The effect of incentive-pay and accounting discretion in a dynamic model of earnings management*

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June 11, 2013

Abstract

This paper analyzes the effects of incentive-pay and accounting discretion on earnings management. I develop a dynamic model of earnings reporting in which the cost of earnings management is endogenous, and in which a privately informed manager trades-off incentives to manipulate earnings which increases the firm's stock-price and his current period payoff against incentives to be honest which improves his reputation and future payoff.

I find that more incentive-pay and more accounting discretion can lead to less earnings management. Incentive-pay and accounting discretion make a manager's per-period payoff more sensitive to reports. This effect increases both the manager's current period payoff to manipulating earnings, and the manager's payoff to having a better reputation. When having a better reputation dominates the benefit of increasing the current period payoff, the manager does less earnings management.

*I am grateful to Haresh Sapra, Milton Harris, Canice Prendergast and Balazs Szentes for their guidance and support. I also wish to thank Omar Al-Ubaydli, Tim Baldenius, Frederico Belo, Maria Correia, Oliver Duerr, Pedro Gete, Frøystein Gjesdal, Maris Goldmanis, Tatiana Fedyk, Kenneth Fjell, Priscilla Man, Xiaojing Meng, Joshua Ronen, Jack Stecher, and Marc Teigner-Baqué, an anonymous referee, and all participants at the FARS and WAE meetings for their comments and suggestions. Financial support by the Fundação para a Ciência e Tecnologia and the University of Chicago is gratefully acknowledge. All errors are mine.

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Keywords: *Earnings Manipulation, Reputation Concerns, Incentive-Pay, Discretion in Accounting Standards.*

1 Introduction

It is well known that managers manipulate earnings. This behavior is often seen as the outcome of a manager's incentive-based compensation coupled with some discretion in reporting, and some of the literature argues that more incentive-pay and accounting discretion should lead to more earnings manipulation. In this paper I reassess these conclusions using a dynamic model of earnings management in which the cost of manipulating earnings is endogenous and related to a manager's reputation concern for honesty. Contrary to conventional wisdom, I find that more incentive-pay and more accounting discretion may lead to less earnings manipulation.

This paper improves on the literature by considering the dynamic effects of earnings reporting to managers. In doing so it shows how a manager's concern for honesty may arise from his desire to increase the future stock price of the firm, and offers a new explanation for why manipulating earnings may be costly. The conclusions of this paper highlight the relevance of using dynamic models of earnings management when evaluating the impact on manipulation of changes in the reporting environment.

I develop a three-period model. In each period a firm generates earnings which are made of cash and accruals. Accruals reverse and become part of the cash of the following period. Each period's cash is publicly observable. True accruals, on the other hand, are only observable by the manager who then reports to shareholders according to accounting rules. These rules constrain a manager's reporting so that he can only manipulate accruals within some bounds, but he may also be incapable of revealing exactly what he observes.

There are two types of managers: a nonstrategic type, henceforth called truthful, who reports with the most precision that accounting rules permit, and a strategic type who maximizes his payoff. Shareholders believe that the manager is truthful with some probability, which I call the manager's reputation. This reputation is updated with new information, in particular after future realizations of the firm's cash. Future cash is useful to update the manager's reputation because it contains information about the firm's current true accruals.

In this sense, future cash works as an imperfect signal of true accruals.

I assume that the manager's per-period payoff increases in the firm's stock price. This assumption creates both a benefit and a cost to manipulate earnings. Manipulating earnings benefits the manager because the current period stock price depends on his report. On the other hand, manipulating earnings is costly because it may blemish the manager's reputation for being truthful. In future periods, the reports of a manager with a worse reputation have less impact on the firm's stock price, and the lesser impact reduces the manager's payoff in those periods. When reporting, the manager optimally trades-off the current period benefit with the future cost of earnings manipulation.

Shareholders use the manager's report about accruals together with the firm's cash to price the firm's stock. The firm's stock price is endogenous and equal to the expected sum of true earnings. When forming expectations shareholders take into consideration their information set and the manager's reporting behavior.

In equilibrium earnings management arises but only when true accruals are low. To be specific, if true accruals are low a strategic manager reports high accruals more frequently than a truthful manager, while when true accruals are high, the strategic manager mimics the behavior of the truthful manager. Despite being manipulated, reported earnings are still informative because the manager may be a truthful type and, more importantly, even the strategic manager's report contains some information.[1] This result implies that the stock price increases in reported earnings.

In contrast with the existing literature, I find that the degree of earnings manipulation may decrease with incentive-pay. A change in the number of stock shares paid to the manager increases both the current payoff to manipulation and the future payoff to reputation, i.e., it increases both benefit and the cost of earnings manipulation. When the increase in the manager's future payoff is larger than the increase in the manager's current payoff, more

[1] In the model section I assume that the accouting standards actually require that the strategic manager's reports have to be informative. This assumption is only for the sake of exposition. The result that the strategic manager's report contains some information can be shown in a more general setting in which the strategic manager's reports are allowed to be uniformative.

incentive-pay leads to less earnings manipulation.[2] The key insight is that the effect of incentive-pay on earnings manipulation depends on how incentive-pay changes over time. When testing whether more incentive-pay leads to more earnings management one should control for the manager's future pay-for-performance.

I also find that more reporting discretion can lead to less earnings management. There are two mechanisms through which discretion affects earnings management. First, more discretion allows a truthful manager to increase the precision and informativeness of his reports. More informative reports lead to a larger difference in stock prices following a high and low report, which gives a strategic manager stronger incentives to manipulate. At the same time, more accurate reports from a truthful manager make it easier to infer the manager's type. The manager's reputation becomes more sensitive to earnings management which gives him less incentives to manipulate. Second, more discretion makes it easier to manipulate earnings in future periods which, in turn, increases the payoff to reputation and thus should lead to less earnings management.

The total effect of discretion on manipulation is a combination of these different costs and benefits, and can lead to less manipulation. It is possible to show that less manipulation follows an increase in discretion when future payoffs and accruals are relatively more important than the first-period payoff and accruals.

Finally, the effect of accounting precision and conservatism on earnings management is ambiguous. For example, both more accounting precision and more conservatism can lead to more earnings manipulation. The mechanisms through which precision and conservatism affect earnings management are similar to the ones for accounting discretion. The ambiguity arises because accounting precision and conservatism affect both the current period payoff to manipulation and the future period payoff to reputation.

[2] This result is consistent with evidence provided by Armstrong et al. (2010) who find that equity incentive-pay has a modest negative impact on the incidence of accounting irregularities.

2 Related Literature

The current paper is related to the literature on how incentive-pay affects earnings management. Fischer and Verrecchia (2000), Goldman and Slezak (2006), and Guttman et al. (2006) are a few examples. The general understanding in this literature is that more incentive-pay leads to more earnings management. I show that this needs not be the case because more incentive-pay increases both the benefit and the cost of manipulating earnings.

This paper also relates to Chen et al. (2007) and Ewert and Wagenhofer (2005) who discuss the role of accounting standards in earnings management. Unlike Chen et al. (2007), I show that conservatism may lead to more earnings manipulation because it reduces the payoff to reputation. Our results differ because my setting considers the effects of conservatism in the manager's future payoff. Similar to Ewert and Wagenhofer (2005), but for different reasons, I find that tighter standards can increase rather than decrease accounting earnings management. In Ewert and Wagenhofer (2005) tighter standards increase the exogenous cost of manipulating earnings which leads to more value relevant reports which in turn increases the incentive to manipulate. In my setting tighter standards reduce the manager's discretion and the payoff to reputation which give more incentives to manipulate. In contrast to Ewert and Wagenhofer (2005), tighter settings actually lead to less value relevant reports.

The role of reputation concerns in the communication of private information is not new, but has received limited attention in the context of managers reporting earnings. Einhorn and Ziv (2008) and Beyer and Dye (2012) are exceptions, and they focus on reputation concerns in settings of voluntary disclosure.[3] Others like Benabou and Laroque (1992), Morris (2001), Ottaviani and Sorensen (2006), Sobel (1985), and Trueman (1994), look at how informed financial experts or political advisers who care about reputation convey their information to decision makers. The setting of this paper shares some of the features with

[3] Another relevant but less akin model is from Stocken (2000) who evaluates the role of reputation in a voluntary disclosure setting. We differ in many aspects, but mainly in our approach to reputation. In his model, there is no fundamental uncertainty about a manager's characteristic. Reputation is a latent and arbitrary variable that describes the history of the game.

these models. The key distinction is the introduction of an accrual constraint and accounting standards, which affect the accumulation of reputation and the biases in communication.

3 Model

A manager runs a firm which randomly generates earnings $y_t \in \Re$ in each of three periods. Earnings y_t are the sum of the cash $z_t \in \Re$ that refers to period t activities and was realized in period t, and of accruals $a_t \in \{a^h, a^l\} \equiv A$. Accruals reverse and become part of the total cash c_{t+1} in the following period, so that $c_{t+1} = z_{t+1} + a_t$. Earnings of period t can thus be written as $y_t \equiv z_t + a_t = c_t + a_t - a_{t-1}$. Since the model only has three periods and the sum of accruals has to be equal to the sum of total cash, we have that period 3 and period 0 accruals are zero, $a_3 = a_0 = 0$. Accruals a_t and cash z_t are i.i.d. within and across periods. Let $l(a_t)$ and $f(z_t)$ denote the likelihood of period t accruals and cash. I assume that the densities $f(c-a^h)$ and $f(c-a^l)$ satisfy the monotone likelihood ratio property, i.e., the ratio $f(c-a^h)/f(c-a^l)$ increases in c.

At the end of each period total cash c_t is publicly observable. On the other hand, the manager privately observes accruals a_t and issues an accrual report $r_t \in \{r^h, r^l\} \equiv R$ s.t. reported earnings are just $e_t \equiv c_t + r_t - r_{t-1}$. I assume that the report set R is identical to A but will keep the different notation to avoid confusion. In the current binary setting, the manager's reporting strategy is a likelihood $g(r^i|a^j)$ of the report r^i given true accruals a^j.

Accounting Standards When reporting, the manager is limited by accounting standards and an auditor's judgement of economic events. To capture the reporting constraints imposed by the standards and the auditor on the manager, I assume that the probability of an accurate report given true accruals a^i is at least $\mu - \varepsilon$ and at most $\mu + \varepsilon$, i.e. $\mu - \varepsilon \leq g(r^i|a^i) \leq \mu + \varepsilon$

with $\frac{1}{2} \leq \mu \leq 1$, $\varepsilon \leq \min(1-\mu, \mu - \frac{1}{2})$.[4,5]

The constant μ is a measure of the precision of reports that the standards would produce absent any reporting discretion. By allowing for some discretion, the precision of reports can be increased or decreased by ε. Perfectly accurate standards that do not leave room for discretion are captured by $\mu = 1$ and $\varepsilon = 0$. The standards impose noise when $\mu + \varepsilon < 1$ because the manager cannot report exactly what he observes. The expression $1 - (\mu + \varepsilon)$ measures the minimum noise that the standards impose. The standards require some precision in reporting when $\mu - \varepsilon > \frac{1}{2}$ because the manager cannot babble. The expression $\mu - \varepsilon$ is the minimum precision that the standards require, and its counterpart $1 - (\mu - \varepsilon)$ is the maximum noise that the standards allow. An increase in the constant μ means that the standards impose a lower minimum noise and require a higher minimum precision. Whether an increase in μ also increases the equilibrium precision of reports depends on the manager's optimal behavior.

The constant ε measures the discretion in the standards, with higher ε meaning more discretion or flexibility. Note that an increase in discretion increases the manager's ability both to report more and less accurately. Thus, discretion may lead to more or less earnings management depending on how it is used.

In its current form the accounting standards constraint imposes the same bounds on reporting high (y^h) and low (y^l) earnings. This assumption may not be realistic due to conservatism. In section 4.2.4 I will relax this assumption.

Manager's Payoff The manager's per-period payoff is a fraction of the firm's stock price, $\gamma_t P_t$. Such payoff can arise because the manager is compensated with a share γ_t of the firm's

[4] None of the results of the model depend on the accounting standards constraining the manager's reporting except of course for the comparative statics related to the accounting standards. These comparative statics would also hold for generic reporting constraints as long as $g(r^h|a^h) \geq g(r^h|a^l)$.

[5] The reporting technology is along the lines of Dutta and Gigler (2002), Gigler and Hemmer (2001), and Goldman and Slezak (2006). These papers offer an alternative interpretation to the current setup: an accounting system, instead of the manager, provides an exogenous report about earnings. The manager can influence this report through actions – for example, by spending time lobbying an auditor. The manager's influence, in a binary setting, is captured by the impact on the likelihood of a report.

stocks or because he is acting in the interest of shareholders and attaches a weight γ_t to the welfare of period-t shareholders. I'll favor the former view when discussing the effects of incentive-pay on earnings management.

Manager's Type A manager can be truthful (T) or strategic (S). The truthful manager tries to get as close as possible to the truth given the reporting constraints and thus reports in the most informative way. His reporting strategy is such that $g_T(r^i|a^i) = \mu + \varepsilon$. The strategic manager reports to maximize his payoff, and his reporting strategy is denoted by $g_S(r|a,\lambda)$. Shareholders do not know which type of manager they face. With probability λ_t they believe that the manager is truthful and such belief is what I call reputation. Upon new information, shareholders update their belief about the manager's type using Bayes' rule. In particular, after observing the period-t report and period-t+1 cash, the manager's reputation becomes:

$$\lambda_{t+1}(r_t, c_{t+1}) = \frac{\lambda_t}{\lambda_t + (1-\lambda_t)\frac{\hat{g}_S(r_t|c_{t+1},\lambda_t)}{g_T(r_t|c_{t+1})}} \tag{1}$$

where $\hat{g}_S(r_t|c_{t+1},\lambda_t) = \sum_{a_t} \hat{g}_S(r_t|a_t,\lambda_t) f(c_{t+1}|a_t)$ incorporates shareholders' beliefs $\hat{g}_S(r_t|a_t,\lambda)$ about the strategy of a type S manager with prior reputation λ_t.[6] The posterior reputation λ_{t+1} is higher when the prior reputation λ_t is higher and when the relative frequency of a report, $\frac{\hat{g}_S(r_t|c_{t+1},\lambda_t)}{g_T(r_t|c_{t+1})}$, is smaller. The ratio $\frac{\hat{g}_S(r_t|c_{t+1},\lambda_t)}{g_T(r_t|c_{t+1})}$ crucially depends on accounting standards: the more discretion they allow the less likely a truthful manager's report r_t is inconsistent with the future cash realization c_{t+1}. For the same beliefs $\hat{g}_S(r_t|c_{t+1},\lambda_t)$, it implies that an inconsistent pair (r_t, c_{t+1}) is relatively more likely to come from a strategic manager. Accounting discretion makes the realizations (r_t, c_{t+1}) more informative about the

[6] By Bayes' rule,

$$\begin{aligned}\lambda_{t+1} &\equiv P(type = T|r_t, c_{t+1}) = \frac{P(r_t, c_{t+1}|type = T)P(type = T)}{P(r_t, c_{t+1})} \\ &= \frac{\lambda P(r_t|c_{t+1}, type = T)}{\lambda P(r_t|c_{t+1}, type = T) + (1-\lambda)P(r_t|c_{t+1}, type = S)}\end{aligned}$$

where the last equality follows from the signal s and the manager's type being independent.

manager's type.

Stock Prices The firm's price in each period is just the expected liquidation value given the information set of shareholders and their beliefs about the manager's strategy: $P_t = E[y_1 + y_2 + y_3|I_t]$. Since the manager's report r_t only depends on the current true accruals a_t, and shareholders observe the firm's total cash, prices simplify to:[7,8]

$$P_1 = c_1 + E[a_1|r_1, \lambda_1] + E[y_2 + y_3] \qquad P_2 = c_1 + c_2 + E[a_2|r_2, \lambda_2] + E[y_3] \tag{2}$$
$$P_3 = c_1 + c_2 + c_3$$

To summarize and recap, figure 1 presents the timeline of the model: at the end of each period shareholders and managers observe total cash c_t, managers privately observe true accruals a_t and issue a report r_t. Shareholders use this report together with their belief about the manager's type λ_t to price the firm, and the manager earns a payoff proportional to the share price, $\gamma_t P_t$. At the end of the following period, cash c_{t+1} is observable and shareholders use it together with the report r_t to update their beliefs about the manager's type, λ_{t+1}.[9] The game is then repeated.

4 Equilibrium Analysis

This section discusses the definition, existence and properties of equilibrium. I'll start the analysis with the third period and then use backward induction until the first period. When discussing each period's stock price, I'll focus mostly on the expected value of accruals. This

[7] The expectations $E[a|r, \lambda]$ are given by:

$$E[a|r, \lambda] = (a^h - a^l)l(a^h|r, \lambda) + a^l \quad and \quad l(a^h|r, \lambda) = \frac{\lambda g_T(r|a^h) + (1-\lambda)g_S(r|a^h)}{\lambda g_T(r) + (1-\lambda)g_S(r)} l(a^h)$$

[8] I assume no dividends in the model to keep it focused on earnings reporting. Including dividends would not change the analysis of the model as long as dividends are uninformative about true accruals.

[9] Allowing shareholders to observe an explicit signal s_t about accruals can easily be accomodated and does not change any of the results.

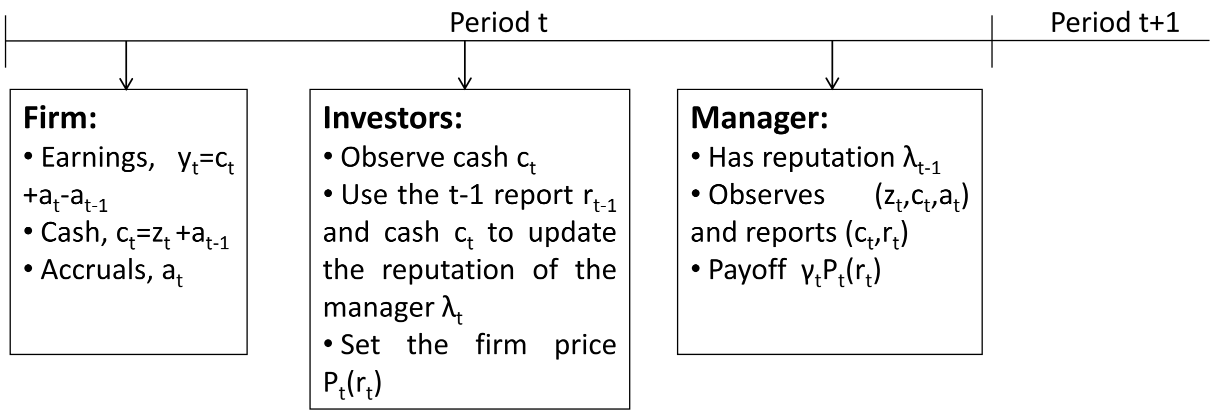

Figure 1: Timeline.

is because reports only affect stock prices through the expected value of accruals, as it can be seen in equation (2).

Third and Second Periods The only role of the third period is to guarantee that the accruals constraint is satisfied. The manager takes no actions, and since total cash is observable, the firm's stock price P_3 does not depend on the manager's past reports or on his reputation. From the manager's perspective his third-period payoff is exogenous.

In the second period the manager chooses the report to maximize:

$$\pi_2(r_2, a_2, \lambda_2) = \gamma_2 P(r_2, \lambda_2) + \gamma_3 E[P_3|I_2]$$

Since shareholders' beliefs are such that the stock price P_2 increases in the report, the strategic manager's optimal strategy is to report r_2^h with the highest possible probability regardless of true accruals. The strategic manager's report may be informative, though, due to the limitations imposed by the accounting standards.

In equilibrium, shareholders' beliefs and the manager's strategy are consistent. The equilibrium stock price is indeed increasing in the report r_2 because an honest and a strategic manager's report is informative. Since an honest manager is more informative than a strategic, average informativeness increases with the manager's reputation. This result implies that the stock price after a high report r_2^h increases with the manager's reputation while the opposite is true after a low report r_2^l. Thus, a manager with a better reputation has a stronger impact on the second-period stock price.

Finally, the strategic manager's expected payoff $\Pi_2(\lambda_2) \equiv E[\pi_2(r_2, a_2, \lambda_2)|c_2]$ increases in his reputation λ_2.[10] The manager's payoff is a weighted sum of the stock prices $P_2(r_2^h, \lambda_2)$ and $P_2(r_2^l, \lambda_2)$, with the weights being the likelihood with which the manager reports high and low accruals. Reputation makes the stock prices move in opposite directions with $P_2(r_2^h, \lambda_2)$ increasing in λ_2. But the weight that a strategic manager puts on the stock price $P_2(r_2^h, \lambda_2)$ is sufficiently high that he gains more from the increase in $P_2(r_2^h, \lambda_2)$ than he loses from the decrease in $P_2(r_2^l, \lambda_2)$. Note then that a manager's reputation concern is endogenous and stems from the manager taking advantage of reports that are more informative.

Lemma 1 summarizes these results.

Lemma 1. *In equilibrium* $g_S(r_2^h|a_2^h) = \mu + \varepsilon$ *and* $g_S(r_2^h|a_2^l) = 1 - (\mu - \varepsilon)$. *The stock price satisfies* $P(r_2^h, \lambda_2) > P(r_2^l, \lambda_2)$, *with* $P(r_2^h, \lambda_2)$ *increasing and* $P(r_2^l, \lambda_2)$ *decreasing in* λ_2. *Also,* $E_S[P_2(r_2, \lambda_2)|a_1, c_2]$ *increases in* λ_2.

First Period Using the second period equilibrium, we can now write the manager's first period payoff as:

$$\pi_1(r_1, a_1, \lambda_1) = \gamma_1 P_1(r_1) + E[\Pi_2(\lambda_2(r_1, c_2))|a_1] \tag{3}$$

The manager's problem is to choose the accrual report r_1 to maximize his payoff in (3) subject to the accounting standards.

The first component of the manager's payoff increases in reported accruals, giving him an incentive to manipulate earnings upwards. On the other hand, the second component

[10] Expectations are taken over a_2 and r_2 and from the manager's perspective:

$$\begin{aligned} E[\pi_2(r_2, a_2, \lambda_2)|c_2] &= \gamma_2\{c_1 + c_2 + g_S(r^h)E[a_2|\lambda_2, r_2^h] + g_S(r^l)E[a_2|\lambda_2, r_2^l]\} \\ &\quad + \gamma_3\{c_1 + c_2 + E[c_3]\} \end{aligned}$$

provides an incentive to build reputation which increases the manager's second-period payoff. Having the manager's payoff increasing in reputation does not mean that an upward manipulation of earnings is costly. Whether manipulation is costly depends on how it endogenously affects reputation. As we will see later, it is indeed the case that in equilibrium an upward manipulation leads to a worse reputation. Hence, the manager's key trade-off is between a higher payoff today and a better reputation tomorrow which increases his future payoff.

With this in hand we are ready to define an equilibrium in the first period:

Definition 2. *A sequential equilibrium of this game is a strategy* $g_S^*(r_1|a_1;\lambda_1)$ *and beliefs* $\hat{g}_S^*(r_1|a_1;\lambda_1)$ *for all* $a_1 \in A$ *s.t.:*

i) A manager chooses a report about accruals to maximize his payoff $\pi_1(r_1, a_1, \lambda_1) = \gamma_1 P_1(r_1) + E[\Pi_2(\lambda_2(r_1, c_2))|a_1]$ *s.t.* $\mu - \varepsilon \leq g_S^*(r_1^i|a_1^i, \lambda_1) \leq \mu + \varepsilon$.

ii) The reporting strategy is a density: $\sum_{r_1=r_1^l, r_1^h} g_S^*(r_1|a_1;\lambda_1) = 1 \;\; \forall a_1$ *and* $g_S^*(r_1|a_1;\lambda_1) \geq 0 \;\; \forall r_1$;

iii) Beliefs are consistent: $g_S^*(r_1|a_1;\lambda_1) = \hat{g}_S^*(r_1|a_1;\lambda_1)$;

iv) Stock prices are the sum of expected earnings $P_t = E[y_1 + y_2 + y_3|I_t]$ *as in* (2).

Condition i) requires that managers behave as rational agents and maximize their payoff, taking shareholders' beliefs as given. The managers' behavior is limited by accounting standards. Condition ii) guarantees that the optimal strategy is a probability measure, i.e., it is nonnegative and sums to one. Condition iii) simply states that shareholders' beliefs about the manager's strategy must be coherent with the actual strategy. Finally, condition iv) requires that stock prices reflect the value of the firm conditional on the information shareholders have.

An equilibrium as defined above exists, but it may not be unique and, in that case, the comparative statics are meaningless. The following theorem shows that there is only one equilibrium and gives a characterization:

Proposition 3. *An equilibrium as in definition 2 exists and is unique. The optimal reporting strategy is:*

$$g_S^*(r_1^h|a_1;\lambda_1) = \left\{ \begin{array}{ll} \mu+\varepsilon & if \quad a_1 = a_1^h \\ \min(1-(\mu-\varepsilon), \tilde{g}_S(r_1^h|a_1^l,\lambda_1)) & if \quad a_1 = a_1^l \end{array} \right\}$$

where $\tilde{g}_S(r_1^h|a_1^l,\lambda_1)$ *is the unique value of* $\hat{g}_S(r_1^h|a_1^l,\lambda_1)$ *that solves* $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l) \equiv \pi_1(r_1^h, a_1^l, \lambda_1) - \pi_1(r_1^l, a_1^l, \lambda_1) = 0$.

Proof. The formal proof is in Appendix. Below I provide an informal argument. To see how $\hat{g}_S(r_1^h|a_1^l,\lambda_1)$ affects $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l)$ please refer to footnote 11. ■

Informal Proof To understand how an equilibrium arises it is useful to do a cost and benefit analysis. Consider the difference:[11]

$$\begin{aligned} \Delta_{r_1^l}^{r_1^h}\pi_1(a_1) &\equiv \pi_1(r_1^h, a_1, \lambda_1) - \pi_1(r_1^l, a_1, \lambda_1) \\ &= \gamma_1[P_1(r_1^h) - P_1(r_1^l)] + E\left[\Pi_2\left(\lambda_2(r_1^h, c_2)\right) - \Pi_2\left(\lambda_2(r_1^l, c_2)\right) \mid a_1\right] \end{aligned} \tag{4}$$

It is immediate that the manager chooses to report $r_1^h(r_1^l)$ with the highest possible probability when $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1) > (<)0$. When $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1) = 0$, the manager is indifferent between reporting high or low earnings. The term $\gamma_1(P_1(r_1^h) - P_1(r_1^l))$ in equation (4) is positive and represents the additional benefit of reporting high accruals r_1^h instead of reporting low accru-

[11]Developing $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1)$ fully yields:

$$\begin{aligned} \Delta_{r_1^l}^{r_1^h}\pi_1(a_1) &= \gamma_1(a_1^h - a_1^l)l(a_1^h)\left(\frac{l(r_1^l|a_1^h)}{l(r_1^h)} - \frac{l(r_1^l|a_1^h)}{l(r_1^l)}\right) \\ &+E\left[\Pi_2\left(\frac{\lambda_1}{\lambda_1+(1-\lambda_1)\frac{g_S(r_1^h|c_2,\lambda_1)}{g_T(r_1^h|c_2,\lambda_1)}}\right) - \Pi_2\left(\frac{\lambda_1}{\lambda_1+(1-\lambda_1)\frac{g_S(r_1^l|c_2,\lambda_1)}{g_T(r_1^l|c_2,\lambda_1)}}\right) \mid a_1\right] \end{aligned}$$

The differential payoff $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l)$ is strictly decreasing in $\hat{g}(r_1^h|a_1^l,\lambda_1)$ because the reputation $\lambda_2(r_1^h, c_2)$ and stock price $P_1(r_1^h)$ are decreasing in $\hat{g}(r_1^h|a_1^l,\lambda_1)$, while the reputation $\lambda_2(r_1^l, c_2)$ and stock price $P_1(r_1^l)$ are increasing in $\hat{g}(r_1^h|a_1^l,\lambda_1)$.

als r_1^l. Similarly, the term $E\left[\Pi_2\left(\lambda_2(r_1^h, c_2)\right) - \Pi_2\left(\lambda_2(r_1^l, c_2)\right) \mid a_1\right]$ represents the additional reputation cost of reporting r_1^h instead of r_1^l.

The reputation cost of reporting high accruals conditional on cash c_2 decreases with c_2. Roughly speaking, a higher cash realization is more consistent with high accruals which points to the manager being honest. The implication is that the expected reputation cost of reporting r_1^h is lower when true accruals are high, and so $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h) > \Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l)$. It also turns out that the difference $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h)$ must be positive in any feasible equilibrium. Hence, when accruals are high $a_1 = a_1^h$, the manager finds it optimal to report r_1^h with the highest possible probability. On the other hand, when true accruals are low $a_1 = a_1^l$, the benefit of reporting high accruals r_1^h may be bigger, equal or smaller than the cost depending on shareholders' beliefs. If shareholders believe the strategic manager is behaving as the truthful manager, i.e. $\hat{g}_S(r_1^h|a_1^l) = 1-(\mu+\varepsilon)$, then the benefit of reporting r_1^h is larger than the cost. This leads the manager to report r_1^h with highest probability, $g(r_1^h|a_1^l) = 1-(\mu-\varepsilon)$, which cannot be an equilibrium.

Only two mutually exclusive scenarios are feasible. Either i) as shareholders beliefs' $\hat{g}_S(r_1^h|a_1^l)$ increase, the reputation cost $E[\Delta_{r_1^l}^{r_1^h}\Pi_2(\lambda_2(r_1, a_1)|a_1]$ also increases and equates the manager's benefit; so that the manager is indifferent between reporting high or low accruals and the solution is consistent; or ii) the benefit $\gamma_1\Delta_{r_1^l}^{r_1^h}P_1(r_1)$ is always larger than the cost even when the reputation cost is highest; and so the manager reports high accruals with the highest probability, which is also consistent with shareholders beliefs'. Which scenario prevails depends on specific parameter values.

Intuition for Equilibrium In equilibrium, the strategic manager mimics the truthful when accruals are high $(a_1 = a_1^h)$. He reports high accruals r_1^h with probability $\mu+\varepsilon$. When true accruals are low $(a_1 = a_1^l)$, the strategic manager reports high(low) accruals more(less) frequently than the truthful, and his report r_1 and the future cash realizations c_2 are more likely to seem inconsistent.

This equilibrium is expected and intuitive. A strategic manager is more likely to report high accruals because it increases his current payoff. A truthful manager is immune to this pressure and reports in the most informative way. Thus, when accruals are high, both types of manager have the same reporting strategy. It is only when true accruals are low that the strategic manager reports high accruals more frequently than the truthful. This result implies that when shareholders observe a high report they assign, on average, a lower reputation to the manager, especially when the cash realization c_2 is more inconsistent with the report r_1. The future reports of a manager with worse reputation have less impact in prices, which reduces the manager's payoff. Reporting high accruals is thus costly to the manager. The cost arises endogenously and disciplines him, but he still manipulates earnings to some degree.

4.1 Incentive-Pay

Compensation contracts of managers typically include an incentive-pay component which, among other things, depends on the firm's stock price. The consensual view in the literature is that more incentive-pay leads to more earnings manipulation. In this section I argue that such conclusion fails to consider the dynamic effects of incentive-pay and, once we account for those, more incentive-pay may actually reduce manipulation.

To analyze the effect of incentive-pay on earnings manipulation, we can reinterpret the manager's per-period payoff $\gamma_t P_t$ as the incentive part of a manager's compensation contract with the weight γ_t measuring the sensitivity to pay-for-performance. Looking at (4), one can see that the weight γ_1 on the period-1 stock price increases the payoff to manipulation, while an increase in γ_2 increases the cost by making future reputation more valuable.[12] It follows that an increase in the weight γ_1 leads to more manipulation, but an increase in γ_2 leads to less manipulation. Thus, how incentive-pay determine earnings manipulation depends on how it is structured over time.

[12] The weight γ_3 has no effect on the cost and benefit of manipulation.

Consider, for example, a manager who has a compensation contract with constant sensitivity to pay-for-performance, $\gamma_1 = \gamma_2 = \gamma_3 = \gamma$. It is then possible to show that the optimal strategy $g^*(r_1^h | a_1^l, \lambda_1)$ does not depend on γ, that is, the degree of earnings manipulation is not affected by incentive-pay. In this case, more incentive-pay increases both current and future payoffs, both the benefit and the reputation cost of reporting high accruals. While an increase in the benefit leads to more earnings manipulation, an increase in the cost has the opposite effect. Because of the manager's risk neutrality and the linearity of his compensation to the stock price, these effects exactly offset and there is no change in equilibrium. This result is consistent with the findings of Armstrong et al. (2010), who document no evidence of a positive association between CEO equity incentives and accounting irregularities.

It is also possible to construct examples in which earnings manipulation decreases with incentive-pay. Suppose, for instance, that the weight γ_t is some function $h(\gamma, t)$ increasing in γ and with $h_{\gamma t} > 0$, i.e., suppose that when incentive-pay increases in all periods, it increases more in later than in earlier periods. In this case, an increase in incentive-pay γ increases the benefit from manipulating accruals by only a fraction $h_\gamma(., 1)/h_\gamma(., 2) < 1$ of what it increases the cost. It follows that more incentive-pay leads to less manipulation.

This case naturally applies to restricted stock and stock options compensation. Restricted stock and stock options usually vest over time, and when they vest they are usually exercised and become part of that period's incentive-pay, $\gamma_t P_t$. Now, suppose that when a firm offers more stock options it also increases the time they take to vest. More stock options means higher weights γ_t in all periods, and a longer vesting period means that the increase in the weights γ_t is higher in later than in earlier periods. Using the previous analysis one concludes that, in this case, more stock options imply less manipulation.

We can also use the current model to analyze how the structure of incentive-pay affects earnings management. It follows from equation (4) that a higher ratio γ_1/γ_2 increases earnings management. Thus, for the same average incentive-pay, a compensation plan that offers more incentive-pay in earlier than in later periods should lead to more earnings management.

Corollary 4. *Let* $\gamma_t \equiv h(\gamma, t)$*, with* $h_\gamma > 0$*. Then more incentive-pay* γ *leads to less earnings manipulation if* $h_{\gamma t} > 0$*, and vice-versa. More incentive-pay has no effect on earnings manipulation if* $h_{\gamma t} = 0$*.*

4.2 Accounting Standards

4.2.1 Accounting Discretion

Accounting rules typically allow for some managerial discretion over the reporting of earnings. The rationale being that then a manager can reflect into earnings his relevant but private information. The drawback is that he may take advantage of his discretion and manipulate earnings in his favor. In what follows I show that this drawback is not necessarily true. More accounting discretion may in fact lead to less earnings manipulation, and attempts to reduce earnings management by constraining accounting discretion may be self-defeating. I also show that the manager's incentive to manipulate earnings is tightly associated with the social benefit of allowing for discretion. It is because discretion helps in reflecting relevant private information into earnings that the manager also has stronger incentives to manipulate.

In the model discretion is captured by the parameter ε. An increase in discretion has three main effects. First, and keeping constant the degree of earnings management, both an honest and a strategic manager's reports become more accurate in the current and future periods. More informative reports in the current period widen the difference in stock prices following a high and low report. This effect gives the manager stronger incentives to manipulate earnings. On the other hand, more informative reports in future periods increase the manager's payoff to reputation which gives an incentive to be honest.

Second, discretion improves the accuracy of an honest manager's reports making it easier to infer his type. The manager's reputation becomes more sensitive to earnings manipulation which in turn becomes more costly.

Finally, more discretion gives a strategic manager more freedom to report earnings. This freedom allows the manager to report high accruals more frequently in the future, and thus take more advantage of his reputation. The payoff to reputation increases and current earnings management becomes more costly.

The total impact of discretion on earnings management is a combination of all these effects. All of these effects lead to less earnings management, except for the effect of discretion on the first-period stock price. It is possible to show that discretion leads to less earnings management when future payoffs and accruals are relatively more important than the first-period payoff and accruals, i.e., when the ratios of weights γ_2/γ_1 and of accruals $\frac{a_2^h - a_2^l}{a_1^h - a_1^l}$ is relatively large.

Note that these effects of discretion are only relevant if $g_S(r^h|a^l, \lambda)$ is interior. Otherwise, when $g_S(e^h|y^l) = 1 - (\mu - \varepsilon)$, a marginal increase in discretion leads inevitably to more earnings manipulation. The manager wants to manipulate earnings the most he can, and an increase in discretion will just allow him to do more of it.

Corollary 5. *An increase in discretion ε leads to more earnings when $g_S^*(r^h|a^l, \lambda) = 1 - (\mu - \varepsilon)$, and it may lead to less manipulation when $g_S^*(r^h|a^l, \lambda) < 1 - (\mu - \varepsilon)$. There are two thresholds T_γ and T_a s.t. when $\gamma_2/\gamma_1 > T_\gamma$ or $\frac{a_2^h - a_2^l}{a_1^h - a_1^l} > T_a$ then an increase in discretion leads to less manipulation.*

4.2.2 Accounting precision

A change in accounting precision μ has similar effects on earnings management as a change in discretion. The surprising result is that manipulation may increase with accounting precision. Numeric results suggest that this is more likely when the first-period payoff and accruals are relatively more important than future period payoffs and accruals. Again, these results hold when $g_S(r^h|a^l, \lambda)$ is interior. Otherwise, a marginal increase in accounting precision has no effect on earnings manipulation, and strictly improves informativeness.

4.2.3 Value Relevance

It is worth noting that both more accounting precision μ and accounting discretion ε lead to more value relevance even if there is more earnings manipulation. I define value relevance as the sensitivity of the firm's stock prices to reports. Value relevance increases despite more earnings manipulation because the manager's reports convey on average more information. This result is true even if we focus only on the information content of a strategic manager's reports. While his high report may become less informative due to more earnings management, his low report becomes much more informative about low accruals. The latter effect dominates the former so that prices become more sensitive to reported accruals.

4.2.4 Conservatism in Accounting Standards

Conservatism in accounting standards refers to the idea that it is easier to recognize events with a negative impact on earnings than events with a positive impact on earnings. For example, inventories are required to be stated at the lower of cost and net realizable value (IAS 2.9). To capture conservatism in the model, let the accounting standards constraints satisfy: $\mu^h - \varepsilon \leq P(r^h|a^h) \leq \mu^h + \varepsilon$ and $\mu^l - \varepsilon \leq P(r^l|a^l) \leq \mu^l + \varepsilon$ with $\mu^h < \mu^l$ and $1 \geq c \equiv \frac{\mu^h}{\mu^l}$. These constraints mean that the required precision $\mu - \varepsilon$ is higher when true accruals are low than when accruals are high. Also, the imposed noise $1 - (\mu + \varepsilon)$ is lower when true accruals are low relative to when accruals are high. The standards are more conservative the bigger the difference in required precision and imposed noise between high and low accruals. This difference is captured by the constant c, with higher c meaning less conservatism.

Consider first the effect of increasing conservatism by reducing μ^h while keeping μ^l constant. A lower ability μ^h to report high accruals reduces the information content of high earnings reports and the sensitivity of the stock price to those reports. Also, since the honest manager is less accurate, reputation becomes less sensitive to earnings management. Both the current-period incentive to manipulate and the future payoff to reputation become smaller, leading to an ambiguous effect on earnings management. Increasing conservatism by increasing μ^l while keeping μ^h constant is the mirror image of the previous case, and ambiguity also arises.

The main message from this analysis is that conservatism has an ambiguous effect on earnings management and may even lead to an increase on earnings management. This result contrasts with Chen et al. (2007) who find that conservatism reduces earnings manipulation. Our results differ because their setting is static and does not include the effects of conservatism on future payoffs.

5 Conclusion

In this paper I showed that a manager's concern for honesty can arise from wanting that his reports have a stronger impact on the firm's future stock price. The concern for honesty creates a cost to manipulating earnings, and tempers the degree of earnings management.

Once we consider the cost of earnings management to a manager's future payoff, I also showed that more incentive pay and accounting discretion may lead to less rather than more manipulation. This result being because discretion and incentive-pay affect both the benefit and cost of earnings management. For similar reasons, more accounting precision and conservatism have an ambiguous effect on earnings management. These results are new to the literature, and contrast with the results of Chen et al. (2007) on conservatism, and the results of Goldman and Slezak (2006) on incentive-pay. The result that more discretion may lead to less earnings management is akin Ewert and Wagenhoffer (2005) finding that tighter standards may lead to more expected earnings management, but the mechanism that yields this result is different.

Finally, I showed that more discretion and accounting precision make stock prices more sensitive to reports, i.e., reports are more value relevant. This is independent of the effect of discretion and accounting precision on earnings management. This result suggests that earnings management is a poor measure of the information content of reports, and one should be careful in using it when conducting empirical research.

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A Proofs on Equilibrium and Comparative Statics

Let ϕ^i and η^i denote the upper and lower probability bounds for reporting r^h when true accruals are a^i, i.e., $g(r^h|a^i) \in [\eta^i, \phi^i]$. In the model's set up, $\phi^h = \mu + \varepsilon$ and $\eta^h = \mu - \varepsilon$, while $\phi^l = 1 - (\mu - \varepsilon)$ and $\eta^l = 1 - (\mu + \varepsilon)$. Note that $\phi^h > \phi^l$ and $\eta^h \geq \phi^l$ since $\mu - \varepsilon \geq \frac{1}{2}$. Finally, I'll often write g_S^{ij} to denote $g_S(r_1^i|a_1^j, \lambda_1)$.

A.1 Lemma 1

Most of the lemma is proven in the main body of the paper. Here I'll just show that the expectation $E_S[P_2(r_2, \lambda_2)|a_1, c_2]$ increases in λ_2:

$$E_S[P_2(r_2, \lambda_2)|a_1, c_2] = c_1 + a_1 + Ez_2 + g_S(r^h)E[a_2|\lambda_2, r_2^h] + g_S(r^l)E[a_2|\lambda_2, r_2^l]\}$$

Differentiating the last expression w.r.t. λ_2:

$$\frac{\partial E_S[P_2(r_2, \lambda_2)|a_1, c_2]}{\partial \lambda_2} = (a_2^h - a_2^l)\left(g_S(r^h)\frac{\partial l(a_2^h|\lambda_2, r_2^h)}{\partial \lambda_2} + g_S(r^l)\frac{\partial l(a_2^h|\lambda_2, r_2^l)}{\partial \lambda_2}\right)$$

with $l(a_2^h|\lambda_2, r_2^h) = \phi^h \frac{l(a_2^h)}{g_{\lambda_2}(r_2^h)}$ and $l(a_2^h|\lambda_2, r_2^l) = (\lambda_2\eta^l + (1-\lambda_2)\phi^l)\frac{l(a_2^h)}{g_{\lambda_2}(r_2^l)}$, and $g_{\lambda_2}(r_2) = \lambda_2 g_T(r_2) + (1-\lambda_2)g_S(r_2)$. It is straightforward to show that $\frac{\partial l(a_2^h|\lambda_2, r_2^h)}{\partial \lambda_2} > 0$ and that $\frac{\partial l(a_2^h|\lambda_2, r_2^l)}{\partial \lambda_2} < 0$. Now, by the law of iterated expectations a shareholder's expectation $E_I[P_2(r_2, \lambda_2)|a_1, c_2]$ is independent of the manager' reputation:

$$\begin{aligned} 0 \;=\; & \frac{\partial E_I[P_2(r_2, \lambda_2)|a_1, c_2]}{\partial \lambda_2} = (a_2^h - a_2^l)\left(g_{\lambda_2}(r^h)\frac{\partial l(a_2^h|\lambda_2, r_2^h)}{\partial \lambda_2} + g_{\lambda_2}(r^l)\frac{\partial l(a_2^h|\lambda_2, r_2^l)}{\partial \lambda_2}\right) \\ & + \frac{\partial g_{\lambda_2}(r^h)}{\partial \lambda_2}\left[P_2(r_2^h, \lambda_2) - P_2(r_2^l, \lambda_2)\right] \end{aligned}$$

Taking the difference between $\frac{\partial E_S[P_2(r_2,\lambda_2)|a_1,c_2]}{\partial \lambda_2}$ and $\frac{\partial E_I[P_2(r_2,\lambda_2)|a_1,c_2]}{\partial \lambda_2}$ yields:

$$(a_2^h - a_2^l)\left[g_S(r^h) - g_{\lambda_2}(r^h)\right]\left(\frac{\partial l(a_2^h|\lambda_2, r_2^h)}{\partial \lambda_2} - \frac{\partial l(a_2^h|\lambda_2, r_2^l)}{\partial \lambda_2}\right) - \frac{\partial g_{\lambda_2}(r^h)}{\partial \lambda_2}\left[P_2(r_2^h, \lambda_2) - P_2(r_2^l, \lambda_2)\right] > 0$$

since $\frac{\partial g_{\lambda_2}(r^h)}{\partial \lambda_2} < 0$. *Q.E.D.*

A.2 Proposition 3

Reputation $\lambda_2(r_1^h, c_2)$ increases and $\lambda_2(r_1^l, c_2)$ decreases in c_2 From equation (4) managers are indifferent between reports when:

$$\Delta_{r_1^l}^{r_1^h} \pi_1(a_1) = 0$$

which is equivalent to:

$$\gamma_1(P_1(r_1^h) - P_1(r_1^l)) = E[\Pi_2(\lambda_2(r_1^l, c_2)) - \Pi_2(\lambda_2(r_1^h, c_2))|a_1] \equiv E[-\Delta_{r^l}^{r^h} \Pi_2(\lambda_2(r_1, c_2))|a_1] \quad (5)$$

with $\Pi_2(\lambda_2)$ given as in footnote 10, and:

$$\lambda_2(r_1^l, c_2) = \frac{\lambda}{\lambda + (1-\lambda)\frac{\hat{g}_S(r_1^l|c_2,\lambda)}{g_T(r_1^l|c_2)}} = \frac{\lambda}{\lambda + (1-\lambda)\frac{1-g_S(r_1^h|c_2,\lambda)}{1-g_T(r_1^h|c_2)}}$$

and

$$\lambda_2(r_1^h, c_2) = \frac{\lambda}{\lambda + (1-\lambda)\frac{\hat{g}_S(r_1^h|c_2,\lambda)}{g_T(r_1^h|c_2)}} = \frac{\lambda}{\lambda + (1-\lambda)\frac{g_S(r_1^h|c_2,\lambda)}{g_T(r_1^h|c_2)}}$$

with both last equalities holding because of equilibrium condition ii), the manager's strategy being a probability function, and beliefs being consistent. Note that:

$$\begin{aligned} g_S(r_1^h|c_2, \lambda) &= g_S^{hh} F(a_1^h|c_2) + g_S^{hl} F(a_1^l|c_2) \\ g_T(r_1^h|c_2, \lambda) &= \phi^h F(a_1^h|c_2) + \eta^l F(a_1^l|c_2) \end{aligned}$$

It is possible to show that $\lambda_2(r_1^h, c_2)$ increases and $\lambda_2(r_1^l, c_2)$ decreases in c_2:

$$\frac{\partial}{\partial c_2}\frac{g_S(r_1^h|c_2,\lambda)}{g_T(r_1^h|c_2)} = \frac{1}{[g_T(r_1^h|c_2)]^2}\left[\frac{\partial f(a_1^l|c_2)}{\partial c_2} f(a_1^h|c_2) - \frac{\partial f(a_1^h|c_2)}{\partial c_2} f(a_1^l|c_2)\right](\phi^h g_S^{hl} - g_S^{hh}\eta^l) < 0$$

The term in square brackets is negative as the density $f(c_2|a_1)$ satisfies the monotone likelihood ratio. The last term is positive whenever the strategic manager is not reporting as the truthful manager. Since the last term is positive, the ratio $\frac{g_S(r_1^h|c_2,\lambda)}{g_T(r_1^h|c_2)}$ decreases in c_2 and thus $\lambda_2(r_1^h, c_2)$ increases in c_2. Using similar algebra one can show that $\lambda_2(r_1^l, c_2)$ decreases in c_2.

Stock price $P_1(r_1)$ increases in the report Using equation (2) we can write the difference $P_1(r_1^h) - P_1(r_1^l)$ as:

$$\begin{aligned} P_1(r_1^h) - P_1(r_1^l) &= (a_1^h - a_1^l)l(a_1^h)\left(\frac{g_\lambda(r^h|a^h)}{g_\lambda(r^h)} - \frac{1 - g_\lambda(r^h|a^h)}{1 - g_\lambda(r^h)}\right) \\ &= (a_1^h - a_1^l)\frac{l(a_1^h)l(a_1^l)}{g_\lambda(r^h)(1 - g_\lambda(r^h))}\left(g_\lambda(r^h|a^h) - g_\lambda(r^h|a^l)\right) \\ &= (a_1^h - a_1^l)\frac{l(a_1^h)l(a_1^l)}{g_\lambda(r^h)(1 - g_\lambda(r^h))}\left(\lambda(\phi^h - \eta^l) + (1-\lambda)(g_S^{hh} - g_S^{hl})\right) > 0 \end{aligned}$$

The difference $P_1(r_1^h) - P_1(r_1^l)$ is positive since from $\eta^h \geq \phi^l$ we have that $g_S^{hh} \geq g_S^{hl}$. Also note that $g_\lambda(r^h) = \lambda g_T(r_1^h) + (1-\lambda)g_S(r_1^h)$ is increasing in $g_S(r_1^h|a_1^l, \lambda) \equiv g_S^{hl}$, and thus the difference $P_1(r_1^h) - P_1(r_1^l)$ strictly decreases in g_S^{hl}.

Existence and Uniqueness of Equilibrium Consider the difference:

$$\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h) - \Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l) = \int \Delta_{r_1^l}^{r_1^h}\Pi_2(\lambda_2(r_1, c_2))\left[f(c_2|a_1^h) - f(c_2|a_1^l)\right] dc_2$$

It is possible to show that this difference is positive: both $\Delta_{r^l}^{r^h}\Pi_2(\lambda_2(r_1, c_2))$ and $f(c_2|a_1^h) - f(c_2|a_1^l)$ increase in c_2, the difference $f(c_2|a_1^h) - f(c_2|a_1^l)$ single crosses 0 because of MLRP, and that same difference integrates to 0.

This result implies that in equilibrium $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h) \geq \Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l)$ with equality holding only when the strategic manager is reporting honestly.

There are three cases to consider:

1. Suppose $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h) > 0$ and $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l) < 0$. Then $g_S^{hh} = \phi^h$ and $g_S^{hl} = \eta^l$, which

implies that $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h) = \Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l)$, a contradiction. Thus, truth-telling is not an equilibrium. That truth-telling is not an equilibrium also implies that the difference $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h) - \Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l)$ is strictly positive.

2. $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h) \leq 0$ and $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l) < 0$. Then $g_S^{hl} = \eta^l$ and, since truth-telling is not an equilibrium, $g_S^{hh} < \phi^h$. These strategies imply that $g_S(r_1^h|c_2, \lambda) > g_T(r_1^h|c_2, \lambda)$ and $\lambda_2(r_1^h, c_2) > \lambda_2(r_1^l, c_2)$ for any c_2, which leads to $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h)$ being positive, a contradiction.

3. $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^h) > 0$ and $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l) \geq 0$. Then $g_S^{hh} = \phi^h \geq g_S^{hl}$. The only feasible equilibria must satisfy $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l) \geq 0$ since all other equilibria are ruled out. Given that the expression $\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l)$ is strictly decreasing in g_S^{hl} the equilibrium must be unique. Depending on parameter values, the equilibrium is such that $g_S^{hl} < \phi^l$ (in which case$\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l) = 0$) or the equilibrium is such that $g_S^{hl} = \phi^l$ (in which case$\Delta_{r_1^l}^{r_1^h}\pi_1(a_1^l) > 0$). *Q.E.D.*

A.3 The effect of accounting standards on earnings manipulation

I will provide an analysis of what happens when we change discretion ε. Changes in accounting precision μ and conservatism have similar effects.

Consider the derivative of (4) w.r.t. ε:

$$\frac{\partial \Delta_{r^l}^{r^h}\pi_1(a_1)}{\partial \varepsilon} = \gamma_1 \frac{\partial (P_1(r_1^h) - P_1(r_1^l))}{\partial \varepsilon} + \frac{\partial}{\partial \varepsilon} E[\Delta_{r^l}^{r^h}\Pi_2(\lambda_2(r_1, c_2))|a_1] \tag{6}$$

It is possible to show that $\frac{\partial (P_1(r_1^h) - P_1(r_1^l))}{\partial \varepsilon} > 0$ and that $\frac{\partial}{\partial \varepsilon} E[\Delta_{r^l}^{r^h}\Pi_2(\lambda_2(r_1, c_2))|a_1] < 0$ (see below). Thus, depending on the parameter values we have $\frac{\partial \Delta_{r^l}^{r^h}\pi(r_1, a_1; \lambda_1)}{\partial \varepsilon} \gtrless 0$. The simplest way to see that the signal of this derivative is ambiguous is to consider what happens when γ_1 becomes very small or very large.

Now, using the implicit function theorem we have that:

$$\frac{\partial g_S^{hl}}{\partial \varepsilon} = -\frac{\frac{\partial \Delta_{r^l}^{r^h} \pi(r_1,a_1;\lambda_1)}{\partial \varepsilon}}{\frac{\partial \Delta_{r^l}^{r^h} \pi(r_1,a_1;\lambda_1)}{\partial g_S^{hl}}}$$

Since the denominator is negative, the sign of $\frac{\partial g_S^{hl}}{\partial \varepsilon}$ is determined by the numerator. Whenever $\frac{\partial \Delta_{r^l}^{r^h} \pi(r_1,a_1;\lambda_1)}{\partial \varepsilon} \gtrless 0$ we then have $\frac{\partial g_S^{hl}}{\partial \varepsilon} \gtrless 0$, and thus manipulation can increase or decrease with discretion.

The effect of discretion on $P_1(r_1^h) - P_1(r_1^l)$ A bit algebra yields:

$$\begin{aligned} 0 \;<\; \frac{\partial (P_1(r_1^h) - P_1(r_1^l))}{\partial \varepsilon} &= (a_1^h - a_1^l) l(a_1^h) l(a_1^l) \\ &\times \left(\frac{\lambda(\eta^l + \phi^h) + (1-\lambda) g_S^{hl}}{\left[g_\lambda(r_1^h)\right]^2} + \frac{\lambda(1-\eta^l + 1 - \phi^h) + (1-\lambda)(1-g_S^{hl})}{\left[g_\lambda(r_1^l)\right]^2} \right) \end{aligned}$$

The effect of discretion on $E[\Delta_{r^l}^{r^h} \Pi_2(\lambda_2(r_1,c_2)) | a_1]$ Taking the derivative w.r.t. to ε:

$$\begin{aligned} \frac{\partial E[\Delta_{r^l}^{r^h} \Pi_2(\lambda_2(r_1,c_2))|a_1]}{\partial \varepsilon} &= E\left[\frac{\partial \Pi_2(\lambda_2(r_1^h,c_2))}{\partial \lambda_2} \frac{\partial \lambda_2(r_1^h,c_2)}{\partial \varepsilon} - \frac{\partial \Pi_2^l(\lambda_2(r_1^l,c_2))}{\partial \lambda_2} \frac{\partial \lambda_2(r_1^l,c_2)}{\partial \varepsilon} \mid a_1 \right] \\ &+ E\left[\frac{\partial \Pi_2(\lambda_2(r_1^h,c_2))}{\partial \varepsilon} - \frac{\partial \Pi_2^l(\lambda_2(r_1^l,c_2))}{\partial \varepsilon} \mid a_1 \right] \end{aligned} \tag{7}$$

The first term is negative since $\Pi_2(\lambda_2)$ increases in λ_2, $\frac{\partial \lambda_2(r_1^h,c_2)}{\partial \varepsilon} < 0$, and $\frac{\partial \lambda_2(r_1^l,c_2)}{\partial \varepsilon} > 0$. The second term is negative because $\frac{\partial^2 \Pi_2(\lambda_2)}{\partial \lambda \partial \varepsilon} > 0$ and $\lambda_2(r_1^l,c_2) > \lambda_2(r_1^h,c_2)$.

A.3.1 Thresholds in Corollary 2

Note that the derivatives:

$$\frac{\partial \Pi_2(\lambda_2)}{\partial \varepsilon} = \gamma_2 \left[P_2(r_2^h,\lambda_2) - P_2(r_2^l,\lambda_2) + g_S(r^h) \frac{\partial P_2(r_2^h,\lambda_2)}{\partial \varepsilon} + (1-g_S(r^h)) \frac{\partial P_2(r_2^l,\lambda_2)}{\partial \varepsilon} \right]$$

and

$$\frac{\partial \Pi_2(\lambda_2)}{\partial \lambda_2} = \gamma_2 \left[g_S(r^h) \frac{\partial P_2(r_2^h, \lambda_2)}{\partial \lambda_2} + (1 - g_S(r^h)) \frac{\partial P_2(r_2^l, \lambda_2)}{\partial \lambda_2} \right]$$

are both proportional to the difference $a_2^h - a_2^l$ and to the weight γ_2. Therefore the derivative $\frac{\partial E[\Delta_{r^l}^{r^h} \Pi_2(\lambda_2(r_1, c_2))|a_1]}{\partial \varepsilon}$ is also proportional to $a_2^h - a_2^l$ and γ_2.

For given parameters $\lambda, \phi^i, l(a^h)$, the expression $\frac{1}{a_1^h - a_1^l} \frac{\partial (P_1(r_1^h) - P_1(r_1^l))}{\partial \varepsilon}$ is bounded from above since g_S^{hl} is also bounded. Let B denote such bound. Also, and as I show below, the expression $\frac{1}{\gamma_2} \frac{1}{a_2^h - a_2^l} \frac{\partial E[\Delta_{r^l}^{r^h} \Pi_2(\lambda_2(r_1, c_2))|a_1]}{\partial \varepsilon}$ is bounded at a value smaller than 0 as γ_2/γ_1 or $\frac{a_2^h - a_2^l}{a_1^h - a_1^l}$ increase. Let b represent such bound. Then, the expression (6) is negative and more discretion leads to less manipulation whenever $\gamma_1(a_1^h - a_1^l)B + \gamma_2(a_2^h - a_2^l)b < 0$. Solving for the ratio γ_2/γ_1 and $\frac{a_2^h - a_2^l}{a_1^h - a_1^l}$ we have that $\frac{\partial \Delta_{r^l}^{r^h} \pi(r_1, a_1; \lambda_1)}{\partial \varepsilon} < 0$ when:

$$\frac{\gamma_2}{\gamma_1} > -\frac{B}{b} \frac{a_1^h - a_1^l}{a_2^h - a_2^l} \equiv T_\gamma$$

$$\frac{a_2^h - a_2^l}{a_1^h - a_1^l} = -\frac{B}{b} \frac{\gamma_1}{\gamma_2} \equiv T_a$$

The bound b To see that the expression $\frac{1}{\gamma_2} \frac{1}{a_2^h - a_2^l} \frac{\partial E[\Delta_{r^l}^{r^h} \Pi_2(\lambda_2(r_1, c_2))|a_1]}{\partial \varepsilon}$ is bounded at a value smaller than 0 as γ_2/γ_1 or $\frac{a_2^h - a_2^l}{a_1^h - a_1^l}$ increase, note that the manager's optimal reporting strategy $g_S^{hl} \to g_T^{hl} = \eta^l$ which then implies that $\lambda_2(r_1^h, c_2) \to \lambda_2(r_1^l, c_2) \to \lambda$. The second term in equation (7) goes to 0, while the first term goes to $E\left[\frac{\partial \Pi_2(\lambda_2)}{\partial \lambda_2} \left(\frac{\partial \lambda_2(r_1^h, c_2)}{\partial \varepsilon} - \frac{\partial \lambda_2(r_1^l, c_2)}{\partial \varepsilon} \right) \mid a_1 \right]$. This term is negative since for any g_S^{hl} the derivatives $\frac{\partial \lambda_2(r_1^h, c_2)}{\partial \varepsilon}$ and $\frac{\partial \lambda_2(r_1^l, c_2)}{\partial \varepsilon}$ are always negative and positive, respectively:

$$\frac{\partial \lambda_2(r_1^h, c_2)}{\partial \varepsilon} = -\lambda_2(r_1^h, c_2)(1 - \lambda_2(r_1^h, c_2)) \frac{F(a_1^h|c_2)F(a_1^l|c_2)(\eta^l + \phi^h - g_S^{hl} + g_S^{hl} \frac{F(a_1^l|c_2)}{F(a_1^h|c_2)})}{[g_T(r_1^h|c_2)]^2} < 0$$

which is negative since $g_S^{hl} \leq \phi^h$. Similarly, the derivative $\frac{\partial \lambda_2(r_1^l, c_2)}{\partial \varepsilon}$ is positive:

$$\frac{\partial \lambda_2(r_1^l, c_2)}{\partial \varepsilon} = \lambda_2(r_1^l, c_2)(1 - \lambda_2(r_1^l, c_2)) \frac{F(a_1^h|c_2)F(a_1^l|c_2)(1 - \eta^l + 1 - \phi^h - (1 - g_S^{hl}) + (1 - g_S^{hl}) \frac{F(a_1^l|c_2)}{F(a_1^h|c_2)})}{[g_T(r_1^l|c_2)]^2} > 0$$

Bound b is obtained by computing the limit of $E\left[\frac{\partial \Pi_2(\lambda_2)}{\partial \lambda_2}\left(\frac{\partial \lambda_2(r_1^h,c_2)}{\partial \varepsilon} - \frac{\partial \lambda_2(r_1^l,c_2)}{\partial \varepsilon}\right) \mid a_1\right]$ as $g_S^{hl} \rightarrow \eta^l$.