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Earnings Management and the Revelation Principle

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Abstract. When the Revelation Principle (RP) holds, managing earnings confers no advantage over revelation. We construct an explanation for earnings management that is based on limitations on owners' ability to make commitments (a violation of the RP's assumptions). Traditionally, earnings management is seen as sneaky managers pulling the wool over the eyes of gullible owners by manipulating accruals; our limited commitment story suggests that the owners, too, can benefit from earnings management. We categorize a variety of extant explanations of earnings management, along with our own, according to which of the assumptions of the RP each explanation violates. Plausibility of multiple simultaneous violations of the assumptions, and strategic use of various accounting and real instruments of earnings management, complicate the task of detecting such management in field data.

When managers choose accounting accruals, neutral communication of the firm's underlying economic reality to the readers of financial reports is not necessarily their only goal. This goal can become enmeshed with managers' desire to use financial reports, especially earnings, opportunistically to serve their own personal ends. The existence of such mixed motives in managers has given rise to hypotheses about management (or manipulation) of earnings, theoretical analyses of the interaction between the two motives for such management, and an empirical literature that attempts to identify and document this phenomenon.

The purpose of the paper is twofold. First, we suggest earnings management is more than just sneaky managers pulling the wool over the eyes of gullible owners. Manipulation can be in the best interests of owners.[1] In particular, we study a setting in which the ability of owners to make binding commitments is constrained. Earnings management is useful because it reduces owner intervention. Although such management is not in the best interest of owners ex post (when the earnings report is submitted), it is in their best interest ex ante (when they are trying to induce the manager to join the firm and exert effort to benefit the firm).

Economic explanations for earnings management require one or more of the assumptions of the Revelation Principle (RP) to be violated (Dye, 1988). The RP states that any equilibrium outcome of any mechanism, however complex, can be replicated by a truth-telling equilibrium outcome of a mechanism under which the agents are asked to report their private information to the principal (see, for example, Myerson (1979)). Hence, when the RP holds, the performance of any mechanism under which managers manipulate earnings can be replicated by a mechanism under which managers report earnings truthfully.[2] As Dye writes, the RP is "a nemesis to the study of earnings management."

Nevertheless, the RP is indirectly useful in studying earnings management. We can look to violations of the RP's assumptions to classify earnings management stories. The second contribution of our paper is to bring out the interrelationships among various earnings management stories. Since multiple simultaneous violations of the assumptions of the RP are plausible, any single explanation of earnings management (including our own) is unlikely to be *the* explanation of the phenomenon.

Two of the better known forms of earnings management are "smoothing" and "big bath." For example, in estimating their bad debt allowance, companies might be tempted to provide a generous allowance in good years and skimp in lean years in order to smooth the stream of reported earnings.[3] In contrast, the big bath hypothesis suggests that managers undertake income decreasing discretionary accruals in lean years. Perhaps managers believe that one very poor performance report is not as harmful as several mediocre performance reports. It has been suggested that big baths often occur under the guise of restructuring charges (see, for example, Elliott and Shaw (1988)) and may coincide with top management transition.

The past thirty years have seen an intensive effort to try to document the existence and nature of earnings management in field data and to build formal models in which management of earnings arises endogenously as a consequence of rational choice made by utility-maximizing economic agents. Data gathered from financial reports of corporations have been scrutinized for finger prints of opportunistic managerial manipulation with only mixed results (see, for example, Archibald (1967), Bartov (1993), Copeland (1968), Cushing (1969), DeAngelo (1986), DeAngelo, DeAngelo, and Skinner (1994), Dechow, Sloan, and Sweeney (1995), Gordan, Horwitz, and Meyers (1966), Healy (1985), Liberty and Zimmerman (1986), Lys and Sivaramakrishnan (1988), McNichols and Wilson (1988), Ronen and Sadan (1981)).[4]

Some of the reasons given for the weak and inconsistent empirical results are: (1) use of unreliable empirical surrogates for managed and unmanaged portions of earnings, (2) the focus of most empirical studies on one accounting instrument of earnings management at a time, (3) a narrow interpretation of earnings management, and (4) managers' incentives to cover their tracks (Sunder, 1997, pp. 74–78). Our paper suggests two more: (5) owners may have incentives to make it easy for managers to hide information and (6) two or more independent conditions that induce earnings management may exist simultaneously, causing studies that focus on a single condition to yield noisy results.

Our limited commitment explanation for earnings management is based on the idea of "at-will" employment contracts. Their implementation depends entirely on the willingness of the parties to continue to subject themselves to their terms. Each employment contract is between an owner and a manager. We assume the owner cannot commit to a policy regarding firing/retention decisions. Also, the manager cannot commit to staying with the firm. This is consistent with observed employment contracts which often specify broad terms and objectives, but rarely specify the exact circumstances under which the employee can quit or be dismissed (Milgrom and Roberts, 1992, p. 330; Sunder, 1997, p. 40).

There are benefits and costs associated with dismissing a manager. The benefits to the owner are that (1) the threat of dismissal for bad outcomes provides the manager with incentives to reduce the probability of bad outcomes through his actions, and (2) dismissal allows the owner to replace a manager who is known to have performed poorly with another

from the pool of candidates whose expected productivity is greater. Because the owner cannot commit to the dismissal decision, she will fire the manager whenever it is in her own ex post best interest. From an ex ante perspective this can result in the manager being fired too often and the cost of the firing option reducing the welfare of the owner.[5,6]

We compare the owner's payoff under a system of unmanaged earnings (the owner herself directly and costlessly observes earnings) to her payoff under a system of managed earnings (earnings reports provided by the manager that may or may not be truthful). A proposition establishes conditions under which the owner prefers managed earnings to unmanaged earnings. The manager manipulates earnings to retain his job for as long as possible, and the owner finds the coarsening and delay of information that occurs under earnings manipulation beneficial as a device that effectively commits her to making firing decisions that are better from an ex ante perspective.[7]

We also present an example in which managed earnings are compared to other benchmarks. The intent is to highlight the particular way in which earnings management coarsens and delays information. Earnings management leads to a time-additive aggregation of performance measures, which prevents the owner from learning the firm's performance in the short run but allows her to detect *persistently poor performance*.[8]

Fudenberg and Tirole (1995) present a story closely related to ours. In their model (and ours) the manager manipulates earnings in order to avoid (delay) dismissal. However, in the Fudenberg and Tirole setting, the owner prefers unmanaged earnings (if available) to managed earnings. This is because, in their setting, the manager does not supply a productive input and the manager's compensation is not modeled. The benefit to the owner of being able to fire the manager is the possibility of removing an unproductive manager; there is no disciplining benefit to firing and no cost to firing.[9]

Shades of our story can also be found in business press. First, managers sometimes find earnings management useful as a way of limiting owner intervention. For example, German executives have been described as viewing secret reserves as useful in keeping "gimlet-eyed shareholders [from] calling the shots" (*The Wall Street Journal*, 1998). The traditional (German) view has been that their reporting standards, which allow for such hidden reserves, encourage managers to focus on the long-run rather than the short-run performance of their companies. Second, placing some bounds on owner intervention is desirable for the company as a whole, and for the owners themselves. An article in *Executive Excellence* (1997) describes one of the board's roles as that of providing autonomy: "Boards must give organization members the autonomy to do their jobs." The presumption here is that, without a certain degree of autonomy, management is not able to perform at its best. Our story links these two views and adds a timing perspective. Earnings management is a substitute for the owners committing ex ante to resist any temptation they might have to intervene ex post. This ex ante commitment is useful in attracting and motivating managers.

In our model, the owner intervenes through her decision to retain or replace the manager. Alternatively, the board may respond to the firm's short-term poor performance by "back seat driving" with respect to decisions normally left to the CEO. By allowing for earnings management, the board gives the CEO more room to work things out. In Section 2.5 of the paper we present a numerical example that illustrates the role earnings management can have in preventing such owner intervention. In the example, owner intervention renders

earnings less informative about the manager's actions and, hence, makes it more difficult for the owner to motivate the manager.

The remainder of the paper is organized as follows. Section 1 uses violations of the assumptions of the RP as an organizing principle to explore the relationships among the extant explanations, as well as our own at-will story. Section 2 presents our at-will contracts explanation for earnings management. Section 3 presents concluding remarks and some implications for analysis and interpretation of data.

1. Organizing the Earnings Management Stories Using RP Violations

The accounting literature includes many formal and informal explanations for income management, each applicable to a limited range of circumstances. Given the variety of environments in which businesses operate, it is unlikely that any single explanation is adequate for all, even most, earnings management. Perhaps it is better to think of a portfolio of earnings management stories and to identify the criteria that determine which one or more of the members of the portfolio are applicable to individual circumstances.

The principal-agent model framework used in this paper is a special case of a mechanism design problem. By a mechanism design problem, we mean a central planner (for example, a principal) constructs a message space (reporting system) and an outcome function (contract) for the purpose of implementing particular actions and/or resource allocations, where the prescribed actions and allocations can depend on the agents' private information. As mentioned earlier, the RP states that any possible equilibrium outcome of any possible mechanism, however complex, can be replicated by a truth-telling equilibrium outcome of a mechanism under which the agents are asked to report their private information to the central planner.

Although the RP is a useful benchmark in establishing the set of actions and allocations that can be implemented, it is difficult to imagine real-world settings (even marriage, let alone employment relationships) that satisfy all of the RP's assumptions. Weakening each assumption of the RP is a convenient way of organizing a portfolio of earnings management stories because at least one of the assumptions must be violated for earnings management to occur.

The RP's assumptions are related to communication, the contract form, and commitment. The RP assumes: (1) communication is not blocked (it is costless to establish communication channels that allow the agents to report fully their private information),[10] (2) the form of the contract is not restricted, and (3) the principal can commit to use the reports submitted by the agents in any prespecified manner.[11]

We present a summary of the existing stories for earnings management first in Table 1, and illustrate and compare them using a series of numerical examples. We found the examples helpful since variations of the existing stories are relatively easy to incorporate within the risk-neutral framework we use subsequently for our at-will contracts story.

In the following examples, we assume that any overstatement or understatement of earnings in the first period is reversed in the second period. Earnings can be managed only intertemporally.

Table 1. Violations of assumptions of the RP and earnings management stories.

Revelation Principle's Assumptions hold	Revelation Principle's assumptions do not hold because of:		
	Limited Communication	**Limited Contract**	**Limited Commitment**
No earnings management	Earnings management is used to convey information regarding: 1. manager's expertise/ productive input supplied 2. the constraints placed on reporting by partial verifiability 3. the permanence of earnings	Earnings management arises as a response to: 1. bonus floors and ceilings 2. incomplete debt covenants	Using earnings management to conceal information enables: 1. risky firms to smooth earnings to pool with safe firms and obtain better credit terms 2. firms to manage earnings downward to reduce demands from employees, shareholders, tax authorities, and other regulators 3. manager to overstate earnings to benefit one generation of shareholders at the cost of another generation

1.1. Relaxing the Communication Assumption

1.1.1. Conveying Expertise

Earnings management can be beneficial to owners because it enables the manager to communicate his acquired expertise. A smooth airline flight is not only comfortable but also reassuring to the passengers about the pilot's expertise. The expertise explanation for earnings management is developed in Demski (1998). We present an example to highlight the idea, although it does not capture some of the important features of Demski's model.

Two risk-neutral parties, an owner and a manager, contract with each other over two periods. They commit not to fire and not to quit after the first period, respectively. During the first period the manager privately chooses one of two possible productive acts labeled a_L (for low) and a_H (for high). These acts have a disutility of 0 (for low) and 1 (for high) to the manager. In period t, $t = 1, 2$, the firm's earnings, x_t, can be either 0 or 200.[12] If the manager chooses the low act, the firm earns 0 with probability 0.4 and 200 with probability 0.6 in each period. Under the high act these probabilities change to 0.3 and 0.7, respectively. Given the manager's act, the distributions of earnings in the two periods are mutually independent; the realization of period-one earnings does not affect the distribution of period-two earnings. The probability distributions and payoffs are common knowledge.

Regardless of his action, the manager privately observes period-one earnings at the end of that period. By choosing the high act, the manager acquires expertise to forecast perfectly period-two earnings at the end of period one. The low act does not furnish him with the foresight and he must await the end of period two to learn the earnings of that period.[13] At the end of each period, the manager submits a report to the owner on that period's earnings. We restrict communication by not permitting him to submit a forecast of period-two earnings at the end of period one.

Suppose unmanaged earnings (x_t) are available for contracting. The owner's objective is to maximize expected earnings less compensation subject to the constraints that the contract: (1) is individually rational (provides the manager with at least his reservation utility), (2) is incentive compatible (it is in the manager's own interest to choose the act the owner intends), and (3) avoids bankruptcy (payments in each period are nonnegative).[14] Assume the manager's two-period reservation utility is 2. Denote by $s(x_1, x_2)$ the compensation paid to the manager as a function of the first- and second-period earnings. The owner's program under unmanaged earnings is as follows. (It can be verified that motivating a_H is optimal.)

$$
\begin{aligned}
\underset{s}{\text{Max}}\ & (.3)(.3)[0 - s(0,0)] + (.3)(.7)[200 - s(0,200)] + \\
& (.7)(.3)[200 - s(200,0)] + (.7)(.7)[400 - s(200,200)] \\
& \text{subject to:} \\
& (.3)(.3)s(0,0) + (.3)(.7)s(0,200) + (.7)(.3)s(200,0) + (.7)(.7)s(200,200) \\
& \quad -1 \geq 2 \\
& (.3)(.3)s(0,0) + (.3)(.7)s(0,200) + (.7)(.3)s(200,0) + (.7)(.7)s(200,200) \\
& \quad -1 \geq \\
& (.4)(.4)s(0,0) + (.4)(.6)s(0,200) + (.6)(.4)s(200,0) + (.6)(.6)s(200,200) \\
& \quad -0 \\
& s(0,0), s(0,200), s(200,0), s(200,200) \geq 0.
\end{aligned}
$$

An optimal solution to the above program is: $s(200, 200) = 7.69$ and $s(\cdot, \cdot) = 0$ otherwise. Under unmanaged earnings the owner's payoff is 276.23.

The owner can do better with managed earnings—that is, allowing the manager the freedom to choose what to report at the end of period 1. An optimal contract is to pay the manager 3 if his first- and second-period earnings reports are equal and 0 otherwise. This contract motivates the manager to choose the high act. If the manager chooses the high act, he is able to smooth earnings (report 0.5[period-one earnings + period-two earnings] at the end of each period) and earn his reservation utility of 2. If the manager chooses the low act, he will not learn period-two earnings at the end of period one; the probability with which he will be able to produce identical first- and second-period earnings reports is only 0.6. His best guess (maximum likelihood estimate) of the second-period earnings level is 200, so he reports .5[period-one earnings +200] at the end of the first period. With probability 0.4 the second-period earnings report will be different than the period-one earnings report. The manager earns only $0.6(3) - 0 = 1.8$ if he chooses the low act. Hence, he prefers the high act. Under managed earnings the owner's payoff is 277, which is higher than the 276.23 she obtains under unmanaged earnings.

Both the level and the smoothing of earnings are informative about the manager's action. While the level alone is not enough for the owner to obtain the first-best solution (the solution under the assumption that the owner observes the manager's action), the smoothing of earnings is. If the manager's ability to predict earnings were imperfect, the optimal contract would depend on both the level as well as the pattern of reported earnings (e.g., earnings smoothing).

In this example earnings management is important, smoothing is not. Any number of earnings management conventions would effectively tell the owner if the manager is an expert (for example, the first-period report is 75 percent of the second-period report). However, smoothing has the advantage of being a simple and, therefore, an easy convention on which agents can coordinate.

The RP does not apply in this example because communication is restricted. If the manager were allowed to submit a period-one earnings report and a forecast of period-two earnings at the end of period one and a period-two earnings report at the end of period two, a revelation mechanism could be used to identify the expert.[15]

1.1.2. Partial Verifiability

Restricted communication is also a key part of the earnings management explanation presented in Evans and Sridhar (1996). They consider an internal control system that sometimes prevents the manager from misreporting the outcome. In the single-period version of Evans and Sridhar's story, because high outcomes indicate the manager worked harder, reports of higher outcomes are associated with larger compensation. As a result, the manager over-reports the outcome whenever the control system allows him to do so. The owner prefers to induce the manager to lie than to bear the cost of motivating truth-telling. However, it is even better for her to observe the actual outcome herself. That is, lying is tolerated but does not benefit the owner as much as an ability to observe the outcome.

The impact of partial verifiability is also studied in Green and Laffont (1986) and Lipman and Seppi (1995). The following numerical example applies the basic idea to earnings management. Earnings, x, can be 0, 1, or 2, with equal chance. The manager privately observes x and reports $\hat{x}$. The contract between the owner and the manager specifies a dividend amount, d, which is contingent on the manager's earnings report. The owner consumes the dividend and the manager consumes the remainder of earnings. The dividend is constrained to being less than or equal to actual earnings, $d \leq x$.

The extent of misreporting by the manager is constrained by a partial verification process. Suppose when earnings are 0 the manager can report only 0; when earnings are 1 the manager can report 0 or 1; and when earnings are 2 the manager can report 1 or 2. The owner can motivate the manager to report earnings truthfully, but only by paying a high price and setting her own dividends to zero irrespective of the report: $d(\hat{x} = 0) = d(\hat{x} = 1) = d(\hat{x} = 2) = 0$. The owner is better off letting (encouraging) the manager to misstate earnings. The owner optimally specifies $d(\hat{x} = 0) = 0$ and $d(\hat{x} = 1) = d(\hat{x} = 2) = 2$. This motivates the manager to report that earnings are 0 when they are 0 or 1 and to report earnings of 2 when they are 2. (Note that the dividend paid is always less than or equal to earnings.)

If the manager could report the set of outcomes the control system will allow him to report instead of reporting a single outcome, there would be an optimal mechanism under which the manager truthfully reveals the set of possible reports. As in Evans and Sridhar (1996) the owner is even better off under unmanaged earnings.

1.1.3. Conveying the Permanence of Earnings

Although conflicting interests (common to the preceding stories) are useful in understanding earnings management, a simple explanation can be given without appealing to such considerations. If managers are not otherwise able to communicate whether earnings changes are permanent or transitory in nature, earnings management can be a way of conveying this information (Fukui, 1996).[16] When a manager believes the increase in earnings of a period to be transient, he hides some to create an earnings reserve. If a drop in earnings is judged to be transient, he reports more by drawing down the reserve. In contrast, when a change in earnings is believed to be permanent, the manager allows his report to reflect the change. Under the assumed restriction on communication, such a policy helps the shareholders arrive at a more accurate valuation of their shares.

If we reintroduce the possibility of a divergence in incentives, managers can have short-run incentives to pretend temporary earnings increases are permanent and/or permanent earnings declines are temporary. In some cases long-run considerations (for example, maintaining one's reputation) dominate short-run considerations. In other cases short-run considerations win out—this is likely to be the case when the manager is near retirement or earnings are so poor that he is likely to be dismissed if the truth is revealed.

1.2. Relaxing the Contract Assumption

1.2.1. The Form of Bonus Schemes

Another explanation for earnings management, due to Healy (1985), is based on the form of linkage between earnings and bonus compensation. Bonus schemes often specify lower and upper bounds on earnings; no bonus is paid if the lower bound is breached, and a fixed bonus is paid if the earnings exceed the upper bound. Between the lower and upper bounds bonuses increase with earnings. Opportunistic managers can increase the present value of their compensation by managing earnings down (up) when earnings fall outside (inside) the range defined by these bounds.

However, there is at least anecdotal evidence that managers sometimes manage earnings down even when they are inside the bonus range. As an extension of Healy's work one could try to explain this phenomenon. Suppose the share of earnings paid to the manager increases over his tenure. This would tend to provide a manager who is currently in the bonus range and thinks it is likely he will be within the bonus range in future periods with incentives to manage current earnings down to save up for future periods. On the other hand, a manager who thinks it is not likely he will be within the bonus range in future periods will manage current earnings up. In this argument the form of the compensation

contract is exogenous. One could take this a step further and derive conditions under which such bonus schemes arise endogenously (for example, because they induce the manager to reveal information about his assessment of the firm's future prospects through earnings management).

1.2.2. The Form of Debt Covenants

Debt covenants can be viewed as incomplete contracts in that they are not conditioned on all accounting methods a firm can choose. The standard story is that debt covenants motivate a firm to adopt income increasing accounting methods when a firm is in danger of violating its covenants (see, for example, Sweeney, 1994). For an analysis of income management (that can be interpreted as a method of avoiding default) in a dynamic agency setting, see Boylan and Villadsen (1997).

A signaling story involving debt covenants is presented in Levine (1996). An incomplete debt contract—a single and fixed debt covenant—induces firms with favorable future prospects to use a conservative accounting method to account for stock-based compensation. By doing so, they can distinguish themselves from firms with unfavorable future prospects in the eyes of their creditors, and thus obtain better credit terms.[17] If a menu of debt covenants could be offered, the choice of a tight debt covenant (instead of accounting method choice) could itself be used to separate firms.

1.3. Relaxing the Commitment Assumption

1.3.1. Improved Credit

In discussing conservatism, Sanders, Hatfield, and Moore (1938, p. 16) argue that some procedures are "undertaken for the purpose of averaging profits over the years, so as to make a better showing in the lean years than the facts warrant. This, it is asserted, enhances the company's credit and prestige." A similar story is presented in Trueman and Titman (1988). A numerical example highlights the idea.

There are two types of risk-neutral firms, safe and risky. Each type is equally likely. Firms have a life of three periods. A risky firm's periodic earnings are 0 with probability 0.1 and 300 with probability 0.9. Earnings across periods are independently distributed. A safe firm's periodic earnings are 150 with probability 1.

In the first two periods the firm's financing is provided by its owners. Period-one and period-two earnings (and paid-in capital) are distributed to the owners by the end of period two. At the beginning of the third period, the firm can contract with a risk-neutral lender to borrow 100 for the third period. The firm repays the principal plus interest to the lender at the end of period three. The payment to the bank at the end of the third period is bounded by the firm's period-three earnings. Because the lender operates in a competitive market, it charges the firms an interest rate such that its expected return is equal to a market rate of return, r_M, say 10 percent.

At the end of each period the firm observes actual earnings while the bank observes only the firm's reported earnings. There are infinitely many partially separating equilibria, all of which involve earnings management and are equivalent in terms of the payoffs to all parties. One such equilibrium is for a safe firm to report its earnings truthfully and for a risky firm to report 150 in the first period and $x_1 + x_2 - 150$ in the second period.

A risky firm is able to mimic a safe firm if $x_1 = 0$ and $x_2 = 300$ or $x_1 = 300$ and $x_2 = 0$. For the other two possible earnings combinations, a risky firm is separated since it cannot report 150 in each period; these firms are charged an interest rate r_R such that: $.9(1+r_R) = 1 + r_M$. Hence, $r_R = 22.22$ percent. The lender cannot differentiate the remaining risky firms (18 percent of the risky firms which constitute 9 percent of the total population) from the safe firms (which constitute 50 percent of the total population) and charges a pooled interest rate, r_P, such that: $(.5/.59)(1 + r_P) + (.09/.59)(.9)(1 + r_P) = 1 + r_M$. Hence, $r_P = 11.71$ percent.

By smoothing earnings, a risky firm sometimes is able to obtain a lower interest rate (of 11.71 percent) than the rate (of 22.22 percent) it would be charged if the lender knew its type. Of course a safe firm is worse off since it is charged a higher interest rate (of 11.71 percent) than it would have been charged if the lender knew its type (of 10 percent).

The RP's assumptions do not hold in this setting since the lender cannot commit to using only the sum of period-one and period-two earnings in determining the interest rate. If this commitment were possible (by all lenders), the same outcomes could be implemented under a truth-telling equilibrium.

1.3.2. Avoiding Demands by Various Constituents

In the above story, one group (risky firms) benefits at the expense of another (safe firms). There are other related stories. Some firms choose to smooth earnings to avoid increased tax levies and demands by employees in good years (Hepworth, 1953). Earnings also may be managed down in good years to avoid regulatory scrutiny and demands from shareholders for increased dividends distributions.[18] In discussing "secret reserves" maintained by some railroads, Cole (1908, p. 217) explains: "The reason given for such practices is that such roads prefer to maintain large margins of safety for poor years, rather than to distribute extra earnings to stockholders."

Dye (1988) shows that earnings management can be used by a manager to make the current shareholders better off at the expense of the future shareholders. In his paper the presence of third-party users (potential new shareholders) of financial statements makes it beneficial for two parties (existing shareholders and managers) to write contracts that induce earnings management. We next present a variation of this story: earnings management is beneficial not because of the presence of third-party users but because of limits on the ability of the current owners to commit to future actions. In such a world of limited commitment, owners find it beneficial to install reporting systems that enable managers to credibly communicate some information while withholding other information.

2. At-will Contracts

2.1. Model

Two risk-neutral parties contract with each other over three periods, indexed by $t = 1, 2$, and 3. One can supply capital and the other can supply skill. Following convention they are called owner and manager, respectively. Their relationship is contractual (and not necessarily hierarchical). At the beginning of period one the owner offers the manager a contract that specifies the payments to be made to the manager in each period. At the end of periods one and two each party can terminate their contractual relationship without owing explanation or compensation—the employment contract is "at will." If the relationship is terminated at the end of periods one or two, no future payments are made to the replaced manager and payments to the new manager for the remaining periods are made in accordance with a new contract. The relationship is always terminated at the end of period three. Denote the manager hired in period one by A. If a new manager is hired in period two he is denoted by B; if a new manager is hired in period three he is denoted by C.

Our assumption of at-will contracts does not allow for severance payments (i.e., ex ante commitment by the owner to pay a fired manager). In our model, severance payments could serve as a commitment device and alleviate the forthcoming demand for earnings management. We make the at-will assumption for two reasons. First, observed employment contracts are often at-will. Second, in practice, severance pay is a costly mechanism—severance payments are, in fact, made. Hence, there may be a role for other mechanisms in serving a similar function. Nevertheless, the exogenous exclusion of severance pay is a limitation. At the end of subsection 2.4 we speculate on what a more complete model might look like.

In his first period of employment the manager privately chooses a productive input (act): either a low act, a_L, or a high act, a_H. The manager's personal cost of choosing the low and the high acts are also a_L and a_H, respectively, $a_L < a_H$. Period-one earnings, x_1, are a function of the manager's act and a random state of nature, $x_1 \in \{x_L, x_H\}$, $x_L < x_H$. Denote by $Pr(x_j \mid a_k)$ the probability that $x_1 = x_j$ if a_k is chosen, $j, k = L, H$. If a new manager is hired in any period, earnings in that period depend on the new manager's effort in the same way they did on the replaced manager's effort in his first period of employment.

Managers do not provide productive inputs in their second or third periods of employment. If the period t manager continues in the firm's employment in period $t + 1$, earnings x_{t+1} of period $t + 1$ are correlated with earnings x_t of period t, $x_t \in \{x_L, x_H\}$. The correlation is assumed to be perfect (we relax this assumption later in the context of a numerical example).

One interpretation of these assumptions is that the level of earnings is determined by the "fit" between the firm and the manager. While neither the manager nor the owner knows how good the fit will be at the time the manager is hired, the fit, once determined, stays unchanged for the duration of the employment. That is, the manager has a type that fits either well or poorly with the firm's type. The manager's particular skills may not be useful in running the firm's particular production process.

Imperfect correlation allows the fit to change with changes in the productive environment in which the firm operates. In both the perfect and the imperfect correlation cases, the manager can influence his fit with the firm to a limited extent. In his first period of employment,

the manager's first a_H units of effort improve his expected fit with the firm; further effort has no effect. Here, we can think of the manager as exerting effort to learn about the firm's operations.

If the contract with manager A is dissolved at the end of period one, he is assumed to incur a disutility of $2K$ (K for each remaining period). If dissolved at the end of period two, the disutility is K. At the end of period three there is no such cost because the firm is liquidated and the manager retires. K can be interpreted as the per period decreased desirability of a new job.

At the end of period t the manager in the firm's employment observes x_t and submits an earnings report $\hat{x}_t$. We consider two possible reporting environments: unmanaged earnings and managed earnings. In the unmanaged earnings regime the owner herself (costlessly) observes x_t. In the managed earnings regime (1) the owner does not observe unmanaged earnings and instead relies on the manager's earnings reports and (2) the manager reports as he deems appropriate.

We assume an overstatement or understatement of earnings in the first period is reversed in the second period: the owner effectively observes $(x_1 + x_2)$ at the end of period two. Also, the owner observes the lifetime earnings of the firm, $(x_1 + x_2 + x_3)$, at the end of period three. The second assumption has been described as the Law of Conservation of Income (Sunder, 1997), which states that total earnings over the firm's life are invariant to accounting method choice.[19] The first assumption is stronger but one we find reasonable since the hardness (limited manipulability) of accounting numbers ensures reversals often occur well before the end of the firm's life. For example, since the auditor can verify the cost of a fixed asset, the choice of depreciation method can be used only to shift earnings intertemporally among the years of use; it cannot alter the total earnings over the asset's life. Since the owner can trivially deduce x_3 from the information she has, the manager is assumed to report $\hat{x}_3$ truthfully.[20]

The contract offered by the owner to induce manager i to join the firm specifies payments, s^i, $i = A, B$, and C, as a function of x_1, x_2, and x_3 under unmanaged earnings and as a function of $\hat{x}_1$, $\hat{x}_2$, and $\hat{x}_3$ under managed earnings. The payoffs and probabilities are common knowledge.

Figure 1 provides the sequence of events.

2.2. The Principal's Program

We assume the owner and the manager will play as follows. The owner offers a contract and subsequently (at the end of each period) makes dismissal/retention decisions to maximize expected earnings less compensation, correctly anticipating the managers' acts and reports. Given a contract, each manager who is hired chooses an act and reports that maximize his expected utility, correctly anticipating the owner's dismissal/retention decision.

The equilibrium strategies of the owner and the manager are required to be individually rational: they must provide the employed manager with an expected utility greater than or equal to that provided by his next best employment opportunity. For simplicity we assume the manager's next best employment opportunity provides him with an expected utility of 0. The contract is also required to satisfy bankruptcy constraints: the owner makes payments

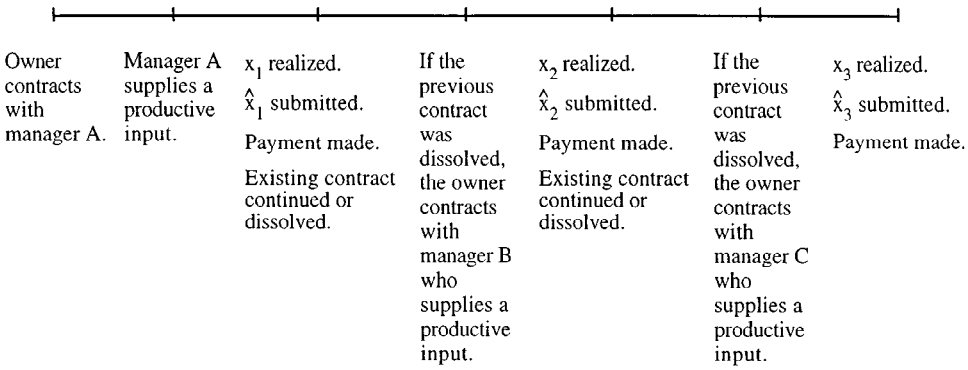

Figure 1. Time line.

to the manager, not the other way around.

The program to find the optimal firing rule and payments in a three-manager, three-period model is cumbersome. The presentation can be simplified by making use of the fact that the optimal solution can be characterized so that the payments to a manager are zero in all periods after his initial period of employment. Given that a manager chooses an act only in his first period of employment and his reservation utility is zero, a manager can be retained by setting his future payments equal to zero.

A binary (dummy) variable, $q_t(x_t)$, is used to represent the owner's firing decision at the end of period t when x_t, $t = 1, 2$, is realized. It takes on a value of 0 if the period-t manager is retained in period $t + 1$ and a value of 1 if the period-t manager is fired.

Under unmanaged earnings, the owner's problem can be solved by backward induction in the following six steps.

Step 1. Manager C's optimal payments are found by minimizing the expected payments subject to the individual rationality, incentive compatibility, and non-negativity constraints. Note that since there is no firing decision involving manager C, K has no role in this step.

$$
\begin{aligned}
P_3 \;=\; & \operatorname*{Max}_{s^C} \sum_{j=L,H} Pr(x_j \mid a_H)[x_j - s^C(x_j)] \\
& \text{subject to:} \\
& \sum_{j=L,H} Pr(x_j \mid a_H) s^C(x_j) - a_H \geq 0 \\
& \sum_{j=L,H} Pr(x_j \mid a_H) s^C(x_j) - a_H \geq \sum_{j=L,H} Pr(x_j \mid a_L) s^C(x_j) - a_L \\
& s^C(x_L), s^C(x_H) \geq 0.
\end{aligned}
$$

Step 2. To determine the firing rule at the end of period 2, the owner compares her expected payoff from retaining the period-two manager with her expected payoff from hiring man-

ager C. If the period-two manager is retained in period three, the owner's expected payoff is x_2 (due to perfect correlation, $x_3 = x_2$). The expected payoff from hiring manager C is P_3.

$$\begin{aligned} q_2(x_2) &= 0 \quad \text{if } P_3 \le x_2, \\ q_2(x_2) &= 1 \quad \text{otherwise.} \end{aligned}$$

Step 3. Manager B's payments are found in a manner analogous to Step 1, with the only difference being that, unlike manager C, manager B can be fired. The probability with which B will be fired at the end of period two is $\sum_{j=L,H} Pr(x_j \mid a_H) q_2(x_j)$, in which event he incurs a disutility of K. The individual rationality and incentive compatibility constraints reflect this cost.

$$\begin{aligned} P_2 &= \operatorname*{Max}_{s^B} \sum_{j=L,H} Pr(x_j \mid a_H)[x_j - s^B(x_j)] \\ &\quad \text{subject to:} \\ &\quad \sum_{j=L,H} Pr(x_j \mid a_H)[s^B(x_j) - q_2(x_j)K] - a_H \ge 0 \\ &\quad \sum_{j=L,H} Pr(x_j \mid a_H)[s^B(x_j) - q_2(x_j)K] - a_H \\ &\qquad \ge \sum_{j=L,H} Pr(x_j \mid a_L)[s^B(x_j) - q_2(x_j)K] - a_L \\ &\quad s^B(x_L), s^B(x_H) \ge 0. \end{aligned}$$

Step 4. The firing rule at the end of period one compares the benefit of retaining manager A in period two versus replacing him with manager B.

$$\begin{aligned} q_1(x_1) &= 0 \quad \text{if } P_2 + \sum_{j=L,H} Pr(x_j \mid a_H)[(1 - q_2(x_j))x_j + q_2(x_j)P_3] \\ &\qquad \le x_1 + (1 - q_2(x_1))x_1 + q_2(x_1)P_3 \\ q_1(x_1) &= 1 \quad \text{otherwise.} \end{aligned}$$

Step 5. Manager A's payments are determined in the same way as manager B's payments with the only difference being that manager A's disutility, if fired at the end of period one, is $2K$ (while it is K at the end of period two).

$$\begin{aligned} P_1 &= \operatorname*{Max}_{s^A} \sum_{j=L,H} Pr(x_j \mid a_H)[x_j - s^A(x_j)] \\ &\quad \text{subject to:} \\ &\quad \sum_{j=L,H} Pr(x_j \mid a_H)[s^A(x_j) - q_1(x_j)2K - (1 - q_1(x_j))q_2(x_j)K] - a_H \ge 0 \\ &\quad \sum_{j=L,H} Pr(x_j \mid a_H)[s^A(x_j) - q_1(x_j)2K - (1 - q_1(x_j))q_2(x_j)K] - a_H \ge \\ &\quad \sum_{j=L,H} Pr(x_j \mid a_L)[s^A(x_j) - q_1(x_j)2K - (1 - q_1(x_j))q_2(x_j)K] - a_L \\ &\quad s^A(x_L), s^A(x_H) \ge 0. \end{aligned}$$

Step 6. In Steps 1 through 5 it is assumed the owner wants to motivate each of the managers to choose a_H. The last step is to verify that this is indeed the case. That is, in each period, the owner prefers to motivate a_H rather than motivate a_L or shut down the firm.

In the case of managed earnings, the owner also has to worry about the managers' reporting incentives. Given that the sum of x_1 and x_2 cannot be manipulated, the optimal contract in the managed earnings case can be characterized such that manager A's payments depend only on $\hat{x}_1 + \hat{x}_2$ while manager C's payments depend on $\hat{x}_3$.[21]

2.3. Result

There are benefits and costs to dismissal. The benefits arise because (1) the threat of dismissal can be used as an incentive device and (2) a manager can be replaced by a new manager whose expected productivity is greater. The cost arises because the owner sometimes finds it ex post optimal to dismiss the manager more often than is desirable from an ex ante perspective.

The benefits and costs are different under unmanaged and managed earnings. The benefits are higher in the unmanaged earnings case; however, so are the costs. This leaves open the question of whether unmanaged or managed earnings are optimal.

In this subsection, we study a more restricted setting than that presented in the previous subsection and provide conditions under which managed earnings are optimal. In particular, we set $Pr(x_H \mid a_L) = 0$. That is, if a_L is chosen, $x_1 = x_L$ with probability 1. For simplicity also set $a_L = 0$ and $x_L = 0$. In the third period, in which contract dissolution is not an issue, we assume the output to be sufficiently valuable so it is optimal to motivate a new manager to choose a_H. This is ensured if $x_H > \frac{a_H}{Pr(x_H|a_H)}$. The following proposition presents our main result.

Proposition *There exists a non-empty interval* $(\underline{K}, \bar{K})$ *such that the owner strictly prefers managed earnings to unmanaged earnings for all* K *in the interval.*

The proof of the proposition (including closed form expressions for $\underline{K}$ and $\bar{K}$) is provided in the Appendix. The intuition for the proof is as follows. The upper bound on K ensures that under unmanaged earnings, the owner dismisses a manager when x_L is observed and retains him when x_H is observed. When the owner relies on the manager's report of earnings, she can write a contract that makes her more patient in her dismissal decision. An optimal contract is for the owner to pay a bonus if and only if x_H is reported in each of the periods. If period-one earnings are x_H, the manager reports x_H in period one and x_H in period two (because of perfect correlation, $x_1 = x_2 = x_H$). If period-one earnings are x_L, the manager reports x_H in period one in order to delay being dismissed; in period two he must report $2x_L - x_H$, since the overstatement of $x_H - x_L$ in the first period has to be followed by an equal understatement in the second period. Since the only informative signal is received at the end of the second period, the manager's dismissal is delayed as intended.

Under managed earnings, manager A is assured of not being fired at the end of period one: manager A's expected future productivity and compensation are identical to that of

manager B. Hence, relative to the unmanaged earnings case, lower (expected) compensation is needed to induce him to join the firm and choose a_H. On the other hand, under managed earnings, the firm makes more inefficient replacement decisions. The lower bound on K ensures the benefit of reduced compensation more than offsets the cost of inefficient replacement decisions, i.e., managed earnings are optimal.

We use a numerical example to illustrate the proposition's result. Suppose $a_H = 1$, $x_H = 10$, $K = 10$, and $Pr(x_H \mid a_H) = 0.5$. Under unmanaged earnings $s^A(x_1 = x_H) = 22$, $s^B(x_2 = x_H) = 12$, and $s^C(x_3 = x_H) = 2$; all other payments are equal to 0. The owner's payoff is $(.5)(30 - 22) + (.5)(.5)(20 - 12) + (.5)(.5)(.5)(10 - 2) = 7$. Under managed earnings $s^A(\hat{x}_1^A = x_H, \hat{x}_2^A = x_H) = 12$ and $s^C(x_3 = x_H) = 2$; all other payments are equal to 0. ($\hat{x}_t^i$ denotes manager i's report in period t.) The owner's payoff is $(.5)(30 - 12) + (.5)(.5)(10 - 2) = 11$. Managed earnings is preferred to unmanaged earnings. In fact, for all $K \in (4.67, 11.33)$, managed earnings are optimal.

The manager communicates directly with the owner in our model. If, instead, the manager and the owner could communicate confidentially with a disinterested mediator, the mediator could do the necessary garbling (e.g., withhold the manager's individual period-one and period-two reports from the owner) and replicate the performance of our managed earnings contract with one in which the manager reports earnings truthfully to the mediator.

In our setting the owner cannot replicate the managed earnings performance with one in which the managers are provided with incentives to report truthfully.[22] This is because, after receiving the period-one earnings information, it is not self-enforcing for her to act as the disinterested mediator would act. In particular, to replicate the managed earnings performance with truthtelling, the owner would have to make a credible promise to manager A that she will ignore the truthful first period earnings report and retain him even if $x_1 = x_L$. This is a difficult promise to keep, since x_L in period one means that the owner would obtain $0 + (.5)(10 - 2) = 4$ by sticking with manager A through the second period (and hiring manager C in the third period) and $(.5)(20 - 12) + (.5)(.5)(10 - 2) = 6$ by hiring manager B for the second period (and hiring manager C in the third period if $x_2 = x_L$). Allowing earnings management is a way of avoiding this commitment problem.

2.4. An Example with Imperfectly Correlated Earnings

In the following example, we relax some simplifying assumptions made earlier in the paper. It is no longer assumed that (1) x_L occurs with probability 1 when the manager chooses a_L and (2) period $t + 1$ earnings are perfectly correlated with period t earnings when the same manager is retained.

With imperfect correlation in earnings across periods the manager has a second reason to manage earnings (besides simply delaying his dismissal). With imperfect correlation, poor earnings may be followed by good earnings. There is now some chance that things will get better and the manager will altogether avoid being dismissed.[23] Because earnings management makes the owner more patient in her firing decision it can lower the compensation needed to motivate the manager.

In the example, earnings management is preferred by the owner to several alternative unmanaged earnings regimes in which she learns: (1) earnings at the end of each period (full information—this was the benchmark in the proposition), (2) period-two earnings at

the end of period two but no period-one earnings information (coarsened information), (3) period-one and period-two earnings at the end of period two (delayed information), and (4) the sum of earnings over the three periods at the end of the firm's life (ship accounting).[24] In all these regimes (except ship accounting) period-three earnings are observed at the end of period three.

The parameters for the numerical example are: $a_H = 5$, $x_H = 200$, and $K = 20$; $x_t = x_H$ with probability 0.2 if a_L is chosen in period t; $x_t = x_H$ with probability 0.5 if a_H is chosen in period t; and $x_{t+1} = x_t$ with probability 0.6 if the period-t manager is retained in period $t + 1$.

2.4.1. *Managed Earnings*

One characterization of the optimal contract is: $s^A(\hat{x}_1^A = x_H, \hat{x}_2^A = x_H) = 36.67$ and $s^C(x_3 = x_H) = 16.67$; all other payments are 0. The equilibrium dismissal and reporting strategies are as follows. The owner retains manager A at the end of the first period if and only if his first period earnings report is x_H and retains him at the end of the second period if and only if his second period earnings report is at least x_L. The manager always reports x_H in the first period and reports $(x_1 + x_2 - x_H)$ in the second period.

These strategies are best responses to each other. If $x_1 = x_H$, manager A reports x_H in order to avoid being fired at the end of period one and to have a chance of receiving the bonus of 36.67 at the end of period two. If $x_1 = x_L$, manager A reports x_H to avoid being fired at the end of period one and to increase his chances of being retained at the end of the second period. The reason the owner will not fire the manager at the end of period one is that no new information is provided at that time—low and high earnings managers pool their reports.[25] If both periods' earnings are x_L, the manager ends up reporting $x_L - (x_H - x_L)$ in period two. This is the only case in which he is fired. That is, the owner ends up firing a manager only if the sum of period-one and period-two earnings reports is $2x_L$. Earnings management is used to delay the revelation of information and, hence, the firing decision, while still exploiting the disciplining role of firing. Under managed earnings the owner's payoff is 292.5.[26]

Earnings management is a costly substitute for commitment in this setting. If the owner had full powers of commitment she could improve her payoff. For example, she could commit to firing the manager with probability 5/18 when the sum of the manager's period-one and period-two earnings reports is $2x_L$. (Note the commitment to randomization.) Under this contract the owner's payoff is 294.31. There are other substitutes for commitment (e.g., coarsened information, delayed information, and ship accounting), though they are all costlier than managed earnings in our example.

2.4.2. *Unmanaged Earnings Environments*

<u>Full Information</u>

Assume the owner observes earnings (but not the managers' actions). More information turns out to be harmful because the owner can no longer credibly commit to retaining the manager at the end of the first period if a low outcome is realized. Under full information,

Table 2. Owner's payoff under various reporting regimes.

Reporting Regime	**Owner's Payoff**
Managed earnings	292.5
Unmanaged earnings:	
Full information	280.75
Coarsened information	274.17
Delayed information	290.83
Ship accounting	291.67

one characterization of the optimal contract is: $s^A(x_1 = x_H) = 58$, $s^B(x_2 = x_H) = 30$, and $s^C(x_3 = x_H) = 16.67$; all other payments are 0. The owner will dismiss a manager at the end of period two if $x_2 = x_L$, since hiring a new manager produces a higher payoff: $0.5[200 - 16.67] = 91.67 > 0.4(200) = 80$. Similarly, if $x_1 = x_L$, the manager will be dismissed at the end of period one: $0.5[200 - 30 + 0.6(200)] + 0.5(.5[200 - 16.67]) = 190.83 > 0.4[200 + 0.6(200)] + 0.6(0.5[200 - 16.67]) = 183$. The owner's payoff is 280.75.

Coarsened Information

Managing earnings is not simply a way of providing the owner with less information on which to base her firing decision. For example, if period-two earnings alone are observed, the owner fires manager A if and only if $x_2 = x_L$. The optimal contract is: $s^A(x_2 = x_H) = 63.33$ and $s^C(x_3 = x_H) = 16.67$; all other payments are 0. The owner's payoff is 274.17.

Delayed Information

It is not true that delayed information by itself is what makes managed earnings optimal. If unmanaged earnings are delayed but fully preserved (both x_1 and x_2 are available to the owner at the end of period two), the owner again dismisses manager A if and only if $x_2 = x_L$. The optimal contract is: $s^A(x_1 = x_H, x_2 = x_H) = 50$ and $s^C(x_3 = x_H) = 16.67$; all other payments are 0. The owner's payoff is 290.83.

Ship Accounting

If the firm adopts ship accounting (the owner observes only the firm's lifetime earnings at the end of period three), the optimal contract is: $s^A(x_1 + x_2 + x_3 = 3x_H) = 46.31$; all other payments are 0. The owner's payoff is 291.67. With ship accounting the owner completely loses the disciplining role of dismissal.

We summarize in Table 2 the owner's payoff under various reporting environments considered.

Earnings management leads to a simple time-additive aggregation of performance measures; this aggregate measure is strictly preferred to disaggregated measures. If one views

period-by-period performance measurement (x_1, x_2, x_3) and performance measurement over the firm's life $(x_1 + x_2 + x_3)$ as two endpoints on a scale of information aggregation, earnings management is a way of achieving an intermediate level of aggregation (the owner learns $x_1 + x_2$ and x_3).[27]

In our story, allowing for earnings management is a substitute for commitment for the owner. There are other possibilities. If payments could be conditioned on firing decisions (severance pay), the owner could credibly commit to not firing the manager at the end of period one and, thus, replicate the performance obtained under managed earnings. If a board of directors were introduced into our model, it might be optimal to have the board include some friendly directors who would collude with management and not fire the manager too soon (from an ex ante perspective). Also, the bundling of news releases may serve to make it difficult to draw inferences about the market's assessment of individual decisions. Our intention is not to argue that one of these commitment mechanisms is best but instead to illustrate the role of earnings management as one of many commitment mechanisms.

Nevertheless, it is interesting to speculate about the conditions under which earnings management might be less costly than other mechanisms. Consider the case of severance pay in a world in which owners receive private information about the desirability of a given manager and where information is obtained during the manager's employment. In this setting, while severance pay may be effective as a way of committing to retain good managers, it may also attract undesirable managers. Moreover, getting rid of undesirable managers involves making severance payments on the equilibrium path and, hence, is costly. In such a setting earnings management may be a less costly way to achieve commitment.

2.5. Other Forms of Owner Intervention

Finally, we would like to reiterate that the point of the at-will explanation is that earnings management can be a way of reducing owner intervention. Owner intervention is modeled as a firing/retention decision. Intervention can take other forms. For example, when short-term performance is poor and this is revealed to the owner, she may take on a greater role in the day-to-day operations of the firm, participating in decisions normally left to the manager.[28]

Suppose an owner contracts with a manager over two periods. At the beginning of the first period the manager chooses either a_L with a disutility of 0 or a_H with a disutility of 1. The act is observable but cannot be verified and, hence, is not contractible. Earnings in period t, $t = 1, 2$, are denoted by $x_t \in \{x_L, x_H\} = \{0, 100\}$. x_1 is equally likely to be x_L or x_H, no matter what act the agent chooses. If a_H is chosen, $x_2 = x_H$ with probability 1. If a_L is chosen, $x_2 = x_1$ with probability 1. At the end of period one the owner can intervene at a cost of 90. Owner intervention, which is also not contractible, ensures $x_2 = x_H$. The contract specifies non-negative payments conditioned either on the earnings numbers (unmanaged earnings) or on the earnings reports (managed earnings).

Under managed earnings the owner does not observe x_1 or x_2 but effectively observes the sum of earnings over the two periods—the manager cannot manipulate $\hat{x}_1 + \hat{x}_2$. Consider the following contract: $s(\hat{x}_1 + \hat{x}_2 = 100) = 2$ and $s(\cdot) = 0$ otherwise. Under this contract it is self enforcing for the owner not to intervene; if the agent chooses a_L, the owner obtains

$100 - 90 - .5(2) = 9$ in period 2 by intervening and $.5(100) = 50$ in period 2 by not intervening. Knowing the owner will not intervene, the manager has incentives to choose a_H. In fact, the above payments are the cheapest way to induce a_H. The owner's payoff under managed earnings is $.5(200) + .5(100 - 2) = 149$.

Under unmanaged earnings consider the manager's behavior if the owner tries to induce a_H by using a similar contract: set $s(0, 100) = 2$ and $s(\cdot, \cdot) = 0$ otherwise. If the manager chooses a_H (or if he chooses a_L and $x_1 = x_H$), it is self enforcing for the owner to not intervene: whether she intervenes or not, $x_2 = x_H$. However, if the manager chooses a_L and $x_1 = x_L$, the owner intervenes: by intervening she obtains $100-90-2 = 8$ in period 2; by not intervening she obtains 0 in period 2. Anticipating this intervention, the manager chooses a_L and obtains $.5(2) - 0 = 1$. If the manager were instead to choose a_H, he would obtain $.5(2) - 1 = 0$. Under unmanaged earnings, as long as the owner has incentives to intervene when a_L and x_L are observed, it is impossible to induce the manager to choose a_H: given the owner's intervention strategy, the events (x_L, x_H) and (x_H, x_H) occur with probability .5 irrespective of the manager's act. One feasible contract is to induce a_L by setting all payments equal to 0 and for the owner to intervene when x_L is realized. The owner's payoff under this contract is $.5(200) + .5(100 - 90) = 105$. However, the owner can induce a_H and obtain a higher payoff.

The optimal contract under unmanaged earnings is to set $s(0, 100) = 10$ and $s(\cdot, \cdot) = 0$ otherwise. The increase in payment from 2 to 10 is needed in order to make it self enforcing for the owner to not intervene even if a_L and x_L are observed: by intervening she obtains $100 - 90 - 10 = 0$ in period 2; by not intervening she again obtains 0 in period 2. Hence, the only difference between managed and unmanaged earnings is that, in the latter case, a larger payment is made. The owner's payoff under unmanaged earnings is $.5(200) + .5(100 - 10) = 145$. The owner is better off with managed earnings.[29]

Our managed earnings regime is equivalent to one in which earnings are fully preserved, but delayed. By delaying the report on x_1, the principal again succeeds in committing to not intervene. The fact that these two regimes yield identical payoffs is not surprising—unlike our three-period at-will setup, in this two-period example, there is only one opportunity for owner intervention. However, managed earnings is preferred to the regime in which the owner observes only period 2 earnings. In the latter environment the optimal contract is to pay 2 when $x_2 = x_H$. The owner's payoff is $.5(200 - 2) + .5(100 - 2) = 148$. At first glance, it may seem surprising that a regime in which both x_1 and x_2 are (ex post) observed does better than one in which only x_2 is observed. After all, the distribution over x_1 is not controlled by the manager. The reason is conditional controllability: x_1 is informative of the agent's act given x_2. (For a development of the notion of conditional controllability, see Antle and Demski (1988).)

The owner is better off under managed earnings because it keeps her from intervening in the running of the firm, which is useful in motivating the agent. With unmanaged earnings, the manager knows he will be "bailed out" by the owner if he chooses a_L and things go awry. To convince the manager that she will not bail him out, the owner has to increase the payment she makes. Key features of the example are the informational improvement over time (earnings become more informative of the manager's actions) and the interaction between the informativeness of earnings and the owner's intervention.

3. Concluding Remarks

In this paper, we use violations of the assumptions of the RP as the organizing criterion for the extant explanations of earnings management, and for highlighting the interrelationships among these explanations. We also model at-will contracts to construct an explanation for earnings management. The explanation is based on the idea that earnings management may serve the interests of shareholders, even as the managers act opportunistically to benefit from their information advantage.

It is reasonable to ask if it makes sense to relax the assumptions of the RP. As in other sciences (for example, the notion of a point in mathematics and frictionless movement or perfectly elastic object in physics), the RP in economics is an idealized benchmark of great value. Deviation of reality from such idealized benchmarks is a norm, not an exception. Indeed, the practical value of the benchmarks arises from the study of deviations.

For example, restricted *communication* is a way of capturing real-world considerations such as rights to privacy and the cost of communicating both data and how the data is to be interpreted (the parties involved must share a state space as well as a language). There also exist legal constraints on communication such as the U.S. prohibition on the sharing of pricing information among competitors and anti-discrimination laws in employment that make it illegal for the employer to ask certain types of questions relevant to the productivity of potential employees.

Restricted *contract* forms are also appealing in that simple contracts appear to be common in practice. Also, the Thirteenth Amendment to the U.S. Constitution and criminal and bankruptcy laws render many types of contracts for economic resources legally unenforceable.

Limited *commitment* seems to be well motivated as well. The cost of making credible and enforceable commitments can be very high (e.g., the fee paid to bail bondsman before an arrested person is set free). In a vast number of day-to-day transactions, commitment is either informal or nonexistent. When informal commitments are not met, the cost of enforcing them through courts, arbitration, mediation, or threats can be high.

There are other useful ways of categorizing earnings management stories. For example, is earnings management being accomplished via disclosed or undisclosed accounting instruments? Effects of disclosed instruments may be inverted by the reader to recapture unmanaged earnings. When earnings management is used to conceal information, earnings must be managed through the use of undisclosed or partially disclosed accounting choices (e.g., accounting estimates) which are insufficient for the reader to perform the inversion operation. In contrast, the objective of conveying information can be accomplished directly through the choice of disclosed accounting methods (e.g., the use of accelerated versus straight-line depreciation or LIFO versus FIFO inventory valuation) and indirectly by properties of the reported earnings stream (e.g., smooth earnings, as in Demski (1998)).

A theme common to our work and Demski (1998) is that allowing for earnings management can be beneficial to owners. Hence, before arguments encouraging the curtailment of managerial discretion in reporting are accepted by those who set financial reporting standards, effort should be made to gain a more complete understanding of the welfare effects of earnings management.

Finally, consider the challenge of testing the theories of income management with data. Empirical studies, often motivated by theories in which management has incentives to conceal the managed component of earnings from the readers of financial reports, still require data on that component. The component is not identified in the field data, and two problems arise in decomposing reported earnings into managed and pre-managed components. First, it is difficult to validate the assumptions that underlie any particular decomposition. Second, a decomposition of the reported earnings by a researcher to isolate the discretionary component can also be replicated by those from whom the information is sought to be concealed in the first place. In a world of rational agents, it does not pay to try to hide information when such an attempt is known to fail. Properly designed laboratory studies hold some promise of yielding the relevant data on the managed component of earnings for testing a range of such theories. Unfortunately, the range is limited because it is difficult to replicate several of the relevant motivations for earnings management in the laboratory.

Two other hurdles stand in the way of reliable testing of theories of earnings management with field or laboratory data. First, there are as many distinct explanations for earnings management as there are ways of violating the assumptions of the RP. This number is undoubtedly very large. Each violation can induce its own peculiar form of earnings manipulation. It may be possible to examine the data for evidence in support of a specific earnings management story. Unfortunately, the plausibility of simultaneous multiple violations of the assumptions of the RP dims our chances of linking data generated in such environments to specific earnings management stories.

A second hurdle arises from the multiplicity of the instruments of earnings management available to the firm. The portfolio of available instruments includes not only a large number of accounting devices, but also real transactions such as timing of investments, sales, hiring, and new product introduction. Furthermore, the firm does not have to stay with its chosen subset of instruments from one year to the next. Therefore, the data we gather from the field is very likely generated by managers' strategic use of dynamically changing instruments of earnings management. Examination of such data under the hypothesis that earnings management, if and when it occurs, uses a single, fixed instrument will yield noisy results at best. Given these difficulties, it is not surprising that a large number of carefully done analyses of data have yielded diverse evidence on earnings management. This leaves us with the open challenge of triangulating among field and lab data and theory to enhance our understanding of this interesting, complex, and elusive phenomenon.

Appendix

Proof of the Proposition:

Under unmanaged earnings, the owner's problem can be solved by backward induction in six steps (see Subsection 2.2). The optimal contract can be characterized so that a positive payment is made to a manager only in the period in which he is hired and only if x_H is observed in that period, i.e., $s^A(x_1 = x_H)$, $s^B(x_2 = x_H)$, and $s^C(x_3 = x_H)$ are positive; all other payments are zero. In the Appendix, we denote $Pr(x_H \mid a_H)$ by p_H.

Step 1. The payment $s^C(x_3 = x_H)$ is found by solving manager C's incentive compatibility constraint as an equality: $p_H s^C(x_3 = x_H) - a_H = 0$. That is, $s^C(x_3 = x_L) = 0$ and $s^C(x_3 = x_H) = \frac{a_H}{p_H}$ is the solution to P_3.

Step 2. If x_H is realized at the end of any period, the owner is better off retaining the existing manager for the remainder of the firm's life, since the remaining outputs are guaranteed to be x_H and no payments have to be made to the retained manager in subsequent periods.

Consider the owner's dismissal/retention decision when $x_2 = x_L$ is realized. From Step 1, if manager C is hired, the owner's expected utility in period three is $p_H[x_H - \frac{a_H}{p_H}]$. If the period-two manager is retained, the owner's expected utility in period three is 0. Since $x_H > \frac{a_H}{p_H}$, it is optimal to fire the period-two manager if $x_2 = x_L$. That is, $q_2(x_2 = x_L) = 1$ and $q_2(x_2 = x_H) = 0$ is the optimal firing decision at the end of period two.

Step 3. From Step 2, the probability with which manager B will be fired at the end of period two is $1 - p_H$ and, in which event, he incurs a disutility of K. The individual rationality constraints for B requires that $s^B(x_2 = x_H) \geq \frac{a_H}{p_H} + \frac{(1-p_H)K}{p_H}$. The incentive compatibility constraint requires that $s^B(x_2 = x_H) \geq \frac{a_H}{p_H} - K$. Since $K > 0$ the individual rationality constraint determines the payment. That is, $s^B(x_2 = x_L) = 0$ and $s^B(x_2 = x_H) = \frac{a_H}{p_H} + \frac{(1-p_H)K}{p_H}$ is the solution to P_2.

Step 4. If $x_1 = x_H$, using the same logic as in Step 2, manager A is retained. Now suppose $x_1 = x_L$. By firing manager A and hiring manager B in period 2 (and manager C in period three if $x_2 = x_L$), the owner's expected utility is $p_H[2x_H - s^B(x_2 = x_H)] + (1 - p_H)p_H[x_H - s^C(x_3 = x_H)]$. By retaining manager A in period two (and hiring manager C in period three), the owner's expected utility is $p_H[x_H - s^C(x_3 = x_H)]$. Algebraic manipulation reveals it is optimal to dismiss manager A at the end of period one when x_L is realized if:

$$K < \frac{p_H x_H}{1 - p_H} + p_H x_H - a_H. \tag{1}$$

That is, under (1), $q_1(x_1 = x_L) = 1$ and $q_1(x_1 = x_H) = 0$ is the optimal firing decision at the end of period one.

Step 5. Given the cost imposed on manager A when he is dismissed at the end of period one is $2K$, $s^A(x_1 = x_H) = \frac{a_H}{p_H} + \frac{(1-p_H)2K}{p_H}$.

Step 6. In Steps 1 through 5 it is assumed the owner wants to motivate each of the managers to choose a_H. That is, in each period, the owner prefers to motivate a_H rather than motivate a_L or shut down the firm. The only difference between motivating a manager to choose a_L and shutting down the firm is that in the former case the manager has to be compensated for the disutility he incurs from being fired at the end of the period. (In both cases, the output is $x_L = 0$.) Hence, from the owner's perspective, shutting down the firm dominates motivating a_L.

It is optimal to motivate manager C to choose a_H if $x_H > \frac{a_H}{p_H}$. It is optimal to motivate manager B to choose a_H if $p_H[2x_H - s^B(x_2 = x_H)] + (1 - p_H)p_H[x_H - s^C(x_3 = x_H)] > 0 + p_H[x_H - s^C(x_3 = x_H)]$. This constraint is already satisfied in Step 4 (assuming K satisfies (1)). It is optimal to motivate manager A to choose a_H if the owner's expected utility over the firm's life $p_H[3x_H - s^A(x_1 = x_H)] + (1 - p_H)p_H[2x_H - s^B(x_2 = x_H)] + (1 - p_H)(1 - p_H)p_H[x_H - s^C(x_3 = x_H)] > 0 + p_H[2x_H - s^B(x_2 = x_H)] + (1 - p_H)p_H[x_H - s^C(x_3 = x_H)]$. This inequality is satisfied if:

$$K < \left(\frac{1}{1 - p_H}\right)\frac{p_H x_H}{2 - p_H} + p_H x_H - a_H\left(\frac{1 - p_H}{2 - p_H}\right) = \bar{K}. \tag{2}$$

Given $x_H > \frac{a_H}{p_H}$, the RHS of the inequality in (2) is smaller than the RHS of (1). Thus, for all $K < \bar{K}$, the solution characterized above is the optimal unmanaged earnings solution.

Next consider the case of managed earnings. The optimal contract can be characterized so that the only positive payments are $s^A(\hat{x}_1^A + \hat{x}_2^A = 2x_H)$, $s^B(\hat{x}_2^B = x_H)$, and $s^C(x_3 = x_H)$. Given $x_1 + x_2$ is revealed at the end of period two and $x_1 + x_2 + x_3$ is revealed at the end of period three, x_3 is effectively available for contracting. The owner's dismissal decision at the end of period two is essentially the same as under unmanaged earnings: if $x_1 + x_2 = 2x_H$, the period-two manager is retained; if $x_1 + x_2 = 2x_L$, manager C is hired and paid $s^C(x_3 = x_H) = \frac{a_H}{p_H}$.

Consider the dismissal decision at the end of period one. If x_H is realized, manager A reports truthfully in order to obtain the bonus at the end of the second period. If x_L is realized, manager A also reports x_H in order to delay firing until the end of the second period. (As argued earlier, if the manager reveals that x_L has been realized, the owner will fire manager A and hire manager B for all $K < \bar{K}$.) Since no information is revealed at the end of period one, manager A is always retained for the second period (manager B is never hired) and is retained for the third period if and only if $\hat{x}_1^A + \hat{x}_2^A = 2x_H$. Hence, $s^A(\hat{x}_1^A + \hat{x}_2^A = 2x_H) = \frac{a_H}{p_H} + \frac{(1-p_H)K}{p_H}$. With managed earnings, the owner's expected utility over the firm's life is $p_H[3x_H - s^A(\hat{x}_1^A + \hat{x}_2^A = 2x_H)] + (1 - p_H)p_H[x_H - s^C(x_3 = x_H)]$.

By substituting the payments given above into the expressions for the owner's expected utility over the firm's life, it can be verified that the expression is greater under managed earnings than under unmanaged earnings if:

$$K > (1 - p_H)\frac{p_H x_H}{2 - p_H} + \left(\frac{1}{2 - p_H}\right)p_H x_H - a_H\left(\frac{1 - p_H}{2 - p_H}\right) = \underline{K}. \tag{3}$$

(Recall, for the assumed firing rules to be optimal we also need $K < \bar{K}$.) Given $x_H > \frac{a_H}{p_H}$, $0 < \underline{K} < \bar{K}$. Thus, the interval $(\underline{K}, \bar{K})$ is non-empty and, for all K in this interval, the owner strictly prefers managed earnings to unmanaged earnings. ■

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Notes

1. Another paper in which earnings management benefits firm owners is Demski (1998). See Section 1 for details.
2. It should be noted that the RP is intended as a means of computing feasible payoffs (and allocations). There may be mechanisms with equilibria involving lying behavior by the participants that replicate the performance achieved by a mechanism involving truthtelling. The RP is not intended to choose from amongst these mechanisms and equilibria. However, for the mechanism designer to achieve a payoff that cannot be replicated by a revelation mechanism and a truthtelling equilibrium, some assumption of the RP must be violated.
3. It was alleged that Sears used its bad debt reserve to smooth earnings but company officials denied the allegations (*The Wall Street Journal*, 1996). Officials of Allied Bancshares admitted to creating a special reserve for the sole purpose of smoothing earnings. As reported in *Fortune* (1984, p. 53) the company's treasurer gave the following explanation of the company's special reserves: "When you are bumping along with such good earnings, you don't get any benefit by showing extraordinary increases. Some years we could have reported extremely higher earnings than we did."
4. Following Jones (1991), a great deal of recent attention has been devoted to estimating nondiscretionary accruals from time series data and then estimating discretionary accruals as total accruals less estimated nondiscretionary accruals.
5. If the owner could develop a reputation for being patient and this reputation enabled her to attract future managers, then a concern for reputation building might eliminate firings that are excessive from an ex ante perspective. Of course, this reputation might also attract the incompetents who would know the owner's patience will provide them with a longer rope. Consideration of reputation is not a part of our analysis.
6. In our model, at the end of each period, the principal can terminate her contractual relationship with the existing manager and negotiate a new contract with another manager. The ability to negotiate a new contractual relationship undermines the principal's ability to commit to a long-term relationship with an existing manager. However, it provides the principal with the ex post benefit of hiring a more productive manager. Somewhat similar tradeoffs arise in renegotiation models. The principal's ability to renegotiate a contract with a manager undermines commitment and, hence, serves as an added constraint in the contract design problem (see, for example, Fudenberg and Tirole (1990), Hart and Moore (1988), and Hart and Tirole (1988)). However, if the principal obtains some unverifiable signal prior to renegotiation, there are potential benefits to renegotiation and these benefits can offset the cost of the added constraint. See Hermalin and Katz (1991) for a setting wherein renegotiation is preferred because it allows for more efficient risk sharing.
7. In our model we assume the owner acts in an ex post rational fashion. If it is in her best interest to use information, she uses it. If it is in her best interest to ignore information, she ignores it. There is experimental evidence that it is difficult for individuals to ignore information even if it is in their own ex post best interest to do so. This result is known as the "curse of knowledge" (Camerer, Lowenstein, and Weber, 1989). Although not modeled in this paper, earnings management might help mitigate the curse of knowledge.
8. There are other studies on the role of coarsened information as a commitment device. In most studies, information is coarsened by removing one of many signals and not by aggregation (see, for example, Baiman (1975), Cremer (1995), and Arya, Glover, and Sivaramakrishnan (1997)). A recent exception is Indjejikian and Nanda (1998).
9. DeFond and Park (1997) use Fudenberg and Tirole's model to develop and test the hypothesis that managers choose income increasing (decreasing) accruals when current performance is poor (good) and expected future performance is good (poor). The case of earnings management for firms engaged in proxy contests (a case in which firing is clearly an issue) has also been examined (for example, see Collins and DeAngelo (1990)).
10. Much of the information studied in accounting is aggregated. For example, managers do not report individual transaction amounts but rather aggregated account balances. Since accounting inevitably deals with such

aggregation, one is out of the revelation game from the very start.

11. Limited commitment is not an issue if the central planner is a disinterested mediator with no payoffs since the agents will believe the central planner will act in any mutually agreed upon prespecified manner.
12. Throughout the paper "earnings" refers to earnings before compensation.
13. It is important that taking a higher productive act increases the manager's expertise in predicting period-two earnings, not that the ability to predict is perfect.
14. The bankruptcy constraints limit the set of feasible allocations. Given the set of feasible allocations, there is no restriction on the form of the contract. Hence, the RP is not violated by bankruptcy constraints.
15. Limits on communication can affect not only the optimal form of communication but also the optimal organization form. In Melumad, Mookherjee, and Reichelstein (1992), blocked communication leads to delegation and, in particular, to the use of responsibility centers. Blocked communication is closely related to the issue of contract complexity (Melumad, Mookherjee, and Reichelstein, 1997).
16. Hepworth (1953) also discusses the role of earnings management in manipulating perceptions, but for the purpose of avoiding irrational waves of optimism or pessimism.
17. A related point is that conservatism itself may be valued: conservative reporting choices may signal that management has a fundamentally conservative disposition (Sanders, Hatfield, and Moore, 1938, p. 13).
18. A case that incorporates many of these aspects of earnings management is "Strassli Holdings, AG," by Gordan Shillinglaw (1987).
19. The Law of Conservation of Income holds as long as the clean surplus rule is followed. The clean surplus rule requires that, with the exception of transactions with shareholders, all changes in owners' equity must pass through the income statement.
20. Our result on the value of earnings management can be derived in a two-period model and, in which case, we need to assume only the Law of Conservation of Income. The reason we chose to study a three-period rather than a two-period model is to emphasize how earnings management allows the owner to detect persistent poor performance and credibly commit to a delayed firing rule. (In a two-period model, delayed firing is equivalent to no firing.)
21. In the event that manager A is fired and manager B is hired, it is assumed that, in addition to learning the sum of x_1 and x_2, the owner can separate the effect of each of the managers—the owner learns x_1 and x_2 separately.
22. In our perfect correlation setting (with $Pr(x_H \mid a_L) = 0$), the owner's expected utility is identical under unmanaged earnings and under an earnings regime in which incentives are provided to the manager to reveal earnings information truthfully. In our numerical example the following characterization of manager A's contract results in manager A reporting truthfully and choosing a_H: $s^A(\hat{x}_1^A = x_H) = 0$, $s^A(\hat{x}_1^A = x_L) = 20$, $s^A(\hat{x}_2^A = x_H) = 2$, and $s^A(\hat{x}_2^A = x_L) = 0$. Note that the expected payments are the same as with unmanaged earnings. Hence, under the conditions provided in our proposition, managed earnings also beat unmanaged earnings as the regime in which earnings reports are truthfully elicited from the manager. In the imperfect correlation example presented in the next subsection, the addition of the truth-telling constraints is costly for the owner, i.e., unmanaged earnings is a more difficult benchmark to beat than one in which truth-telling constraints are imposed.
23. In the previous subsection of the paper the only reason the manager wants to delay firing is that being fired at the end of period one is more costly than being fired at the end of period two ($2K$ versus K). Because there is now a second reason for the manager to delay firing, earnings management is sometimes valuable even if the cost to the manager of being fired at the end of period one and period two is the same (K in either case). Such a numerical example is available from the authors.
24. "The only way to be certain of how successfully a business has performed is to close its doors, sell all its assets, pay all liabilities, and return any leftover cash to the owner. Indeed in the 1400s, Venetian merchant traders did exactly that. For each voyage, cash was invested, goods were acquired and exported to foreign markets, and sold for cash. The proceeds were distributed to the original investors" (Horngren, Sundem, and Elliott, 1996, p. 41). Hence, we refer to a firm's lifetime earnings as "ship accounting."
25. In our managed earnings setting, the first period earnings report is uninformative—the earnings report is always high. This is a consequence of studying a two-outcome model. (With two outcome levels, pooling can be achieved only if the earnings report conveys no information.) If there were three or more earnings levels, partial pooling may be enough to ensure that manager A is not fired; in this case, the period-one earnings report would be informative. We thank Amir Ziv for this suggestion.
26. The owner's payoff is calculated as follows: $Pr(x_1 = x_H \mid a_H)[x_H + Pr(x_2 = x_H \mid x_1 = x_H) \ldots] + Pr(x_1 =$

$x_L \mid a_H)[x_L + Pr(x_2 = x_H \mid x_1 = x_L)\ldots] = 0.5[200 + 0.6(200 - 36.67 + 0.6(200) + 0.4(0)) + 0.4(0 + 0.4(200) + 0.6(0))] + 0.5[0 + 0.4(200 + 0.6(200) + 0.4(0)) + 0.6(0 + 0.5(200 - 16.67) + 0.5(0))]$.

27. In a different context Lim and Sunder (1991) show that an intermediate level of aggregation can yield statistically more precise estimates than more extreme choices.
28. Other parties may find earnings management useful in limiting their own intervention. Debtholders and regulators (e.g., bank regulators) come to mind.
29. The welfare implications are different in this setup than in the at-will setup. In the at-will model the manager is indifferent between managed and unmanaged earnings while the owner prefers the former. In the current setup the owner is made better off with managed earnings but this is done at the expense of the manager (the manager's payoff under managed earnings is 0 while it is 4 under unmanaged earnings). The reason there is a welfare improvement with managed earnings in the at-will setup is that the deadweight loss associated with managerial firing (the K-cost) decreases when firing is delayed.

References

Antle, R., and J. Demski. (1988). "The Controllability Principle in Responsibility Accounting." *The Accounting Review* 63, 700–718.

Archibald, T. (1967). "The Return to Straight Line Depreciation: An Analysis of a Change in Accounting Method." *Journal of Accounting Research* 5, 164–180.

Arya, A., J. Glover, and K. Sivaramakrishnan. (1997). "The Interaction Between Decision and Control Problems and the Value of Information." *The Accounting Review* 72, 561–574.

Baiman, S. (1975). "The Evaluation and Choice of Internal Information Systems within a Multiperson World." *Journal of Accounting Research* 13, 1–15.

Bartov, E. (1993). "The Timing of Asset Sales and Earnings Manipulation." *The Accounting Review* 68, 840–855.

Boylan, R., and B. Villadsen. (1997). "An Algorithmic Approach to Contracting in an Infinite Agency Model." Working paper, Washington University in St. Louis.

Camerer, C., G. Lowenstein, and M. Weber. (1989). "The Curse of Knowledge in Economic Settings: An Experimental Analysis." *Journal of Political Economy* 97, 1232–1254.

Cole, W. (1908). *Accounts: Their Construction and Interpretation*. Boston, MA: Houghton Mifflin Company.

Collins, D., and L. DeAngelo. (1990). "Accounting Information and Corporate Governance: Market and Analyst Reactions to Earnings of Firms Engaged in Proxy Contests." *Journal of Accounting and Economics* 13, 213–247.

Copeland, R. (1968). "Income Smoothing." *Journal of Accounting Research* 6, 101–116.

Cremer, J. (1995). "Arm's Length Relationships." *Quarterly Journal of Economics* 110, 275–295.

Cushing, B. (1969). "An Empirical Study of Changes in Accounting Policy." *Journal of Accounting Research* 7, 196–203.

DeAngelo, L. (1986). "Accounting Numbers as Market Valuation Substitutes: A Study of Management Buyouts of Public Stockholders." *Accounting Review* 61, 400–420.

DeAngelo, H., L. DeAngelo, and D. Skinner. (1994). "Accounting Choice in Troubled Companies." *Journal of Accounting and Economics* 18, 113–143.

Dechow, P., R. Sloan, and A. Sweeney. (1995). "Detecting Earnings Management." *The Accounting Review* 70, 193–225.

DeFond, M., and C. Park. (1997). "Smoothing Income in Anticipation of Future Earnings." *Journal of Accounting and Economics* 23, 115–139.

Demski, J. (1998). "Performance Smoothing Incentives." Working paper, University of Florida.

Dye, R. (1988). "Earnings Management in an Overlapping Generations Model." *Journal of Accounting Research* 26, 195–235.

Elliott, J., and W. Shaw. (1988). "Write-offs as Accounting Procedures to Manage Perceptions." *Journal of Accounting Research* 26, 91–119.

Evans, J., and S. Sridhar. (1996). "Multiple Control Systems, Accrual Accounting, and Earnings Management." *Journal of Accounting Research* 34, 45–65.

Executive Excellence. (1997). "Grade A Boards." September.

Fortune. (1984). "Manipulating Profits: How it's Done." 25 June, 50–54.

Fudenberg, D., and J. Tirole. (1990). "Moral Hazard and Renegotiation in Agency Contracts." *Econometrica* 58, 1279–1320.

Fudenberg, D., and J. Tirole. (1995). "A Theory of Income and Dividend Smoothing Based on Incumbency Rents." *Journal of Political Economy* 103, 75–93.

Fukui, Y. (1996). "Earnings Management: Not for Managers but for Investors." Working paper, Carnegie Mellon University.

Gordan, M., B. Horwitz, and P. Meyers. (1966). "Accounting Measurements and Normal Growth of the Firm." In R. Jaedicke, Y. Ijiri, and O. Nielsen (eds.), *Research in Accounting Measurement*. Sarasota, FL: American Accounting Association.

Green, J., and J. Laffont. (1986). "Partially Verifiable Information and Mechanism Design." *Review of Economic Studies* 53, 447–456.

Hart, O., and J. Moore. (1988). "Incomplete Contracts and Renegotiation." *Econometrica* 56, 755–786.

Hart, O., and J. Tirole. (1988). "Contract Renegotiation and Coasian Dynamics." *The Review of Economic Studies* 55, 509–540.

Healy, P. (1985). "Effect of Bonus Schemes on Accounting Decisions." *Journal of Accounting and Economics* 7, 85–107.

Hepworth, S. (1953). "Smoothing Periodic Income." *The Accounting Review* 28, 32–39.

Hermalin, B., and M. Katz. (1991). "Moral Hazard and Verifiability: The Effects of Renegotiation in Agency." *Econometrica* 59, 1735–1753.

Horngren, C., G. Sundem, and J. Elliott. (1996). *Introduction to Financial Accounting*. Englewood Cliffs, NJ: Prentice Hall.

Indjejikian, R., and D. Nanda. (1998). "Dynamic Incentives and Responsibility Accounting." Working paper, University of Michigan.

Jones, J. (1991). "Earnings Management During Import Relief Investigations." *Journal of Accounting Research* 29, 193–228.

Levine, C. (1996). *Conservatism, Contracts and Information Revelation*. Unpublished dissertation, Carnegie Mellon University.

Liberty, S., and J. Zimmerman. (1986). "Labor Union Contract Negotiations and Accounting Choices." *Accounting Review* 61, 692–712.

Lim, S., and S. Sunder. (1991). "Efficiency of Asset Valuation Rules Under Price Movement and Measurement Errors." *The Accounting Review* 66, 669–693.

Lipman, B., and D. Seppi. (1995). "Robust Inference in Communication Games with Partial Provability." *Journal of Economic Theory* 66, 370–405.

Lys, T., and K. Sivaramakrishnan. (1988). "Earnings Expectations and Capital Restructuring: The Case of Equity-For-Debt Swaps." *Journal of Accounting Research* 26, 273–299.

McNichols, M., and P. Wilson. (1988). "Evidence of Earnings Management From the Provision for Bad Debts." *Journal of Accounting Research* 26, 1–31.

Melumad, N., D. Mookherjee, and S. Reichelstein. (1992). "A Theory of Responsibility Centers." *Journal of Accounting and Economics* 15, 445–484.

Melumad, N., D. Mookherjee, and S. Reichelstein. (1997). "Contract Complexity, Incentives, and the Value of Delegation." *Journal of Economics and Management Strategy* 6, 257–289.

Milgrom, P., and J. Roberts. (1992). *Economics, Organization and Management*. Englewood Cliffs, NJ: Prentice Hall.

Myerson, R. (1979). "Incentive Compatibility and the Bargaining Problem." *Econometrica* 47, 61–74.

Ronen, J., and S. Sadan. (1981). *Smoothing Income Numbers: Objective, Means and Implications*. Reading, MA: Addison-Wesley Publishing Co.

Sanders, T., H. Hatfield, and U. Moore. (1938). *A Statement of Accounting Principles*. Sarasota, FL: American Accounting Association.

Shillinglaw, G. (1987). "Strassli Holding, AG." In J. Schweikart (ed.), *Cases in International Accounting*. Sarasota, FL: American Accounting Association.

Sunder, S. (1997). *Theory of Accounting and Control*. Cincinnati, OH: South-Western Publishing.

Sweeney, A. (1994). "Debt-Covenant Violations and Manager's Accounting Responses." *Journal of Accounting and Economics* 17, 281–308.

Trueman, B., and S. Titman. (1988). "An Explanation for Accounting Income Smoothing." *Journal of Accounting Research* 26, 127–139.

The Wall Street Journal. (1996). "Sears's Credit-Card Reserves May Have Propped Up Earnings." 4 November, C1–C2.

The Wall Street Journal. (1998). "Before Chrysler, Daimler Was a Soap Opera." 10 June, C1–C2.