Effects of corporate governance and managerial optimism on accounting conservatism and manipulation*

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Abstract

We develop a model to analyze how corporate governance and managerial optimism affect firms' financial reporting choices, and managers' incentives to manipulate accounting reports. Conservative accounting is advantageous because it enables boards to act on bad news and block investment ideas that are unattractive to shareholders but attractive to management. This feature of conservatism, however, causes managers to manipulate the system in an attempt to distort boards' investment decisions. Effective board oversight curtails managers' ability to manipulate, reducing the negative side effects of conservatism. Our model predicts that stronger governance, or weaker optimism, leads to greater accounting conservatism, greater manipulation, and greater investment efficiency.

Keywords: Corporate governance, conservatism, manipulation, managerial optimism, investment decisions

1 Introduction

In the wake of recent accounting scandals around the world, commentators and regulators have called for stronger governance and board oversight to curb accounting manipulation and fraud. These calls have led to boards with more outside directors and greater financial expertise.[1] Recent empirical evidence suggests that stronger governance and board oversight is associated with more conservative accounting (e.g., Lobo and Zhou 2006; Ahmed and Duellman 2007; Ramalingegowda and Yu 2012; García Lara et al. 2009).[2] We offer a model that provides a rationale for this observation and generates predictions that relate corporate governance to the optimal choice of conservatism, the magnitude of accounting manipulation, reporting quality, and the efficiency of investment decisions.

Our model is based on the idea that conservative accounting enables the board to block investment ideas that are unattractive to shareholders but attractive to management. The fact that conservatism allows the board to act on bad news encourages the manager to manipulate the accounting system to mislead the board and distort its decisions. Stronger board oversight curtails managers' manipulation ability, and thereby reduces the negative side effects associated with conservative accounting. Consequently, we predict that stronger governance is associated with more conservative accounting. Surprisingly, better governance increases the level of manipulation in our setting. While better governance has a direct effect that mitigates manipulation, it also increases conservatism which, in turn, encourages manipulation.

[1] For example, the New York Stock Exchange listed company manual requires an audit committee comprised of "financially literate" independent board members and places restrictions on the number of audit committees on which those members serve. The manual also prescribes reporting oversight responsibilities beyond those required by the Securities and Exchange Commission in, for example, Rule 10-3A.

[2] In contrast, Larcker et al. (2007) find no relation between governance and conservatism.

We consider a model in which the board faces an investment choice that can be viewed as expanding the firm into a new market or product. The accounting system generates information that guides the board's decision. We follow the FASB's (1980, ¶95) characterization of conservatism: "if two estimates of amounts to be received or paid in the future are about equally likely, conservatism dictates using the less optimistic estimate." In particular, a signal may convey no information about the profitability of expansion, and we model conservative accounting as the extent to which such a signal generates an unfavorable, rather than favorable, accounting report. However, conservatism does not interfere with how the accounting system represents informative signals, which can be either favorable or unfavorable. *Ceteris paribus*, directors prefer conservative accounting because it maps uninformative signals to unfavorable reports, allowing them to block expansion when no new information is available. In this setting, accounting conservatism supports the board's preference for conservative expansion decisions. The board can influence the conservatism of the company's accounting via the audit committee's oversight of financial reporting, accounting policies, and internal controls.

In contrast to the board, the manager wishes to pursue expansion even in the absence of additional information. This conflict of interest can arise from, for example, private benefits that are proportional to the gross payoff from expansion (Stein 1997; Scharfstein and Stein 2000), managerial optimism (e.g., Malmendier and Tate 2005, 2008; Graham et al. 2013), or stock option holdings.[3] Because conservatism maps uninformative signals to unfavorable reports that lead the board to reject expansion,

[3]Malmendier and Tate (2005) show that managerial optimism can lead to overinvestment even when the manager intends to maximize shareholder value. Harris and Raviv (2008) develop a cheap talk model that assumes that managers prefer overinvestment, and show how this affects communication with the board.

conservative accounting encourages managers to manipulate the accounting system to distort the board's decisions.

Coupling these two forces determines the optimal (interior) level of conservatism. On the one hand, an increase in conservatism helps the board to block undesirable expansions, as long as the manager fails to manipulate the system. On the other hand, increased conservatism distorts investment decisions because it increases incentives for manipulation. As governance becomes more effective, the manager's ability to manipulate declines, and the latter (indirect) effect becomes less important relative to the former (direct) effect. As a result, firms with better governance find it optimal to use more conservative accounting systems.[4]

In addition, our model provides insights into the effects of governance on accounting manipulation and investment efficiency. All else equal, stronger governance leads to less manipulation, consistent with conventional views. However, the fact that governance directly curbs manipulation renders it optimal to choose more conservative accounting, which encourages manipulation. This indirect effect on manipulation via conservatism dominates the direct effect, such that improvements in governance quality lead to more accounting manipulation. Nevertheless, better governance improves the quality of reporting and the firm's investment decisions. Our model therefore predicts that stronger corporate governance is associated with greater accounting conservatism, manipulation, reporting quality, and investment efficiency.

We also contribute to recent research on the impact of managerial optimism on accounting conservatism and manipulation. Ahmed and Duellman (2013) find evidence

[4]For example, Goh and Li (2011) provide evidence that internal controls facilitate conservative accounting, while Krishnan and Visvanathan (2008) find evidence that financial experts on the board of directors facilitate firm's use of conservative accounting. Conversely, Chung and Wynn (2008) find evidence that higher D&O coverage, which reduces managers' personal costs of manipulation, is associated with less conservative accounting.

that firms run by optimistic managers exhibit less conservative accounting, which they interpret as due to optimistic managers overvaluing net assets. Our model provides an alterative explanation for their evidence. A manager who is overly optimistic about the performance of expansion has a stronger incentive to distort the accounting system (consistent with Schrand and Zechman 2012) to increase the likelihood that the board approves expansion. While the board cannot control the manager's optimism, it can control the manipulation incentive that stems from conservative accounting. The board optimally reduces accounting conservatism to mitigate the optimistic manager's incentive to manipulate, yielding a negative relation between conservatism and manager optimism. In equilibrium, the indirect effect via changes in the level of conservatism dominates, and greater managerial optimism leads to *less* manipulation. In addition, we predict that managerial optimism leads to lower reporting quality and investment efficiency.

In addition to the predictions mentioned above, we predict a negative association between the value of the firm's growth opportunities and accounting conservatism. The smaller the *ex ante* value of the firm's expansion opportunities, the more the board prefers to map uninformative signals to bad reports. Because manipulation increases with conservatism, we also predict a negative link between growth opportunities and manipulation. This is consistent with Givoly et al.'s (2007) finding of a negative relation between market-to-book ratios and Basu's (1997) conservatism measure; however, Roychowdhury and Watts (2007) provide evidence that measurement problems account for some of the observed negative relation.

Our model suggests that the magnitude of manipulation does not always proxy for reporting quality (measured as the report's ability to facilitate investment decisions). On the one hand, as discussed earlier, stronger governance leads to greater investment efficiency, but also leads to more conservative accounting, which induces more manipulation. Governance can therefore induce a positive relation between manipulation and reporting quality. On the other hand, another driver of reporting quality is the likelihood of producing an informative signal. A more informative accounting system reduces the manager's incentives to manipulate and increases investment efficiency, leading to a negative association between manipulation and reporting quality.

Prior studies develop settings where conservatism reduces the incentives for manipulation, consistent with the arguments in Watts (2003a). In Chen et al. (2007), conservatism lowers manipulation incentives by reducing the difference in share prices after favorable and unfavorable accounting reports. In Gao (2013), conservatism reduces the incentives for manipulation by increasing the scrutiny applied to favorable reports. In contrast to these studies, Göx and Wagenhofer (2009) predict that the ability to manipulate reports leads to more conservative accounting, in the sense of stricter thresholds for impairment. Our study differs from these by showing a setting where conservative accounting leads to more manipulation, and the manager's ability to manipulate renders the optimal accounting system less conservative.[5]

In a concurrent study, Bertomeu et al. (2013) show that conservative accounting can lead to greater manipulation in a setting in which accounting reports are used to evaluate managerial performance. There, the board designs an accounting system to induce productive effort at the lowest possible compensation cost. Bertomeu et al.'s (2013) results show that contracts can create, rather than eliminate, forces such that conservative accounting leads to manipulation. In contrast, we abstract from optimal contracting, and consider the usefulness of accounting reports for project selection

[5] Several studies examine accounting conservatism in debt contracting context where there is no conflict between managers and shareholders, and there is no earnings manipulation (e.g., Gigler et al. 2009; Caskey and Hughes 2012; Li 2013).

decisions in an environment in which the board and the manager have conflicting investment interests and the manager manipulates the report to distort the decision.

Gao and Wagenhofer (2012) also offer a novel explanation for the positive link between governance and conservatism. In their model, the board's task is to replace untalented executives. The board can base its decision on either an accounting report (which imprecisely signals talent), or a perfect signal obtained from a costly monitoring action. If the board has a low monitoring cost, which represents high governance quality, it optimally chooses a conservative accounting system. The conservative accounting system maximizes the information content of the good report, and the board only monitors after a bad report. If the board has a high monitoring cost, it chooses an aggressive accounting system that maximizes the information content of a bad report. With aggressive accounting, the board fires the manager after a bad report and does not require a corroborating signal from monitoring. We also predict a positive relation between governance and conservatism, but for different reasons. In addition, our model sheds light on the impact of governance and managerial optimism on the optimal choice of conservatism, accounting manipulation, reporting quality, and investment efficiency (firm value).

The next section develops our model. Section 3 derives the manager's reporting choice and Section 4 derives the shareholders' accounting choice, taking into account how it impacts the manager's behavior. Section 5 analyzes how equilibrium choices vary with the model's exogenous parameters and Section 6 provides empirical predictions in terms of observable variables. Section 7 concludes. Unless otherwise stated, all proofs are in Appendix A.

2 Model

In our setting, a risk-neutral manager runs a firm owned by risk-neutral shareholders who are represented by a benevolent board. The model has times 0, 1, and 2. At Time 0, the board determines the firm's accounting policies. At Time 1, the manager provides a report to the board, who decides whether to expand the firm's operations. The report can be viewed as reflecting the Time 1 results of the firm's operations.

The payoff from expansion depends on the state θ of the world, which is either good or bad, $\theta \in \{\theta_g, \theta_b\}$. In the good (bad) state, the expansion succeeds (fails) with certainty. If successful, the project generates incremental cash flows of $X > 0$, and it generates zero incremental cash flows if it fails. To implement the expansion, shareholders must invest $I > 0$, where $X > I$. We normalize the status quo cash flows, from not expanding the firm, to zero.

The shareholders and the manager may disagree on the *a priori* probability of the good state. The manager's and the shareholders' prior subjective beliefs about the probability of the good state are α_m and α_s, respectively, with $\alpha_s \leq \alpha_m < 1$. The players' beliefs (α_s, α_m) are common knowledge. Allowing the manager to be optimistic enables us to study how managerial optimism affects the optimal design of the accounting system and the extent of manipulation. A large body of empirical and survey evidence supports the notion that individuals, and especially executives and entrepreneurs, can have overly optimistic beliefs about the chances that their investment ideas will succeed (Larwood and Whittaker 1977; Cooper et al. 1988; Malmendier and Tate 2005; Landier and Thesmar 2009; Ben-David et al. 2010; Graham et al. 2013).[6]

[6]See Van den Steen (2010) for a survey of the rapidly growing literature that models players as having different prior beliefs.

We assume that, in the absence of additional information, the shareholders believe the project has a negative net present value, $\alpha_s X - I < 0$. In the context of an accounting report, this can be viewed as representing a low-growth industry where only unexpectedly high earnings would indicate profitable growth opportunities. In a capital budgeting context, this could reflect risky industries, such as pharmaceuticals, where the typical project is likely to fail and it only pays to pursue projects after receiving some preliminary news of their profitability. The assumption of negative *ex ante* net present value (NPV) creates a natural demand for conservative accounting, as we explain later in this section.[7]

Figure 1 provides a diagram of the accounting system. The firm's information system produces an unobservable signal, $S \in \{S_g, S_b\}$. With probability p, the signal is perfectly informative of the state in the sense that $S = S_i$ if $\theta = \theta_i$, for $i \in \{g, b\}$. With probability $(1-p)$, the signal is independent of the state and thus uninformative. We employ a notion of conservatism as it pertains to the treatment of uninformative signals, which differs from much of the prior analytical work on conservatism.[8] Uninformative signals appear as bad (S_b) with probability c and good (S_g) with probability $(1 - c)$, where the parameter c captures the level of conservatism. The larger the level of conservatism, the higher is the probability that uninformative signals are classified as bad. Thus, if the state is good, the accounting system generates a good signal with probability $p + (1 - p)(1 - c)$ and a bad signal with probability $(1 - p)c$. Conversely,

[7] This is related to Gigler et al. (2009), who analyze conservative accounting in a setting with debt contracts and an interim abandonment decision. They predict that conservative accounting has value only when the *ex ante* belief is that the project should be abandoned at the interim stage. Also see a similar prediction in Lu and Sapra (2009), where clients prefer conservative auditors when they have relatively poor *ex ante* payoffs from investment.

[8] Our conservatism parameter c satisfies Gigler et al.'s (2009, see conditions A1-A4) notion of unconditional conservatism. Prior work typically treats conservatism as unfavorable reports arising from favorable states, as opposed to from uninformative signals (e.g., Gigler and Hemmer 2001; Bagnoli and Watts 2005; Chen et al. 2007; Li 2013).

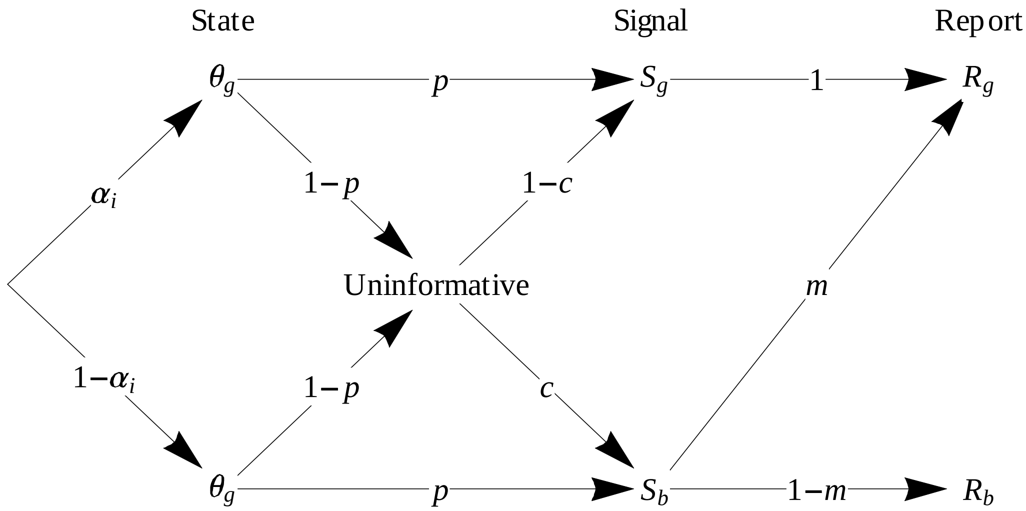

Figure 1: Signal structure. The shareholders' (manager's) prior belief of a good state is α_s (α_m). The signal is informative with probability p and the accounting system reports uninformative signals as bad with probability c. The manager successfully manipulates a bad signal with probability m.

if the state is bad, the signal is good with probability $(1-p)(1-c)$ and bad with probability $p+(1-p)c$. The larger the parameter p, the more informative the signal is for the expansion decision. In the extreme of $p=1$, the signal S perfectly reveals the state θ and conservatism c is irrelevant.

From an *ex ante* perspective, the manager's and shareholders' differing priors cause them to perceive different probabilities of obtaining a bad signal. From the manager's perspective, the probability that the signal is bad is $(1-\alpha_m)\,p+(1-p)\,c$, which is increasing in the level of conservatism. The manager's beliefs conditional on the signal S are:

$$\mathrm{P}_m(\theta_g|S_g) = \alpha_m \frac{p+(1-p)(1-c)}{\alpha_m p+(1-p)\,(1-c)} \geq \alpha_m, \tag{1}$$

$$\mathrm{P}_m(\theta_b|S_b) = (1-\alpha_m)\,\frac{p+(1-p)\,c}{(1-\alpha_m)\,p+(1-p)\,c} \geq 1-\alpha_m. \tag{2}$$

Note that the information content of the good signal increases with c, $\frac{\mathrm{d}\ \mathrm{P}_m(\theta_g|S_g)}{\mathrm{d}c} > 0$, and the information content of the bad signal decreases with c, $\frac{\mathrm{d}\ \mathrm{P}_m(\theta_b|S_b)}{\mathrm{d}c} < 0$. At the maximum level of conservatism, $c = 1$, the good signal perfectly reveals that the state is good, $\mathrm{P}_m(\theta_g|S_g; c = 1) = 1$. Conversely, at the lowest level of conservatism, $c = 0$, the bad signal perfectly reveals that the state is bad, $\mathrm{P}_m(\theta_b|S_b; c = 0) = 1$.

The same arguments hold for the board except that the board has the prior α_s instead of α_m. However, the board does not directly observe S but instead observes a report $R \in \{R_g, R_b\}$ generated by the accounting system. In the absence of manipulation, the accounting report is perfectly informative about the signal and $R_i = S_i$ for $i \in \{g, b\}$.

Before the signal is realized, the manager can interfere with the accounting system so that a bad signal S_b generates a good report R_g with probability $m \in [0, 1]$. As we show later, the manager never wishes to increase the probability of a bad report. The resulting probability of the accounting system producing a good report given a good signal is $\mathrm{P}(R_g|S_g) = 1$ while the probability of the accounting system producing a good report given a bad signal is $\mathrm{P}(R_g|S_b) = m$.

In Appendix A, we consider a more elaborate model where manipulation has a greater effect on the uninformative signal than on the informative bad signal. A special case of this setting is equivalent to an information structure that generates a third value, say $S_\emptyset$, for the uninformative signal. We show that the main insights of our study are robust to this modeling variation.

Interfering with the accounting system costs the manager $\frac{1}{2}km^2$, with $k \geq 0$. The manager chooses the level of m and incurs the associated cost before the signal S is realized.[9] For example, the manager creates vulnerabilities in the accounting system

[9]See Gao (2013) for a similar assumption that the manager incurs manipulation costs *ex ante*. In

that render it possible to misrepresent bad signals, as in Bar-Gill and Bebchuk (2003), and the manager may face sanctions for failing to maintain adequate internal controls (PCAOB 2007, esp. "controls over management override").

We interpret the marginal manipulation cost, k, as an indicator of the quality of corporate governance and board oversight. Greater oversight (higher k) discourages manipulation by increasing the likelihood that the board or regulators will discover and penalize the manager for deficiencies in the financial reporting system.

After the accounting report is observed, the board (acting in the best interest of the shareholders) decides whether to expand operations, depending on whether they perceive expansion to be a positive NPV investment. Because the manager does not take any actions to increase the likelihood of a bad report, a bad report indicates that the signal is bad, $\mathrm{P}_s(\theta_g|R_b) = \mathrm{P}_s(\theta_g|S_b) \leq \alpha_s$. Given that $\mathrm{P}_s(\theta_g|R_b)X - I \leq \alpha_s X - I < 0$, the board finds it optimal to reject expansion when $R = R_b$.

If the report is favorable, the board understands that it might have been distorted. Nevertheless, to ensure that the report is useful for decision making, we assume that it is optimal to implement the project in this case. Specifically, we assume that:

$$\mathrm{P}_s(\theta_g|R_g)X - I \geq 0, \tag{3}$$

and later verify the conditions under which this assumption holds. Direct computa-

Appendix B, we discuss an alternative setting in which the manager only incurs manipulation costs after observing a bad signal S_b and show that similar forces apply, although conservatism c always takes a corner solution of zero or one. The comparative statics on the threshold that determines the choice of $c \in \{0, 1\}$ resemble the comparative statics on c in our primary analysis.

tions give:

$$
\begin{aligned}
\mathrm{P}_s(R_g|\theta_g) &= \underbrace{p}_{\substack{\text{Accurate}\\ \text{report}}} + \underbrace{(1-p)\,(1-c(1-m))}_{\substack{\text{Uninformative signal}\\ \text{classified as } R_g}}, && (4)\\
\mathrm{P}_s(R_g|\theta_b) &= \underbrace{(1-p)(1-c)}_{\substack{\text{Uninformative signal}\\ \text{classified as } R_g}} + \underbrace{m(p+(1-p)c)}_{\substack{\text{Signal } S_b\\ \text{reported as } R_g}}, && (5)
\end{aligned}
$$

which gives:

$$
\begin{aligned}
\mathrm{P}_s(\theta_g|R_g) &= \frac{\mathrm{P}_s(R_g|\theta_g)\alpha_s}{\mathrm{P}_s(R_g|\theta_g)\alpha_s + \mathrm{P}_s(R_g|\theta_b)(1-\alpha_s)}\\
&= \alpha_s \frac{p+(1-p)\,(1-c(1-m))}{p+(1-p)\,(1-c(1-m))-(1-\alpha_s)p(1-m)}. \qquad (6)
\end{aligned}
$$

Note that $\mathrm{P}_s(\theta_g|R_g)$ is declining in m. For the extreme in which $m=1$ we have $\mathrm{P}_s(\theta_g|R_g)=\alpha_s$ and $\mathrm{P}_s(\theta_g|R_g)X-I<0$. This is intuitive because the report has no information content when $m=1$. Thus, to ensure that assumption (3) is satisfied, we assume that the parameters are such that m is not too large.[10]

We assume that the manager enjoys private benefits of control or reputation benefits that are proportional to the cash payoff x from expansion, as in Stein (1997) and Scharfstein and Stein (2000). The manager's utility function takes the form:

$$\beta x - \tfrac{1}{2}km^2, \qquad (7)$$

where βx represents the payoff from expansion and $\frac{1}{2}km^2$ is the cost of altering the accounting system. It is convenient to define $B \equiv \beta X$, where X is the outcome in case of success. Thus, the manager enjoys B in the event of successful expansion and zero,

[10] Appendix A gives the specific parameter regions that satisfy (3).

otherwise. This preference function has two implications: First, the manager does not internalize the cost I, and therefore is eager to expand unless he is certain that expansion will fail ($x = 0$). Second, this inclination is stronger when the manager expects a higher probability of success.

We obtain a similar preference function when the manager is holding stock options.[11] To see this, let A denote the firm's initial assets in place, β the number of options the manager is holding, E the exercise price of the options, and assume, without loss of generality, that the total number of issued shares of stock is one. When the exercise price equals the firm's no-expansion value, $E = A$, the value of the manager's options is $\beta(A + X - I - E) = \beta(X - I)$ in case of a successful expansion and zero otherwise. In this case, we would interpret B as $\beta(X - I)$.

Finally, managerial optimism or overconfidence yields similar results even when the manager wishes to maximize shareholder value. When the manager's prior belief about the probability of success, α_m, is sufficiently high, the manager perceives a positive *ex ante* NPV from expanding ($\alpha_m X > I > \alpha_s X$) and therefore wishes to expand even in the absence of additional positive information. In this case, the manager has an incentive to manipulate the report to prevent the board from rejecting what the manager perceives to be valuable expansion opportunities.

A key feature of our setting is that the manager and the board have different preferences regarding expansion following an uninformative signal, which creates an incentive for the manager to manipulate the report. The board could eliminate the manager's investment bias and hence incentives for manipulation by promising a

[11] See Bertomeu et al. (2013) for a setting that explicitly considers optimal contracts in a moral hazard setting that features the interaction between conservative accounting and manipulation. There, the firm faces no investment decisions but instead constructs the accounting system and a compensation contract in order to minimize the cost of inducing the manager to exert effort.

bonus for a low accounting report. For example, if the manager's expected payoff from successful manipulation is $E[c, B]$, the board can prevent manipulation by promising the manager a payment of $Pay = E[c, B]$ if and only if the report is unfavorable. Of course, such a contract is not only costly but would also dilute effort incentives in a richer setting where the manager chooses productive effort *ex ante*. We abstract from these considerations to carve out the incentive effects associated with changes in accounting conservatism and to keep the model tractable.

3 Manager behavior

In this section, we determine the manager's manipulation strategy, conditional on the level of conservatism. The manager restructures the accounting system (chooses m) prior to the signal realization to maximize his expected payoff:

$$U_m = \underbrace{(p + (1-p)\,(1 - c(1-m)))\,\alpha_m}_{\mathrm{P}_m(\text{Successful expansion})=\mathrm{P}_m(R_g,\theta_g)} B - \tfrac{1}{2}km^2, \tag{8}$$

The manager's preferences can be explained as follows. The manager receives a positive payoff B only when the project is implemented and successful, which occurs if the state is good. From the manager's perspective, the state is good with probability α_m. Assuming a good state, the probability of expansion (i.e., the probability of a high report) can be decomposed into two terms. With probability p, the signal is informative, and the good state translates into a good report. With probability $1 - p$, the signal is uninformative and is either mapped into a good or bad report, depending on the level of conservatism and the level of manipulation. Specifically, the uninformative signal maps to a bad report if it is initially classified as bad, with probability c, and the manager's manipulation fails, with probability $1 - m$. Conversely, an uninformative signal is mapped into a good report with probability $1 - c(1 - m)$. The manager's choice of m satisfies:

$$m = (1 - p)c\ \alpha_m B/k. \tag{9}$$

The numerator of equation (9) reflects that the manager benefits from manipulation only if the state is good but the (unmanipulated) report is bad, preventing expansion. This situation occurs with probability $\alpha_m(1-p)c$. Otherwise, if the signal is good, any effort allocated to distorting the accounting system is wasted because the report would be good anyway; and if the state is bad, the manager does not wish to implement the project because it will fail with certainty.

The following comparative statics results follow immediately from (9):

Lemma 1 *The manager's choice of manipulation, m, increases if*
(i) the accounting system is more conservative (c is higher),
(ii) the accounting system is less informative (p is lower),
(iii) the quality of corporate governance is weaker (k is lower),
(iv) the manager has greater private benefits (B is larger),
(v) the manager is more optimistic (α_m is higher).

The manager's desire to manipulate the accounting system arises from the conflict of interest regarding project implementation. The manager prefers expansion so long as there is a chance of success, whereas the board prefers expansion only if the probability of success is sufficiently high. Thus, for uninformative signals, the board prefers the status quo whereas the manager prefers expansion.

When the information system becomes more conservative (c increases), uninformative signals are more likely classified as bad, which trigger the board to reject expansion. Intuitively, conservative accounting enables the board to make a cautious expansion decision. The manager's inclination to overinvest creates an incentive to distort the accounting system in order to induce the board to allow expansion. The more conservative the accounting, the greater the manager's incentive to manipulate. The same argument applies when the accounting system becomes less reliable (p decreases). For a lower p, the probability that the signal is uninformative increases, which again increases the probability of board intervention and hence makes manipulation more attractive for the manager.

This argument implies that the board can eliminate manipulation by simply choosing an aggressive accounting system ($c = 0$). For $c = 0$, an uninformative signal is always classified as good, triggering expansion as desired by the manager. The manager has no incentive to increase the probability that informative bad signals are also misreported. When $c = 0$, a bad signal indicates that expansion will surely fail, and the manager receives no benefit from a failed expansion.

Higher private benefits B increase the manager's reward for successful expansion and greater optimism α_m increases his perceived probability that expansion will succeed. Both forces encourage the manager to manipulate the report to increase the probability of expansion when signals are uninformative. Finally, when corporate governance is stronger (k is larger), the manager chooses a lower level of manipulation.

4 Optimal accounting system

In this section, we study the optimal design of the accounting system from the shareholders' perspective.[12] The board (acting in the best interests of the shareholders) chooses c to maximize firm value:

$$U_s = \mathrm{P}_s(R_g)\left(\mathrm{P}_s(\theta_g|R_g)X - I\right), \tag{10}$$

Using (6) and $\mathrm{P}_s(R_g) = m + (1-m)(\alpha_s p + (1-p)(1-c))$, (10) can be written as

$$U_s = \underbrace{\alpha_s X - I}_{\substack{\text{Loss if firm}\\ \text{always expands}\\ (\alpha_s X - I < 0)}} + \underbrace{p(1-m)(1-\alpha_s)I}_{\substack{\text{Save } I \text{ when } \theta_b \text{ yields}\\ S_b \text{ and manager fails to}\\ \text{reclassify as } R_g}} + \underbrace{(1-p)c(1-m)(I-\alpha_s X)}_{\substack{\text{Avoid investment when signal}\\ \text{is uninformative and manager}\\ \text{fails to reclassify as } R_g}}. \tag{11}$$

The shareholders' preference function (11) can be explained in an intuitive way. If the board always allowed expansion, the firm would earn the negative $\alpha_s X - I < 0$ *ex ante* NPV. By relying on the accounting system, it avoids expanding when the signal is informative and bad, so long as the manager fails to successfully manipulate the report. In addition, the board avoids investment after an uninformative signal so long as the signal is classified as S_b, which occurs with probability c, and the manager fails to manipulate the report, with probability $(1-m)$.

A change in the level of conservatism affects firm value U_s directly, via its effect on classifying an uninformative signal, and indirectly, via its impact on manipulation.

[12] Alternatively, we could consider a standard setter that designs the accounting system to maximize social welfare. Social welfare is the aggregate utility of shareholders and the manager. While social welfare includes the manager's personal cost of manipulation, we are unsure to what extent a standard setter would recognize this cost. We therefore could weight the cost by a multiplier $\lambda \in [0,1]$ in the standard setter's preference function. In that case the standard setter would also weight the benefits the manager reaps through manipulation by λ. In the appendix, we show that our results are robust to this alternative modeling choice (regardless of the weight λ).

To study the direct effect of conservatism, suppose for the moment that the level m of manipulation is fixed. An increase in conservatism benefits shareholders by allowing them to avoid expansion when the signal is uninformative; that is, the third term in (11) increases with c. This direct effect of an increase in c gets weaker as m increases because conservatism only influences the investment decision when the manager's manipulation attempt fails. Nevertheless, for a fixed $m < 1$, it is strictly optimal to choose the maximum level of conservatism ($c = 1$).

However, the manager's choice of manipulation is not fixed — it changes with the level of accounting conservatism. A conservative accounting system ($c > 0$) provides the manager with an incentive to manipulate because uninformative signals will sometimes be classified as bad, which causes the board to reject expansion. As conservatism increases, the manager becomes more concerned that projects are rejected based on uninformative signals, and hence has a stronger incentive to manipulate the system (Lemma 1). Heightened manipulation effort is costly to shareholders because it increases the probability of project implementation when the signal is uninformative and, even worse, informative and bad. That is, manipulation reduces the second and third term in (11).

Assuming an interior solution, the first-order condition for the optimal level of c can be stated as follows, after substituting from (9) for m:

$$0 = -p(1-p)(1-\alpha_s)I\frac{\alpha_m B}{k} + (1-p)(I-\alpha_s X)\left(1 - 2c(1-p)\frac{\alpha_m B}{k}\right)$$
$$\Longrightarrow \qquad c = \frac{1}{2(1-p)}\left(\frac{k}{\alpha_m B} - p\frac{(1-\alpha_s)I}{I-\alpha_s X}\right). \quad (12)$$

Condition (12) shows the importance of assuming that the unconditional NPV is negative ($\alpha_s X - I < 0$). If the *ex ante* NPV is positive ($\alpha_s X - I > 0$), the trade-off outlined above is moot because the board wishes to (i) expand even when the signal is uninformative, and (ii) eliminate manipulation incentives. Both goals can be achieved by choosing an aggressive system ($c = 0$), that classifies uninformative signals as good.

From (12), we see that the board chooses conservative accounting ($c > 0$) when the manager faces sufficiently high governance constraints k relative to private benefits $\alpha_m B$ $\left(\frac{k}{\alpha_m B} > p\frac{(1-\alpha_s)I}{I-\alpha_s X}\right)$. If the manager faces relatively low incentives to manipulate $\left(\frac{k}{\alpha_m B} > p\frac{(1-\alpha_s)I}{I-\alpha_s X} + 2(1-p)\right)$, then the board chooses maximum conservatism ($c = 1$). The following proposition summarizes the results:

Proposition 1 *There is an interior solution, $c \in (0,1)$, if and only if :*

$$\underbrace{p\frac{(1-\alpha_s)I}{I-\alpha_s X}}_{For\ c>0} < \frac{k}{\alpha_m B} < \underbrace{p\frac{(1-\alpha_s)I}{I-\alpha_s X} + 2(1-p)}_{For\ c<1}. \tag{13}$$

In an interior solution, the optimal level of conservatism is:

$$c^* = \frac{1}{2(1-p)}\left(\frac{k}{\alpha_m B} - p\frac{(1-\alpha_s)I}{I-\alpha_s X}\right), \tag{14}$$

with manipulation:

$$m^* = \frac{1}{2}\left(1 - p\frac{(1-\alpha_s)I}{I-\alpha_s X}\frac{\alpha_m B}{k}\right) < \frac{1}{2}. \tag{15}$$

Appendix A gives the parameter regions for which the assumptions (3) and (13) hold. Essentially, the assumptions exclude extreme divergence between the manager's and board's preferences to expand. In such cases, the board requires convincing evidence in order to agree to expand (large *ex ante* loss $I - \alpha_s X$), but the manager's incentive to manipulate is so high (low $k/(\alpha_m B)$) that he is unable to provide convincing evidence.

5 Comparative Statics

5.1 Effects of environmental changes on the optimal accounting system

In order to analyze the effects of parameters on the accounting system, we state the board's first order condition as:

$$0 = \underbrace{(1-p)\left(1-(1-p)c\frac{\alpha_m B}{k}\right)(I-\alpha_s X)}_{\frac{\partial U_s}{\partial c}>0}$$
$$\underbrace{-\left(p(1-\alpha_s)I + (1-p)c(I-\alpha_s X)\right)}_{\frac{\partial U_s}{\partial m}<0}\underbrace{(1-p)\frac{\alpha_m B}{k}}_{\frac{\mathrm{d}m}{\mathrm{d}c}>0}. \quad (16)$$

The first term of (16) represents the beneficial direct effect of conservatism, whereby investors avoid expansion after an uninformative signal. The second term reflects the indirect effect of conservatism via its impact on accounting manipulation. The equilibrium c equates these two forces. The following proposition states the effect of the model's parameters on the optimal choice of c.

Proposition 2 *The firm's optimal level of conservatism c is greater if:*

(i) the loss $I-\alpha_s X$ of unconditional expansion increases,

(ii) the strength of corporate governance, k, increases,

(iii) managerial optimism, α_m, or private benefits, B, decrease,

(iv) the informativeness, p, increases and $\frac{k}{\alpha_m B} > \frac{(1-\alpha_s)I}{I-\alpha_s X}$, the informativeness, p, decreases and $\frac{k}{\alpha_m B} < \frac{(1-\alpha_s)I}{I-\alpha_s X}$.[13]

Expanding without further information is costly to shareholders, $I - \alpha_s X > 0$. When this cost increases, then both the direct benefit of conservatism ($\frac{\partial^2 U_s}{\partial c \partial (I-\alpha_s X)} > 0$) and the costs of inducing manipulation ($\frac{\partial^2 U_s}{\partial m \partial (I-\alpha_s X)} < 0$) increase. For $m < 1/2$, which holds in equilibrium per Proposition 1, the former, direct effect dominates and results in a higher optimal c.

An increase in governance strength k has two effects, both of which work to increase the optimal level of conservatism. First, all else equal, a higher k leads to less manipulation and hence a lower probability that the report is distorted, which increases the direct benefit of conservative accounting ($\frac{\partial^2 U_s}{\partial c \partial k} > 0$). Second, a higher k weakens the positive relation between conservatism and manipulation ($\frac{\mathrm{d}^2 m}{\mathrm{d}c\mathrm{d}k} < 0$), which decreases the associated indirect costs of conservative accounting (from $\frac{\partial U_s}{\partial m} < 0$). Both of these effects – increasing the benefits of conservative accounting and reducing its costs – motivate the board to choose more conservative accounting. The impact of governance quality k is the opposite of that in Gao (2013), where accounting becomes more conservative when earnings are easier to manipulate. Whereas conservatism counteracts accounting manipulation in Gao (2013) and Chen et al. (2007), conservatism *induces* manipulation in our setting because the manager wishes to reclassify bad signals that he perceives may have been produced by uninformative signals.

Lower private benefits B or weaker managerial optimism, α_m, directly reduce the manager's temptation to engage in manipulation, and have identical effects to an

[13] If the baseline accounting system is insufficiently informative ($p < \sqrt{2} - 1 \approx 0.41$), then c is always decreasing in p. In other words, when $p < \sqrt{2} - 1$, there are no values of the parameters $(I, X, \alpha_s, \alpha_m, B, k)$ such that $c \in (0, 1)$, assumption (3) is satisfied, and $\frac{k}{\alpha_m B} > \frac{(1-\alpha_s)I}{I-\alpha_s X}$.

increase in governance quality. Thus, the board optimally responds to reductions in B or α_m by increasing the level of conservatism.

An increase in the accounting system's overall informativeness p reduces the direct benefit of conservative accounting ($\frac{\partial^2 U_s}{\partial c \partial p} < 0$) because conservatism only matters when signals are uninformative and a higher p reduces that probability. More informative accounting systems also reduce the costs of conservative accounting because the manager has less of an incentive to manipulate when he knows that signals are more likely informative of the state. When governance is sufficiently effective in constraining manipulation (high $\frac{k}{\alpha_m B}$), the effect on manipulation dominates so that c is increasing in p.

5.2 Effect of environmental changes on equilibrium manipulation and firm value

We now turn to the question of how changes in the parameters affect the level of manipulation and investment efficiency (firm value).

Proposition 3 *The equilibrium level of manipulation m is greater if*

(i) the loss $I - \alpha_s X$ of unconditional expansion increases,

(ii) the strength of corporate governance, k, increases,

(iii) managerial optimism, α_m, or private benefits, B, decrease,

(iv) and the informativeness, p, decreases.

At first glance, the results reported in Proposition 3 are counterintuitive. A larger expected loss from (uninformed) expanding ($I - \alpha_s X$) has no direct effect on the manager's manipulation choice but indirectly affects m via c. As shown in Proposition

2, the optimal level of conservatism increases with $(I - \alpha_s X)$. A more conservative accounting system creates stronger incentives to manipulate.

Stronger governance, k, directly curbs manipulation. However, Proposition 2 shows that the board reacts to an increase in k by choosing more conservative accounting, which, in turn, increases the manager's manipulation incentive. The indirect effect via conservatism dominates the direct effect, yielding a positive relation between governance quality and manipulation.

Likewise, greater private benefits B or managerial optimism α_m have a direct increasing effect on the manager's incentive to manipulate, but the associated reduction in conservatism lowers manipulation incentives. The indirect effect via conservatism dominates so that increases in α_m or B lead to less manipulation.

From (9), an increase in informativeness p directly reduces manipulation, because the manager only benefits from manipulation when the signal is uninformative. Proposition 2 shows that an increase in p sometimes increases conservatism c, which leads to an increase in manipulation. However, the direct effect dominates so that manipulation incentives decline when the accounting system becomes more informative.

We next analyze how changes in the parameters affect the efficiency of the investment decision and hence firm value.

Proposition 4 *Investment efficiency* (U_s) *is greater if*

(i) the strength of corporate governance, k*, increases,*

(ii) managerial optimism, α_m*, or private benefits,* B*, decrease,*

(iii) the informativeness, p*, of the accounting system increases.*

Proposition 4 follows from applying the envelope theorem to the board's objective function. Keeping c constant, an increase in governance quality k, directly lowers manipulation, and hence increases the quality of the report, the investment efficiency, and shareholder value U_s. The board responds to the change in k by increasing the level of accounting conservatism, which ultimately leads to more manipulation as shown in Proposition 3. But, by the envelope theorem, this indirect effect on U_s via c can be ignored and the shareholders' payoff is increasing in k.

Likewise, when the manager enjoys greater benefits B from successful expansion or believes that the probability of success is greater, α_m, he has a stronger direct incentive to manipulate, and investment efficiency decreases. Again, by the envelope theorem, the indirect effect on U_s via changes in c can be ignored.

The informativeness p of the accounting system improves investment efficiency in two ways. First, holding conservatism c and manipulation m fixed, U_s is increasing in p because it increases the probability that a bad state results in a bad report, so that the board rejects expansion. Second, keeping c fixed, from (9) we know that manipulation m is decreasing in p, giving a further improvement in U_s. By the envelope theorem, we can ignore the effect of p on c when assessing the impact on the optimized U_s.

6 Empirical Predictions and Discussion

Our analysis of the board's choice of conservatism in Proposition 2 pertains to the baseline accounting system. However, empiricists observe only the outputs of the accounting system, which also reflect manipulation. Manipulation drives a wedge between the board's accounting choices and the conservatism reflected in the financial statements. We take the probability $\mathrm{P}_s(R_b)$ of a bad report as an observable measure of conservative accounting. A direct empirical analog would be the incidence of large negative net income (e.g., Barth et al. 2008).

The denominator of expression (6) gives $\mathrm{P}_s(R_g)$, from which we can compute $\mathrm{P}_s(R_b) = ((1-p)c + (1-\alpha_s)p)\,(1-m)$. Were it not for the $1-m$ term, the probability $\mathrm{P}_s(R_b)$ of a bad report provides a clear proxy for the board's choice of c. However, manipulation m increases with conservatism c, so that an increase in m will partially offset the direct effect of an increase in c on $\mathrm{P}_s(R_b)$. The effect on c dominates so that observed conservatism $\mathrm{P}_s(R_b)$ increases in $I - \alpha_s X$ and k, and decreases in α_m and B, consistent with the effects on c as given in Proposition 2.[14]

We can interpret the effect of $I - \alpha_s X$ on observed conservatism $\mathrm{P}_s(R_b)$ as implying that firms with few profitable growth opportunities will have relatively more conservative accounting. This differs from Bagnoli and Watts (2005), where managers may use conservative accounting to signal private information. In our setting, the board and shareholders know the manager's prior belief regarding the value of expansion and there is no role for signaling. Just as conservative accounting is beneficial to induce abandonment of negative NPV projects (Gigler et al. 2009), conservative accounting becomes more attractive when expansion is not justified based on *ex ante* beliefs.

Prior empirical studies (e.g., Watts 2003a,b; Ahmed and Duellman 2007; García Lara et al. 2009) and analytical work (e.g., Gao 2013) have portrayed accounting conservatism as a tool that enables boards to perform their monitoring duties, particularly in regard to mitigating earnings manipulation. In our model, accounting conservatism enables boards to act on negative news but this feature of conservatism

[14]This conclusion follows from direct computations of the derivatives of $\mathrm{P}_s(R_b)$. Signing $\mathrm{dP}_s(R_b)/\mathrm{d}k$ requires the use of the parameter restrictions $\frac{k}{\alpha_m B} > p\frac{(1-\alpha_s)I}{I-\alpha_s X}$ and $\frac{(1-\alpha_s)I}{I-\alpha_s X} > 1$, discussed in Appendix A, necessary for an interior value $c \in (0,1)$ and a negative *ex ante* NPV of expanding.

increases the manager's incentive to manipulate the accounting system. Thus, boards can afford to use conservative accounting only if they have sufficiently strong governance to mitigate the negative side effects on manipulation. We predict that accounting becomes more *aggressive* as agency problems increase, which occurs because conservative accounting exacerbates the manager's incentive to manipulate reporting.

Summarizing, we have the following predictions regarding the observed level of conservatism:

Prediction 1 *The observed level of conservatism $P_s(R_b)$ is greater for:*
(i) Firms with fewer valuable growth opportunities (higher $I - \alpha_s X$);
(ii) Firms with effective monitoring, low private benefits, and low managerial optimism (high k and low B, α_m).

As was the case with the board's choice c of conservatism, empiricists cannot directly observe the managers' manipulation choice m. The corresponding observable feature of the reporting environment is detected manipulations. If detection requires a failed expansion, where expansion only follows a good report, the probability of detected manipulation will be $\mathrm{P}_s(\theta_b, R_g, S_b)$ – a failed expansion that later investigation reveals to have been based on an underlying bad signal S_b. Direct computations show that the effects of the *ex ante* loss $I - \alpha_s X$, governance k, optimism α_m, private benefits B, and informativeness p on detected manipulation $\mathrm{P}_s(\theta_b, R_g, S_b)$ have the same signs as on the actual manipulation m given in Proposition 3.[15] This yields the following predictions, which are in the same direction as those for observed conser-

[15]Signing the derivative of $\mathrm{P}_s(\theta_b, R_g, S_b)$ with respect to p requires accounting for the parameter restrictions that $\frac{k}{\alpha_m B} > p\frac{(1-\alpha_s)I}{I-\alpha_s X}$ and $\frac{(1-\alpha_s)I}{I-\alpha_s X} > 1$.

vatism due to the positive link between conservative accounting and the incentive to manipulate earnings:

Prediction 2 *Detected manipulations $P_s(\theta_b, R_g, S_b)$ are greater for:*
(i) Firms with fewer valuable growth opportunities (higher $I - \alpha_s X$);
(ii) Firms with effective monitoring, low private benefits and low managerial optimism (high k and low B, α_m);
(iii) Firms where current earnings are less informative about future growth opportunities (low p).

While we predict that firms with stronger governance experience more accounting manipulation, this does not imply that governance reduces investment efficiency and firm value. Proposition 4 indicates that company value is increasing in the effectiveness of monitoring (high k). The higher manipulation in well-governed firms is a by-product of their choice of more conservative accounting. The effect of higher conservatism dominates the partially offsetting impact of higher accounting manipulation so that firms with effective monitoring are less likely to invest absent an informative, positive signal.

All of these predictions are counterintuitive but can be explained by the observation that the board optimally responds to changes in the environment that reduce (foster) manipulation incentives by increasing (decreasing) the level of conservatism, which, in turn, strengthens (weakens) manager's desire to distort the accounting system. In our setting, given that the only goal of the reporting system is to facilitate investment decisions, an accounting system is of better quality if it leads to better investment decisions.

The above analysis demonstrates that the presence of manipulation need not be an indicator of poor reporting quality. On the one hand, manipulation associated with a low level of informativeness p indicates poor reporting quality. On the other hand, manipulation can also be associated with effective monitoring (high k), which is also associated with conservative reporting and efficient investment decisions that are indicative of high reporting quality. Our results suggest that empirical researchers should be careful when using the magnitude of manipulation in firms as a proxy for reporting quality – it is not always true that less manipulation actually represents an environment with better financial reporting.

7 Conclusion

We develop a model to analyze the effects of corporate governance on the optimal choice of conservatism, the magnitude of accounting manipulation, reporting quality, and investment efficiency. The accounting report guides the board's decision of whether to pursue a new investment opportunity such as expanding the firm. We model conservatism as the probability that uninformative signals are mapped into bad accounting reports. The demand for conservatism arises because directors (and shareholders) require new, positive, information before approving expansion. All else equal, conservatism helps the board to prevent expansion when signals are uninformative and hence improves investment efficiency. In contrast to the board, the manager has a preference for expansion as long as there is a chance of success, for example, because the manager enjoys private benefits of control or is holding stock options.

We first show that conservative accounting encourages the manager to distort the accounting report. This result arises because conservatism increases the probability that the board rejects investment opportunities that the manager finds personally attractive. Thus, the manager manipulates in an attempt to distort the board's decision to his favor.

This negative effect of conservatism on manipulation explains our second main result: corporate governance is positively related to conservatism. The optimality of conservative accounting depends on boards being able to effectively monitor financial reporting, and thereby mitigate the negative side effects of conservatism. Poorly governed firms cannot directly curb manipulation, and therefore choose aggressive accounting systems in order to reduce manipulation incentives.

Paradoxically, we predict that an improvement in the board's ability to monitor the manager is associated with more, rather than less, manipulation of the accounting system. This follows because stronger boards not only directly deter manipulation, but also choose more conservative accounting systems. The higher conservatism encourages manipulation, and this latter effect dominates the former. Although governance and manipulation are positively related, improvements in governance unambiguously lead to higher reporting quality and more efficient investment decisions.

We also generate predictions relating managerial optimism to the optimal level of conservatism, accounting manipulation, quality of reporting, and investment efficiency. Essentially, when the manager is more optimistic about the probability of successful expansion, he has a stronger direct incentive to manipulate the accounting report, which causes the board to choose less conservative accounting. The reduction in conservatism lowers incentives for manipulation, such that in equilibrium, firms with more optimistic managers exhibit a smaller level of manipulation. Nevertheless, managerial optimism always leads to lower reporting quality and less efficient investments.

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A Proofs and derivations

A.1 Derivation of equilibrium (Lemma 1 and Proposition 1)

For the purposes of deriving the equilibrium, we include a parameter $\delta \in [0,1]$ that reflects the relative effectiveness of manipulation when the signal S_b is informative about the bad state as opposed to being an uninformative signal diverted to S_b by accounting conservatism. For example, it may be easier to manipulate an uninformative signal than an informative bad signal ($\delta < 1$). The main body corresponds to $\delta = 1$, where manipulation is equally effective when S_b is informative. Putting $\delta = 0$ corresponds to a setting where the manager can control whether manipulation applies only to uninformative signals. The manager has no benefit from manipulating informative bad signals and, given the choice, would choose $\delta = 0$ and manipulate only uninformative signals.

The $\delta = 0$ case also corresponds to a setting where the accounting system is such that uninformative signals produce a distinct pre-manipulation report $S_\emptyset$ with probability c and produce S_g with probability $1 - c$. The board would reject expansion following reports R_b or $R_\emptyset$ and, under appropriate parameter restrictions, approve expansion following report R_g. If the accounting system produced a separate signal, the manager would never manipulate S_b because it yields no benefits, and manipulating only $S_\emptyset$ is equivalent to $\delta = 0$ in the notation we use in this Appendix.

Under this modified structure, we have for $i \in \{s, m\}$:

$$\mathrm{P}_i(R_g|\theta_g) = p + (1-p)\left(1 - c(1-m)\right), \tag{A.1a}$$

$$\mathrm{P}_i(R_g|\theta_b) = p\delta m + (1-p)\left(1 - c(1-m)\right), \tag{A.1b}$$

$$\mathrm{P}_i(R_g) = p\left(\alpha_i + (1-\alpha_i)\delta m\right) + (1-p)\left(1 - c(1-m)\right). \tag{A.1c}$$

The manager's problem remains exactly as stated in (8) with the corresponding manipulation choice (9). The δ parameter has no direct effect on the manager's manipulation choice because it has no effect on the manager's cost/benefit trade-off. The manager's trade-off depends on the manipulation cost k and the likelihood that uninformative signals map to a good report R_g. The δ parameter affects the reporting of only the informative bad signal, which does not affect the manager's payoff.

The δ parameter slightly changes the board's objective (11), where it appears in the second term:

$$U_s = \underbrace{\alpha_s X - I}_{\substack{\text{Loss if firm} \\ \text{always expands} \\ (\alpha_s X - I < 0)}} + \underbrace{p(1-\delta m)(1-\alpha_s)I}_{\substack{\text{Save } I \text{ when } \theta_b \text{ yields} \\ S_b \text{ and manager fails to} \\ \text{reclassify as } R_g}} + \underbrace{(1-p)c(1-m)(I-\alpha_s X)}_{\substack{\text{Avoid investment when signal} \\ \text{is uninformative and manager} \\ \text{fails to reclassify as } R_g}}. \tag{A.2}$$

The negative *ex ante* NPV assumption ($\alpha_s X < I$) implies that the second-order condition is satisfied when choosing c to maximize (A.2) and solving the first-order condition gives:

$$c^* = \frac{1}{2(1-p)} \left(\frac{k}{\alpha_m B} - p\delta \frac{(1-\alpha_s)I}{I - \alpha_s X} \right), \tag{A.3}$$

which lies in $(0, 1)$ if:

$$\underbrace{p\delta \frac{(1-\alpha_s)I}{I-\alpha_s X}}_{\text{For } c>0} < \frac{k}{\alpha_m B} < \underbrace{p\delta \frac{(1-\alpha_s)I}{I-\alpha_s X} + 2(1-p)}_{\text{For } c<1}. \tag{A.4}$$

The equilibrium manipulation m^* is the following, where $c \in (0, 1)$ implies $m^* \in (0, 1/2)$:

$$m^* = \frac{1}{2} \left(1 - p\delta \frac{(1-\alpha_s)I}{I-\alpha_s X} \frac{\alpha_m B}{k} \right). \tag{A.5}$$

This completes the proof of Proposition 1. We now derive the parameter restrictions that guarantee an interior level of conservatism and satisfy the positive *ex post* NPV assumption (3). We first state the parameter restrictions.

Define $\underline{z} = \frac{\sqrt{4(1-p)(1-p(1-\delta))+\delta^2}+2p-2+\delta}{2p\delta}$, where $\underline{z} \in (1, 1/p)$ for all $\delta \in [0,1]$ and $p \in (0,1)$. If $\frac{(1-\alpha_s)I}{I-\alpha_s X} < \underline{z}$, then there is no equilibrium with interior c and positive *ex post* NPV. Otherwise, if $\frac{(1-\alpha_s)I}{I-\alpha_s X} > \frac{1}{p}$, then the positive NPV restriction is not binding and (A.4) is sufficient for an equilibrium with interior c. If $\frac{(1-\alpha_s)I}{I-\alpha_s X} \in (\underline{z}, 1/p)$, then the lower bound on $\frac{k}{\alpha_m B}$ required to satisfy the positive NPV condition exceeds the lower end of the interval (A.4), and the equilibrium requires:[16]

$$\underbrace{p\delta\frac{(1-\alpha_s)I}{I-\alpha_s X} + 2\left(1 - p\tfrac{(1-\alpha_s)I}{I-\alpha_x X} + \sqrt{\left(1-p\tfrac{(1-\alpha_s)I}{I-\alpha_x X}\right)\left(1-p(1-\delta)\tfrac{(1-\alpha_s)I}{I-\alpha_x X}\right)}\right)}_{\text{For positive } ex\ post \text{ NPV}}$$
$$< \frac{k}{\alpha_m B} < \underbrace{p\delta\frac{(1-\alpha_s)I}{I-\alpha_s X} + 2(1-p)}_{\text{For } c<1}. \quad \text{(A.6)}$$

When deriving the parameter ranges, put $y = \frac{k}{\alpha_m B}$ and $z = \frac{(1-\alpha_s)I}{I-\alpha_s X}$, where $X \in (I, I/\alpha_s)$ implies that $z > 1$. We can write (A.4) as $p\delta z \equiv y_0 < y < p\delta z + 2(1-p) \equiv y_1$, $c = \frac{y-p\delta z}{2(1-p)}$, and $m = \frac{1}{2}\left(1 - p\delta\frac{z}{y}\right)$. With these substitutions, the *ex post* NPV $\mathrm{P}_s(\theta_g|R_g)X - I$ is proportional to $y^2 - 2\left(2 - p(2-\delta)z\right)y + p^2\delta^2 z^2$. Denote the $+\sqrt{\bullet}$ and $-\sqrt{\bullet}$ roots of the quadratic as y_+ and y_-, respectively, so that the positive *ex post* NPV condition is $y \notin (y_-, y_+)$. The discriminant of the quadratic is $(1-pz)(1-pz(1-\delta))$, which is positive if $z \notin (\frac{1}{p}, \frac{1}{p(1-\delta)})$. If $z \in (\frac{1}{p}, \frac{1}{p(1-\delta)})$, then the quadratic is always positive so that the NPV condition does not place a binding constraint on the parameters. Direct computations show that $p, \delta \in (0,1)$ and $z > 1$ imply that $y_- < y_0$, so that there is no range of $y < y_-$ with an equilibrium

[16] The assumptions $\alpha_s X < I$, $\delta \in [0,1]$, and $X > I$ imply that the lower bound on the left-hand-side of the interval is less than the upper bound on the right-hand-side.

having interior c and positive *ex post* NPV. The root $y_+ > y_0$ if and only if $z > 1/p$. If $z > \frac{1}{p(1-\delta)}$, then the positive NPV condition is not a binding constraint on the parameters, and the only remaining range where the positive NPV condition might be binding is $z \in (1, 1/p)$. In order for there to be an equilibrium with some $y > y_+$ satisfying the NPV condition and also giving an interior c, it must be the case that $y_+ < y_1$, which, for $z \in (1, 1/p)$, holds if and only if $z \in (\underline{z}, 1/p)$. The bound $\underline{z}$ is increasing in δ and lies between $\frac{1}{p}\frac{1+p}{2} \in (1, 1/p)$ for $\delta \to 0$, and $\frac{1}{p}$ at $\delta = 1$. ∎

Alternative objective for setting c

Here, we derive results in a setting where a regulator determines c to maximize social welfare. Given a weight λ that measures the importance of the manager's utility U_m, given by (8), relative to the shareholders' utility U_s, given by (11), we have the regulator's objective:

$$\max_m U_s + \lambda U_m, \tag{A.7}$$

which has the following first-order condition:

$$\begin{aligned} 0 &= \frac{\mathrm{d}U_s}{\mathrm{d}c} + \lambda \frac{\mathrm{d}U_m}{\mathrm{d}c} \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \text{(A.8)} \\ &= \underbrace{-p\frac{\alpha_m B}{k} + \frac{I - \alpha_s X}{(1-\alpha_s)I}\left(1 - 2c(1-p)\frac{\alpha_m B}{k}\right)}_{\propto \mathrm{d}U_s/\mathrm{d}c} + \frac{\lambda k}{(1-\alpha_s)I}\underbrace{\left(-\frac{\alpha_m B}{k}\left(1 - c(1-p)\frac{\alpha_m B}{k}\right)\right)}_{\propto \mathrm{d}U_m/\mathrm{d}c}. \end{aligned}$$

Solving (A.8) for c gives the following, which simplifies to (14) when the weight on the manager $\lambda = 0$:

$$c = \frac{1}{2(1-p)} \frac{\frac{k}{\alpha_m B} - \frac{(1-\alpha_s)I}{I-\alpha_s X}\left(p + \frac{\lambda k}{(1-\alpha_s)I}\right)}{1 - \frac{\lambda}{2}\frac{\alpha_m B}{I - \alpha_s X}}. \tag{A.9}$$

Direct computations show that conservatism and manipulation are both lower when the objective also includes the manager's utility. In other words, conservatism c is decreasing in λ, which implies that manipulation is decreasing in λ, as well. This follows directly from the manager perceiving a positive *ex ante* value of expanding.

Direct computations show that $m, c \in (0,1)$ if the following holds, where $y = \frac{k}{\alpha_m B}$, $z = \frac{(1-\alpha_s)I}{I-\alpha_s X}$, and $\lambda_2 = \frac{\lambda k}{(1-\alpha_s)I}$:

$$(p+\lambda_2)z < y < (pz+2(1-p))\frac{1}{2}\left(1+\sqrt{1+\frac{z^2\lambda_2(2p+\lambda_2)}{(pz+2(1-p))^2}}\right)+\frac{1}{2}z\lambda_2. \quad \text{(A.10)}$$

The above inequalities simplify to (13) as $\lambda \to 0$. Both the upper and lower bounds are shifted upward relative to the bounds in (13).

For any $\lambda > 0$, the comparative statics in Propositions 2, 3, and 4 are the same as given in the main body except for the following exception. In Proposition 2, $\frac{k}{\alpha_m B} > \frac{(1-\alpha_s)I}{I-\alpha_s X}$ is a necessary and sufficient condition for c to be increasing in p, but it is only a necessary condition when the choice of c places positive weight on the manager's objective ($\lambda > 0$). Proving that U_s is increasing in $\frac{(1-\alpha_s)I}{I-\alpha_s X}$ requires first establishing that $\frac{\mathrm{d}^2 U_s}{\mathrm{d}\left(\frac{(1-\alpha_s)I}{I-\alpha_s X}\right)\mathrm{d}\lambda_2} < 0$, and then taking the limit $\lim_{\lambda_2\to\infty}\mathrm{d}U_s/\mathrm{d}\left(\frac{(1-\alpha_s)I}{I-\alpha_s X}\right)$, which equals zero. Because U_s is increasing in $\frac{(1-\alpha_s)I}{I-\alpha_s X}$ for $\lambda = 0$ case in the main body, this implies that U_s is increasing in $\frac{(1-\alpha_s)I}{I-\alpha_s X}$ for all positive λ. ∎

Proof of Proposition 2

The statements on the effects of parameters follow directly from computations of the derivatives of c^* as given in expression (14). The proposition states the effect of the *ex ante* loss $I - \alpha_s X$ as a single quantity. Direct computations also show that its components satisfy $\frac{\mathrm{d}c}{\mathrm{d}I} > 0$ and $\frac{\mathrm{d}c}{\mathrm{d}X}, \frac{\mathrm{d}c}{\mathrm{d}\alpha_s} < 0$. The parameter restrictions for $\mathrm{d}c/\mathrm{d}p > 0$

follow because $\frac{k}{\alpha_m B} > \frac{(1-\alpha_s)I}{I-\alpha_s X}$ requires that $\frac{(1-\alpha_s)I}{I-\alpha_s X} < p\frac{(1-\alpha_s)I}{I-\alpha_s X} + 2(1-p)$, the highest possible value of $\frac{k}{\alpha_m B}$, for cases with an interior solution. The inequality $\frac{(1-\alpha_s)I}{I-\alpha_s X} < p\frac{(1-\alpha_s)I}{I-\alpha_s X} + 2(1-p)$ holds if and only if $\frac{(1-\alpha_s)I}{I-\alpha_s X} < 2$. The derivation of the parameter ranges states that we obtain interior solutions for $\frac{(1-\alpha_s)I}{I-\alpha_s X} > \frac{1}{2p}\left(\sqrt{5-4p} + 2p - 1\right)$. For there to be any parameters with $\mathrm{d}c/\mathrm{d}p > 0$ we must have $\frac{1}{2p}\left(\sqrt{5-4p} + 2p - 1\right) < 2$, which holds if $p < \sqrt{2} - 1 \approx 0.41$. ∎

B Alternative cost function

In this Appendix, we discuss an alternative formulation where the manager incurs the manipulation cost only when attempting to manipulate following a bad signal S_b. In this setting, the manager's objective function is:

$$\underbrace{\frac{(1-p)c\ \alpha_m}{(1-p)c + p(1-\alpha_m)}}_{\mathrm{P}_m(\theta_g|S_b)} \underbrace{m}_{\mathrm{P}_m(R_g|S_b)} B - \frac{k}{2}m^2. \tag{B.1}$$

Solving the manager's first-order condition gives $m = \frac{(1-p)c}{(1-p)c+p(1-\alpha_m)p}\frac{\alpha_m B}{k}$, bounded above by 1. The second-order condition is satisfied by $k > 0$. The board's objective is identical to (10). This setting affects how m reacts to c. Direct computations show that $\frac{\mathrm{d}m}{\mathrm{d}c} \geq 0$, with equality for $m = 1$, and that the board's second-order condition is never satisfied:

$$\frac{\mathrm{d}^2 U_s}{\mathrm{d}c^2} = \underbrace{\frac{2(1-p)p\left((X-I)\alpha_s + \alpha_m(I-\alpha_s X)\right)}{(1-p)c + (1-\alpha_m)p}}_{>0 \text{ because } I<X<\frac{1}{\alpha_s}I} \underbrace{\frac{\mathrm{d}m}{\mathrm{d}c}}_{\geq 0}. \tag{B.2}$$

The board therefore adopts a corner solution of $c \in \{0, 1\}$. The board chooses between:[17]

$$U_s(c = 0) = \alpha_s X - I + p(1 - \alpha_s)I, \tag{B.3}$$

where $c = 0$ implies that $m = 0$, and:

$$U_s(c = 1) = \alpha_s X - I + (1 - m)\left(p(1 - \alpha_s)I + (1 - p)(I - \alpha_s X)\right). \tag{B.4}$$

The board's choice then depends on:

$$U_s(c = 1) - U_s(c = 0) = \underbrace{(1 - p)(I - \alpha_s X)}_{\substack{\text{Avoid investing after} \\ \text{uninformative signal}}} - \underbrace{m\left((1 - p)(I - \alpha_s X) + p(1 - \alpha_s)I\right)}_{\text{Invest after successful manipulation}}. \tag{B.5}$$

Expression (B.5) implies that the board chooses conservative accounting ($c = 1$) if:

$$m < \frac{1}{1 + \frac{p}{1-p}\frac{(1-\alpha_s)I}{I-\alpha_s X}} \quad \Leftrightarrow \quad \frac{k}{\alpha_m B}(1 - \alpha_m p) > 1 + p\left(\frac{(1 - \alpha_s)I}{I - \alpha_s X} - 1\right). \tag{B.6}$$

In our primary setting, conservatism and manipulation both increase in the strength k of governance and the *ex ante* loss $I - \alpha_s X$ (See Propositions 2 and 3). Here, a sufficiently high k and/or $I - \alpha_s X$ are needed to satisfy (B.6) so that conservatism and manipulation will occur.

[17] If p is too small, a positive report does not sufficiently alter the board's prior beliefs that expansion has a negative NPV, and the board never expands. Formally, $U_s(c = 0)$ is positive only when $p > \frac{I-\alpha_s X}{(1-\alpha_s)I}$, where $I < X < \frac{1}{\alpha_s}I$ implies that $\frac{I-\alpha_s X}{(1-\alpha_s)I} \in (0, 1)$.