Financial Statement Audits, a Game of Chicken?

Charles J. Coate
Robert E. Florence
Kristi L. Kral

ABSTRACT. This paper uses the intuition from the *game of chicken* to model client-auditor financial reporting and audit effort strategies. Within an ethical context, our model is concerned with the client misreporting and its detection by the auditor. The paper uses a *welfare game* (similar to the *game of chicken*) to more formally model client-auditor strategies. The *welfare game* is then extended to provide additional insight into ethical and audit effort issues.

Such a *welfare game* provides equilibrium in mixed strategies. This mixed strategy solution makes possible four outcomes from the game: 1) Financial Statements are fairly presented by client and the auditor performs a normal audit, 2) Financial Statements are fairly presented by client and the auditor performs an extended audit (over auditing), 3) Financial Statements are misstated by client and detected by the auditor, and 4) Financial Statements are misstated by client and not detected by the auditor (audit failure despite no intended unethical action on the part of the auditor).

The first extension of the *welfare game* allows clients to be ethical or unethical clients. Unethical clients are rewarded for misreporting because the auditor wishes to minimize audit effort for ethical clients. The second extension allows the client to unknowingly misstate the financial statements; the client "strategy" then becomes random (a play of nature). The auditor must distinguish between this random play and the strategic play of the *welfare game*. Finally auditor ethics are considered and the influence of auditor ethics on reducing failed audits.

KEY WORDS: auditing, ethics, game theory

Charles J. Coate is currently an associate professor of accounting at St. Bonaventure University. Professor Coate earned his Ph.D. from the University of Maryland. In addition to ethics, Professor Coate's research interests are in the areas of accounting education and professional issues.

Robert E. Florence is currently an assistant professor of economics at St. Bonaventure University. Professor Florence earned his Ph.D. from Purdue University. In addition to ethics, Professor Florence's research interests are in the areas of public choice, public policy, game theory and environmental economics.

Kristi L. Kral is currently working in the Batavia office, Freed, Maxick & Battaglia PC. Ms. Kral received her accounting degree from SUNY Geneseo. Ms. Kral's assurance clients are in the manufacturing industry.

Introduction

Independent Auditors (CPAs) perform financial statement audits to provide reasonable assurance that financial statements are free of material misstatements. Failed financial statement audits occur when the auditor fails to detect or detects but fails to report a material misstatement in a set of financial statements. Misstatements may be either errors (unintentional) or frauds (intentional). The most dangerous fraud is management fraud, deliberate fraudulent financial reporting by management. Ethical considerations relating to an auditor's failure to report a misstatement are obvious; our paper does not address these. More subtle are the ethical considerations relating to failure to detect. Auditors have an ethical responsibility to perform an audit that provides reasonable assurance of detecting a misstatement. Also, client management has an ethical responsibility to report fairly in financial statements. Our paper deals with these ethical issues.

Our paper uses the *game of chicken* to provide insight into a client auditor relationship that may result in a failed audit. Specifically, we examine the potential for misstatement of the financial

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statements by the client and the level of auditing effort to detect or prevent misstatements by the auditor. While game theory has been commonly used in a variety of audit contexts, only once (Cushing, 1999) has a well-known game been used to model an audit context. Cushing (1999) used the *prisoner's dilemma game* to model the issue of opinion shopping. Other authors construct mathematically complex games to model a specific audit issue or set of issues. The advantage of Cushing's (1999) use of a well-known game is in its intuition and understandability to those less familiar with more mathematical or rigorous game theory applications.

The purpose of our paper is to use the well-known *game of chicken* and the lesser-known but related *welfare game* to provide better intuition for and understanding of the game theoretic relationship between client and auditor and the literature relating game theory and auditing. Further, our paper considers as paramount the role of client and auditor ethics underlying the framework of the above games. We show that some failed audits are unavoidable if clients are unethical; auditors do not detect all client misstatements. However, we show that higher auditor ethics result in more ethical practices (play) by unethical clients. We also discuss the importance of auditor assessment of client ethics and how this assessment will dictate auditor practices (play within games).

Literature

The value of game theory in auditing is well established and well varied in the audit literature. One basic application in this literature establishes a role for the auditor as a monitor in a classic agency model with an owner (principle) using an auditor (monitor) as a control for a manager (agent) (Morton, 1993). Morton's (1993) results show the auditor's strategy to be both probabilistic and contingent. The owner decides to audit with a positive probability or not to audit at all.

A second application of game theory deals with audit pricing and allows auditors to bid (auctioning by the client) for a client engagement. This stream of literature was begun by DeAngelo (1981), resumed by Magee and Tseng (1990), and extended by numerous authors (for example, Dye (1991) and Kanodia and Mukherji (1994)). A common characteristic of these author's models is the creation of low-balling and potential loss of auditor independence.

Game theory has also been applied to auditor reporting issues. Antle and Nalebuff (1992) modeled auditing efforts and reporting as a negotiation game between auditor and client. They suggest that auditors may tend to be more accommodating than conservative. The auditors' tendencies are dependent upon the cost sharing rule for additional audit expenditures and client ability to replace auditors. Matsumura, Subramanyam, and Tucker (1997) modeled the auditor's decision to issue a going concern opinion in conjunction with the client's decision to replace the auditor.

However, at an operational level potentially the most important work was that of Fellingham and Newman (1985). They modeled audit work using an approach that was a strategic rather than a deterministic perspective. They suggested that the auditor and client were competing (playing a game) against each other in a way that "allow(s) the auditor to influence the behavior of the auditee" (p. 635). This of course also implies the auditee (client) will influence the behavior of the auditor. In their game, the client chooses high or low effort to eliminate misstatements from the financials; the auditor chooses high or low audit effort to detect misstatements and then prepares an audit report (qualified or unqualified.) Fellingham and Newman (1985) add that their approach "can radically alter how audits are planned and audit risk is evaluated." (p. 635).

Shibano (1990) extended the strategic game research by allowing for misstatements to be derived from both errors and irregularities and tied his model to the three components of audit risk. Thus, he provides game theory framework that distinguishes between tests of controls and substantive testing. Bloomfield (1995) extended Shibano's (1990) work by including imperfect information about manager's incentives to misrepresent account balances and predict the impact on the accuracy of auditor's risk assessments of

issues such as unintentional error rates, audit technologies and manager's payoffs.

Newman and Noel (1989) and Matsumura and Tucker (1992) extended the strategic game line of research suggested by Fellingham and Newman (1985) by explicitly considered an auditor's testing for fraud. These studies found implications for fraud prevention or detection based on such variables as auditor or auditee (client) payoff and internal control structure. Smith et al. (2000) extended the examination of fraud testing by also considering the allocations of auditor's resources. The most significant enhancement of Smith et al. (2000) involves the use of a twostage audit interaction model. The first stage provides information on control systems (this information determines manager's "type," willingness or opportunity to commit fraud) and the second stage involves testing for fraud.

Despite the intuitive appeal of this strategic, competitive game approach and the considerable modeling literature to evolve from this approach, it was not until Hansen and Watts (1997) that empirical evidence first provided support for this approach. (We note the related work of Hatherly et al. (1996) that explored modeling the client auditor relationship as a cooperative game rather than competitive game and Cook et al. (1997) that investigated conditions where cooperative and competitive games provide similar results. However, these works include limiting assumptions; for example, Hatherly et al. (1997) assumed that fraud could not occur.)

The above streams of literature relating to auditing and game theory all seek to identify audit relationships or audit processes and build game theory models (utilizing differing complexity). In contrast is the recent work of Cushing (1999) relating to game theory. In this paper Cushing (1999) utilizes two substantial differences. First, Cushing (1999) begins with a well-known game (*the prisoners' dilemma*). The prisoners' dilemma is a situation where two prisoners are separated and each face the option of finking out their partner or keeping quiet. Collectively they are better off if both keep quiet than both fink. But individually they are better off if they fink and their partner keeps quiet (see Rasmusen, 1989, pp. 28–29) Second, Cushing (1999) explicitly rather than implicitly frames his discussion around an ethical issue, opinion shopping. In Cushing's (1999) paper the *prisoners' dilemma* game models two auditors auditing different clients. Each auditor must either consent to or deny a client request for approval of a dubious accounting method. The clients will change auditors if the auditors deny the client requests. Collectively the auditors are better off if they both deny, but (in a single play) consent is a dominant strategy; hence the *prisoner's dilemma* game. Within the framework of this game, Cushing (1999) then considers the benefits of a strict versus laissez faire approach to ethics to improve the ethical outcome of the game.

We believe the significance of the use of a well-known game cannot be understated. More complex game theory mathematical models are readable and understandable to game theorists and provide excellent theoretical foundations for audit theory. However, these same complex mathematical models are less readable and understandable to most other readers (including auditors). In contrast, well-known games such as the *prisoners' dilemma* are often intuitive and understandable to the common reader.

Our paper is similar to Cushing's (1999) paper in that we begin with an established game (the *game of chicken*); and we explicitly build our discussions around the ethical intentions of client and auditor. Thus we feel our paper gains the advantages of understandability that Cushing's (1999) paper enjoys. Further, our approach serves to supplement the above literature in that it allows us to tie together, within an ethical perspective, a number of the topics addressed in the above research.

The *game of chicken* and the audit

In the *game of chicken*, there are two players, say Andy and Chuck, who start at different ends of the road. Chuck drives north down the road while Andy drives south down the same road at the same time. As they move closer to each other and face a possible collision, they each have to chose an action to stay on the road or swerve

off the road (chicken). If only one player *swerves*, he loses face; the player who *stays* gains respect and glory. If both players stay, then both players will crash and receive the lowest payoff. If both players *swerve*, they both experience some embarrassment and lose a little face. Table I (see Rasmusen, 1989, pp. 73–74) shows a payoff matrix consistent with the description above.

The solution (see Rasmusen, 1989, p. 74) to this game relies on the symmetry of the game; that is, each player has the same choice of actions with the same payoffs. Hence, the strategy for both players will be the same. Further, the payoff to a player from playing either *stay or swerve* must also be the same. If *a* is the probability of either player playing *stay*, then the solution to the below equation represents equilibrium condition.

(Payoff from *swerve*)
$= (a) \times (0) + (1 - a) \times (1)$
$= (a) \times (-3) + (1 - a) \times (2)$
= (Payoff from *stay*)

This equation easily reduces to $(1 - a = 2\text{-}5a)$ or $(a = 0.25)$. The equilibrium strategy for this game is a mixed strategy where each player plays *stay* with a probability of 0.25 and *swerve* with a probability of 0.75. The probability of the socially desirable outcome, at least one player will *swerve* (no crash), is $1 - (a \times a)$ or 0.9375. In other words, if this game is played repeatedly the socially undesirable outcome (crash) is expected to occur with a frequency of 6.25%.

In a client auditor context we apply the following interpretation to the *game of chicken*. The client may consider misstating their financial statements (for example, overstating earnings). The client's choice is either to *stay* (overstate earnings) or *swerve* (report earnings fairly). The client makes this choice and reports year end earnings. The client's report is made prior to the audit, but the auditor is unaware of the client's choice. The auditor faces the choice of performing a normal audit (*swerve*) or an extensive and more expensive audit (*stay*). An extensive audit detects overstated earnings, whereas a normal audit does not detect overstated earnings.

The client ethical issue here is management fraud (deliberate misstatement of the financial statements by the client's management). The auditor's ethical issue is performing an audit that provides reasonable assurance of preventing or detecting management fraud. We use management fraud because, unlike employee fraud, it almost always involves material misstatements of financial statements.

If the auditor could observe the client's actions, the auditor's choice would be trivial. However, we assume that the auditor cannot observe the client's action choice. Hence, from a game theory perspective the client and auditor are playing simultaneously and this game is interesting, as opposed to trivial, because it is strategic in nature. That is, the auditor's willingness or unwillingness to play *stay* must influence the client's willingness or unwillingness to play *stay*. Similarly, the client's willingness or unwillingness to play *stay* must influence the auditor's willingness or unwillingness to play *stay*. This will only be so if the client prefers to overstate earnings; or more directly stated the client is unethical and willing to opportunistically commit a fraud.

TABLE I
Table of payoffs for *game of chicken*

		Chuck	
		Stay	Swerve
Andy	Stay	–3, –3	2, 0
	Swerve	0, 2	1, 1

Payoffs (Andy, Chuck).

A better model, the *welfare game*

While the *game of chicken* provides intuition for the client's reporting and the auditor's effort choices, the *game of chicken* is inappropriate to model these related client auditor choices at a more detailed level. This is because the client auditor game is not symmetrical. While the client and auditor face the same action choices, they face different payoffs from the action choices and consequently play different strategies.

The client's highest payoff comes from an undetected fraud (recall, the client is assumed to benefit from and to be willing to commit a fraud). The client's lowest payoff comes from a detected fraud. The client is indifferent to the auditor's action when the client reports fairly. The client's preferred strategy then is to *stay* when the auditor *swerves* and *swerve* when the auditor *stays*. The client wishes to attempt a fraud only when it will not be detected and report fairly only when the auditor performs an extensive audit.

The auditor's highest payoff is when both the client and the auditor *swerve*. The financial statements are reported fairly and the auditor avoids an extended audit. The auditor's lowest payoff, in fact negative, occurs when there is an audit failure (the auditor *swerves* and the client *stays*). The auditor's intermediate payoffs occur when the auditor plays *stay*. The auditor prefers the client play *swerve* as this avoids the detection of a misstatement and a subsequent client auditor conflict. We assume this conflict is costly to the auditor. The auditor's preferred strategy then is to *stay* when the client *stays* and *swerve* when the client *swerves*. That is, the auditor wishes to perform a normal audit when the client reports fairly and a more expensive (and extensive) audit when the client attempts a fraud.

Recall, in the game of chicken society wishes the players to avoid (*stay*, *stay*) a crash. In our client auditor game, society wishes firstly to avoid (*swerve*, *stay*) a failed audit and secondly to avoid (*stay*, *swerve*) over auditing.

The below payoff matrix provides numerical values that are consistent with the above descriptions.

TABLE II
Table of payoffs for the client auditor welfare game

		Client (C)	
		Stay	Swerve
Auditor (A)	Stay	2, –5	4, –1
	Swerve	–10, 5	7, –1

Payoffs (Auditor, Client).

Note that while this game is similar to the sample *game of chicken*, the payoffs are different. Similarly, both players have the same action choices *stay* or *swerve*; however, both players face different payoffs from the combinations of their actions. That is, the game produces a non-symmetrical payoff matrix. Our client auditor game is better described as a *welfare game* (Rasmusen, 1989, p. 70).

The solution to this *welfare game* will also be in mixed strategies as no pure strategy equilibrium exists. For example, as explained above the client prefers to play *stay* only when the auditor plays *swerve*; and the auditor prefers to play *stay* only when the client plays *stay*. Solving for the mixed strategy requires setting up a payoff function for the auditor and client in terms of probabilities of actions and maximizing this function over the probability of taking either action.

The first payoff function to consider is the expected profit to the auditor where Pa is the probability the auditor plays *stay* (then 1 – Pa is the probability the auditor plays *swerve*) and Pc is the probability the client plays *stay*. The payoff function is then differentiated with respect to the action choice (probability the auditor plays *stay*) and solved to find the probability the client plays *stay*. This procedure is repeated considering the expected profit to the client and solved to find the probability the auditor plays *stay*.

$$
\begin{aligned}
&\text{Expected profit to the auditor} = E_{\text{Auditor profit}} \\
&\quad = Pa[2Pc + (4)(1 - Pc)] + \\
&\qquad [1 - Pa][-10Pc + 7(1 - Pc)] \\
&\quad = Pa[2Pc + 4 - 4Pc] + \\
&\qquad [1 - Pa][-10Pc + 7 - 7Pc] \\
&\quad = Pa[-2Pc + 4] + [1 - Pa][-17Pc + 7] \\
&\quad = Pa[-2Pc + 4] - 17Pc + 7 + 17PaPc - 7Pa \\
&\quad = -2PaPc + 4Pa - 17Pc + 7 + 17PaPc - 7Pa \\
&\quad = 15PaPc - 3Pa - 17Pc + 7 \\
&\quad = Pa[15Pc - 3] - 17Pc + 7 \\
&0 = dE_{\text{Auditor profit}}/dPa = 15Pc - 3 \\
&Pc = 3/15 = 1/5 \\
&\qquad = \text{the probability of the client staying}
\end{aligned}
$$

Expected profit to the client = EClient profit
= Pa(-5Pc + (–1)[1 – Pc]) +
(1 – Pa)(5Pc + (–1)[1 – Pc])
= –5PaPc – 1Pa + PcPa +
(1 – Pa)(5Pw – 1 + Pc)
= –4 PaPc – 1Pa + (1 – Pa)(6Pc – 1)
= –4 PaPc – 1Pa + 6Pc – 6PaPc – 1 + Pa
= –10PaPc + 6Pc – 1
= –Pc(10Pa – 6) – 1
$0 = dE_{\text{Client profit}}/dPc = -(10Pa - 6)$
Pa = 6/10 = 3/5
= the probability of the auditor staying

The solution to this *welfare game* is an equilibrium in mixed strategies; both client and auditor *swerve* some of the time and *stay* some of the time. This mixed strategy solution makes possible four outcomes from the game: (1) Financial Statements are fairly presented by the client and the auditor performs a normal audit (*swerve*, *swerve*), (2) Financial Statements are fairly presented by client and the auditor performs an extended audit (over auditing; *stay*, *swerve*), (3) Financial Statements are misstated by client and detected by the auditor (*stay*, *stay*), and (4) Financial Statements are misstated by client and not detected by the auditor (*swerve*, *stay*). Note, in outcome (4) there is an audit failure despite no intended unethical action on the part of the auditor.

The solution shows that even with an imposing negative payoff accruing to auditors as a result of a failed audit, the auditor *swerves* when client *stays*, there will still be failed audits. The probability that the client *stays* is 1/5. The probability that the auditor *swerves* is 2/5. By multiplying the two probabilities, the probability of a failed audit (assuming the client has an incentive and is willing to commit fraud) is shown to be 2/25 or 8%. It is important to note that the failed audit occurs as a result of client ethics and without the auditor's direct intent. Further, the solution shows that the occurrence of "over auditing" is also significant; the auditor *stays* with a probability of 3/5 and the client *swerves* with a probability of 4/5. The probability of over auditing is 12/25 or 48%. The large percentage of over auditing indicates the auditor's detection or prevention efforts. Again, note auditor efforts are not the result of ethical consideration per se; auditors are acting as rational economic agents given the structure of the game.

The general solution

The above client auditor game payoffs can easily be generalized as shown in the game payoff matrix in Table III. The payoff for (*swerve*, *swerve*) is normalized to (zero, zero); this is done for computational ease. The actual payoff for the auditor is the audit fee less costs and likely to be positive except for a failed audit.

When the auditor plays *stay*, performs an extended audit, the auditor incurs an extra cost to this work of *w*, hence the auditor's payoff for a (*stay*, *swerve*) play is *–w*. If the client also plays *stay* there is a dispute and an additional cost to the auditor of *d*. These costs might include potential costs of disputes such as a damaged client relationship or a possible auditor change. When the auditor *swerves* and the client plays *stay*, the auditor incurs the cost of a failed audit, *l*. It is assumed that *l* is greater than *w* + *d*. From a practical perspective this means the cost of a failed audit exceeds the cost of an extended audit and dispute. From a game theory perspective, this assumption is critical. Without this assumption the auditor would have a dominant strategy of playing *swerve*.

When the client *swerves*, there is no cost to the client. When the client plays *stay* there is a cost of *c* if the client's misreporting is detected (auditor plays *stay*) and a benefit of *b* if the client fraud is undetected (auditor plays *swerve*). No

TABLE III
Generalized payoff matrix for client auditor *welfare game*

		Client (C)	
		Stay	Swerve
Auditor (A)	Stay	$-w - d, -c$	$-w$, 0
	Swerve	–l, *b*	0, 0

Payoffs (Auditor, Client)

assumption is made on the relative values of c and b. Table III provides a payoff matrix consistent with the above description.

To solve this game we use the same methodology as in the numeric example.

$$\text{Expected profit to the auditor} = E_{\text{Auditor profit}} = \text{Pa}[-(w + d)\text{Pc} + (-w)(1 - \text{Pc})] + [1 - \text{Pa}][-(l)\text{Pc} + (0)(1 - \text{Pc})]$$

which reduces to

$$= (l - d)\text{PaPc} - (w)\text{Pa} - (l)\text{Pc}$$

and yields

$$0 = dE_{\text{Auditor profit}}/d\text{Pa} = (l - d)\text{Pc} - w$$
$$\text{Pc} = w/(l - d)$$
$$= \text{the probability of the client staying.}$$

$$\text{Expected profit to the client} = E_{\text{Client profit}} = \text{Pa}[(-c)\text{Pc} + (0)(1 - \text{Pc})] + (1 - \text{Pa})[(b)\text{Pc} + (0)(1 - \text{Pc})]$$

which reduces to

$$= -(c + b)\text{Pc} + (b)\text{Pc}$$

and yields

$$0 = dE_{\text{Client profit}}/d\text{Pc} = -(10\text{Pa} - 6)$$
$$\text{Pa} = b/(c + b)$$
$$= \text{the probability of the auditor staying.}$$

From this solution we make the following observations and related discussions.

(1.) The solution will always be in mixed strategy. That is, Pa and Pc will always be between zero and one.

(2a.) Pa (the probability the auditor stays) is increasing in b (the benefit to the client of an undetected misstatement) and decreasing in c (the cost to the client of a detected misstatement).

(2b.) Pc (the probability the client stays) is increasing in d (the cost to the auditor of a dispute) and w (the cost to the auditor of additional audit effort) and decreasing in l (the cost to the auditor of a failed audit).

To see (1.) consider the following. Pa must be positive but less than one since both c and b are positive. Pc must be positive since w, l, and d are positive. Pc will be less than one if $l - d$ is greater than w or equivalently l is greater than $d + w$. Recall, the cost to the auditor of a failed audit (l) is defined to be greater than the cost of detecting a client misstatement ($w + d$). (2a.) and (2b.) follow directly from the general solution.

As found in the numeric example and generalized above, both client and auditor employ a mixed strategy solution. This is significant because it ensures the expectation of some failed audits and some over-auditing. Mixed strategy solutions are common in game theory and have been applied in the audit related literature, examples include Fellingham and Newman (1985) and Smith et al. (2000). Also common in game theory we note from (2a.) and (2b.) that the play of the auditor is determined by the payoffs to the client while the play of the client is determined by the payoffs to the auditor. For example, an increase in w, the cost to the auditor of performing and extended audit, will increase the client's frequency of playing *stay*.

Examining these observations from the perspective of the societal objective of reducing audit failures and over-auditing is an insightful analysis. The optimal play from a societal perspective is for both client and auditor to *swerve*. An obvious means of inducing such a play is to modify the payoffs. First we recognize that only l and c are costs (or penalties) that can be influenced by society. By increasing l society increases the cost to the auditor of a failed audit and reduces the frequency the client plays *stay*. This is because the client knows the auditor will play *stay* more frequently if the penalty to a failed audit is increased.

While decreasing either w or d will also increase the client's play of *swerve*, these costs are not controlled by society. The cost of additional audit effort, w, is determined by the situation and audit technology. The cost of a dispute, d, is largely influenced by the client. For example, the

client may (indirectly) threaten to switch auditors if a dispute arises. Such non-ethical behavior by the client is unsettling but also unavoidable. The benefit to the client of an undetected misstatement, b, is situation determined. For example, when the client's financial performance is strong, the client has little incentive to misstate the financial statements, b is low and the auditor responds by playing *swerve* more frequently. The above, of course, supports the auditor risk assessment requirement under SAS82 for fraudulent financial reporting.

The ethical client and the less competent client

A critical assumption of the *welfare game* described above is that the client is unethical. That is, the client is willing to opportunistically misstate the financial statements (commit management fraud). This assumption is of course an unfair description of all clients.

We now consider changes in the game if the client is assumed to be ethical. The assumption of an ethical client, in terms of our game could change the payoff matrix so that the client has a greater payoff for playing ethically; in other words, the client has a disutility of magnitude equal to e where $e > b$ for unethical actions such as misreporting earnings. Such a payoff matrix provides the client a dominant strategy of always playing *swerve*. Since the ethical client always plays *swerve* (reports fairly), the auditor always also plays *swerve* and performs a normal audit. This is the optimal scenario for society since no audit failures and no over-auditing occurs. Interestingly this societal optimal outcome is reached with the ethical disposition of the client and not the play of the auditor being critical.

The possibility of an ethical client allows "types" of clients, ethical and unethical. When dealing with an ethical client the auditor always *swerves*. When dealing with an unethical client, however, the auditor must play the strategic *welfare game*. Our next step is to consider a situation (game) where the auditor does not know the client's type. This can be modeled if we assume the auditor determines or knows the client is unethical with probability p and ethical with probability $(1 - p)$. This assumption is consistent with the auditor knowing the client is drawn from a pool of clients where p is the proportion of client who are unethical; or the auditor determining a probability that the client is unethical on a client by client basis.

We first consider an extreme case. If p is small enough, the auditor plays as if all clients are ethical. The auditor is willing to always allow unethical clients to misstate earnings so as to avoid the costs of extended audits on all other audits. To see this, consider the following. The cost to the auditor of always swerving is $p \times l$, the probability of an unethical auditor times the cost of a failed audit. The cost to the auditor of always staying is w, the cost of always performing an extended audit. From this we see that if $p < w/l$, the auditor prefers always swerving to always staying. Relative to the game where all clients are unethical this game introduces a two edged sword for the auditor. On the one side failed audits are reduced because no failed audits will occur with ethical clients. On the other side a greater percentage of unethical clients will attempt frauds and these frauds will be undetected.

In the less extreme case, p is larger, the client auditor game reverts to a welfare type game where both players play mixed strategies. However, the two-edged sword downside effect remains. Unethical clients are able to leverage the auditor's uncertainty as to client type generating undetected misstatements. This two-edged sword effect illustrates the importance of the auditor of determining client type. Knowing client type determines the game the auditor plays with the client and hence reduces management fraud. The issue of client type is also found in Matsumura and Tucker (1992) and Smith et al. (2000). In these papers client type refers to the client's systems strength. Clients are always willing to commit fraud but are deterred by quality of (control) systems. These client systems could also be interpreted as a measure of client ethical disposition.

Thus far we have considered both an ethical and an unethical client. In each case we assume that the client will knowingly fairly state or

misstate the financial statements. In making this assumption we have dealt with the issue of management fraud. We now allow for unintentional (or random) misstatements; we may interpret this as a situation where the client is ethical but less competent.

We introduce the problem of the less competent client not because of complexity but to distinguish it from our *welfare game*. Specifically, we wish to distinguish the auditor's strategic play of the *welfare game* and the auditor's deterministic play in response to a possible unintentional misstatement, a random play (or play of nature). This distinction is the fundamental motivation for Fellingham and Newman (1985).

To consider the auditor's decision assume the probability of a random error is q and the auditor must either *stay* or *swerve*. The occurrence of the error is independent of the auditor's play, hence, there is no interaction between client and auditor. The payoffs to the auditor's plays of *swerve* or *stay* are expressed below. Given a q value, the auditor computes the payoffs and selects the higher.

Auditor payoffs

$$stay = q(-w - d) + (1 - q)(-w) = -q(d) - w$$
$$swerve = q(-l) + (1 - q)(0) = -q(l)$$

To find the q where the auditor is indifferent between a play of *stay* or *swerve*, these two payoffs are set to equal each other. The resulting q value is $w/(l - d)$. If the misstatement rate is high (a q value greater than $w/(l - d)$), the auditor always performs an extensive audit; if misstatement rate is low the auditor will always perform a normal audit.

Clearly the auditor's strategies are different in the strategic and deterministic games. However, in terms of outcomes they may appear quite similar. Given a number of audits and the deterministic setting some clients will receive extensive audits while other clients will receive normal audits. Of these extensive audits some will detect errors and others will be over audits. Similarly of the normal audits some will result in failed audits. These outcomes are very similar to the outcomes from the strategic play of the *welfare game*.

This issue of both intentional and unintentional errors has not been overlooked in the literature. Shibano (1990) and Bloomfield (1995) have included both error type possibilities in their models. While approach of the prior literature is more mathematically rigorous than ours, the intuitions are similar. Auditors must be aware of which types of misstatements they are attempting to detect. In our discussion we explicitly recognize the importance of the auditor's assessment of client ethics in determining if a strategic approach (*welfare game*) or a deterministic approach (random) to the audit is required.

The ethics of the auditor

In our game models we assume the auditor is a rational economic agent; that is, the auditor is a profit maximizer. In this sense the auditor is not explicitly considered ethical or unethical. The auditor is motivated to perform additional audit work to avoid the cost of a failed audit and not because of any ethical considerations. We now consider two means of expanding the model to account for auditor ethics and induce additional audit effort. The first means relies on the professional ethics requirement that the auditor perform an audit to provide *reasonable assurance* that the financial statements are free of material error. The second means allows the auditor to have a disutility, other than monetary, to a failed audit. We chose these two because of Cushing's (1999) discussions of formal versus laissez faire approaches to auditor's professional ethics.

The concept of *reasonable assurance* requires the audit to plan and perform an auditor to provide reasonable (but not absolute) assurance that a material misstatement will be detected. This is a formal mechanism. The *reasonable assurance* concept recognizes the possibility that a material misstatement will exist in the financial statements but not be detected by the auditor. Hence, this concept is not inconsistent with our *welfare game* model and the possibility of a failed audit. By imposing a constraint on the *welfare game* a *reasonable assurance* requirement can be modeled. The constraint would require the probability of a failed audit not exceed some cut off (reason-

able assurance) level. The auditor may solve this constrained *welfare game* by first solving the unconstrained game and checking if the optimal solution satisfies this constraint. If the constraint is satisfied, then the risk of an audit failure is acceptably low when the auditor employs the strategy from the unconstrained *welfare game*. Otherwise, the auditor is forced to increase the frequency of his playing *stay* forcing the client to play *swerve* more frequently; thus, the probability of a failed audit is reduced until the *reasonable assurance* level is reached. The auditor of course, "pays" for his ethics with an increase in auditing costs.

Allowing the auditor a non-monetary disutility for failed audits is consistent with a laissez faire approach. In the laissez faire approach the auditor's ethical disposition, due to socialization and other factors, causes the cost to the auditor of a failed audit to be some amount greater than *l*. From the general solution we recall that the frequency which the client plays *stay* is decreasing in *l*. Hence, an increase to the auditor of a failed audit will make it less likely the client plays *stay* and the probability of a failed audit decreases. In summary, a more ethical auditor will induce more ethical play (more frequent play of *swerve*) by a client. This result is similar to Cushing's (1999) finding (Proposition 2, page 354) that the more ethical one auditor the more ethical the other auditor's play.

Conclusion and future research

Our paper uses the well-known *game of chicken* and the related, but lesser-known *welfare game* to provide an intuitive and easily understandable game theory model of the client auditor relationship. Specifically, we used game theory to model the client decision to misstate or not misstate financial statements and the auditor decision to provide or not provide the effort to detect misstatements. Within this model we consider the roles of client and auditor ethics. The approach of our paper was motivated by the work of Cushing (1999). Cushing (1999) used the *prisoners' dilemma game* to examine the ethical issue of opinion shopping. Using a well-known, but simple game offers the advantage of understandability to readers, but sacrifices the detail of more complex models. Given that the literature relating the auditing and game theory, with the exception of Cushing (1999), relies on complex modeling, we elected the well-known, simple game approach.

The *welfare game* solution shows both failed audits and over auditing to be unavoidable if the client is unethical. This finding is without consideration of auditor's ethics. If the auditor is ethical the client can be made to play more ethically, but failed audits cannot be eliminated. Only if the client is ethical and competent can failed audits and over auditing be avoided. If the client is ethical but not competent (randomly misstates the financial statements), failed audits and over auditing are, again, unavoidable. In determining an audit strategy the auditor must assess client ethics and competence to determine what 'game' should be played. Results found with the simple games are largely consistent with the more complex game theoretic models in the literature. The simple games in our paper explicitly include an ethical perspective. Thus, the simple games with an ethical perspective provide similar results to the complex models but with a greater level of intuition and understanding for the reader. Further, a simple game offers a starting point for future research with multi-period games. While multi-period games can quickly become complex, they also offer potential insights to the relationship of client reporting, audit effort and issues such as auditor turnover or auditor rotation.

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Charles J. Coate and Robert E. Florence
School of Business,
St. Bonaventure University,
St. Bonaventure, NY 14778,
U.S.A.
E-mail: ccoate@sbu.edu
rflorenc@sbu.edu

Kristi L. Kral
Fred, Maxick & Battaglia PC,
1 Evans Street,
Batavia NY 14020,
U.S.A.
E-mail: kristi.l.kral@freedmaxick.com