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Illicit accounting practice and corporate earnings irregularities

Abstract

This paper develops a static model of earnings manipulation as illicit activity conducted by top executives of a firm, such as a firm's chief financial officer or chief executive officer. In the model, the utility-maximizing executive decides upon an allocation of time, a costly resource, to the commission of licit and illicit accounting activity based on the expected benefits and costs of these actions. Illicit accounting practices may benefit the firm's profitability and possibly the executive's compensation but also incur risks of detection and subsequent sanctions, including jail time; the expected cost of the illicit activity potentially acts as a deterrence to such practices. We investigate comparative-static relationships that formalize how the individual's illegal activity might increase or decrease given variation in key exogenous factors, some of which may reflect official policy or procedure. Our study provides a more concrete conceptual foundation for empirical analysis than typically observed in the earnings-management literature.

Keywords: earnings management, executive compensation.
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Introduction

In this paper we develop a static model of earnings manipulation that draws upon the economic model of crime, advanced in seminal work by Becker (1968) and Ehrlich (1973) and extended by Block and Heineke (1975), Witte (1980), Schmidt and Witte (1984). In its classic form, the model illustrates how individuals decide whether to allocate time to the commission of illegal activity based on the expected benefits and costs of legal and illegal activities. Each activity potentially generates income and, hence, utility. In considering illegal activity, the hypothetical agent faces a risk of detection and sanctioning that potentially can act as a deterrence. Under these circumstances, the hypothetical agent selects the level of illegality that maximizes expected utility. Having framed the essential economic problem facing this agent, the modeller can then investigate comparative-static relationships that formalize how the individual's illegal activity might increase or decrease given variation in key exogenous factors, some of which may reflect official policy or procedure.

In the variant of the model developed here, the generalized economic agent in question becomes a hypothetical corporate executive responsible for disseminating the firm's financial information. In practice, a firm's chief executive officer (CEO) or chief financial officer (CFO) would typically perform this role. Material earnings manipulation constitutes an individual violation of generally accepted rules – specifically, generally accepted accounting principles (GAAP) – such that potential violators, like criminals in society, face a risk of detection, through internal and external monitoring and auditing, and the possibility of incurring a sanction, in the form of an income loss. Certain more severe types of earnings manipulation not only violate GAAP but also contravene formal securities law and, as such, resemble societal crimes that call for fines or even imprisonment. In corporate settings, as Teoh, Welch, and Wang (1998) discuss, GAAP rules act as mechanisms to control opportunistic accounting behavior by managers of firms. Executives in these settings additionally face the possibility of sustaining income losses due to negative returns from financial markets if any earnings manipulation becomes publicly exposed.

Because executives, and by extension their firms, can benefit from earnings manipulation, executives may have an individual incentive to engage in such activity, which requires allocations of time away from GAAP-compliant accounting activity[1]. In this way, corporate earnings manipulators resemble societal criminals who allocate time to illegality. Our analyses of the executive's utility-maximizing earnings manipulation behavior and subsequent derivation of comparative statics reveal mechanisms by which earnings manipulation may occur and establish a more concrete conceptual foundation for empirical analysis than typically observed in the earnings-management literature[2].

1. Earnings manipulation behavior

1.1. Definitions and assumptions. As many analysts have recognized, both licit (i.e., GAAP-compliant) and illicit accounting activities reflect microeconomic decisions made by executives in charge of disseminating financial information. Thus,

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[1] Dechow, Sloan, and Sweeney (1996) illustrate how the sequence of events of a typical earnings manipulation case (as pursued by the Securities and Exchange Commission) includes a "manipulation period", indicative of the necessary use of time in this respect.

[2] Nelson, Elliott, and Tarpley (2002) also apply concepts from law and economics to study earnings management, drawing on the notion that the imprecision of certain rules and laws, such as those governing accounting practice, can lead to undesirable avoidance behaviors by those facing such regulations.

to analyze these activities, we must characterize the hypothetical executive's objective function. Much in the spirit of Holthausen, Larcker, and Sloan (1995), we suppose the executive receives compensation from three sources: a fixed salary linked solely to licit accounting practice, and variable portions linked to the firm's performance (e.g., its profitability) and to the value of the firm's stock in financial markets. The variable portions collectively represent incentive-based executive compensation, realistic in light of classic principal-agent problems that exist in the governance of corporations. Consider these components in detail.

We express the fixed-salary component as $M = M(t_L; \gamma)$, specifying it as a direct function of licit time allocation, t_L, i.e., $\partial M/\partial t_L > 0$. The parameter $\gamma > 0$ captures exogenous factors that impact the executive's salary directly or that impact the marginal relationship between licit accounting activity and M, such that $\partial M/\partial \gamma > 0$ and $\partial^2 M/\partial t_L \partial \gamma > 0$. The marginal effect $\partial M/\partial t_L$ essentially captures the executive's marginal wage rate, while γ captures any factor that enhances the degree to which licit accounting activity creates income for the executive, such as an executive's experience or expertise in the practice of licit accounting activity. Similarly, as DeFond and Jiambalvo (1991) and Agrawal and Chadha (2005) discuss, the firm itself or its primary internal auditor may have a demonstrable history of engaging in GAAP-compliant practices, suggesting a greater internal reward to such practices by the executive in question. As Palmrose and Scholz (2004) discuss, GAAP-compliant practice potentially can serve as a substitute for illicit practice. In general, the greater the value of these various forms of human capital is, the more efficiently the executive in question can earn income through GAAP-compliant accounting practice, potentially creating an internal deterrence to GAAP-violating practices.

Previous earnings-management research indicates a direct relationship between earnings manipulation and the compensation of top executives through incentives tied to the performance, or earnings, of the firm[1]. For present analytical purposes, we write the executive's firm-based variable compensation as $N = N(R\text{-}G; \eta)$. In this function, R represents the firm's *reported earnings* and G represents the firm's *true earnings*; we characterize $E = R\text{-}G$ as *manipulated earnings*, the degree of material excess of reported over true earnings. The condition $R = G$ implies no material discrepancy between reported and true earnings. The condition $R \neq G$ implies the presence of some earnings manipulation, either overreporting of true earnings ($R > G$) or underreporting of true earnings ($R < G$). We model reported earnings as a positive function of illicit (GAAP-violating) accounting activity, t_I, and we model the firm's true earnings as a positive function of the agent's productive activities and those of other managers and workers, so that $R = R(t_I)$ and $G = G(t_I + t_L + t_x, \tau_j) = G(\tau_i, \tau_j)$. In the true-earnings function, t_x represents the executive's productive *non*-accounting time allocation, so that $t_I + t_L + t_x = \tau_i$ represents the total amount of productive time the *i*th executive may allocate; we assume that $\partial G/\partial \tau_i > 0$. The input τ_j represents the sum of every other worker's individual time allocations. In the N function, the parameter $\eta > 0$ captures exogenous variation in the executive's firm-based variable compensation such that $\partial^2 N/\partial K \partial \eta > 0$. In practice, η might capture the executive's overall bargaining or intra-firm power, whereby a larger η implies a greater extent to which reported earnings create income for the executive. We further stipulate that the executive receives θ_N percentage of firm-based variable compensation. If $\theta_N = 0$, then the executive receives no share of the firm's profitability, but more realistically $\theta_N > 0$ in practice.

The executive also potentially earns income related to the performance of the firm's stock in financial markets. The presence of this form of incentive-based compensation can increase the incentive for executives to manipulate earnings, but the possibility of adverse financial repercussions can act as a deterrence[2]. We express the firm's stock performance as K, often measured empirically as the firm's stock price. In light of empirical findings in the earnings-management literature, we assume that financial markets reward profitability and growth when accurately reported but penalize or ignore downturns and inaccuracies in reporting[3]. Thus, we write financial-market performance functionally as $K = K(G\text{-}R; \delta)$ and stipulate that $\partial K/\partial(G\text{-}R) > 0$ if $G = R$ and that $\partial K/\partial(G\text{-}R) \leq 0$ if $G \neq R$. In this function, $\delta > 0$ represents an exogenous parameter that captures the degree to which variation in $R\text{-}G$ impacts the firm's financial market performance, such that $\partial^2 K/\partial(G\text{-}R)\partial\delta > 0$ if $G = R$ and $\partial^2 K/\partial(G\text{-}R)\partial\delta < 0$ if $G \neq R$. In essence, δ captures the sensitivity of financial-market actors to discrepancies between true and reported corporate earnings. We further stipulate that the executive receives θ_K percentage of K as part of his total compensation; thus, $\theta_K > 0$

[1] See, for example, DeFond and Jiambalvo (1991), Jones (1991), and Holthausen, Larcker, and Sloan (1995).

[2] See Nelson, Elliott, and Tarpley (2002), Burns and Kedia (2006), and Bergstresser and Philippon (2006) for recent discussions and empirical evidence.

[3] For example, Palmrose, Richardson, and Scholz (2004) show empirical evidence of a 9% drop in stock price after a restatement announcement for a sample of 400 firms. Teoh, Welch, and Wong (1998), Bartov, Givoly, and Hayn (2002), and Agrawal and Chadha (2005) present additional empirical evidence of such repercussions.

implies that the executive receives stock options as part of incentive-based compensation.

Executives who manipulate earnings face an expected cost related to the likelihood of detection and any sanction potentially incurred thereafter. Define the auditor as any person in position to observe and report any accounting irregularity; suppose auditors will detect any illicit accounting activity by the executive with probability p[1]. We assume that this detection probability varies directly with the magnitude of the discrepancy between R and G, so that functionally $p = p[R(t_I) - G(t_I + t_L + t_x; \tau_j); \sigma]$, where the parameter $\sigma > 0$ captures exogenous variation in this probability. Conceptually, σ may represent the expertise of auditors at detecting such irregularity. More technically, if we view p as a specific probability density function, σ may represent the variance parameter relevant to that pdf. Over repeated samplings of reported and true earnings (R and G) for a firm, wider variance in such earnings may create greater suspicion within the auditor – perhaps more so given a greater degree of auditor experience, expertise, or diligence – thus increasing the probability of detection. Thus, we assume that $\partial^2 p/\partial t_I \partial\sigma > 0$. In practice, we might observe more proficient auditing in firms that exhibit relatively greater independence in their auditing boards or that employ a Big 4 accounting firm, as examples.

If auditors detect any illicit accounting activity, the executive may incur a sanction in the form of an income loss. For example, as Palmrose and Scholz (2004) indicate, violations of the Sarbanes-Oxley Act of 2002 call for forfeiture of illicitly-gained bonuses and profits. More serious accounting violations may call for imprisonment, thus temporarily suspending the violator's ability to earn income altogether. We write the sanction generally as $S = S(t_I; \varphi)$, which specifies the sanction as a direct function of the amount of illicit accounting activity undertaken, subject to the parameter $\varphi > 0$, such that $\partial S/\partial t_I > 0$ and $\partial^2 S/\partial t_I \partial\varphi > 0$. This parameter captures any exogenous factor that makes the official sanction for illicit accounting activity more severe, such as when the Financial Accounting Standards Board or regulators within government alter GAAP or broader laws governing the public disclosure of financial information. Cross-sectional variation in φ might also reflect differences in auditing or regulatory environments across nations or across firms.

1.2. The executive's problem. Given the components of executive income defined above, if the executive engages in illicit accounting activity undetected by auditors, the executive will receive income

$$I_u = M(t_L;\gamma) + \theta_N N[R(t_I) - G(t_I + t_L + t_x, \tau_j);\eta] + \theta_K K[G(t_I + t_L + t_x, \tau_j) - R(t_I);\delta]. \quad (1)$$

If auditors detect illicit activity, the executive receives

$$I_d = M(t_L;\gamma) + \theta_N N[R(t_I) - G(t_I + t_L + t_x, \tau_j);\eta] + \theta_K K[G(t_I + t_L + t_x, \tau_j) - R(t_I);\delta] - S(t_I;\varphi). \quad (2)$$

In light of the probabilities of detection and non-detection, the executive thus seeks the levels of t_I, t_L, and t_x that maximize expected utility

$$Z = E(U) = (1 - p)U(I_u) + pU(I_d), \quad (3)$$

subject to the implicit time constraint $t_I + t_L + t_x = \tau_i$ and where $U(\cdot)$ is a quasi-concave utility function. For present purposes, we focus on the selection of illicit accounting activity t_I, an argument in p and in elements of I_u and I_d. After developing the basic utility-maximization problem for the hypothetical executive, we derive comparative statics that suggest how utility-maximizing illicit accounting activity might vary given variation in key exogenous factors.

The first-order condition for the utility-maximizing selection of t_I implies that

$$H_1 = \frac{\partial Z}{\partial t_I} = (1-p)\frac{\partial U}{\partial I_u}\frac{\partial I_u}{\partial t_I} - U(I_u)\frac{\partial p}{\partial t_I} + p\frac{\partial U}{\partial I_d}\frac{\partial I_d}{\partial t_I} + U(I_d)\frac{\partial p}{\partial t_I} = 0. \quad (4)$$

Incentive compatibility for the hypothetical executive in this problem requires that $\partial R/\partial t_I$ - $\partial G/\partial t_I$ and θ_N - θ_K have the same sign, which ensures that $\partial I_d/\partial t_I$ and $\partial I_u/\partial t_I$ are each non-negative: logically, the hypothetical executive will not engage in illicit accounting activity if doing so reduces his income[2]. Thus, if $\theta_N > \theta_K$, then $\partial R/\partial t_I > \partial G/\partial t_I$; if $\theta_N < \theta_K$, then $\partial R/\partial t_I < \partial G/\partial t_I$; and if $\theta_N = \theta_K$, then $\partial R/\partial t_I = \partial G/\partial t_I$. Each case characterizes a different manner by which a given executive receives incentive-based compensation and by which the executive manipulates earnings.

If $\theta_N > \theta_K$, then the executive receives a greater percentage of incentive compensation from firm-based performance than from financial-market performance (stock options). Incentive compatibility re-

[1] As noted by numerous authors, executives may face monitoring in this way not only by professional auditors but also by shareholders, board members, SEC investigators, and even consumers.

[2] To see this, first note that the necessary condition for utility maximization requires that $(1-p)(\partial U/\partial I_u)(\partial I_u/\partial t_I) = [U(I_u) - U(I_d)](\partial p/\partial t_I) - p(\partial U/\partial I_d)(\partial I_d/\partial t_I)$. The contrary, $\partial I_u/\partial t_I < 0$ and $\partial I_d/\partial t_I < 0$, implies that the left side of this expression is negative, requiring the right side to be negative. But since the first term on the right side is positive and the second term negative under this condition, the right side could not be negative. However, if $\partial I_u/\partial t_I \geq 0$ and $\partial I_d/\partial t_I \geq 0$, as stipulated, the utility-maximization condition can hold.

quires $\partial R/\partial t_I > \partial G/\partial t_I$ under this condition. Given that $\partial G/\partial t_I > 0$, $\partial R/\partial t_I$ must be positive; that is, $\theta_N > \theta_K$ implies that a rational executive will tend to overstate (overreport) rather than understate (underreport) the firm's true earnings. Alternatively, $\theta_N < \theta_K$ implies that $\partial R/\partial t_I - \partial G/\partial t_I < 0$, which requires only that $\partial R/\partial t_I < \partial G/\partial t_I$. Since $\partial G/\partial t_I > 0$, this could hold if $\partial R/\partial t_I$ were positive (although smaller than $\partial G/\partial t_I$), negative, or equal to zero. When stock options dominate *firm*-based incentive-compensation, a rational hypothetical executive has an opportunity to engage in more types of earnings manipulation, both overreporting *and* underreporting of true earnings. This suggests a crime-economic explanation for empirical findings by Burns and Kedia (2006) and Bergstresser and Philippon (2006) of greater earnings manipulations in the presence of stock options. From a statistical perspective, one might conceivably observe a smaller mean level of earnings management (such as measured by discretionary accruals) in a sample of firms where stock options predominate and substantial earnings manipulation exists than in a sample where stock options are less prevalent, due to the cancelling out of economically rational positive and negative accruals.

Using implicit differentiation of H_1 and application of the envelope theorem (see Silberberg, 1990), we now study comparative statics that capture variation in $t_I^* = \text{argmax}(Z)$ associated with five exogenous factors: detection probability, fixed (licit) executive compensation, variable (illicit) executive compensation, financial-market repercussions, and the sanction imposed for illicit activity.

1.3. Comparative statics. *1.3.1. The probability of detection.* Exogenous variation in the probability of detection of illicit accounting activity affects the executive's equilibrium illicit activity according to the derivative $\partial t_I^*/\partial\sigma$. Following total differentiation of H_1, one can observe that $\partial t_I^*/\partial\sigma = -Z_{I\sigma}/Z_{II}$. Because the concavity of U renders $Z_{II} < 0$, the sign of $\partial t_I^*/\partial\sigma$ will mirror the sign of $Z_{I\sigma}$. Differentiating Z_I with respect to σ yields

$$Z_{I\sigma} = \frac{\partial p}{\partial\sigma}\left[\frac{\partial U(I_d)}{\partial I_d}\frac{\partial I_d}{\partial t_I} - \frac{\partial U(I_u)}{\partial I_u}\frac{\partial I_u}{\partial t_I}\right] + \frac{\partial^2 p}{\partial t_I \partial\sigma}[U(I_d) - U(I_u)]. \quad (5)$$

One can readily establish that $Z_{I\sigma} < 0$, consistent with an exogenously greater detection probability discouraging illicit accounting activity, other things being equal. In the first term of (5), $\partial p/\partial\sigma > 0$ by assumption. Also, $\partial I_d/\partial t_I < \partial I_u/\partial t_I$, as $\partial I_d/\partial t_I$ involves the income-loss (or sanction-) effect $\partial S/\partial t_I$[1]. In addition, $\partial U/\partial I_u > \partial U/\partial I_d$ because the executive gains greater marginal utility from income when any illicit activity goes undetected than when detected. These facts render the bracketed term within the first term of (5) negative. In the second term of (5), $\partial^2 p/\partial t_I\partial\sigma > 0$ by assumption and the bracketed term is negative because $U(I_u) > U(I_d)$, i.e., the executive gains more utility if his illicit activity is undetected than if detected. Hence, $Z_{I\sigma} < 0$.

In practice, an accounting executive may face an exogenously higher probability of detection if, for example, auditors gain expertise over time in the detection of illicit accounting activity independent of their scrutiny of any specific executive. Auditors may also vary in their proficiencies across cases at a point in time.

1.3.2. Fixed compensation. Exogenous variation in the fixed component of accounting executive compensation affects illicit accounting practice according to the derivative $\partial t_I^*/\partial\gamma = -Z_{I\gamma}/Z_{II}$, the sign of which mirrors that of $Z_{I\gamma}$. Observe that

$$Z_{I\gamma} = \frac{\partial p}{\partial t_I}\left[\frac{\partial U(I_d)}{\partial\gamma} - \frac{\partial U(I_u)}{\partial\gamma}\right] + p\frac{\partial I_d}{\partial t_I}\frac{\partial^2 U(I_d)}{\partial I_d\partial\gamma} + (1-p)\frac{\partial I_u}{\partial t_I}\frac{\partial^2 U(I_u)}{\partial I_u\partial\gamma}. \quad (6)$$

If $Z_{I\gamma} < 0$, then $\partial t_I^*/\partial\gamma < 0$, meaning that exogenously greater compensation for licit accounting activity would tend to discourage illicit accounting activity, as many analysts have suggested. Consider how this result might hold.

In (6), $\partial p/\partial t_I > 0$, and the bracketed term is negative, rendering the first term negative. In the second term, $p > 0$, $\partial I_d/\partial t_I > 0$, and $\partial^2 U/\partial I_d\partial\gamma < 0$ for a risk-averse executive. In the third term, $(1 - p) > 0$, $\partial I_u/\partial t_I > 0$, and similarly $\partial^2 U/\partial I_u\partial\gamma < 0$ for a risk-averse executive, making the third term negative as well. Thus, under risk aversion, exogenously greater income from licit accounting activity discourages the executive from engaging in illicit accounting activity, other things being equal. To put this in perspective, risk neutrality clearly implies a lesser deterrent effect; in such a case, $\partial^2 U/\partial I_d\partial\gamma = \partial^2 U/\partial I_u\partial\gamma = 0$, and only the first term in (6) would survive. This illustrates, not unreasonably, that risk aversion, relative to risk neutrality, more definitively reinforces a deterrent effect of a higher fixed salary[2].

[1] Specifically, $\partial I_d/\partial t_I = (\partial R/\partial t_I - \partial G/\partial t_I)(\theta_N - \theta_K) - \partial S/\partial t_I$, while $\partial I_u/\partial t_I = (\partial R/\partial t_I - \partial G/\partial t_I)(\theta_N - \theta_K)$, implying that $\partial I_d/\partial t_I < \partial I_u/\partial t_I$.

[2] In a more traditional application to the economics of crime, the comparable result illustrates how greater availability of legitimate income opportunities societally can deter illegal activity, especially among risk-averse individuals. See Ehrlich (1973), Schmidt and Witte (1984), and Grogger (1998) for more extensive discussions.

In general, the $\partial t_I^*/\partial\gamma$ effect suggests that, for most executives, a stronger relationship between the executive's licit accounting activity and the compensation received from this activity tends to reduce the executive's incentive to engage in illicit accounting activity. In practice, we might observe a stronger such relationship if the executive or the chief internal auditor possesses relatively greater financial accounting expertise or experience – human capital characteristics exogenous to the executive's current earnings manipulation decision. One might investigate this relationship empirically with the assistance of data capturing auditor traits along these lines.

1.3.3. Variable compensation. Exogenous variation in the variable (incentive-based) portion of the executive's compensation affects illicit accounting activity according to the derivative $\partial t_I^*/\partial\eta = -Z_{I\eta}/Z_{II}$, whose sign mirrors the sign of

$$Z_{I\eta} = (1-p)\frac{\partial I_u}{\partial t_I}\frac{\partial^2 U}{\partial I_u \partial\eta} + p\frac{\partial I_d}{\partial t_I}\frac{\partial^2 U}{\partial I_d \partial\eta}. \qquad (7)$$

Like the impact of fixed compensation, this outcome depends on the nature of the executive's risk preference. For a risk-neutral executive, $\partial^2 U/\partial I_u\partial\eta = \partial^2 U/\partial I_d\partial\eta = 0$, implying that $Z_{I\eta} = 0$ and $\partial t_I^*/\partial\eta = 0$: exogenous variation in variable compensation would not impact the executive's incentive to engage in illicit accounting activity. However, for a risk-averse executive, for whom $\partial^2 U/\partial I_u\partial\eta < 0$ and $\partial^2 U/\partial I_d\partial\eta < 0$, greater variable compensation would discourage illicit accounting activity, other things being equal. The hypothetical risk-neutral executive pays attention only to the greater overall income implied by this occurrence, subject to the probabilities of detection and non-detection. The risk-averse executive recognizes this income opportunity but also accounts for the greater marginal risk of income loss, making such an executive less likely to engage in illicit activity when encountering an exogenously higher N.

One might investigate this relationship empirically by incorporating measures of organizational performance exogenous to the hypothetical executive's current time-allocation decision but that nevertheless influences the variable component of compensation. These might include the productivity of other workers or of physical capital, the firm's performance in earlier years, or the firm's monopoly power, as examples.

1.3.4. Financial market repercussions. Discrepancies between a corporation's true and reported earnings may adversely impact the performance of the firm's stock, subject to the sensitivity of financial market participants. Because the firm's financial-market performance potentially impacts the hypothetical executive's compensation, albeit indirectly, greater such sensitivity may impact the executive's decision to engage in illicit accounting practice. Such variation occurs according to $\partial t_I^*/\partial\delta = -Z_{I\delta}/Z_{II}$, the sign of which mirrors that of

$$Z_{I\delta} = (1-p)\frac{\partial I_u}{\partial t_I}\frac{\partial^2 U(I_u)}{\partial I_u \partial\delta} + p\frac{\partial I_d}{\partial t_I}\frac{\partial^2 U(I_d)}{\partial I_d \partial\delta}. \qquad (8)$$

The outcome $\partial t_I^*/\partial\delta < 0$, which requires $Z_{I\delta} < 0$, would imply that greater market sensitivity to corporate earnings discrepancy would generally discourage illicit accounting activity. Like the effect of variable compensation, this result holds under risk aversion but exerts no effect under risk neutrality. More generally, the effect $\partial t_I^*/\partial\delta$ illustrates how the hypothetical executive in the current model faces more than one type of cost when considering illicit accounting practice, each of which poses a threat of lost income. Beyond the expected cost traceable to the presence of auditors, who act as agents of the accounting profession in the enforcement of GAAP and broader regulations, the executive faces a risk of income loss traceable to financial-market repercussions.

1.3.5. The sanction. Exogenous variation in the official sanction imposed for illicit accounting practice affects illicit accounting activity according to the derivative $\partial t_I^*/\partial\varphi = -Z_{I\varphi}/Z_{II}$, the sign of which mirrors that of

$$Z_{I\varphi} = p\left[\frac{\partial^2 U}{\partial I_d \partial\varphi}\frac{\partial I_d}{\partial t_I} + \frac{\partial U(I_d)}{\partial I_d}\frac{\partial^2 I_d}{\partial t_I \partial\varphi}\right] + \frac{\partial U(I_d)}{\partial\varphi}\frac{\partial p}{\partial t_I}. \qquad (9)$$

One can readily establish that $Z_{I\varphi} < 0$, consistent with a more severe sanction discouraging illicit accounting activity, other things equal. In the first term of (9), $\partial^2 U/\partial I_d\partial\varphi < 0$ under risk aversion, $\partial^2 I_d/\partial t_I\,\partial\varphi < 0$, and all other terms are positive, rendering the first term of (9) negative. The second term of (9) is negative because $\partial U/\partial\varphi < 0$ and $\partial p/\partial t_I > 0$. Thus, $Z_{I\varphi}$ represents the sum of two negatives, suggesting lesser amounts of earnings manipulation where the legal environment carries relatively more severe sanctions for such activity.

1.4. The role of incentive compensation. The nature of the hypothetical executive's incentive-based compensation and subsequently the manner by which the executive manipulates earnings indirectly impact the magnitude of the comparative-static relationships derived above. The income derivatives $\partial I_u/\partial t_I = (\partial R/\partial t_I - \partial G/\partial t_I)(\theta_N - \theta_K)$ and $\partial I_d/\partial t_I = (\partial R/\partial t_I - \partial G/\partial t_I)(\theta_N - \theta_K) - \partial S/\partial t_I$ appear in each second partial derivative of expected utility that determines the sign of each comparative static, reinforcing the magnitude of each. Because incentive compatibility requires $\partial I_u/\partial t_I \geq 0$ and $\partial I_d/\partial t_I \geq 0$, and because these relationships speak to the deterrence of GAAP-violating earnings manipulation, it becomes instructive to study the mechanisms that might enhance or dilute the magnitude of the deterrent effects.

As illustration, consider again the impact of exogenous variation in the probability of detection on illicit accounting activity, such as associated with more effective auditing. Making use of the definitions of $\partial I_u/\partial t_I$ and $\partial I_d/\partial t_I$, we can rewrite $Z_{I\sigma}$ as

$$Z_{I\sigma} = \frac{\partial p}{\partial \sigma}\left[\left(\frac{\partial R}{\partial t_I} - \frac{\partial G}{\partial t_I}\right)(\theta_N - \theta_K)\left(\frac{\partial U}{\partial I_d} - \frac{\partial U}{\partial I_u}\right)\right] + \frac{\partial^2 p}{\partial t_I \partial \sigma}[U(I_d) - U(I_u)]. \tag{10}$$

In the simplest situation, the absence of any incentive-based compensation, $\theta_N = \theta_K = 0$, and the first term in (10) vanishes, leaving $Z_{I\sigma} = \partial^2 p/\partial t_I \partial\sigma[U(I_d) - U(I_u)] < 0$, consistent with deterrence, other things being equal. Under these circumstances, the increased likelihood of detection of earnings manipulation discourages the behavior solely because the executive prefers not to incur the sanction associated with detection, present in $U(I_d)$. Of course, while such an arrangement would facilitate deterrence in the face of enhanced auditing, it would not allow firm owners to address classic principal-agent problems present in corporate governance environments. Alternatively, suppose the firm, addressing these problems, specifies $\theta_N > 0$ and $\theta_K > 0$, thus allowing the executive to receive a positive share of the firm's profit as well as stock options. Given equal shares ($\theta_N = \theta_K$), the first term of (10) vanishes as in the simplest case, yielding the same deterrent effect of a greater detection probability. Only when $\theta_N \neq \theta_K$ does the first term in (10) survive. However, since $\partial p/\partial\sigma > 0$, $(\partial R/\partial t_I - \partial G/\partial t_I)(\theta_N - \theta_K) > 0$, and $\partial U/\partial I_d - \partial U/\partial I_u < 0$, that first term would always be negative, thus reinforcing the deterrent effect of the greater detection probability. This pattern of reinforcement holds for all of the other comparative statics derived here as well, as indicated by the presence of $\partial I_u/\partial t_I$ and $\partial I_d/\partial t_I$ in the other key second cross-partial derivatives of expected utility highlighted above.

But while awarding incentive-based executive compensation such that $\theta_N \neq \theta_K$ appears to reinforce exogenous deterrent effects, this arrangement can create other complications, especially related to exogenous variation in the incentive-compensation shares themselves. One might easily imagine firms increasing one or both of those shares as a means of rewarding the executive. Variation in θ_N along these lines affects utility-maximizing illicit accounting activity according to the derivative $\partial t_I^*/\partial\theta_N$, whose sign mirrors that of

$$\frac{\partial Z_I}{\partial \theta_N} = \left(\frac{\partial R}{\partial t_I} - \frac{\partial G}{\partial t_I}\right)\left[(1-p)\frac{\partial U}{\partial I_u} + p\frac{\partial U}{\partial I_d}\right] + \frac{\partial p}{\partial t_I} N\left[\frac{\partial U(I_d)}{\partial I_d} - \frac{\partial U(I_u)}{\partial I_u}\right]. \tag{11}$$

Comparable variation in θ_K affects illicit accounting activity according to $\partial t_I^*/\partial\theta_K$, whose sign mirrors that of

$$\frac{\partial Z_I}{\partial \theta_K} = -\left(\frac{\partial R}{\partial t_I} - \frac{\partial G}{\partial t_I}\right)\left[(1-p)\frac{\partial U}{\partial I_u} + p\frac{\partial U}{\partial I_d}\right] + \frac{\partial p}{\partial t_I} K\left[\frac{\partial U(I_d)}{\partial I_d} - \frac{\partial U(I_u)}{\partial I_u}\right]. \tag{12}$$

Study of these comparative statics allows us to see a critical tradeoff between the use of incentive-based executive compensation, such as to address principal-agent problems, and the desire to forestall earnings manipulation behavior by executives.

Suppose $\theta_N = \theta_K$: because of the incentive-compatibility constraint, only the last term in (11) and in (12) survives, consistent with a deterrent effect and reinforced by stronger monitoring (i.e., a stronger $\partial p/\partial t_I$, capturing the extent to which the illicit accounting activity creates a risk of detection at the margin) and altogether stronger firm performance (greater *N* or *K*). But if $\theta_N \neq \theta_K$, a larger share θ_N or a larger share θ_K will tend to *dilute* the deterrent effect associated with the larger of the two. For example, if $\theta_N > \theta_K$, then necessarily $\partial R/\partial t_I - \partial G/\partial t_I > 0$, making the first term of (11) positive and countering the effect of the negative second term. But the same situation serves to *reinforce* the deterrent effect of θ_K rising, as implied by the negative sign in front of the first term in (12). If the opposite ($\theta_N < \theta_K$) held, variation in the shares would undermine the deterrent effect associated with stock options θ_K and enhance that of θ_N. These patterns suggest that the most definitive way for firms to use incentive-based executive compensation as a *reward* and yet maintain the microeconomic disincentive to engage in illicit accounting activity is to require $\theta_N > 0$, $\theta_K > 0$, and $\theta_N = \theta_K$. In such an arrangement, the executive has the opportunity to earn incentive-based compensation, to the presumed benefit of firm owners, but no single *form* of incentive compensation tempts earnings manipulation behavior one way or the other.

Conclusion

In this paper, we apply elements of the economic model of crime to analyze earnings manipulation by corporate executives. As such, we model their behavior within a risk-reward framework, where the risk of detection by auditors and regulators potentially acts as a deterrence to what amounts to illicit behavior. Our model does not consider earnings manipulation as a tool to convey private information to investors but instead emphasizes a perspective whereby the hypothetical executive uses earnings manipulations as a strategy to maximize private gain. We also examine compensation schemes that can minimize the temptation of the CEO to manipulate earnings. The model provides theoretical structure for ongoing and future empirical research in this area.

References

1. Agrawal, Anup, and Sahiba Chadha (October 2005), "Corporate Governance and Accounting Scandals". *Journal of Law and Economics* 48, pp. 371-406.
2. Bartov, Eli, Dan Givoly, and Carla Hayn (June 2002), "The Rewards to Meeting or Beating Earnings Expectations". *Journal of Accounting and Economics* 33, pp. 173-204.
3. Becker, Gary S. (March/April 1968), "Crime and Punishment: An Economic Approach". *Journal of Political Economy* 76, pp. 169-217.
4. Bergstresser, Daniel, and Thomas Philippon (June 2006), "CEO Incentives and Earnings Management". J*ournal of Financial Economics* 80, pp. 511-529.
5. Block, M.K., and J.M. Heineke (June 1975), "A Labor Theoretic Analysis of the Criminal Choice", *American Economic Review* 65, pp. 314-325.
6. Burns, Natasha, and Simi Kedia (January 2006), "The Impact of Performance-Based Compensation on Misreporting", *Journal of Financial Economics* 79, pp. 35-67.
7. Dechow, Patricia M., Richard G. Sloan, and Amy P. Sweeney (Spring 1996), "Causes and Consequences of Earnings Manipulation: An Analysis of Firms Subject to Enforcement Actions by the SEC", *Contemporary Accounting Research* 13, pp. 1-36.
8. DeFond, Mark L., and James Jiambalvo (July 1991), "Incidence and Circumstances of Accounting Errors". *The Accounting Review* 66, pp. 643-655.
9. Ehrlich, Isaac (May/June 1973), "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation". *Journal of Political Economy* 81, pp. 521-565.
10. Grogger, Jeff (October 1998), "Market Wages and Youth Crime". *Journal of Labor Economics* 16, pp. 756-791.
11. Holthausen, Robert W., David F. Larcker, and Richard G. Sloan (February 1995), "Annual Bonus Schemes and the Manipulation of Earnings". *Journal of Accounting and Economics* 19, pp. 29-74.
12. Jones, Jennifer J. (Autumn 1991), "Earnings Management During Import Relief Investigations". *Journal of Accounting Research* 29, pp. 193-228.
13. Nelson, Mark W., John A. Elliott, and Robin L. Tarpley (Supplement 2002), "Evidence from Auditors about Managers' and Auditors' Earnings Management Decisions". *The Accounting Review* 77, pp. 175-202.
14. Palmrose, Zoe-Vonna, and Susan Scholz (Spring 2004), "The Circumstances and Legal Consequences of Non-GAAP Reporting: Evidence from Restatements". *Contemporary Accounting Research* 21, pp. 142-180.
15. Schmidt, Peter D., and Ann D. Witte (1984), *An Economic Analysis of Crime and Justice: Theory, Methods, and Applications.* Orlando, FL: Academic Press.
16. Silberberg, Eugene (1990), *The Structure of Economics*. New York: McGraw-Hill.
17. Teoh, Siew Hong, Ivo Welch, and T.J. Wong (December 1998), "Earnings Management and the Long-Run Market Performance of Initial Public Offerings". *Journal of Finance* 53, pp. 1935-1974.
18. Witte, Ann Dryden (February 1980), "Estimating the Economic Model of Crime with Individual Data". *Quarterly Journal of Economics* 94, pp. 57-84.