose both good and bad news, whereas when interacting with a short-term shareholder, firms will only disclose good news. Second, we demonstrate that an increase in shareholder short-termism reduces the likelihood of voluntary disclosure, as the manager reduces disclosure to deter excessive intervention from a short-term shareholder. Third, we find that an increase in shareholder short-termism has contrasting effects on the disclosure of good and bad news: it reduces the disclosure of bad news and increases the disclosure of good news. Consistent with this result, Khurana et al. (2018) show that the manager is less likely to convey bad news in earnings forecasts when hedge fund intervention lasts for a short time period. Fourth, our model predicts that the likelihood of disclosure decreases when the market expects more value addition from intervention.

We also show that the relation between the market reaction to intervention and firms' disclosure decision is mixed. If the shareholder is sufficiently long-term oriented, the market reacts more strongly to intervention in a nondisclosing firm than in a disclosing firm, whereas if the shareholder is sufficiently short-term oriented, the market reacts more strongly to intervention in a disclosing firm. In addition, we also find that nondisclosing firms experience more volatile long-term stock returns after intervention than disclosing firms.

For the role of managerial myopia, we expect that a more myopic manager is less likely to disclose, but we do not expect to empirically observe a relation between managerial myopia and the expected probability of intervention. For managerial choice between different communication channels, our model predicts that private communication and negotiations between the management and the activist are more likely to occur when the activist has a longer investment horizon.

8 Conclusion

This paper examines how a manager strategically uses voluntary disclosure to influence shareholder intervention. A short-term shareholder can intervene excessively when she knows the current firm value and can intervene either excessively or insufficiently when she does not know the current firm value. The manager thus trades off excessive and insufficient intervention in his disclosure decision. We find that when the shareholder is relatively long-term oriented, the manager discloses both extremely good and bad news about current firm value to improve intervention efficiency. But when the shareholder has a strong short-term incentive, only good news is disclosed.

In our setting, the shareholder's short-term incentive and information asymmetry between the shareholder and the market create inefficient intervention. Figuring out alternative mechanisms to alleviate these problems can be an interesting direction for future research. One option is to let the shareholder communicate her private information to the manager before the manager's disclosure. While the shareholder may sometimes have an incentive to communicate her private information, truthfully revealing her private information is unlikely to occur all the time. This is because revealing private information to the manager has both a benefit and a cost for the shareholder. On the benefit side, sharing information prior to the manager's disclosure can allow the manager to better tailor his disclosure strategy to improve the liquidation value and thus increases the shareholder's expected utility. On the cost side, such communication lowers the shareholder's ability to intervene excessively and benefit from a higher stock price. We conjecture that the above trade-off can sustain some informative communication if the shareholder is sufficiently long-term oriented. When the shareholder is extremely short-term oriented, her incentive to communicate a higher value to inflate the stock price may always dominate so that informative communication cannot be sustained.

Another way to reduce inefficient intervention is to allow the shareholder to delegate the decision to the manager. Existing theoretical studies on the allocation of control between the manager and shareholders have provided insights that support the control residing with either one of the two parties.[13] In our setting, the short-term shareholder controls the decision and determines which strategy will be implemented by the firm. Harris and Raviv (2010) finds that it might still be optimal for a non-value-maximizing shareholder to control the decision when the benefit of using her private information outweighs the cost of her incentive problem. Consistent with this theory, Cohn et al. (2016) shows that an increase in shareholder control can generally benefit shareholders.

[13]For instance, while Bebchuk (2005) argues that increasing shareholder power can reduce managers' entrenchment issue, Cohn and Rajan (2013) shows that limiting the manager's discretion can distort managerial decisions.

Appendix

Proof of Lemma 1 The shareholder's net benefits from intervention equal

$$E[U_S(a=1)|\mu,d,a=1] - E[U_S(a=0)|\mu,d,a=0] = \eta E[\mu|d,a=1] + (1-\eta)\mu - E[v|d].$$

In the above expression, $E[\mu|d,a=1]$ and $E[v|d]$ are independent of μ since μ is the shareholder's private information. Hence, net benefits from intervention is increasing in μ. Therefore, if a shareholder with $\mu = \mu^*(d)$ prefers to intervene, then any shareholder with $\mu > \mu^*(d)$ will prefer to intervene. Thus, the intervention strategy will be of a threshold type. The indifference condition that determines the threshold on μ is

$$\eta E[\mu|\mu \geq \mu^*(d)] + (1-\eta)\mu^*(d) - E[v|d] = 0.$$

Rearranging the above equation yields $\mu^*(d) = \frac{2}{2-\eta}E[v|d] - \frac{\eta}{2-\eta}\bar{\mu}$.

Proof of Propositions 1 and 3 We will derive the proof for the more general result with $\gamma \in [0,1]$ as in Proposition 3 and then substitute $\gamma = 0$ to show the result in Proposition 1.

If an informed manager discloses v, his expected utility can be written as

$$E[U_M(v)|v,v] = Pr(\mu \geq \mu^*(v))E[\mu|v,v,a=1] + Pr(\mu < \mu^*(v))v.$$

If the manager does not disclose v, his expected utility can be written as

$$E[U_M(ND)|v,ND] = Pr(\mu \geq \mu^*(ND))E[\mu|ND,a=1] + Pr(\mu < \mu^*(ND))\left(\gamma \cdot E[v|ND] + (1-\gamma)\cdot v\right).$$

The manager discloses v if and only if $E[U_M(v)|v,v] \geq E[U_M(ND)|v,ND]$. Rewriting yields

$$(v - E[v|ND])\left[\lambda(1+\lambda-\gamma)\bar{\mu} + (1+\lambda)(\tfrac{1-\lambda}{2}v + (\gamma - \tfrac{1+\lambda}{2})E[v|ND])\right] > 0. \quad (14)$$

The above inequality is always satisfied when $v > E[v|ND]$. Hence, one disclosure threshold (or indifference point) is always given by $v = E[v|ND]$. In addition, the above inequality is also satisfied if $v < E[v|ND]$ and

$$\lambda(1+\lambda-\gamma)\bar{\mu} + (1+\lambda)(\tfrac{1-\lambda}{2}v + (\gamma - \tfrac{1+\lambda}{2})E[v|ND]) < 0.$$

If the above inequality is not satisfied for any $E[v|ND] > v > \underline{v}$, then there exists an upper-tailed disclosure equilibrium. The disclosure threshold v'_γ is defined by

$$v'_\gamma = E[v|ND] = \frac{pPr(v<v'_\gamma)}{pPr(v<v'_\gamma)+1-p}E[v|v<v'_\gamma] + \frac{1-p}{pPr(v<v'_\gamma)+1-p}E[v].$$

Rewriting yields

$$\frac{p}{1-p}(v'_\gamma - \underline{v})^2 = 2(\bar{v}-\underline{v})(\frac{\bar{v}+\underline{v}}{2} - v'_\gamma). \tag{15}$$

Note that in this case, the disclosure threshold v'_γ is independent of γ and λ.

If inequality (14) is satisfied for some $E[v|ND] > v > \underline{v}$, then there exists a two-tailed disclosure equilibrium with an intermediate nondisclosure region, where the upper disclosure threshold is defined by $v_2^\gamma = E[v|ND]$, and the lower disclosure threshold v_1^γ is defined by

$$\lambda(1+\lambda-\gamma)\bar{\mu} + (1+\lambda)(\frac{1-\lambda}{2}v_1^\gamma + (\gamma - \frac{1+\lambda}{2})E[v|ND]) = 0, \tag{16}$$

where

$$v_2^\gamma = E[v|ND] = \frac{pPr(v_1^\gamma<v<v_2^\gamma)}{pPr(v_1^\gamma<v<v_2^\gamma)+1-p}E[v|v_1^\gamma < v < v_2^\gamma] + \frac{1-p}{pPr(v_1^\gamma<v<v_2^\gamma)+1-p}E[v]. \tag{17}$$

Given $E[v|ND] > v_1^\gamma > \underline{v}$, it is straightforward to show that inequality (14) holds for all $v \in [\underline{v}, v_1^\gamma]$, that is, an informed manager with $v \in [\underline{v}, v_1^\gamma]$ will disclose v. We now derive the condition under which the solution of v_1^γ from equation (16) satisfies $E[v|ND] > v_1^\gamma > \underline{v}$.

First of all, any solution to equation (16) satisfies $v_1^\gamma < E[v|ND]$, because the L.H.S. of equation (16) increases with v_1^γ, and for $v_1^\gamma = E[v|ND]$, the L.H.S. of equation (16) can be simplified to $\lambda(1+\lambda-\gamma)\bar{\mu} - (1+\lambda)(\lambda-\gamma)E[v|ND] \geq 0$.

Second, we prove that the solution of equation (16) satisfies $v_1^\gamma > \underline{v}$ when λ and γ are sufficiently small. Note that when $\gamma = 0$ and $\lambda = 0$, we get $v_1^\gamma = E[v|ND]$ as the solution to equation (16). This characterizes the full disclosure equilibrium as $v_1^\gamma = E[v|ND] = v_2^\gamma$.

When $\gamma = 1$, the L.H.S. of equation (16) becomes $\lambda^2\bar{\mu} + \frac{1-\lambda^2}{2}(v_1^\gamma + E[v|ND]) > 0$. In this case, for all $\lambda \in [0,1]$, equation (16) has no solution satisfying $v_1^\gamma > \underline{v}$, as the solution is negative. Similarly, if we substitute $\lambda = 1$, the L.H.S. of equation (16) becomes $(2-\gamma)\bar{\mu} - 2(1-\gamma)E[v|ND] > 0$. Again, for all $\gamma \in [0,1]$, equation (16) has no solution satisfying $v_1^\gamma > \underline{v}$.

Given $E[v|ND]$, taking the derivative of the L.H.S. of equation (16) w.r.t. γ yields (1 +

$\lambda)E[v|ND] - \lambda\bar{\mu} > 0$. Hence, the L.H.S. is increasing in γ. Similarly, taking the derivative of equation (16) w.r.t. λ, we get $(1+2\lambda-\gamma)\bar{\mu} - (1+\lambda-\gamma)E[v|ND] - \lambda v_1^\gamma > 0$, that is, the L.H.S. is increasing in λ.

Therefore, when $\gamma = 0$ and $\lambda = 0$, the solution to equation (16) is $v_1^\gamma = E[v|ND]$. When either $\gamma = 1$ or $\lambda = 1$, solution to equation (16) is $v_1^\gamma < 0$. Since equation (16) increases with v_1^γ, λ and γ, we know that there exist thresholds λ' and γ' such that solution to equation (16) satisfies $v_1^\gamma > \underline{v}$.

Simplifying equation (17) defines the relation between the two disclosure thresholds

$$p(v_2^\gamma - v_1^\gamma)^2 + 2(1-p)(\bar{v} - \underline{v})v_2^\gamma - (1-p)(\bar{v}^2 - \underline{v}^2) = 0.$$

Rewriting the above equation gives us

$$\frac{p}{1-p}(v_2^\gamma - v_1^\gamma)^2 = 2(\bar{v} - \underline{v})(\frac{\bar{v}+\underline{v}}{2} - v_2^\gamma). \tag{18}$$

Since the L.H.S. of the above expression is positive, this suggests that in equilibrium, $v_2^\gamma < \frac{\bar{v}+\underline{v}}{2}$. This completes the proof of Proposition 3.

Now we will derive the disclosure equilibrium for the special case of a long-term manager (i.e., $\gamma = 0$) discussed in Proposition 1. The proof is similar as before. Given $\gamma = 0$, if inequality (14) is not satisfied for all $E[v|ND] > v > \underline{v}$, then there exists an upper-tailed disclosure equilibrium, where the disclosure threshold v' equals

$$v^{'} = E[v|ND] = \frac{pPr(v<v^{'})}{pPr(v<v^{'})+1-p}E[v|v<v^{'}] + \frac{1-p}{pPr(v<v^{'})+1-p}E[v].$$

Note that $v' = v_\gamma^{'}$ holds such that equation (15) also defines v'. This is because in the upper-tailed disclosure equilibrium, the disclosure threshold is independent of γ and λ.

Given $\gamma = 0$, if inequality (14) is satisfied for some $E[v|ND] > v > \underline{v}$, then there exists a two-tailed disclosure equilibrium, where the upper disclosure threshold is defined by $v_2 = E[v|ND]$, and the lower disclosure threshold v_1 is defined by

$$\lambda\bar{\mu} + \frac{1-\lambda}{2}v_1 - \frac{1+\lambda}{2}E[v|ND] = 0. \tag{19}$$

For a given $E[v|ND]$ and v_1, taking the derivative of the L.H.S of the above equation w.r.t. λ yields $\bar{\mu} - \frac{1}{2}v_1 - \frac{1}{2}E[v|ND] > 0$. Therefore, the L.H.S. increases with λ. When $\lambda = 0$, solution to equation (19) equals $v_1 = E[v|ND] = v_2$. The disclosure thresholds coincide, suggesting that any manager who is informed will disclose due to the absence of any frictions. As the L.H.S. of equation (19) increases with both v_1 and λ, there exists a threshold λ^* such that when $\lambda \in (0, \lambda^*)$, solution to equation (19) satisfies $E[v|ND] > v > \underline{v}$. For high values of λ, solution to equation (19) does not satisfy $E[v|ND] > v > \underline{v}$ such that we have an upper-tailed disclosure equilibrium. This completes the proof of Proposition 1.

Proof of Proposition 2 When the manager only cares about the liquidation value (i.e. $\gamma = 0$), the existence of a nondisclosure region directly implies that nondisclosure in these regions yields a higher expected liquidation value than disclosure. We now prove that the nondisclosure region exists for $\lambda \in (0, 1]$. When $\gamma = 0$ and $\lambda \in (0, \lambda^*]$ such that a two-tailed disclosure strategy arises, we can replace $v_2 = E[v|ND]$ into equation (19) and rearrange it as

$$v_2 - v_1 = \frac{2\lambda}{1-\lambda}(\bar{\mu} - v_2),$$

which is always positive. Therefore, nondisclosure leads to a higher expected liquidation value than disclosure for $v \in (v_1, v_2)$.

Similarly, when $\gamma = 0$ and $\lambda \in (\lambda^*, 1]$ such that an upper-tailed disclosure equilibrium exists, we can rearrange equation (15) as

$$v' - \underline{v} = \sqrt{\frac{1-p}{p}(\bar{v} - \underline{v})(\bar{v} + \underline{v} - 2v')},$$

which is also always positive. This suggests that nondisclosure when $v \in [\underline{v}, v')$ yields a higher expected liquidation value than disclosure.

Proof of Corollary 1 We prove this corollary with $\gamma \in [0, 1]$ so that the implications also hold when the manager is myopic. If the equilibrium is an upper-tailed disclosure equilibrium, then for all $v \in [v', \bar{v}]$, it holds that $v > E[v|ND]$, which also implies that the intervention threshold given disclosure is always higher than the intervention threshold given no disclosure, i.e., $\mu^*(v) > \mu^*(ND)$. Therefore, the probability of intervention for all disclosing firms is lower than the probability of intervention for nondisclosing firms in this case, that is, for all $v \in [v', \bar{v}]$, it holds that

$$Pr(\mu \geq \mu^*(v)) = 1 - \frac{\mu^*(v)}{\bar{\mu}} \geq Pr(\mu \geq \mu^*(ND)) = 1 - \frac{\mu^*(ND)}{\bar{\mu}}.$$

If the equilibrium is a two-tailed disclosure equilibrium, the probability of intervention for a firm that discloses v is equal to

$$Pr(\mu \geq \mu^*(v)) = (1+\lambda)(1 - \frac{v}{\bar{\mu}}).$$

Since the above expression is linear in v, the expected probability of intervention for a disclosing firm is

$$\frac{\int_{\underline{v}}^{v_1^\gamma} Pr(\mu \geq \mu^*(v))dv + \int_{v_2^\gamma}^{\bar{v}} Pr(\mu \geq \mu^*(v))dv}{\int_{\underline{v}}^{v_1^\gamma} dv + \int_{v_2^\gamma}^{\bar{v}} dv} = (1+\lambda)\left(1 - \frac{1}{2\bar{\mu}} \frac{(v_1^\gamma)^2 - \underline{v}^2 + \bar{v}^2 - (v_2^\gamma)^2}{v_1^\gamma - \underline{v} + \bar{v} - v_2^\gamma}\right).$$

The probability of intervention for a firm that does not disclose v is equal to

$$Pr(\mu \geq \mu^*(ND)) = (1+\lambda)(1 - \frac{v_2^\gamma}{\bar{\mu}}).$$

The expected probability of intervention for a nondisclosing firm also equals $(1+\lambda)(1 - \frac{v_2^\gamma}{\bar{\mu}})$, because all nondisclosing firms face the same probability of intervention.

Then one can derive that the condition for a nondisclosing firm to be more likely to face intervention than a disclosing firm is

$$v_2^\gamma < \frac{1}{2} \frac{(v_1^\gamma)^2 - \underline{v}^2 + \bar{v}^2 - (v_2^\gamma)^2}{v_1 - \underline{v} + \bar{v} - v_2}.$$

Simplifying the above inequality yields

$$(\bar{v} - \underline{v})(2v_2^\gamma - (\bar{v} + \underline{v})) < (v_2^\gamma - v_1^\gamma)^2. \tag{20}$$

Equation (20) is always satisfied, because its R.H.S. is always greater than zero, whereas its L.H.S. is always less than zero.

Proof of Corollary 2 We prove this corollary with $\gamma \in [0, 1]$ so that the implication also holds when the manager is myopic. For the upper-tailed disclosure equilibrium, the likelihood of disclosure is independent of $\bar{\mu}$, as the disclosure threshold is independent of $\bar{\mu}$. For the two-tailed disclosure equilibrium, we will show that the likelihood of nondisclosure given by $1 - p + p\frac{v_2 - v_1}{\bar{v} - \underline{v}}$ is increasing in $\bar{\mu}$.

Denote $\Gamma = \lambda(1 + \lambda - \gamma)\bar{\mu} + (1+\lambda)((\gamma - \lambda)v_2^\gamma - \frac{1-\lambda}{2}(v_2^\gamma - v_1^\gamma))$. $\Gamma = 0$ denotes the relation between the two disclosure thresholds v_1^γ and v_2^γ. Using the Implicit Function Theorem, we have

$$\frac{dv_2^\gamma}{d\bar{\mu}} = \frac{\lambda(1+\lambda-\gamma)}{(1+\lambda)(\lambda-\gamma-\frac{1-\lambda}{2}(\frac{dv_1^\gamma}{dv_2^\gamma}-1))}. \tag{21}$$

Taking partial derivative of v_2^γ w.r.t. v_1^γ using equation (18) gives the following

$$\frac{dv_1^\gamma}{dv_2^\gamma} = 1 + \frac{1-p}{p}\frac{\bar{v}-\underline{v}}{v_2^\gamma - v_1^\gamma}.$$

Substituting the above expression into equation (21) yields

$$\frac{dv_2^\gamma}{d\bar{\mu}} = \frac{\lambda(1+\lambda-\gamma)}{(1+\lambda)(\lambda-\gamma-\frac{1-\lambda}{2}\frac{1-p}{p}\frac{\bar{v}-\underline{v}}{v_2^\gamma-v_1^\gamma})}.$$

It implies that v_2^γ is decreasing in $\bar{\mu}$ if $\frac{2(\lambda-\gamma)}{1-\lambda} < \frac{1-p}{p}\frac{\bar{v}-\underline{v}}{v_2^\gamma-v_1^\gamma}$. Rewriting $\frac{1-p}{p}\frac{\bar{v}-\underline{v}}{v_2^\gamma-v_1^\gamma}$ with $\frac{v_2^\gamma-v_1^\gamma}{\bar{v}+\underline{v}-2v_2^\gamma}$, one can show that v_2^γ is decreasing in $\bar{\mu}$ if $2(\lambda-\gamma)(\bar{v}+\underline{v}-2v_2^\gamma) < (1-\lambda)(v_2^\gamma - v_1^\gamma)$. Using equation (16), we can write $(1-\lambda)(v_2^\gamma - v_1^\gamma)$ as $\frac{2}{1+\lambda}(\lambda(1+\lambda-\gamma)(\bar{\mu}-v_2^\gamma)+\gamma v_2^\gamma)$ and hence, v_2^γ is decreasing in $\bar{\mu}$ if

$$(1+\lambda)(\lambda-\gamma)(\bar{v}+\underline{v}-2v_2^\gamma) < \lambda(1+\lambda-\gamma)(\bar{\mu}-v_2^\gamma)+\gamma v_2^\gamma$$

Rearranging the terms above allows us to write the condition as

$$\gamma(v_2^\gamma - \bar{v} - \underline{v}) < \lambda(1+\lambda-\gamma)(\bar{\mu}+v_2^\gamma-\bar{v}-\underline{v})$$

which always holds. Hence, v_2^γ is decreasing in $\bar{\mu}$. It also indicates that $v_2^\gamma - v_1^\gamma$ is increasing in $\bar{\mu}$ and thus, likelihood of disclosure is decreasing in $\bar{\mu}$.

Proof of Corollary 3 We prove this corollary with $\gamma \in [0,1]$ so that the implication also holds when the manager is myopic. A firm's expected probability of intervention equals

$$\begin{aligned} &Pr(d=v)E[(1+\lambda)(1-\tfrac{v}{\bar{\mu}})|d=v] + Pr(d=ND)(1+\lambda)(1-\tfrac{E[v|ND]}{\bar{\mu}}) \\ =&(1+\lambda)\left(1-\tfrac{E[v]}{\bar{\mu}}\right). \end{aligned} \tag{22}$$

It is easy to see that the above expression is increasing in λ.

Proof of Corollary 4 We prove this corollary with $\gamma \in [0,1]$ so that the implication also holds when the manager is myopic. For the upper-tailed disclosure equilibrium, it is straightforward to show that the likelihood of disclosure is independent of λ since the disclosure threshold v'_γ is independent of λ.

In the two-tailed disclosure equilibrium, applying the implicit function theorem to equation (18), one can show that

$$\frac{dv_1^\gamma}{dv_2^\gamma} = 1 + \frac{1-p}{p}\frac{\bar{v}-\underline{v}}{v_2^\gamma - v_1^\gamma} > 1, \tag{23}$$

which suggests that the lower and upper disclosure thresholds will move in the same direction. Replacing $v_2^\gamma = E[v|ND]$ into equation (16), we get

$$\lambda(1+\lambda-\gamma)\bar{\mu} + (1+\lambda)(\frac{1-\lambda}{2}v_1^\gamma + (\gamma - \frac{1+\lambda}{2})v_2^\gamma) = 0. \tag{24}$$

If we take the derivative of equation (24) w.r.t. λ, we have

$$\frac{1-\lambda^2}{2}\frac{dv_1^\gamma}{d\lambda} - (1+\lambda)(\frac{1+\lambda}{2} - \gamma)\frac{dv_2^\gamma}{d\lambda} = \lambda v_1^\gamma + (1+\lambda-\gamma)v_2^\gamma - (1+2\lambda-\gamma)\bar{\mu}.$$

Using $\frac{dv_1^\gamma}{d\lambda} = \frac{dv_1^\gamma}{dv_2^\gamma}\frac{dv_2^\gamma}{d\lambda}$, we can rewrite the above expression as

$$(1+\lambda)(\gamma - \lambda + \frac{1-\lambda}{2}\frac{1-p}{p}\frac{\bar{v}-\underline{v}}{\gamma - v_1^\gamma})\frac{dv_2^\gamma}{d\lambda} = \lambda v_1^\gamma + (1+\lambda-\gamma)v_2^\gamma - (1+2\lambda-\gamma)\bar{\mu}. \tag{25}$$

Replacing $\frac{1-p}{p}\frac{\bar{v}-\underline{v}}{v_2^\gamma - v_1^\gamma}$ with $\frac{v_2^\gamma - v_1^\gamma}{\bar{v}+\underline{v}-2v_2^\gamma}$ and replacing $\frac{1-\lambda}{2}(v_2^\gamma - v_1^\gamma)$ with $\frac{\lambda}{1+\lambda}(1+\lambda-\gamma)\bar{\mu} - (\lambda-\gamma)v_2^\gamma$, we can rewrite equation (25) as

$$\frac{1}{\bar{v}+\underline{v}-2v_2^\gamma}((1+\lambda)(\gamma-\lambda)(\bar{v}+\underline{v}-v_2^\gamma) + \lambda(1+\lambda-\gamma)\bar{\mu})\frac{dv_2^\gamma}{d\lambda} = \lambda v_1^\gamma + (1+\lambda-\gamma)v_2^\gamma - (1+2\lambda-\gamma)\bar{\mu}.$$

First, consider the R.H.S. of the above equation. Note that $\lambda v_1^\gamma + (1+\lambda-\gamma)v_2^\gamma - (1+2\lambda-\gamma)\bar{\mu} < (1+2\lambda-\gamma)(v_2^\gamma - \bar{\mu}) < 0$. On the L.H.S. of the above equation, we have already shown that $v_2^\gamma < \frac{\bar{v}+\underline{v}}{2}$. Now $(1+\lambda)(\gamma-\lambda)(\bar{v}+\underline{v}-v_2^\gamma) + \lambda(1+\lambda-\gamma)\bar{\mu} > 0$ if $\gamma > \lambda$. When $\gamma < \lambda$, then $(1+\lambda)(\gamma-\lambda)(\bar{v}+\underline{v}-v_2^\gamma) + \lambda(1+\lambda-\gamma)\bar{\mu} > (\lambda(1+\lambda-\gamma) - (1+\lambda)(\lambda-\gamma))\bar{\mu} > \gamma\bar{\mu} > 0$. Hence, since the R.H.S. of the above equation is negative whereas the co-efficient on $\frac{dv_2^\gamma}{d\lambda}$ is positive, it is clear that $\frac{dv_2^\gamma}{d\lambda} < 0$.

Together with the result in equation (23) that $\frac{dv_1^\gamma}{dv_2^\gamma} > 1$, i.e., v_1^γ moves in the same direction as v_2^γ but changes at a faster rate than v_2^γ, it is clear that $\frac{d(v_2^\gamma - v_1^\gamma)}{d\lambda} > 0$. We thus prove that the likelihood of disclosure decreases in λ in the two-tailed disclosure equilibrium.

Proof of Corollary 5 Based on the probability of intervention expression in equation (22), it is easy to see that the probability of intervention is independent of p.

Proof of Corollary 6 As the market reaction to intervention $P(d, a = 1) - P(d)$ is for a given d, the proof applies to all $\gamma \in [0, 1]$. The market reaction to intervention given v equals

$$P(v, a = 1) - P(v) = Pr(\mu < \mu^*(v))(E[\mu|\mu \geq \mu^*(v)] - v) = (1 - \lambda)(\bar{\mu} - v)\tfrac{(1+\lambda)v-\lambda\bar{\mu}}{\bar{\mu}}. \quad (26)$$

and the market reaction to intervention given no disclosure equals

$$P(ND, a = 1) - P(ND) = (1 - \lambda)(\bar{\mu} - E[v|ND])\tfrac{(1+\lambda)E[v|ND]-\lambda\bar{\mu}}{\bar{\mu}}. \quad (27)$$

Taking expectation of v in the disclosure region, we can show that the market reaction to intervention given disclosure is greater than given no disclosure if

$$\tfrac{1+2\lambda}{1+\lambda}\bar{\mu}(E[v|v \notin ND] - E[v|ND]) > E[v^2|v \notin ND] - E[v|ND]^2. \quad (28)$$

First, note that when λ is sufficiently high such that the disclosure strategy is upper-tailed, using that $E[v|v \notin ND] = \frac{v'_\gamma+\bar{v}}{2}$, $E[v^2|v \notin ND] = \frac{\bar{v}^2+\bar{v}v'_\gamma+v'^2_\gamma}{3}$ and $E[v|ND] = v'_\gamma$, the above inequality can be rewritten as

$$\tfrac{1+2\lambda}{1+\lambda}\bar{\mu} > \tfrac{2}{3}\bar{v} + \tfrac{4}{3}v'_\gamma.$$

When $\lambda = 1$, the above inequality is always satisfied when $\bar{v}$ approaches $\frac{\bar{\mu}}{2}$. When $\lambda = 0$, the above inequality is never satisfied. As the L.H.S. of the inequality is increasing in λ and the R.H.S. is independent of λ, by continuity we know that there exists a threshold λ_2 such that the above inequality is satisfied for $\lambda \in [\lambda_2, 1]$.

When λ is sufficiently low and γ is sufficiently low such that the disclosure strategy is two-tailed, using that $E[v|v \notin ND] = \frac{\bar{v}^2-v_2^{\gamma 2}+v_1^{\gamma 2}-\underline{v}^2}{2(\bar{v}-v_2^\gamma+v_1^\gamma-\underline{v})}$, $E[v^2|v \notin ND] = \frac{\bar{v}^3-v_2^{\gamma 3}+v_1^{\gamma 3}-\underline{v}^3}{3(\bar{v}-v_2^\gamma+v_1^\gamma-\underline{v})}$ and $E[v|ND] = v_2^\gamma$, the condition (28) can be written as

$$\tfrac{1+2\lambda}{1+\lambda}\bar{\mu}(\bar{v} - \underline{v})(E[v] - v_2^\gamma) > (\bar{v} - \underline{v})(\tfrac{\bar{v}^2+\bar{v}\underline{v}+\underline{v}^2}{3} - (v_2^\gamma)^2) + \tfrac{2(v_2^\gamma)^3+(v_1^\gamma)^3-3v_1^\gamma(v_2^\gamma)^2}{3}$$

Both the L.H.S. and the R.H.S. of the above inequality are increasing in λ and the $L.H.S. < R.H.S.$ at $\lambda = 0$. Hence, by continuity, there exists a threshold λ_1 such that for $\lambda \in [0, \lambda_1]$ the above inequality cannot hold.

Proof of Corollary 7 When the intervention is efficient, that is, $\mu > v$, for a given disclosure decision d, the expected long-term stock return equals

$$E[\mu|\mu > v] - P(d, a = 1) = \frac{E[v|d]+\bar{\mu}}{2} - \frac{(1+\lambda)E[v|d]+(1-\lambda)\bar{\mu}}{2} = \frac{\lambda(\bar{\mu}-E[v|d])}{2} > 0.$$

Since the expected current firm value given disclosure is higher than given no disclosure, that is, $E[v|v \notin ND] > E[v|ND]$, it is clear that the expected long-term stock return is higher for nondisclosing firms than for disclosing firms when the intervention is efficient.

When the intervention is inefficient, that is, $v \geq \mu \geq \mu^*(d)$, for a given disclosure decision d, the expected long-term stock return is

$$E[\mu|v \geq \mu \geq \mu^*(d)] - P(d, a = 1) = \frac{(1+\lambda)E[v|d]-\lambda\bar{\mu}+E[v|d]}{2} - \frac{(1+\lambda)E[v|d]+(1-\lambda)\bar{\mu}}{2} = -\frac{(\bar{\mu}-E[v|d])}{2} < 0.$$

Again, since $E[v|v \notin ND] > E[v|ND]$, it is clear that the expected long-term stock return is more negative for nondisclosing firms than for disclosing firms when the intervention is inefficient.

Proof of Corollary 8 For the upper-tailed disclosure equilibrium, it is straightforward to show that the likelihood of disclosure is independent of γ since the disclosure threshold v'_γ is independent of γ. For the two-tailed disclosure equilibrium, to show how the disclosure likelihood changes with γ, we first take the derivative of equation (24) w.r.t. γ, which gives

$$\frac{1-\lambda^2}{2}\frac{dv_1^\gamma}{d\gamma} - (1+\lambda)(\frac{1+\lambda}{2} - \gamma)\frac{dv_2^\gamma}{d\gamma} = \lambda\bar{\mu} - (1+\lambda)v_2^\gamma.$$

Using $\frac{dv_1^\gamma}{d\gamma} = \frac{dv_1^\gamma}{dv_2^\gamma}\frac{dv_2^\gamma}{d\gamma}$, we can rewrite the above expression as

$$(1+\lambda)(\gamma - \lambda + \frac{1-\lambda}{2}\frac{1-p}{p}\frac{\bar{v}-\underline{v}}{v_2^\gamma - v_1^\gamma})\frac{dv_2^\gamma}{d\gamma} = \lambda\bar{\mu} - (1+\lambda)v_2^\gamma.$$

We have already shown in the proof of Corollary 4 that $\gamma - \lambda + \frac{1-\lambda}{2}\frac{1-p}{p}\frac{\bar{v}-\underline{v}}{v_2^\gamma - v_1^\gamma} > 0$. Hence, the coefficient on $\frac{dv_2^\gamma}{d\gamma}$ is positive. On the other hand, by Assumption 1, we have $\lambda\bar{\mu} < (1+\lambda)v_2^\gamma$ suggesting that the R.H.S. of the above equation is negative. Hence, it is clear that $\frac{dv_2^\gamma}{d\gamma} < 0$. Together with the result in equation (23) that $\frac{dv_1^\gamma}{dv_2^\gamma} > 1$, i.e., v_1^γ moves in the same direction as v_2^γ but changes at a faster rate than v_2^γ, one can show that $\frac{d(v_2^\gamma - v_1^\gamma)}{d\gamma} > 0$, suggesting that the likelihood of disclosure decreases as γ increases when the disclosure equilibrium is two-tailed.

Proof of Corollary 9 Based on the probability of intervention expression in equation (22), it is easy to see that the probability of intervention is independent of γ.

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