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A Theory of Income and Dividend Smoothing Based on Incumbency Rents

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"Income smoothing" is the process of manipulating the time profile of earnings or earnings reports to make the reported income stream less variable. This paper builds a theory of income smoothing based on the managers' concern about keeping their position or avoiding interference, and on the idea that current performance receives more weight than past performance when one is assessing the future. When investment is added to the model, so that income reports and dividends can be set independently, we find that both dividends and income reports may be smoothed and that dividends may convey information not present in the income report.

I. Introduction

"Income smoothing" is the process of manipulating the time profile of earnings or earnings reports to make the reported income stream less variable, while not increasing reported earnings over the long run.[1] To smooth income, a manager takes actions that increase re-

[1] As Merchant (1989) observes, long-run cumulative earnings closely approximate long-run cumulative cash flows and are hence more difficult to manipulate.

ported income when income is low and takes actions that decrease reported income when income is relatively high; this latter aspect is what differentiates income smoothing from the related process of trying to exaggerate earnings in all states.

The accounting literature has developed considerable evidence that managers of profit centers within large corporations engage in income smoothing;[2] there is also some suggestion that such smoothing occurs on the level of the firm as a whole. To help clarify what is meant by income smoothing, let us note that two methods can be used to smooth earnings reports. The first is the use of the flexibility allowed in the generally accepted accounting procedures to change reported earnings without changing the underlying cash flows. Examples of this type of manipulation include adjusting reserves for losses (inventory obsolescence and bad debt), altering the point at which sales are recognized, and shifting costs between expense and capital accounts. The second method with which managers can smooth reported earnings is to change operations to smooth the underlying cash flows themselves. Examples of this include altering shipment schedules, offering end-of-period sales, and speeding up or deferring maintenance.

Using operating decisions to smooth income has real economic costs, and using accounting practices to smooth income reports at least requires additional accounting resources. Such costs of earnings management include poor timing of sales, overtime incurred to accelerate shipments, disruption of the suppliers' and customers' delivery schedules, time spent to learn the accounting system and tinker with it, or simple distaste for lying. Yet income smoothing is prevalent despite these costs, which raises the question of why it is allowed to occur. It is easy to see how a given incentive contract may induce smoothing; roughly speaking, it suffices that the manager's utility be a concave function of his report.[3] The deeper question is whether such contracts are flawed because of the income smoothing they induce, or whether income smoothing is a consequence of the optimal contract for the given situation.

This paper studies income smoothing in a particular and highly stylized model of optimal contracting between the manager of a profit center and a principal, which we call the "firm." In our model, income smoothing arises from the conjunction of the following features. First, the manager enjoys a private benefit from running the profit

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[2] See Merchant (1989) and the references cited therein. Healy (1985) discusses related examples of earnings manipulation.

[3] This is the case in which managers' bonuses are capped, as in the oil wildcatters studied by Healy (1985). We discuss Healy's paper further in Sec. VI.

center and is averse to income risk. To simplify the analysis and highlight the role of incumbency rents, we assume that the manager does not respond at all to monetary incentives. Second, the firm cannot commit itself to a long-term incentive contract,[4] so that if the firm learns that the manager's division is performing poorly, it will shut the division down or fire the manager or both. More generally, we suppose that poor performance will lead the firm to "intervene" in the division's operations in some way that reduces the manager's private benefit.[5]

These first two features imply that the manager will have an incentive to distort reported earnings to maximize her expected length of tenure, but need not imply that the optimal contract will induce income smoothing. For example, if the firm decides whether or not to intervene in a third period by looking at the sum of the earnings reports in the first two periods, the manager will want to maximize this sum and has no incentive to transfer earnings from one period to the next. Thus, if the sum of the first two periods' earnings is a sufficient statistic for the firm's decision whether or not to intervene, the optimal contract will not induce income smoothing.

This brings us to the third key feature of our model, which is that recent income observations are more informative than older ones about the future prospects of the division. In this case of "information decay," the sum of the division's per period income is not a sufficient statistic for the firm's decision problem, and so the reporting strategy that maximizes the manager's expected length of tenure need not maximize the firm's present value. Thus our model identifies information decay as one of the key factors leading to income smoothing. Casual empiricism suggests that such information decay is an important part of many sorts of performance evaluation, for example tenure reviews.

When these three building blocks are put together, managers are shown to smooth income in two related ways. They boost their earnings in bad times to lengthen their tenure. In good times, they are less concerned by their short-term prospects, and information decay gives them an incentive to save for future bad times. The general implication of our model of earnings management is that information filters out slowly and income is smoothed. Indeed, in a three-period model in which the manager is guaranteed tenure for at least two periods, no information can be obtained from the first-period report.

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[4] This assumption seems realistic (see Merchant 1989, chap. 2).
[5] Merchant (1989, p. 30) argues that the manager's loss of credibility and the concomitant intervention following a missed budget target tend to be more important than the reduction in bonuses.

When the firm may intervene at the end of the first period, the first-period report may be informative, but we obtain an upper bound on the information that is released by this report. Furthermore, when applied at the level of the firm, the model predicts a positive correlation between earnings report and stock price, a well-documented fact.

The main difference between this paper and previous work on income smoothing is our focus on the design of optimal contracts that take account of private incentives. In Ronen and Sadan (1981) and Trueman and Titman (1988), the managers act to defend the shareholders' interests rather than their own. These papers also specify a preference for smoother income on the part of the external capital market. In Lambert (1984) and Dye (1988), risk-averse managers without access to capital markets want to smooth the firm's reported income in order to provide themselves with insurance. These papers do not consider optimal contracts, and it is not clear whether income smoothing could be eliminated by a change in the managerial compensation scheme.

Our basic model lacks productive investment, and reported income can be envisioned as removed from the division (or firm) in the form of a transfer or dividend. Introducing productive investment yields a distinction between reports and dividends. The model with productive investment may help explain three well-known facts. First, firms pay dividends despite favorable tax treatment of capital gains.[6] Because of earnings management, information about real income is imperfect, and forcing the firm to pay out cash may perform a screening function that would be absent if income were verifiable. Second, an increased dividend causes the stock price to rise, and conversely for cuts in the dividend (see Black 1976; Allen 1990). Third, corporations smooth dividends. This occurs in our model for the same reasons that lead to the smoothing of reports, even though reports and dividends are not necessarily equivalent signals.

There are already several models in the literature that explain the existence of dividends as a way for the firm to signal its information. These models (e.g., Bhattacharya 1979; Miller and Rock 1985) differ from ours in supposing that dividends are chosen to maximize the total wealth of the firm's current shareholders.[7] Moreover, these

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[6] As in the rest of the literature, we do not explain why firms pay dividends instead of repurchasing shares. We only appeal to the fact that regular repurchases are likely to be taxed on the same basis as dividends.

[7] This may be a reasonable assumption in some circumstances, but it is not justified in the papers in question. It would be interesting to develop a similar model in a setting in which the allocation of control over dividends is chosen as part of an optimal charter for the firm.

models predict that the firm will always try to signal an exaggeratedly high income, and so do not explain dividend smoothing.[8]

More recently, Warther (1991a) developed a signaling model of dividends with self-interested managers. In his model, managers observe first-period income, pay out some as dividends, and reinvest the rest. His model, unlike ours, does not allow for income reports to convey information. Also, his signaling game has many equilibria, only some of which exhibit dividend smoothing, whereas income and dividend smoothing is the unique outcome in most versions of our model. On the other hand, Warther studies the infinite-horizon version of his model, whereas we content ourselves with only three periods; moreover Warther (1991b) conducts an empirical test of his theory.

II. The Basic Model

This section presents the simplest version of our model; later sections consider various extensions. In all these models, there are two players, a manager (e.g., of a division) and a principal or "owner" or "firm," and three periods.

In period 1, the manager observes the division's profit y_1 and makes a report r_1 to the firm. Unless we specify otherwise, y_1 has only two possible values, $\bar{y}_1$ and $\underline{y}_1$, with probabilities v_0 and $1 - v_0$, respectively. Let $\Delta y_1 \equiv \bar{y}_1 - \underline{y}_1 > 0$. Because there is no investment in this basic model, one can think of r_1 as being handed over to the firm in cash.

The reported profit r_1 need not equal the actual profit; the difference $y_1 - r_1 = s_1$ is the manager's "hidden savings." These savings (or dissavings, if s_1 is negative) transfer income from one period to the next in a way that is not observed by the firm. Each dollar of hidden savings yields $g(s_1)$ dollars of additional income tomorrow; we suppose that $g(0) = 0$, $g' > 0$, and $g'' < 0$ and, moreover, $g'(s_1) < 1$ for $s_1 > 0$ and $g'(s_1) > 1$ for $s_1 < 0$. (Because we shall take the interest rate to be zero, these latter conditions imply that the efficient level of hidden savings or earnings management is zero.)

The measured second-period income of the division is the sum $z_2 = y_2 + g(s_1)$ of the second-period operating profit y_2 and the return on first-period savings $g(s_1)$.[9] The probability distribution over y_2

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[8] A referee has suggested that income smoothing might follow from the assumption that investors are risk averse, since they would then have a preference for a less volatile overall income stream. Clearly, going from that observation to the conclusion that investors value smoothing on a firm-by-firm basis is possible only in a setting in which the Modigliani-Miller theorem does not apply.

[9] Note that the firm can observe total net income $y_1 + y_2 - s_1 + g(s_1) = z_2 + r_1$.

when the first-period profit is y_1 is represented by the density f and cumulative distribution F; density $\bar{f}$ and cumulative distribution $\bar{F}$ obtain when $y_1 = \bar{y}_1$. Let

$$R_2(\bar{y}_1) \equiv \int_{-\infty}^{\infty} y_2 \bar{f}(y_2)\, dy_2$$

denote the expected second-period income conditional on first-period income $\bar{y}_1$, and let

$$R_2(\underline{y}_1) \equiv \int_{-\infty}^{\infty} y_2 \underline{f}(y_2)\, dy_2.$$

At the end of the second period the manager is audited by the firm. We suppose that the audit reveals the current income z_2 (the manager is not able to transfer income between periods 2 and 3) and that the audit does *not* reveal y_1 or s_1.

Thus an important implicit assumption of our basic model is that the losses due to income smoothing are smaller than the cost of observing the firm's actual and potential earnings via the use of frequent audits and evaluations of managerial decisions: If the firm obtains an exact statement of each period's earnings and also an indication of which operating decisions were motivated primarily by considerations of income smoothing, then the issue of income smoothing does not arise.[10] In our basic model, the firm is restricted to auditing the division's financial records and its current-period operating decisions; it is not able to use audits to evaluate operating decisions in previous periods. One interpretation of our model is that the "period 1" report corresponds to soft quarterly reports and the period 2 audit is the fourth-quarter or annual external audit or performance review. Alternatively, the period 1 report corresponds to the annual audit (which still leaves the manager substantial discretion over operating decisions), and the period 2 audit stands for a more thorough investigation by headquarters or the board of directors. What is needed for our basic model is that the manager is not continuously audited at full strength.

We assume that the expected third-period income R_3 (if the unit is not shut down at the end of period 2) is an increasing function of a weighted average $\rho y_1 + y_2$ of the firm's first two incomes. We assume that there is information decay, that is, that $\rho < 1$. Actually, most of the paper considers the polar case of $\rho = 0$, so that income

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[10] In practice, this second type of income smoothing may be more costly to detect; it may even be impossible to establish with certainty. Moreover, if auditors can collude with management, then the evaluation of an auditing policy should consider any additional payments required to prevent the auditors from colluding with management or the loss of accuracy caused by collusion (see, e.g., Kofman and Lawarrée 1993).

(under the current management) follows a first-order Markov process.[11] The firm shuts down and gets third-period income $y_3 = 0$ if the manager is fired at the end of period 2. It gets second- and third-period incomes $y_2 = y_3 = 0$ if firing occurs at the end of period 1.[12] When the manager is fired at the end of period 1, the (positive or negative) savings are recovered by the firm. Section III assumes that the expected second-period profits $R_2(\underline{y}_1)$ and $R_2(\bar{y}_1)$ are large enough that it is not optimal to fire the manager at the end of period 1. Section IV considers the more general case in which period 1 firing may occur.

We assume that the firm defines a set of allowable reports in period 1. This implicitly supposes that the firm can commit itself to penalize reports outside the allowed set. However, we suppose that the firm cannot commit itself to decisions about the manager's tenure: The firm fires the manager if and only if this raises its expected profit under its current beliefs.

To complete the description of the model, we specify the players' preferences. We suppose that the firm is risk neutral. The manager is infinitely risk averse in income and therefore does not respond to monetary incentives. She is paid a fixed wage, which we normalize at zero,[13] and receives private benefit $B > 0$ per period during her tenure. This assumption simplifies the analysis and starkly highlights the role of career concerns. It is clear that the more the manager internalizes profit, the less incentive she has to manage earnings. Both parties have discount factors equal to one.

III. One-Time Decisions

A. Income Follows a First-Order Markov Process ($\rho = 0$)

This section assumes that second-period profits are large enough that the manager is never fired at the end of period 1, so that the firm's

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[11] If (y_1, y_2, y_3) were drawn from a joint normal distribution, one would have

$$\rho = \frac{\sigma_2(\rho_{13} - \rho_{12}\rho_{23})}{\sigma_1(\rho_{23} - \rho_{12}\rho_{13})},$$

where σ_t^2 denotes the variance of y_t and ρ_{st} denotes the correlation of y_s and y_t. Thus $\rho = 0$ corresponds to $\rho_{13} = \rho_{12}\rho_{23}$. More generally, $\rho < 1$ is an assumption that y_3 is more correlated with y_2 than with y_1.

[12] These zero incomes can be interpreted as a normalized income obtained by the firm when a new manager is brought in. In this interpretation, the sequence of incomes y_t reflects the current manager's ability to run the firm.

[13] Arbitrarily small mistakes in auditing the first-period savings when the manager is fired at the end of period 1 are needed to prevent the first-best from being reached and for making our fixed-wage contract optimal.

only decision comes at the end of period 2. We begin with the simplest case, which is $\rho = 0$.

Define y_2^* by $R_3(y_2^*) = 0$. If the firm observed y_2 directly, it would fire the manager at the end of period 2 if and only if $y_2 < y_2^*$. Instead, the firm observes $z_2 = y_2 + g(y_1 - r_1)$ and bases its firing decision on this observation and the report r_1. The firm optimally uses a cutoff rule: For a given report r_1, it fires the manager if $z_2 < z_2^*(r_1, v)$ and keeps her if $z_2 > z_2^*(r_1, v)$. The optimal cutoff is given by

$$
\max_{z_2^*} \left\{ v \int_{z_2^* - g(\bar{y}_1 - r_1)}^{\infty} R_3(y_2) \bar{f}(y_2)\, dy_2 \right.
$$

$$
\left. + (1 - v) \int_{z_2^* - g(\underline{y}_1 - r_1)}^{\infty} R_3(y_2) \underline{f}(y_2)\, dy_2 \right\}. \tag{1}
$$

We assume that the maximand in program (1) is quasi-concave.[14]

LEMMA 1. *Cross-subsidization.*—Suppose that $\rho = 0$. Let v denote the firm's posterior belief that $y_1 = \bar{y}_1$. (i) The cutoff $z_2^*(r_1, v)$ is increasing in v. (ii) The cutoff second-period incomes for types $\bar{y}_1$ and $\underline{y}_1$, namely

$$
\bar{y}_2^*(r_1, v) = z_2^*(r_1, v) - g(\bar{y}_1 - r_1)
$$

and

$$
\underline{y}_2^*(r_1, v) = z_2^*(r_1, v) - g(\underline{y}_1 - r_1),
$$

satisfy $\bar{y}_2^* \leq y_2^* \leq \underline{y}_2^*$, with $\bar{y}_2^* = y_2^*$ if and only if $v = 1$ and $\underline{y}_2 = y_2^*$ if and only if $v = 0$.

Part i shows that for a fixed report r_1 and posterior beliefs v, the firm fires the manager whenever z_2 falls below some cutoff. It follows that the firm's equilibrium strategy—which is a function of r_1 alone—can be represented by a cutoff rule $\hat{z}_2(r_1) \equiv z_2^*(r_1, v(r_1))$.[15] That is, for each r_1 and the associated posterior beliefs $v(r_1)$, the firm fires the manager if and only if $z_2 < \hat{z}_2(r_1)$.

When the probability of high savings (i.e., of type $\bar{y}_1$) is high, the firm is more pessimistic about current operating income for a given measured income z_2 and is therefore tougher (part i). Type $\underline{y}_1$ cross-subsidizes type $\bar{y}_1$ to the extent that the firm's lack of information leads to more second-period firing of type $\underline{y}_1$ and less of type $\bar{y}_1$ than in the absence of earnings management.

Proof of lemma 1. Let $\bar{y}_2^* \equiv z_2^* - g(\bar{y}_1 - r_1)$ and $\underline{y}_2^* \equiv z_2^* - g(\underline{y}_1 - r_1)$. Then the first-order condition for program (1) is

$$
v R_3(\bar{y}_2^*) \bar{f}(\bar{y}_2^*) + (1 - v) R_3(\underline{y}_2^*) \underline{f}(\underline{y}_2^*) = 0. \tag{2}
$$

---

[14] For instance, if $\underline{f} = \bar{f} = f$ and if f'/f is nondecreasing, this maximand is quasi-concave.

[15] Note that we have not claimed that $\hat{z}_2$ is a monotonic function.

Because $\bar{y}_2^* < \underline{y}_2^*$ and R_3 is increasing, $\bar{y}_2^* \leq y_2^* \leq \underline{y}_2^*$ and $R_3(\bar{y}_2^*) \leq 0 \leq R_3(\underline{y}_2^*)$ with strict inequalities if $0 < \nu < 1$.

From our assumption that the objective function in (1) is quasi-concave, the differentiation of (2) yields

$$\text{sign}\left(\frac{\partial z_2^*}{\partial \nu}\right) = \text{sign}[-R_3(\bar{y}_2^*)\bar{f}(\bar{y}_2^*) + R_3(\underline{y}_2^*)\underline{f}(\underline{y}_2^*)] > 0.$$

Q.E.D.

PROPOSITION 1. Assume that it is not optimal to fire the manager before the end of period 2 and that $\rho = 0$. (i) The first-period report is uninformative. The manager reports a fixed r_1 independently of the realization of first-period income. (ii) Index the size of the third-period expected income by $k > 0$ (i.e., third-period income is $kR_3(y_2)$). There exists $k^* > 0$ such that $0 < k < k^*$ implies $\underline{y}_1 < r_1 < \bar{y}_1$ and $k^* < k$ implies $r_1 < \underline{y}_1$.

The first part of this proposition says that the equilibrium is pooling. This result is hardly surprising given the assumption that the manager is never fired in period 1: In this case, regardless of first-period income, the manager prefers to make as low a report as possible in order to have the most hidden savings to bring forward to period 2.

Part ii says that if the third period is sufficiently important, the firm gives the manager a "loose target" in period 1, in the sense that the report is lower than the lowest possible income level. To see why, note that the firm's choice of the optimal first-period report balances two effects, the "costly earning management effect" and the "information effect." Since hidden savings are inefficient, departures of the report from true income are costly. To minimize the cost of earnings management, the report should lie between $\underline{y}_1$ and $\bar{y}_1$. On the other hand, the report also affects the accuracy of the firing decision at the end of period 2. Low reports reduce the difference between the hidden savings of the two types (which equals $g(\bar{y}_1 - r_1) - g(\underline{y}_1 - r_1)$), since the marginal return to hidden savings is decreasing. Low reports or loose targets thus increase the informational content of the measured second-period income z_2.

Proof of proposition 1. To prove part i, we claim first that there cannot exist a report $\bar{r}_1$ chosen by type $\bar{y}_1$ only. Otherwise, there would be some other report $\underline{r}_1$ chosen with positive probability by type $\underline{y}_1$, so that, from lemma 1, $\bar{y}_2^*(\underline{r}_1, \nu(\underline{r}_1)) < \bar{y}_2^*(\bar{r}_1, 1) = y_2^*$. Type $\bar{y}_1$ would therefore be strictly better off reporting $\underline{r}_1$.

Similarly, there cannot exist a report $\underline{r}_1$ chosen by type $\underline{y}_1$ only: Since no report is chosen only by type $\bar{y}_1$, there would have to be some other report $\bar{r}_1$ that is chosen with positive probability by both

types. Lemma 1 implies that $y_2^*(\underline{r}_1, 0) = \underline{y}_2^* < y_2^*(\bar{r}_1, v(\bar{r}_1))$. Therefore, type $\underline{y}_1$ strictly prefers report $\underline{r}_1$ to report $\bar{r}_1$, a contradiction.

The discussion above shows that every report that is chosen with positive probability is chosen with positive probability by each type. Suppose finally that there were two or more distinct reports r_1 and r_1' that both have positive probability in equilibrium, giving rise to posterior beliefs v and v', respectively. Optimal reporting by the manager implies that

$$z_2^*(r_1, v) - g(\bar{y}_1 - r_1) = z_2^*(r_1', v') - g(\bar{y}_1 - r_1') \tag{3}$$

and

$$z_2^*(r_1, v) - g(\underline{y}_1 - r_1) = z_2^*(r_1', v') - g(\underline{y}_1 - r_1'). \tag{4}$$

Subtracting (4) from (3) yields

$$\int_{r_1}^{r_1'} \int_{\underline{y}_1}^{\bar{y}_1} g''(y_1 - x)\, dy_1\, dx = 0,$$

which, together with $g'' < 0$, yields $r_1 = r_1'$. This establishes part i of the proposition: There is only one equilibrium report.

To prove part ii, we use our assumption that the firm chooses the set of allowable first-period reports. If we index the importance of the third period by k, the pooling report r_1 is chosen to maximize

$$\max_{r_1} \left\{ v_0 \left[r_1 + g(\bar{y}_1 - r_1) + \int_{z_2^*(r_1, v_0) - g(\bar{y}_1 - r_1)}^{\infty} kR_3(y_2)\bar{f}(y_2)\, dy_2 \right] \right.$$
$$\left. + (1 - v_0) \left[r_1 + g(\underline{y}_1 - r_1) + \int_{z_2^*(r_1, v_0) - g(\underline{y}_1 - r_1)}^{\infty} kR_3(y_2)\underline{f}(y_2)\, dy_2 \right] \right\}. \tag{5}$$

Using (1), we can write the first-order condition as

$$1 - A = kD, \tag{6}$$

where

$$A \equiv v_0 g'(\bar{y}_1 - r_1) + (1 - v_0)g'(\underline{y}_1 - r_1)$$

and

$$D \equiv v_0 g'(\bar{y}_1 - r_1)R_3(\bar{y}_2^*)\bar{f}(\bar{y}_2^*) + (1 - v_0)g'(\underline{y}_1 - r_1)R_3(\underline{y}_2^*)\underline{f}(\underline{y}_2^*)$$
$$= (1 - v_0)R_3(\underline{y}_2^*)\underline{f}(\underline{y}_2^*)[g'(\underline{y}_1 - r_1) - g'(\bar{y}_1 - r_1)],$$

using (2). The term $1 - A$ is the expected marginal benefit of the report and corresponds to the costly earnings management effect. When k is near zero, the optimal pooling report lies between the

true incomes y_1 and $\bar{y}_1$ in order to minimize the cost of earnings management. The term D is positive since $R_3(y_2^*) > 0$ (from lemma 1), and g is concave and calls for low reports. Therefore, $r_1 < \underline{y}_1$ if and only if k exceeds some threshold. Q.E.D.

Note that our theory is consistent with the fact that fourth-quarter reports are more informative than those in earlier quarters. Indeed, in the polar case described in proposition 1, no information is revealed in period 1, whereas some does surface in period 2.

B. Higher-Order Process ($\rho > 0$)

We briefly investigate the case in which the expected third-period income $R_3(\rho y_1 + y_2)$ depends on both incomes, with $\rho < 1$. Let $Y \equiv \rho y_1 + y_2$, let Y^* be the "full information cutoff" defined by $R_3(Y^*) \equiv 0$, and let $\rho^* = g(\Delta y_1)/\Delta y_1$; note that $\rho^* \in (0, 1)$.

PROPOSITION 2. For $\rho \geq \rho^*$, the optimal contract induces truthful reporting, so that earnings management does not occur.

Proof. Since truthful reporting minimizes the cost of hidden savings and also provides the most information for the firing decision, it is optimal whenever it can be implemented. Suppose that the firm allows only the reports $\underline{y}_1$ and $\bar{y}_1$. Checking that the manager reports truthfully in period 1 amounts to checking the incentive constraints for types $\bar{y}_1$ and $\underline{y}_1$:

$$Y^* - \rho\bar{y}_1 \leq Y^* - \rho\underline{y}_1 - [g(\Delta y_1) - g(0)]$$

and

$$Y^* - \rho\underline{y}_1 \leq Y^* - \rho\bar{y}_1 - [g(-\Delta y_1) - g(0)],$$

where $g(0) = 0$. The latter constraint is always satisfied, and the former holds for $\rho \geq \rho^*$. Q.E.D.

However, truthful reporting cannot be induced with a continuum of first-period income levels, as shown in the following proposition.

PROPOSITION 3. Suppose that the distribution of first-period incomes is absolutely continuous with respect to the Lebesgue measure either on $(-\infty, \infty)$ or on an interval $[a, b]$. Then for any $\rho < 1$, there is no subinterval S of types such that $r_1(y_1) = y_1$ for all $y_1 \in S$.[16]

Remark.—Proposition 3 does not imply that there are no separating equilibria. Such equilibria do exist, but they necessarily involve earnings management, and the cost (for the principal) of inducing separation becomes infinite as $\rho \to 0$. If the support of y_1 is $(-\infty, \infty)$, the

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[16] We believe that this result can be strengthened to show that there must be probability zero of a truthful report.

separating equilibrium is given by $g'(y_1 - r_1(y_1)) = \rho$ and involves underreporting by all types.

Proof. Suppose that there is some subinterval S in which $r_1(y_1) = y_1$ for all $y_1 \in S$. Then local incentive compatibility requires that $\hat{z}_2' = -1$ almost everywhere on S: If type y_1 reports $y_1 - \epsilon$ instead of y_1, her second-period cutoff income changes by

$$\hat{z}_2(y_1 - \epsilon) - \hat{z}_2(y_1) + g(\epsilon) - g(0)$$

$$\cong \epsilon[-\hat{z}_2'(y_1) + g'(0)] = \epsilon[-\hat{z}_2'(y_1) + 1].$$

Since $g'' < 0$, all types (if any) greater than $\sup(S)$ strictly prefer reporting $\sup(S)$ to any lower report, and all types (if any) less than $\inf(S)$ strictly prefer reporting $\inf(S)$ to higher reports. Thus the posterior beliefs following any report y_1 in the interior of S are a point mass on y_1, and hence for such reports $\hat{z}_2(r_1) = Y^* - \rho y_1$. But then $\hat{z}_2' = -\rho \neq 1$, a contradiction. Q.E.D.

Let us return (for the rest of the paper) to the two-type case. It can be shown that the results we obtained for $\rho = 0$ hold approximately for ρ close to zero. One difference from the previous analysis is that it is possible to design contracts that permit the firm to learn y_1 from the report. However, the cost to the firm of inducing revealing reports tends to infinity as ρ tends to ρ, so that the optimal contracts are still pooling. To see this, let the firm allow reports $\underline{r}_1$ ($< \underline{y}_1$) and $\bar{y}_1$. In order for the two types to separate with positive probability, it must be that $\bar{y}_1$ does not want to report $\underline{r}_1$, which requires that

$$Y^* - \rho \bar{y}_1 \leq Y^* - \rho \underline{y}_1 - [g(\bar{y}_1 - \underline{r}_1) - g(\underline{y}_1 - \underline{r}_1)]$$

or

$$g(\bar{y}_1 - \underline{r}_1) - g(\underline{y}_1 - \underline{r}_1) \leq \rho \Delta y_1.$$

For this condition to be satisfied in the limit as ρ tends to zero, $\underline{r}_1$ must tend to $-\infty$. As ρ decreases, this extreme underreporting becomes too costly for the firm, and the optimum approximates the full pooling allocation described in proposition 1.

IV. Ongoing Decision Making

We now drop the assumption that the second-period expected profit is large and allow the firm to fire the manager in period 1 as well as in period 2. There is now a cost for the manager of low reports, since they may lead to early termination of employment. To study this, we consider two first-period income levels and $\rho = 0$, as in Section IIIA.

To make things interesting, we assume that under full information, the manager is fired in period 1 if and only if income is $\underline{y}_1$:

$$R_2(\underline{y}_1) + \int_{y_2^*}^{\infty} R_3(y_2)\underline{f}(y_2)\,dy_2 < 0 < R_2(\bar{y}_1) + \int_{y_2^*}^{\infty} R_3(y_2)\bar{f}(y_2)\,dy_2. \quad (7)$$

Let

$$\tilde{\Delta}(\nu) = \nu\left[R_2(\bar{y}_1) + \int_{y_2^*}^{\infty} R(y_3)\bar{f}(y_2)\,dy_2\right]$$

$$+ (1 - \nu)\left[R_2(\underline{y}_1) + \int_{y_2^*}^{\infty} R(y_3)\underline{f}(y_2)\,dy_2\right]. \quad (8)$$

This expression measures the firm's gain from not firing the manager at the end of period 1 in a hypothetical situation in which the firm assigns probability ν to $y_1 = \bar{y}_1$ *and* expects to learn y_2 before making its second-period decision. Note that the hidden savings $\nu g(\bar{y}_1 - r_1) + (1 - \nu)g(\underline{y}_1 - r_1)$ have no influence on the firing decision since they are received by the firm whether the manager is retained or fired. Note also that for a fixed report r_1 and posterior beliefs ν, the expected payoff to continuing when only z_2 will be observed, and not y_2, cannot be higher than the payoff $\tilde{\Delta}(\nu)$. Next, define $\tilde{\nu}$ by $\tilde{\Delta}(\tilde{\nu}) = 0$; this is the first-period beliefs that make the firm indifferent in the hypothetical situation corresponding to $\tilde{\Delta}$.

We do not offer a complete analysis of equilibrium for ongoing decision making. We content ourselves with showing that the first-period report can be informative, but that there is an upper bound on the amount of information it reveals.

PROPOSITION 4. Assume that $\rho = 0$. Either (*a*) the firm pulls the plug at the end of period 1 following every report (this occurs in particular when $\nu_0 < \tilde{\nu}$) or (*b*) the firm retains the manager with positive probability following every report that has positive probability in equilibrium. In this case all equilibrium reports $\hat{r}_1$ satisfy $\nu(\hat{r}_1) \geq \tilde{\nu}$. There is at most one equilibrium report that gives the manager probability one of being retained at the end of the first period.

Proof. To prove part *a*, all types of manager strictly prefer a report that gives a positive probability of being retained to a report that is certain to get them fired at the end of the first period. Thus, if there is an equilibrium report that leads the firm to fire the manager with probability one at the end of the first period, then all allowed reports must have this same consequence.

Because the expectation of the posterior beliefs equals the prior, if the prior $\nu_0 < \tilde{\nu}$, there must exist an equilibrium report $\hat{r}_1$ such that $\nu(\hat{r}_1) < \tilde{\nu}$. Since $\tilde{\Delta}$ is strictly increasing, $\tilde{\Delta}(\nu(\hat{r}_1)) < 0$, and since the

payoff to continuing is no greater than $\tilde{\Delta}$, the owner strictly prefers to fire the manager. Hence by the previous argument the manager must be fired following every report.

To prove part b, the same reasoning as in part a shows that if there is an equilibrium report such that the manager is retained at the end of the first period with positive probability, then all equilibrium reports must give a positive probability of being retained at the end of the first period. Since the firm lacks commitment power, this implies that the expected continuation value is positive for all reports $\hat{r}_1$ that have positive probability in equilibrium, and since this value is bounded above by $\Delta(v(\hat{r}_1))$ and Δ is strictly increasing, $v(\hat{r}_1) \geq \bar{v}$.

Finally, the case of two reports leading to the manager being retained with probability one is ruled out by the argument of proposition 1, which shows that pooling in reporting is the only outcome when there is no firing in period 1. Q.E.D.

V. Dividend Smoothing

As we discussed earlier, in the absence of investment opportunities that are specific to the manager, one may assume that all the reported income is paid to the owner as a transfer or dividend. To allow a distinction between reports and dividends, we now consider a more general model, in which the manager makes investments as well as reports and so is allowed to retain some of the earnings (in the case of profit centers, this corresponds to a capital budget). The transfer or dividend from the manager to the firm is then equal to the difference between the report and retained earnings. Not surprisingly, the career concerns that give rise to income smoothing also create dividend smoothing.

A.   An Example with Uninformative Dividend Distribution

Consider our basic model as studied in Section IIIA. Suppose that the manager's measured second-period income is $y_2 + g(y_1 - r_1) + h(i_1)$, where y_2 is the base income, $g(y_1 - r_1)$ is the return to hidden savings, $i_1 = r_1 - d_1$ is retained earnings or authorized investment for report r_1 and dividend d_1, and $h(i_1)$ is the return to retained earnings. We assume $h' > 0$, $h'' < 0$, $h(0) = 0$, $h'(0) = \infty$, and $h'(\infty) = 0$. This case is fairly trivial because the return to retained earnings enters additively,[17] and hence the level of retained earnings has no

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[17] This occurs, for instance, when the verifiable investment is allocated to a new and independent project and the hidden savings are used for an existing one.

effect on the information received by the owner. Hence it is optimal for the owner to set $i_1 = i^*$ for all types, where $h'(i^*) = 1$. Up to the constant $h(i^*)$, the analysis is the same as in Section IIIA, and therefore the first-period report is uninformative about the real income. So is the dividend $d_1 = r_1 - i^*$. Note that the same reasoning holds when $\rho > 0$. We know from Section IIIB that the report can then be informative. In this case, the dividend moves one for one with the report.

We thus conclude that when hidden investment and verifiable investment are neither complements nor substitutes, the income report may or may not be informative and the dividend contains no residual information once income has been reported.

B. *The Residual Informational Value of Dividends*

The previous simple example explains the distribution of dividends by emphasizing the relevance of income disclosure. It also yields dividend smoothing. It does not explain why dividend announcements reveal information not contained in income reports. We now investigate whether the dividend can be used as a screening variable when retained earnings enter in a nonadditive form in the production function.

We assume that hidden and verifiable savings combine additively in the investment function. The manager's measured second-period income is $y_2 + h(g(y_1 - r_1) + i_1)$, where h is increasing and concave.

To start with a simple case, suppose that $g(s_1) = s_1$; that is, income smoothing is costless. Then

$$h(g(y_1 - r_1) + i_1) = h(y_1 - r_1 + i_1) = h(y_1 - d_1).$$

The levels of the report and of the retained earnings are indeterminate, but their difference, the dividend, is not. Indeed, the model is formally identical to the model of income smoothing studied in this paper once g is replaced by h and r_1 is replaced by d_1. Income can be screened using the dividend alone, and the report itself is redundant, since the dividend level is a sufficient statistic for the level of income. In such a world, the stock price reacts to dividend announcements but not to income reports. We thus obtain a polar case opposite to that discussed in subsection A.

Is the analysis of these polar cases suggestive of a more general case in which the report and then the dividend both have informational value? Let us come back to the case in which income smoothing is costly (g is strictly concave). Suppose as in Section IIIA that $\rho = 0$ and that there is no intervention in period 1. From the steps of lemma 1, it is easy to see that the second-period cutoffs $\underline{y_2^*}$ and $\bar{y_2^*}$ for types

y_1 and $\bar{y}_1$ satisfy $\bar{y}_2^* \leq y_2^* \leq \underline{y}_2^*$, with $\bar{y}_2^* = y_2^*$ if and only if the income report–dividend distribution pair (r_1, d_1) reveals that $y_1 = \bar{y}_1$, and $\underline{y}_2^* = y_2^*$ if and only if it reveals that $y_1 = \underline{y}_1$. A straightforward consequence is that no equilibrium report–dividend pair is fully revealing. So all such pairs must be optimal for both types. Consider two equilibrium report-dividend pairs, (r_1, d_1) and $(\underline{r}_1, \underline{d}_1)$ (we do not exclude the possibility that $r_1 = \underline{r}_1$ or $d_1 = \underline{d}_1$ at this stage). Let $i_1 = r_1 - d_1$ and $\underline{i}_1 \equiv \underline{r}_1 - \underline{d}_1$. The requirement that both types be willing to choose both pairs implies

$$\int_{\underline{y}_1}^{\bar{y}_1} [h'(g(y_1 - r_1) + i_1)g'(y_1 - r_1)$$
$$- h'(g(y_1 - \underline{r}_1) + \underline{i}_1)g'(y_1 - \underline{r}_1)]dy_1 = 0. \tag{9}$$

Now suppose that $r_1 > \underline{r}_1$. Then, for all y_1, $g'(y_1 - r_1) > g'(y_1 - \underline{r}_1)$. For (9) to hold, there must exist y_1 such that

$$h'(g(y_1 - r_1) + i_1) < h'(g(y_1 - \underline{r}_1) + \underline{i}_1).$$

But $g(y_1 - r_1) < g(y_1 - \underline{r}_1)$ and h' is decreasing. So $i_1 > \underline{i}_1$: Higher reports must be associated with higher authorized investments.

The same reasoning also shows that $r_1 = \underline{r}_1$ if and only if $i_1 = \underline{i}_1$. Thus, even though the report-dividend pair may be informative, the dividend contains no information not contained in the income report. To reconcile this with the observation that dividends seem to contain residual information, we might suppose that the firm has private information about the productivity of investment, that is, that h' depends on some private information parameter θ. In this case, the report and the dividend are both informative.

Note that, even though $\rho = 0$, incentive compatibility permits more than one report-dividend pair, and so some information about income can be obtained in period 1. The reason for the comonotonicity of report and authorized investment is that the firm prefers a low report when income is low, but because it has low hidden savings and the two investments are substitutes, it then has a high marginal productivity of (authorized) investment. The comonotonicity is needed for different report-dividend pairs to be optimal for both types. Note further that it may indeed be optimal for the owner to have several equilibrium report-dividend pairs. Suppose that the third-period expected income is, as in proposition 1, indexed by a multiplicative factor k. When the value of information is large (k tends to infinity), it is important to learn from the report and dividend. The distortions associated with earning management and nonoptimal investment become negligible relative to the gain in information.

VI. Extensions

Although we believe that incumbency rents are a key factor leading to income and dividend smoothing, the simple model of this paper provides only a small step toward a complete understanding of these phenomena. A better analysis might consider some of the following extensions.

Monetary incentives.—As noted earlier, linear bonuses would reduce, although not eliminate, income smoothing in our model. This contrasts with Healy's (1985) explanation of income smoothing as the result of monetary incentive schemes. His point is that bonuses are generally not linear in performance. In particular, bonuses are often capped, which gives the manager an incentive to save when her income exceeds the level required for the maximum bonus.

Healy's observation raises the question of why firms use incentive schemes that reinforce rather than reduce the incentive to smooth income. Incumbency rents of the kind considered in this paper offer one potential explanation: If the manager's bonus is linear in reported income, then, when current income is low and the future looks bleak, the manager's expected tenure is short, and the manager has an incentive to exaggerate income by running down assets and deferring maintenance in order to claim a high bonus. This incentive to "take the money and run" can be reduced by capping the bonus, but, as Healy noted, such caps may induce the manager to underreport when income is very high. This suggests that models combining incumbency rents with monetary incentives may provide further insights into income smoothing.

Corporate control.—Section V introduces the distinction between reports and dividends. More generally, the firm sends a multidimensional signal that includes not only the report and the dividend on common stock, but also payment of interest and principal to creditors, the dividend on preferred stock, and so forth.[18] The existence of payments to multiple claimholders raises the interesting issue of the relationship between earnings management and corporate control. Managers and shareholders fear debtholders' control;[19] the current and future threats of such control depend not only on repayment of short-term debt but also on dividend distribution and earnings management. Again, we would expect a fruitful interaction between the theory of earnings management developed in this paper and corporate governance considerations.

[18] In our model, there is no separate role for debt and dividend payments. In practice, the dividend policy seems to matter most when debt is high and the firm is thus cash constrained.

[19] See Dewatripont and Tirole (in press) for theoretical foundations for such preferences and for a few thoughts about earnings management for control purposes.

Intertemporal version of income smoothing.—Our theory explains why income reports convey limited information and why managers have an incentive to inflate income in bad times and to underreport in good times. It suggests but, as is, does not explain why income reports are serially correlated. We believe that an infinite-horizon, say, version of our model with a stationary Markov process for earnings would deliver this intertemporal version of income smoothing, but we have not developed it.

Random and endogenous auditing rules.—Our assumption that routine audits alternate with more thorough ones in a deterministic manner is too strong. In practice, the occurrence of a thorough audit may be effectively random, and moreover the audit probability may depend on the income report. We do not believe that exogenously random audits would lead to a qualitative difference in our results, but the issue of endogenous audits raises a number of fascinating issues, such as whether it is more valuable to audit high reports or low ones.

Smoothing in hierarchies.—Our model analyzes smoothing in a simple principal-agent framework. It would be interesting to consider smoothing in a three-level hierarchy, with a number of divisions all reporting to corporate headquarters, which in turn makes reports to the board of directors or to financial markets and market analysts. Suppose that both the heads of the divisions and the corporate headquarters receive rents from continuing in their current positions, so that they all have an incentive to smooth their reports. In this case the desire of corporate headquarters to smooth the firm's overall reported income might create an additional force favoring the smoothing of reports at the divisional level. For example, when unit 1 is doing poorly, corporate headquarters might encourage unit 2 to increase its reported income. Casual empiricism suggests that such "push-down" smoothing is a common phenomenon in at least some corporations.

While the possibility of push-down smoothing suggests that multiunit hierarchies might exhibit more income smoothing than our one-unit model would suggest, the fact that corporate headquarters can average over the profit shocks to different units may lead to a countervailing force that reduces the incentive to engage in income-smoothing activities. Hence, determining the overall implications of smoothing in hierarchies will require a careful analysis of a fully specified model. We expect that the key consideration here will be the timing of the unit's reports to headquarters, the extent to which these reports are observed by the top-level principal, and whether the top level or the intermediate one is responsible for writing the terms of contracts with the heads of the divisional units, and deciding whether to renew them.

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