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Legal System, Mandatory Auditor Rotation, and Auditor Independence
– Theory and Experimental Evidence

by

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1. INTRODUCTION

Auditor independence has long been regarded as a key foundation to the auditing profession because it not only increases the likelihood that firms’ financial statements are in conformity with the GAAP, but also encourages the investors to rely more on the financial statements (Dopuch, King, and Schwartz 2003; Mednick 1997; AICPA 1999; Levitt 2000; SEC 2000). However, since many audit failures have been attributed to a lack of independence (e.g., Andersen vs. Enron 2001; Ernst & Young vs. PeopleSoft 2003), the regulators, practitioners, and academic have emphasized the importance of improving auditors’ independence in restoring public confidence (e.g., Abbott, Parker, Peters, and Raghunandan 2003; Citron 2003; Cote 2002; Craswell, Stokes, and Laughton 2002; Dopuch, King, and Schwartz 2003; Gerde and White 2003; Hodge 2003; Kaiser and Perris 2003; Kopel 2003; Lousteau and Reid 2003; SEC 2003).

Since the 1970s, the mandatory rotation of audit firms has been recommended as a mechanism to improve auditor independence and, in turn, improve the quality of financial reporting (U.S. Senate’s Metcalf Report 1977; AICPA’s Cohen Report 1978; SEC 1994; POB 2002). However, most of the current academic research generates mixed results to support the adoption of mandatory rotation. Using analytical modeling in an “end game” setting, for example, Elitzur and Falk (1996) finds that the levels of planned audit quality are negatively influenced by an auditor rotation requirement because the planned audit quality will diminish over time. In addition, Arrunada and Paz-Ares (1997) indicates that mandatory auditor rotation may lead to an increase in audit cost and price through the destruction of assets and the distortions of competition. Also, Summer (1998) proves that regulation by rotation rules may actually impair auditor’s independence rather than enhance it due to a lack of incentive for the auditor to report honestly at the last period of an audit engagement. Using empirical-archival data, Geiger and Raghunandan (2002) shows an inverse relationship between audit tenure and audit reporting failures. Based on this result, the authors conclude that the arguments of those who propose mandatory rotation are not supported. Johnson, Khurana, and Reynolds (2002) examines whether the length of audit-firm tenure is associated with financial-reporting quality. Using two proxies for financial-reporting quality and a sample of Big 6
clients matched on industry and size, this study finds that short audit-firm tenures of two to three years are associated with lower-quality financial reports. Myers, Myers, and Omer (2003) uses the Jones model to document a positive relationship between earnings quality and auditor tenure. The authors interpret these results as suggesting that longer tenure, on average, results in auditors placing greater constraints on extreme management decisions in reporting of financial performance. In contrast, Dopuch, King, and Schwartz (2001) adopts the experimental economics approach to show that mandatory auditor rotation does improve auditor independence either as a stand-alone rule or in conjunction with mandatory retention.

These prior studies suffer several deficiencies. For example, the analytical studies generally ignore the side payment effect at the end game of an audit engagement (Lee and Gu 1998) and omit auditor’s possible actions after the compulsory termination of an audit. On the other hand, because there is currently no requirement for the US public companies to rotate audit firms, a continuance or termination of an audit engagement (and therefore the length of auditor tenure) is endogenously determined by the auditor’s or the client’s own decisions (e.g., opinion shopping, increased audit risk, disagreements on the applications of GAAP, scope limitations, and audit fee consideration), but is not exogenously determined by a mandatory rotation rule. Therefore, there is no naturally-occurring data based on which we can directly examine the effectiveness of mandatory rotation on auditor independence. In light of these and other anecdotal evidence, the efficacy of mandatory rotation on improving auditor independence is still in debate. Therefore, more research should continue to shed light on other aspects of mandatory rotation that may enhance auditor independence for regulatory purposes.

This study contributes to the growing literature on auditor independence by analytically and experimentally investigating the interactive effects of mandatory auditor rotation and legal liability on auditor independence in a strategic setting in which auditor and manager interact with each other. This issue is important because prior research typically focuses on mandatory rotation in isolation and overlooks the joint effects of rotation in conjunction with other mechanisms. From a regulatory perspective, a more complete understanding about how to effectively enhance auditor independence
requires an explicit recognition of interactions across different mechanisms. In fact, no single mechanism can by itself improve auditor independence without considering other complementary mechanisms.

This study also contributes to the literature in auditor’s legal liability by showing how legal system may affect auditor’s independence decision together with a mandatory rotation mechanism. This issue is important to the determination of an appropriate legal system imposing on the auditor but has been overlooked by the regulators, practitioners, and academic. In general, a complete legal system affecting the auditing profession consists of liability regimes (negligence vs. strict) and damage apportionment rules (joint-and-several vs. proportionate). Liability regimes determine whether an auditor is held liable for damage losses incurred by investors; damage apportionment rules determine the share of the entire damages paid by each of the co-defendants. While prior analytical and experimental studies comparing the relative effectiveness of different legal systems have generally focused on the effects of legal regimes (Dopuch and King 1992; King and Schwartz 1999, 2000; Radhakrishnan 1999; Schwartz 1997) or damage apportionment rules (Boritz and Zhang 1997; Chan and Pae 1998; Dopuch, King, and Schatzberg 1994; Dopuch, Ingerman, and King 1997; Hillegeist 1999; Narayanan 1994) alone on audit effort and firm’s investments, few attempts, if any, have ever been made to incorporate both components in investigating auditor’s independence behavior in conjunction with mandatory auditor rotation. This study complements the literature by linking studies in auditor independence and auditor’s legal liability to analytically and experimentally examine how different combinations of legal systems and mandatory rotation may affect auditor’s independence decision.

2. RESEARCH DESIGN

2.1 Basic Model Setting:

Suppose a firm intends to expand its operations. Because there is no internal fund available, the firm’s risk-neutral manager must seek to raise capital from outside investors. The scale of the expansion is flexible and can be adjusted to the amount of the investment \( I \). To simplify the model
setting, I assume that the investors are willing to provide $I$ to the firm for undertaking the expansion project. After obtaining the money, however, the manager may choose to invest the whole amount of $I$ on a high-cost innovative project (denoted by $I_{\text{high}}$) or only invest part of $I$ on a low-cost established project (denoted by $I_{\text{low}}$) at an effort cost $C(e_A^i)$ (where $i \in \{\text{high, low}\}$). The realized outcome of the investment can be either high (denoted by $H$) or low (denoted by $L$), depending on the dollar amount invested. Given the investment amount $I_i$, I define $\rho(I_i)$ to be the probability that the outcome is $H$, where $\rho(I_i)$ is increasing in $I_i$ and $\rho(I_i) \in (0, 1)$. The manager pays a flat audit fee $F$ to hire a risk-neutral auditor to credibly verify the outcome of the investment.

I exogenize manager’s reporting decision because my model focuses on auditor’s independence decision. The auditor chooses an effort level $e_A$ at a cost $C(e_A)$ and obtains a signal $\xi$ regarding the probable outcome of the investment, which can be either high (denoted by $S^H$) or low (denoted by $S^L$), $\xi \in \{S^H, S^L\}$.

The audit technology is assumed to have one-sided errors: If the true outcome is $H$, the auditor will not obtain $S^L$, no matter what effort level the auditor exerts. If the true output is $L$, however, the auditor will obtain a correct signal $S^L$ with probability $q(e_A)$ and obtain an incorrect signal $S^H$ with probability $1 - q(e_A)$, where $q'(e_A) > 0$. To simplify the model tractability, I assume that the auditor has two effort level to choose: a low effort level (denoted by $e_A^{\text{low}}$) or a high effort level (denoted by $e_A^{\text{high}}$). Based on the audit signal obtained, the auditor issues a report $r \in \{\hat{H}, \hat{L}\}$ to the investors. To provide the manager with strong impetus to induce the auditor to issue a favorable audit report, I follow Dopuch et al. (2001) by assuming that an $\hat{H}$ report results in a higher compensation for the manager than an $\hat{L}$ report (denoted by $M_{\hat{H}}$ and $M_{\hat{L}}$, respectively).

If the audit signal is $S^H$, the auditor can only issue an $\hat{H}$ report. Note that signal $S^H$ may come from two possible scenarios: (a) the true outcome is $H$, and (b) the true outcome is $L$ and the auditor has $1 - q(e_A)$ probability of obtaining $S^H$. I refer to scenario (b) as a technical audit failure (denoted by $\text{AF}_{\text{tec}} \equiv p(S^H | L)$) because the auditor cannot effectively discover the true outcome of the
investment due to his imperfect audit technology and effort level. When an AFtec occurs, the auditor’s legal liability will depend on the state of the economy and the auditor’s effort level. If the state of the economy is good (with probability $1 - \delta$), I assume that the firm will not go bankrupt (even though the investment outcome is $L$) and, therefore, the investors will not sue the auditor for damage compensations. In contrast, a lawsuit against the auditor will be triggered when the state of the economy is bad (with probability $\delta$) because the firm cannot survive as a going-concern due to its low investment outcome. Since AFtec involves an unknowing violation of the securities laws, the 1995 Reform Act stipulates that the auditor be held liable for the AFtec damages proportionately. I assume that the court will find the auditor negligent with probability $\lambda(e_\lambda)$, where $\lambda'(e_\lambda) < 0$. Note that $\lambda(e_\lambda)$ is strictly less than one under the negligence legal regime (denoted by NE) but equals one under the strict legal regime (denoted by ST) to reflect the fundamental difference between these two legal regimes. If the court holds the auditor liable, it then determines the portion $k$ of the total damages $D_{\text{tec}}$ that will be paid by the auditor. In my model, this damage portion $k$ equals one under the joint-and-several (denoted by JS) rule and is strictly less than one under the proportionate (denoted by PR) rule.

On the other hand, if the audit signal is $S^L$, the imperfect audit technology ensures the auditor that the true investment outcome is $L$. In this situation, the auditor may issue either an $\hat{H}$ or $\hat{L}$ report, depending on his independence decision. Since the manager’s compensation is influenced by auditor’s report, the manager has strong motivation to induce the auditor to issue an $\hat{H}$ report. To create a setting in which the auditor will compromise his independence to the highest level, I assume that the manager provides (a) the present value of quasi rents accrued in future audit engagements (denoted by $ER$), and (b) the manager’s side payment to the auditor in the current period (denoted by $SP$) to the auditor in exchange of an $\hat{H}$ report. Under this setting, the auditor has two reporting strategies to choose. If he decides to keep $ER$ and accept the $SP$, the auditor will issue an $\hat{H}$ report and the manager will retain the auditor for another period (if mandatory rotation is not required). I refer to this scenario as an independence audit failure (denoted by $AF_{\text{ind}} \equiv p(\hat{H} | S^L)$) because the auditor
intentionally misrepresents the true outcome of the investment due to his lack of independence. When an AF_{ind} occurs, the auditor’s legal liability will still depend on the state of the economy and his effort level. If the state of the economy is good, the investors will not sue the auditor for damage losses because the firm is not bankrupt. In contrast, the investors will file a lawsuit against the auditor when the state of the economy is bad because the firm will go bankrupt. Since the auditor commits a knowing violation of the securities laws, the 1995 Reform Act rules that he will be held liable for the AF_{ind} damages jointly and severally. Again, I assume that the court will find the auditor negligent with probability \( \lambda(e_d) \). If the court holds the auditor liable, it then determines the total damages \( D_{ind} \) the auditor should pay to the investors.

If the auditor decides to refuse the SP and insist on issuing an \( \hat{L} \) report, the manager may chose to dismiss or retain the auditor. A manager who dismisses an auditor incurs a switching cost (denoted by \( SC \)) in the first period of the new audit engagement. Because the auditor is dismissed, he will lose the present value of future quasi rents \( ER \). This one-period game then ends. Figure 1 presents the game tree of the interactions between manager and auditor.

[Insert Figure 1 here]

This study will then conduct a series of experiments (see section 2.2 below) to test the economic and behavioral predictions (or hypotheses) specified in the model. Laboratory markets are used because of the complexity of real markets and a lack of naturally occurring data on important environmental and institutional variables. Also, experimental methodology provides a controlled environment to investigate the issue of interest. If the experimental results support the model, such support may emerge in spite of \( ex \ ante \) behavioral considerations to the contrary. If the results do not support the model’s predictions, a theoretical basis should be pursued to explain why these are not supported (Kachelmeier 1996; Smith 1989, 1994). In fact, deliberate artificiality allows for more direct tests of theory, and this more direct access to theoretical propositions may improve generalization, because it is the theoretical statements, not raw findings, that are used to explain or describe phenomena in the real world (Swieringa and Weick 1982).
2.2 Experimental Design:

To test the hypotheses of interest, this study adopts the split-plot factorial design, with two between-subject variable, REGIME (manipulated at two levels: NE vs. ST) and ROTATION (No vs. 4-period rotation vs. 8-period rotation), and one within-subject variable, RULE (manipulated at two levels: JS vs. PR), leading to 12 experiments. Two different lengths of mandatory rotation periods are examined because the extension of the rotation period may change the incentives of auditors to adopt different cooperative strategies when a mandatory rotation mechanism is implemented (Dopuch et al. 2001). The split-plot factorial design is used to reduce noises in the experimental data, which is often high in early periods of the experiments because of the complexity of the experimental environment (Bloomfield and Wilks 2000; Libby, Bloomfield, and Nelson 2002). Each experiment consists of 40 periods of treatment JS and 40 periods of treatment PR. To minimize the carryover effect, two RULE orders are manipulated for each REGIME level: JS_PR (labeled “Order #1”) and PR_JS (labeled “Order #2”). Each period simulates the one-period game between auditor and manager specified in section 2.1. Four dependent variables are of particular interest: (a) the firm’s investment level, (b) auditor’s effort level, (c) auditor’s AF_{tec} rate, and (d) auditor’s AF_{ind} rate. Table 1 demonstrates the experimental design adopted in this study.

Following Dopuch et al.’s (2001) matching process, a manager who dismisses an auditor will be randomly matched with a different auditor. This matching process gives the manager a 80% probability of being matched with any unemployed auditor (if there are unemployed auditors), and a 20% probability of being matched with an employed auditor. Subjects will be informed of the matching processing, although they will not know these probabilities. Subjects will know that auditors are never matched with more than two managers at any given period, and that an auditor is never re-matched with a manager who has just dismissed him. In addition, once a manager dismisses an auditor, all subsequent auditors interacting with this manager will be informed that the manager has ever dismissed an auditor. The formation of such reputation increases the credibility
of the dismissal threat, which is necessary to create an incentive to compromise auditor independence.

A notional currency called *Experimental Dollars* (EDs) is used in the experiments. All market communications and exchanges being handled by a system of networked personal computers. One pilot test will be conducted before the formal experiments to test the appropriateness of the experimental instructions. In the formal experiments, a total of 240 junior and senior student subjects will be recruited from the Business Schools at National Chengchi University, with ten human auditors and ten human managers in each of the 12 experimental markets. Students will participate in two sessions. At the one-hour *training* session, subjects will receive written instructions that will be read aloud by the experimenter. After clarifying questions are answered, a quiz (consists of 10 true-false questions) is given on the computer screen to ensure that all subjects have understood the instructions and how their decisions might affect their cash payments. Participants will then be given the opportunity to practice transactions via the computers by making decisions in two different roles (i.e., auditor and manager). Each subject plays each role for 10 periods to become familiar with the way in which different players arrive at different decisions. This training session is scheduled because of the relative complexity of the experiments. Prior experimental research has shown that the volatility of subjects’ behavior decreases with experience in the particular market settings and with exposure to decisions faced by other players (Forsythe and Lundholm 1990). Even though subjects’ payoffs will be calculated at the end of the training session, no physical cash payments shall be made.

Immediately following the training session will be the two-and-half-hour *experiment* session. All subjects will draw to determine the role they will play in the experiment and the market periods then commence. Upon completion of all market periods, subjects will be asked to complete a post-experiment questionnaire, paid their earnings privately in cash, and dismissed.

### 2.3 Statistical Analysis:

Two points related to the data analyses are worth noting. First, the data set of 240 observations
consists of 20 independent replications of each of the 12 experiments. One observation represents the *average* behavior of the overall 40 periods played by the same subject. Second, the parametric ANOVA, regression, and paired $t$ tests will be used for statistical analyses. A nonparametric bootstrap method will also be used to verify the results because of the relatively small number of observations in each experiment.

3. EXPERIMENTAL RESULTS

Please contact the author for detailed analysis results.
Manager determines investment level and effort level

$$\begin{align*}
&\rho(I_i) \\
&1 - \rho(I_i)
\end{align*}$$

Investment output realized

$$H$$

$$L$$

Auditor chooses effort level

$$1$$

$$q(e_A)$$

$$1 - q(e_A)$$

Audit signal received

$$S^H$$

$$S^L$$

Auditor determines audit report type

$$\hat{H}$$

$$\hat{L}$$

Audit failure?

No

Yes

Audit failure?

No

$$\lambda(e_A)$$

$$1 - \lambda(e_A)$$

Audit failure?

No

$$\lambda(e_A)$$

$$1 - \lambda(e_A)$$

Is auditor liable?

Yes

No

Is auditor liable?

Yes

No

Dismiss auditor?

retain

NA$^*$

NA$^*$

NA$^*$

NA$^*$

NA$^*$

NA$^*$

retain

$$\delta$$

$$1 - \delta$$

$$\delta$$

$$1 - \delta$$

*Since the firm will go bankrupt under these four situations, the manager’s dismissal decision is not available. Therefore, the auditor has to terminate the audit engagement and be matched with a new client in the next period.
<table>
<thead>
<tr>
<th>Experiments</th>
<th>REGIME Parameter</th>
<th>λ(e₁₄)</th>
<th>ROTATION</th>
<th>RULE Parameter</th>
<th>RULE Parameter k</th>
<th>Number of Periods</th>
<th>Number of Subjects</th>
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</thead>
<tbody>
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<td>1 (Order #1)</td>
<td>NE</td>
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<td>JS</td>
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<td>PR</td>
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<td>REGIME Parameter $\lambda(e_A)$</td>
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