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Board of Director Characteristics and Earnings Management- Evidence from the Effect of Family- Controlling on Taiwan Corporations*

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ABSTRACT: Recently, there were quite a number of accounting scandals and financial fraudulence emerged within American stock markets that led to austere dubiousness about the true financial performance of the company. Unsuitable corporate governance system has been esteemed the root of the matter suffering the serious consequences on financial statement fraud instances. Corrupt morals of firm management provide lessons for Taiwan to stress the pivot of corporate governance. According to the stipulations of Taiwan Stock Exchange (TSE) and Taiwan’s computerized over-the-counter market (OTC) listing rules, every publicly held company should at least bring two independent directors and one independent supervisor into their boards after 2002. This study examines whether accounting choices are driven by opportunistic managers who exploit lax corporate governance system and the impact of family business group on the effectiveness of governing firm management. This paper finds that firms with family-controlled structure show a poor corporate governance system. However, with respect to lower family-controlled firms, researchers find that boards are more independent than their counterparts. Likewise, abnormal accruals decline when board size exceeds nine board members and when managerial stockholdings exceeds 25%. A negative relation is also found between foreign institutional shareholdings and abnormal accruals. Further investigation provides evidence that family-controlled firms are associated with weak board monitoring.

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Data Availability: Board independence data are derived from a proprietary database, other data are available from public sources identified in this study.

I. INTRODUCTION

On account of the accounting scandals found at American large companies in recent years, critics argue that opportunistic managers enrich their wealth by making aggressive accounting discretion at the expense of shareholders' interests. This raised concerns in the effectiveness of corporate governance about monitoring managerial accountability. To date, however, lacking of empirical research that seeks to make sure whether the role of the board can improve the integrity of accounting information. This paper uses data from Taiwan to explore the cross-sectional relation between board composition, ownership structure and accounting discretion measured as abnormal accruals following the publication of the TSE listing rules after controlling for other determinants of earnings management.

To recover the capital market's confidence in the financial statements of companies, the U.S. government has enacted the Sarbanes-Oxley Act of 2002, in which corporate governance systems are listed as a crucial part. Implicit in the promulgation acts is the assertion that good corporate governance structures are beneficial to improving the credibility of financial reports of public company. Additionally, Blue Ribbon Committee's recommendations (BRC) are the view that solid corporate governance plays critical roles in ensuring the reliability of published financial statements, and independent board members are better monitors of management. In recent years, there has been a rising appeal for companies in Taiwan to enhance the corporate governance function and improve the credibility of financial reporting. Knowing that inadequate corporate governance does harm to the going-concern of the firms, Taiwan securities regulator (Securities and Futures Commission, SFC) set out to amend TSE (the Taiwan Stock Exchange) Listing Rules and Supplementing Rules to TSE Listing Rules in 2002 that actively introduce the system of independent directors and independent supervisors. In response to continuing concerns with the integrity of financial reporting process, the board directors in Taiwan need not satisfy the qualification of shareholders according to the amended Companies Law 192(1). It is thus hoped that such amendment can make

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1 In the aftermath of financial statement fraud such as Enron, WorldCom, Global Crossing and AOL Time Warner, many believe managers sometimes make accounting choices to maximize their own personal benefits rather than those of the company or its external constituents.

2 Blue Ribbon Committee sponsored by the NYSE (New York Stock Exchange) and NASD (National Association of Securities Dealers) primarily aimed at improving the reliability and integrity of financial statement of public companies.

3 The article content of the Companies Law 192(1) is as follows: the board of directors of a company shall
outside directors help to restrain accrual management and aim at promoting higher quality of reporting earnings.

For splendid corporate governance, the integrity and composition of the corporate boards are the most critical elements. The integrity of the board hinges upon its construction in terms of number and relative percentage of independent directors and inside directors. Proponents of board monitoring role hold that outside directors are pivotal to the effective alleviation of agency problems between managers and shareholders (Fama and Jensen, 1983; Williamson, 1983). Insiders include incumbent employees of the company or relatives of firm officers. Outsiders have no affiliation or business ties with the firms beyond being a board member but need necessary professional knowledge and related practices, which equip the individuals with financial sophistication to be effective monitors to govern firm management, and thereby they are also called public directors or independent directors. The independent directors should be independent of management and without any business or financial links that could exacerbate the agency conflicts between shareholders and upper management. Thus, outside directors play a more prominent role in preventing managers’ rent-seeking behavior (Fama and Jensen, 1983). It is believed that insiders are subordinated to the upper management and unable to carry out overseeing duties on behalf of its shareholders (Weisbach, 1988). Boards structured to be independent of management are best able to perform their oversight tasks and to avoid managers sacrificing the interests of shareholders (Fama and Jensen, 1983). U.S. evidence shows that independent boards do have great capability of withstanding pressure from the firm to make accounting discretions, where earnings reports may reflect the artificial operating performance of the company. For example, Beasley (1996) finds that a higher percentage of outside directors on the board is related to a lower occurrences of fraudulent financial reporting. Dechow et al (1996) examined a similar sample using firms subject to SEC Accounting and Auditing Enforcement Releases (AAERS) and found results which were consistent with those reported by Beasley (1996). In addition, empirical studies in the U.S. also find evidence to indicate that the presence of institutional shareholders and managerial ownership has lower amounts of estimated abnormal accruals and can stifle earnings management (Warfield et al. 1995; Klein 2002).

The lack of research on the relation of board characteristics and earnings management in Taiwan could be attributable to the data collection difficulties. However, only few literatures are pertinent to the issues of the impact of board members characteristics on corporate governance. These characteristics include board size, the combination of CEO and Board Chair positions, board members’ shareholding, institutional ownership and the percentage of outside directors on the board (Liu and Yeh 1999; Chen and Yeh 2002; Yeh et al. 2002; Wu 2003). Unfortunately, the above literatures provide no consensus about the association between board characteristics and

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4 Because of inability to access the detailed data about board members’ certification from the publicly objective reports, a major shortcoming of previous studies is that the criteria to judge independent directors may vary according to each researcher, which may result in the inconsistent research conclusions.
Notwithstanding exploration the issues of board structure on earnings management is plenty of empirical evidences in U.S. Yet corporate governance devices and watch-out activities undoubtedly affect the magnitude of earnings management, and the weights of these factors vary across firms and across countries (Ching et al. 2002). The unique corporate governance system in Taiwan can be characterized by the prevalence of business groups that consist of legally independent, horizontally and vertically distributed firms, which is different from the U.S. management group environment. The U.S. economy may be characterized as the separation of ownership and control whose firm management is made up of professional managers. Thus, the prominent role for corporate governance lies in introducing outsiders as a means to ameliorate managerial agency problem. The purpose of corporate governance in Taiwan is closely bound up with the protection of minority shareholders. Therefore, research studies using American data have limited relevance for Taiwan. For the sake of comparison, a dearth of investigation of this topic in Taiwan merits researchers’ attention.

The Taiwan government sees strong corporate governance as necessary measures to protect shareholders and investors. Hence, SFC recently amended and released “Criteria governing information to be published in annual reports of companies” in 2001. Compliance with the foregoing TSE listing rules is voluntary and such stipulation that companies remain free to choose their own board composition. But the SFC demands all Taiwan listed firms to depict a statement of compliance with the disclosure rules in their annual report. These compliance reports, together with the independence standards based on the TSE listing rules, are used to accurately measure the relationship between board composition and earnings management, which might help to improve the research validity.

Additionally, the Taiwan economy can be dominated by the popularity of controlling shareholders in family relationship. Prior studies on earnings management typically stop at the analysis stage of the whole observations, and then report the associative link between abnormal accruals and proxies for poor corporate governance as evidence in favor of managerial rent-seeking behavior. However, such an observed relation may be premature because of ignoring the influence of the family firms. To disentangle researchers’ interpretation from the other papers, this paper further investigates whether the family-controlled firm has poorer corporate governance mechanisms than the non-family-controlled firm does in the viewpoint of earnings management. At present evaluating the executing efficacy of independent directors’ system is a hot issue, however, domestic research to date is in want of the empirical evidence on the corporate board of directors. This finding has policy implications for investors, practitioners, and regulators, which would tighten board independence.

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5 There is a substitution effect between the external takeover market and the internal board mechanism. For example, Williamson (1984) suggests a “Substitute Hypothesis” which claims that when the managerial control market is weak, the importance of board as corporate control function is highlighted and whose composition would tend to have more outside directors in order to avoid tunneling defined as the practice of expropriating firm resources by controlling shareholders. In addition, Hsu et al (2003) show that the board seats indicator is better than the directors’ ownership indicator in term of measuring the decision-influencing power of controlling family.
requirements for family-controlled firms.

Measuring accounting discretion is laden with difficulty. This paper follows past literature by using the absolute value of abnormal accruals to proxy for earnings management activity. Four board characteristics are examined here: board independence, board size, the role of institutional investors and managerial shareholdings. This study finds little explicit association between earnings management and board characteristics as a whole sample. However, by virtue of deeply going into board composition nature, researchers are able to demonstrate significant linkages between earnings management and how boards are structured. First, board size and managerial ownership yield a nonlinear effect on earnings management. Next, corporate governance role of institutional investors indeed vary with their types. Third, the production a remarkable effect of corporate governance finally depends on specific board construction. It is distinct that the presence of family-controlled boards will undoubtedly have an adverse effect on governing firm management, which would cause most of corporate governance mechanisms to be useless including the existing independent directors and supervisors system. The empirical evidence corresponds to the thought that appropriately structured boards are carrying out their financial reporting duties more effectively.

The remainder of this paper proceeds as follows: Section II reviews prior research on the issues of corporate governance and earnings management. The hypotheses development and research design issues are depicted in Section III. Section IV discusses the sample selection and data characteristics, and Section V presents the empirical analyses and the findings. This paper concludes with a summary and discussion in Section VI.

II. REVIEWS OF RELATED LITERATURE

The past ten years have put an ongoing emphasis on the area of corporate governance research (Pettigrew 1992). A number of papers have been done recently and thus it has become common in the modern management field research. The fundamental ideas of corporate governance encompass the combinations of market and institutional mechanisms that persuade rent-seeking managers to chase the maximization value of the firm on behalf of outside shareholders. In general, corporate governance researches to date mostly highlight the contributions into context in the corporate governance literatures on board interaction with other organizations of firm, board compositions, the playing role of the board and the proliferation of agency problems (Zajac 1990; Westphal and Zajac 1997). Hence, researchers survey the papers related to the issues on board characteristics and corporate ownership structure. A concise investigation into these related literatures are organized as follows:

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6 This study aims exclusively at the method of earnings management related to accruals discretion. The tests don’t include other possible tools of earnings management such as accounting method choices, asset write-downs or disposal, the measurement of bad debt expenses and the valuation of deferred income tax asset or liability. Thus, the terms “abnormal accruals” and “earnings management” will be interchangeably used in this paper.

7 Audit committees are not mandatory in Taiwan board structure and do not generally exist for most of publicly held firms, so this study fails to take audit committee role into consideration.
The Relationship between Board Composition and Earnings Management

One stream of the corporate governance literature examines the association between board structures and earnings management. Prior studies find that the quality of financial statements is associated with certain board characteristics. The underlying intuition is that having a higher proportion of independent outside directors on the board would result in better monitoring activities and protect shareholders from their interests expropriated by firm management (Weisbach 1988; Byrd and Hickman 1992; Brickley et al. 1994). Recent empirical work on the association between board independence and earnings management include Chtourou et al. (2001); Peasnell et al. (2001); Klein (2002) and Xie et al. (2003). These researches consistently demonstrate that outside directors who are less aligned to management may be more inclined to constrain firms to manage their reported earnings in order to maintain the value of their reputation capital. As to the field of Taiwan’s board independence, there is short of a series of empirical studies to provide systematic evidences, the main reason behind this is due to no stipulation of board independence system and the problem of data collection.

The number of board directors is an essential factor in role performing of the board. Yet these papers to date don’t come to a consistent conclusion about the association between board size and board oversight function. Some literatures provide evidence that a smaller board may be functional effective and provide scrupulous financial statements oversight (Jensen 1993; Beasley 1996). Yet, other studies argue that a larger board may be able to accommodate a broader members of corporate experience or financial knowledge and might be better at preventing managers’ opportunistic actions (Dalton et al. 1996; Chtourou et al. 2001; Chen and Yeh 2002; Yeh et al. 2002; Wu 2003; Xie et al. 2003). Given these conflicting results, the empirical direction of the relationship between board size and board effectiveness is unclear. In addition, when one person occupies both board chairs and CEO positions, the board can’t keep an eye on management for outside shareholders (Fama and Jensen 1983; Jensen 1993). In such situations, the makeup of the board of directors is less effective as monitors of management (Dechow et al. 1996; Chen and Yeh 2002).

The Relationship between Ownership Structures and Earnings Management

A second strand of corporate governance research investigates whether the presence of institutional investors and managerial ownership mitigates managers’ incentives to manipulate accounting earnings. It is generally believed that institutional investors with a considerable stockholdings in the companies are more likely to criticize and challenge board’s decision because firm’s operation performance has a tremendous impact on their investment wealth (Blair 1995; Liu and Yeh 1999). As to Taiwan stock market, although the stake of institution’s shareholdings is not material, and yet institutional owners gradually hold a substantial position along with the financial market being actively opened and released from fund transfer regulation. The fact of being capital market participants can’t never be neglected. Moreover, partial institutional investors with sizeable ownership and professional reputation maintenance provide them with strong motivations to monitor firm management closely and act as an important corporate governance role (Ko 2000). U.S. empirical evidences argue that large institutional ownership may induce a lower level of abnormal accruals (Rajgopal and Venkatachalam
The involvement of managerial ownership in corporate governance arises from the separation of ownership and control and the lack of incentives for cutting agency costs. That is, managers have incentives to behave opportunistically in the absence of monitoring. Managerial ownership can be as another oversight mechanism from the viewpoint of agency problem. This hypothesis arises from Jensen and Meckling (1976) theory that as the manager’s share ownership falls, they will increases looting firm’s wealth. As the manager’s share ownership rises, the manager will have increased incentives to maximize job performance and reduced incentives to consume perks. Several empirical results supporting the view of Jensen and Meckling (1976) show that as managerial ownership increases, firms are less likely to manipulate earnings performance (Dhaliwal et al. 1982; Warfield et al. 1995; Klein 2002). However, based on the performance of maintaining or raising stock return and avoiding wealth loss, others content that there exists an inverse relationship between managerial ownership concentration and earnings management (Yermack 1997; Aboody and Kasznik 2000). The evidence on the role of managerial ownership is inconclusive.

III. HYPOTHESES DEVELOPMENT AND RESEARCH DESIGN

Theory and hypotheses development

This study examines the impact of board composition and ownership structure on earnings management by firms. Board composition is measured by the proportion of non-executive directors, CEO duality and board size. Ownership structure is characterized by managerial ownership and institutional ownership. Researchers elaborate on these theories and describe how hypotheses are developed in greater detail below.

Board Independence

Prior researches have shown that earnings manipulation is closely connected to weaknesses in the oversight of firm management (Beasley 1996; Dechow et al. 1996). The effectiveness of internal corporate governance mechanisms corresponds to the structure of board member (Weisbach 1988; Rosenstein and Wyatt 1990; Byrd and Hickman 1992; Brickley et al. 1994). Outside directors may view board member experience as a means of developing reputation as experts in the external labor market (Fama and Jensen 1983; Shivdasani 1993). Therefore the inclusion of outside directors is crucial to strengthening a board’s independence. Beasley (1996) finds that the incidence of fraudulent financial reporting allegations is characterized by a lower percentage of outside directors on the board. Dechow et al. (1996) report similar findings for firms subject to SEC accounting enforcement actions. Similarly, Klein (2002) and Xie et al. (2003) present evidence of the negative link between the absolute abnormal accruals and the proportion of outside directors. Peasnell et al. (2001) also find that the income-increasing accruals are negatively related to the percentage of outside directors for a sample of U.K. firm. Hence, one might expect outside directors indeed perform monitoring duties more effectively than inside directors. This leads to the formulation of

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8 The expectation that the extent of earnings management will be negatively related to the proportion of outside directors is based on the following two reasons: (a) outside directors usually possess necessary
the first hypothesis:\(^9\):

**Hypothesis 1:** There is a negative association between board independence and the degree of earnings management.

**Size of the Board**

The two opposing views about the role of board size in corporate governance are controversy. On the one hand, Jensen (1993) argue that firms with smaller board of director play better monitors because they are less easily controlled by CEO than is a large unwieldy board. Beasley (1996) finds that as board size increases, the occurrences of fraudulent financial reporting increases. On the other hand, another view holds that large boards are valuable for the breadth of their services and more effective in preventing manager’s opportunistic behavior (Dalton et al. 1999). Chtourou et al. (2001) and Xie et al. (2003) document the evidence supporting that a larger board seems to govern the financial statements process more effectively.

Chen and Yeh (2002) argue that a larger board possesses broader environmental links and more expertise which may provide better financial reporting oversight. Yeh et al. (2002) and Wu (2003) also indicate that the power of controlling shareholders decreases as more directors are added to firm board because of larger size making it difficult to extending their board seats. If so, a larger board might be better at preventing earnings management. Because of this lack of consensus about the directional relationship between board size and abnormal accruals, this study has no directional predictions for board size. Following these arguments hence, the second hypothesis is stated as follows:

**Hypothesis 2:** The board size is related to the degree of earnings management.

**CEO-duality**

Academic literatures and corporate governance reports\(^10\) recommend that the combination of CEO and Board Chair positions should be prohibited so as to guard against most of power laid at the mercy of the CEO (Fama and Jensen 1983; Jensen 1993; Dechow et al. 1996; Park 1999; Chen and Yeh 2002). The power to grasp the corporate boards comes from the fact that the chair may heavily influence the board’s agenda-setting and meetings-running, and from the authority of the board’s role in assigning and overseeing managers. However, there still exist a few researches indicating that the relation between CEO-duality and financial statements fraud or the manipulation of accounting earnings is not affirmative (Abbott et al. 2000; Beasley et al. 2000; Bowen et al. 2003). In order to draw a sharp profile in the effect of CEO-duality, this study investigates once again the association between the combination of CEO and chairman incentives to govern the presentation of financial statements for their personal reputations (Peasnell et al. 1999) and (b) outside directors have the ability to detect earnings management activity because they often serve as senior management positions in other large companies (Fama and Jensen 1983). All hypotheses in this paper are stated in the alternative form.

\(^9\) According to BRC recommendations, the segregation of CEO and Board Chair positions is appropriate to enhancing the board governing function and avoids to being the rubber stamp of firm management.
role and abnormal accruals. This leads to the third hypothesis.

**Hypothesis 3:** There is a positive association between CEO duality and the degree of earnings management.

**Institutional Ownership**

In addition to board membership, this study also examines corporate governance as represented by ownership structure. Because of their sophistication and significant stockholdings, many believe that institutional owners would seek to guarantee their stakes against investment loss by monitoring management and have increased credibility of accounting information. Theory and empirical evidence indicate that institutional shareholders possessing the technical expertise serve as a valuable controlling function (Rajgopal and Venkatachalam 1998; Peasnell et al. 1999; Rajgopal et al. 1999; Matsumoto 2002). Researchers will examine whether the presence of institutional shareholders will likely reduce managers’ incentives to distort current earnings numbers. Hence, this study posits a negative relationship between level of institutional owners and the magnitude of abnormal accruals. This leads to the formulation of the fourth hypothesis:

**Hypothesis 4:** There is a negative association between institutional shareholders and the degree of earnings management.

**Managerial Ownership**

Finally, the overseeing function of corporate governance is also contingent on the disciplining mechanisms from firm management. Stockholdings by managers is a double-edged sword. When managerial ownership is low, there is a greater agency problem. That is, the manager has greater incentives to focus on self-interest. But higher stock ownership by managers leads to a closer alignment of managers’ interest and other stakeholders’ interests. Prior research by Warfield et al. (1995) and Klein (2002) document a negative relationship between earnings management measured as absolute abnormal accruals and managerial ownership. Dhaliwal et al. (1982) also find that managerial ownership is negatively related to income-increasing accounting methods. However, a competing view holds that if managers of higher level of stock holdings believe that failing to meet or outweigh the past earnings targets may result in a fall in stock price and the value of managers’ wealth, they would probably make accounting discretion (Yermack 1997; Aboody and Kasznik 2000). Thus, one might expect a two-sided prediction on the association between managerial ownership and abnormal accruals. These views that form the basis of the final hypothesis are elaborated below.

**Hypothesis 5:** Managerial ownership will be related to the degree of earnings management.

The above research hypotheses are established on extant theories and empirical results that concern the overall impact of corporate governance measures on earnings
management as a whole. Specifically, it is argued that family business is one of the dominant characteristics existed in Taiwan companies. This unique setting may affect the investigating links between earnings management and various corporate governance aspects. Accordingly, The article further examines whether business groups (so called “family-controlled firms”) have weaker corporate governance systems than independent firms (so called “non-family-controlled firms”) do.

Finally, the above analyses are based on the assumption that board characteristics and ownership structure have a linear effect on earnings management. However, there are a few literatures indicating that the nonlinearity relationship may exist in some corporate governance mechanisms. For example, Vafeas (2000) shows that the value of board size in enhancing the quality of financial reports may be non-linear. Liu and Lu (2002) suggest that the association between managerial ownership and accruals exhibits an inverse U-shape relationship. Hence, this article also investigates whether board size and managerial ownership effects on earnings management vary depending upon the level of the two.

**Empirical Methodology**

**Calculation of Abnormal Accruals**

This study mainly employs the multiple regression models to test whether poor corporate governance devices weaken the quality of firm financial statements. Accruals management is not directly observable. Hence, this paper uses the absolute value of abnormal accruals as a gauge of measuring management manipulation in determining accounting numbers. Because this study is concerned with the using of both income-increasing and income-decreasing accruals by managerial discretion, researchers use the absolute abnormal accruals in lieu of the signed measures (Defond and Jiambalvo 1994; Subramanyam 1996; Becker et al. 1998; Francis et al. 1999).

Recent research (Dechow et al. 1995; Guay et al. 1996) concludes that, of all the available models, the modified Jones model is the best model to date for measuring earnings management. Extant literatures further posit that a cross-sectional approach as opposed to the time-series counterpart helps to maximize the sample size and avoid the survivorship bias problem and not require the assumption that data remains stationary.

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11 Accruals-based measurement methods are theoretically appropriate to capturing opportunistic earnings management because they reflect aggregate outcome of accounting numbers formation and are relatively difficult to detect (Schipper 1989). Generally speaking, the earnings management literatures propose to decompose total accruals into discretionary and nondiscretionary components. Non-discretionary accruals are connected to normal operating activity, which mostly reflects the reasonable changes of accruals within the influence of dynamic economic environment. Discretionary accruals allow management to have leeway in the reported accounting numbers, and the managers choose an accrual subject to GAAP range.

12 The absolute value of abnormal accruals is an appropriate surrogate for the proximity to the combined effect of income-increasing and income-decreasing earnings management decisions (Warfield et al. 1995; Francis et al. 1999; Reynolds and Francis 2001; Frankel et al. 2002).

13 Empirical evidence demonstrates that the modified-Jones model measures discretionary accruals inaccurately due to the unusual nondiscretionary events unrelated to earnings management in the period (Healy 1996; Bernard and Skinner 1996; Collins and Hribar 2000). These non-articulation (non-operating) events include mergers and acquisitions, income from discontinuing department and foreign currency translation. Accordingly, this study labels estimated non-discretionary accruals as “normal accruals” and estimated discretionary accruals as “abnormal accruals”.
over time (Subramanyam 1996; Bartov et al. 2001). Therefore, the cross-sectional specification is the most extensively employed method in detecting earnings management models so far.

This paper also contributes to the estimation method on measuring abnormal accruals. Past literatures demonstrate that the estimation of abnormal accruals is related to a firm’s contemporaneous and past performance (Dechow et al. 1995; Guay et al. 1996; Healy 1996; Ashbaugh et al. 2003; Kothari et al. 2004). Specifically, they hold that not controlling for extreme performance growth in firm’s earnings pattern leads to measurement bias in estimating abnormal accruals, which may cause model misspecification. The designing well-specified tests of earnings management used throughout this paper adopts the regression-based approach technique as suggested by recent authors (Ashbaugh et al. 2003 and Kothari et al. 2004).

Consistent with recent U.S. studies (Becker et al. 1998; DeFond and Subramanyam 1998), this study uses a cross-sectional specification of the modified-Jones model to estimate parameters. The parameter of the modified-Jones model is estimated separately for each combination of industry codes and calendar years. All variables are deflated by lagged total assets to alleviate heteroskedasticity. Industry-year portfolios with less than thirty observations are excluded from the sample in order to ameliorate the efficiency of the parameters estimation. This study employs the regression parameters, \( \hat{\alpha}_j, \hat{\beta}_j, \hat{\gamma}_j, \) and \( \hat{\delta}_j \), from Eq. (1) to calculate abnormal accruals. Abnormal accruals are measured by subtracting normal accruals from total accruals, that is, abnormal accruals are defined as the fitted value from Eq. (2). The cross-sectional version of the modified-Jones model to estimate abnormal accruals is as follows:

\[
TA_{jt} / A_{jt-1} = \alpha_j (1 / A_{jt-1}) + \beta_j [(\Delta REV_{jt} - \Delta REC_{jt}) / A_{jt-1}] + \gamma_j (PPE_{jt} / A_{jt-1}) + \delta_j ROA_{jt-1} + \epsilon_{jt} \tag{1}
\]

\[
AbAcc_{jt} = TA_{jt} / A_{jt-1} - \{\alpha_j (1 / A_{jt-1}) + \beta_j [(\Delta REV_{jt} - \Delta REC_{jt}) / A_{jt-1}] + \gamma_j (PPE_{jt} / A_{jt-1}) + \delta_j ROA_{jt-1}\} \tag{2}
\]

Where \( TA_{jt} \) is total accruals measured by the difference between earnings before

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14Kothari et al. (2004) examine the model specification and test power based on a performance-controlling abnormal accruals measure and compare it with extant counterparts (e.g., the Original Jones and Modified Jones models). Their results suggest that performance-controlling abnormal accruals measure is better than traditional designing approach, which can mitigate the misspecification problem to reduce the likelihood of incorrect inferences.

15This study presents results based on last year’s ROA as a means to control for firm performance and include it to the Modified-Jones models as an additional regressor. Researchers leaving the matched-firm approach out of consideration subjects to the following three reasons: First, control firms which meet the same industry and the same performance standard is sparse because of larger sample firms used in this study; secondly, a matched-paired design may cause the selection bias problem due to the subjective matching process; third, Kothari et al. (2004) believe that if the abnormal accruals models are specified to address the linearity property, the regression approach might be an effective design.

16Industry-year portfolios with insufficient data include Automobile firms (industry code: 22) and Composite firms (industry code: 98).
extraordinary items and discontinued operations and cash flow from operations following Hribar and Collins (2002), \( A_{ijt-1} \) is the beginning of year's total assets, \( \Delta REV_{jt} \) is the change in net sales, \( \Delta RECi_{jt} \) is the change in accounts receivables, \( PPE_{jt} \) is gross property, plant and equipment, \( ROA_{ijt-2} \) is return on assets, \( i, j, \) and \( t \) are firm, industry, and time subscripts respectively. The residuals \( (\epsilon_{jt}) \) reckoned from equation (1) portray the firm-year discretionary portion of accruals.

**Variable Measurement**

The first hypothesis is that more independent boards are related to smaller absolute value of abnormal accruals. This study defines board independence in two ways. First, researchers define board independence as the proportion of non-executive directors on the board (Beasley 1996; Klein 2002). This is common definition used in the prior researches. Under this definition, board independence is measured by the percentage of outsiders, gray directors and independent directors on the firm's board. This study classifies directors as insiders, outsiders, gray directors and independent directors with the firm in accordance with the TSE listing requirements. The classification used in this study basically is consistent with most of the U.S. researches (Weisbach 1988; Byrd and Hickman 1992; Brickley et al. 1994; Klein 2002). As to how to measure these four statuses of directors, it will be explained in more detail in the fourth section. Second, researchers define board independence as a majority of non-executive directors on the board (Dechow et al. 1996; Klein 2002). The majority rule of board independence is measured by at least 50% of board members are outside directors or independent directors. The rationale behind this metric is that majority definition masters board decision-making and is fully free from managerial intervention.

To test Hypothesis 2 on the influence of board size on earnings management. The simple linear structure may not adequately capture the influence of board size on management discretion. Piecewise linear regression models may be more powerful at detecting such influence (Morck et al. 1988; Vafeas 2000; Joh 2003). The nonlinear effects of board size are estimated in three piecewise linear splines whose specification is calculated in the following manner. The "board size in first quartile" variable \( \text{sizel} \) is the value of board size if it is less than seven members, and seven members otherwise. Likewise, the "board size in second quartile" variable \( \text{sizem} \) is board size minus seven members if it is greater than seven members but less than nine members. It is two members if it is greater than nine members. Finally, the "board size above second quartile" variable \( \text{sizeh} \) is board size minus nine members if it is greater than nine members, and 0 otherwise. The piecewise linear regressions used throughout this paper are linear regressions with the above variables as regressors.

To test Hypothesis 3 on the effect of holdings of the CEO and Board Chair positions by the same person on earnings management researchers define a dummy variable, CEO-duality, that is set to one if the board chairman is the CEO and zero otherwise.

Hypothesis 4 concerns the impact of aggregate institutional ownership on earnings management. Prior research identifies that the effect of institutional investors on earnings management behavior depends upon the type of institution (Bushee 1998; Cheng and Reitenga 2001). Because institutional investors may differ in their trading strategy and
governance incentives. This study classifies institutional investors into three groups—foreign investors (foreign), securities investment trust enterprises (trust) and securities firms (broke)—based on the investment environment of extant Taiwan stock market.

Hypothesis 5 explores the impact of managerial ownership on earnings management. The managerial ownership data are manually collected from the annual reports. According to disclosure, percentage of equity ownership by major officers and inside directors, this variable (mgta) is calculated by reference to this information. As to dealing with the nonlinearity of managerial ownership effect, to be more specific, ownership’s nonlinear effects can be estimated in using piecewise linear splines from 0-5%, 5%-25%, 25%-100% (Morck et al. 1988; Joh 2003). The model specification is illustrated as follows. As an example of 28% managerial ownership, the “0-5%” variable (mgta0) is equal to 0.05, the “5-25%” variable (mgta1) is equal to 0.20, and the “over 25%” variable (mgta2) is equal to 0.03.

Recognizing that board composition and ownership structure are not the sole determinant of earnings management. This study also identifies several control variables that have been found in prior research to influence managers’ accounting discretion. A brief discussion of these control variables are described as follows:

The economic role of audits is to provide the credibility of reported earnings and to restrain opportunistic reporting of accruals. Past researches have demonstrated that Big-6 audited firms face severe monitoring of financial reporting practices and such overseeing constrain managers’ magnitude to employ discretionary accruals (Becker et al. 1998; Francis et al. 1999). The inclusion of firm size is motivated by the political-cost hypothesis based on positive accounting theory. Furthermore, controlling for firm size minimizes the potential correlated omitted variables problem (Becker et al. 1998). DeFond and Jiambalvo (1994) and Dechow et al. (1996) suggest that firms with greater debt are more likely to use abnormal accruals to avoid covenants violations. DeAngelo et al. (1994) argue that firms with financial difficulties may decrease reported earnings in order to strive for more concessions from the creditors. Previous literatures show that companies are inclined to exercise abnormal accruals to deter reporting losses when they had been faced with past negative earnings (Collins et al. 1999; Klein 2002). Warfield et al. (1995) and Klein (2002) find that growth firms have an incentive to use accounting discretion to avoid earnings volatility increasing perceived firm risk. In addition, Dechow et al. (1995) posit that tests of earnings management may result in misspecification when abnormal accruals are related to extreme earnings performance. Accordingly, This study uses the absolute change of current income before extraordinary items to capture the effects of extreme performance on abnormal accruals (Bartov et al. 2001; Klein 2002). Finally, Previous studies also suggest that the cash flow from operation is found to be negatively associated with the amount of abnormal accruals (Dechow et al. 1995; Becker et al. 1998).

This study employs maximum likelihood estimation (MLE) to examine the relationship between earnings management and the explanatory variables. The following regression specification is estimated:
\[ |AbAcc_i| = \beta_0 + \beta_1 Boindep_i + \beta_2 Size_i + \beta_3 Size_{em} + \beta_4 Size_{eh} + \beta_5 Ceo_i + \beta_6 Forei_i + \beta_7 Broke_i + \beta_8 Trust_i + \beta_9 Mgtal_i + \beta_{10} Mgtam_i + \beta_{11} Mgtah_i + \beta_{12} Boindep_i \ast Five_i + \beta_{13} Lnas_i + \beta_{14} Leve_i + \beta_{15} Twoni_i + \beta_{16} Btm_i + \beta_{17} Extn_i + \beta_{18} Cfo_i + \epsilon_i \]  

(3)

Where:

- \( |AbAcc_i| \) = the absolute value of abnormal accruals computed using the modified-Jones model after controlling firm performance;
- \( Boindep_i \) = board independence (the independent variables include Outr, Indep, Gray, Outm, Indepm, the percentage of the majority of non-executive directors on the entire board);
- \( Size_i \) = board size if board size < 7 (first quartile), 7 if board size \( \geq 7 \);
- \( Size_{em} \) = 0 if board size < 7, board size minus 7 if 7 \( \leq \) board size < 9 (second quartile), 2 if board size \( \geq 9 \);
- \( Size_{eh} \) = 0 if board size < 9, board size minus 9 if board size \( \geq 9 \);
- \( Ceo_i \) = the value of one if the board chairman is the CEO and zero otherwise;
- \( Forei_i \) = ratio of foreign investors’ ownership to total ordinary shares outstanding;
- \( Broke_i \) = ratio of securities firms’ ownership to total ordinary shares outstanding;
- \( Trust_i \) = ratio of securities investment trust enterprises’ ownership to total ordinary shares outstanding;
- \( Mgtal_i \) = managerial ownership if managerial ownership < 0.05, 0.05 if managerial ownership \( \geq 0.05 \);
- \( Mgtam_i \) = 0 if managerial ownership < 0.05, managerial ownership minus 0.05 if 0.05 \( \leq \) managerial ownership < 0.25, 0.2 if managerial ownership \( \geq 0.25 \);
- \( Mgtah_i \) = 0 if managerial ownership < 0.25, managerial ownership minus 0.25 if managerial ownership \( \geq 0.25 \);
- \( Boindep_i \ast Five_i \) = interaction term of \( Boindep \) and audit quality (coded as 1 if audited by Big 5 auditors and 0 otherwise);
- \( Lnas_i \) = natural logarithm of beginning year’s total assets;
- \( Leve_i \) = total liabilities divided by total assets;
- \( Twoni_i \) = coded as 1 if the firm had two or more consecutive years of reported losses and 0 otherwise;
- \( Btm_i \) = fraction of market-to-book value of equity;
- \( Extn_i \) = the absolute change in the current year’s income before extraordinary items divided by lagged total assets;
- \( Cfo_i \) = the cash flow from operation divided by lagged total assets;
- \( \epsilon_i \) = the error term;
IV. SAMPLE SELECTION AND SAMPLE CHARACTERISTICS

The sample for this study is drawn from firms listed on the Taiwan Stock Exchange. Most of the corporate governance data were hand-collected from the firm's annual reports for the year 2001. The formation of board composition data primarily grounds on the following disclosure information. In accordance with the board independence standards based on the §17 Supplementing Rules to TSE Listing Rules, all Taiwan listed companies need to portray a statement of compliance with the TSE rules in their annual report from 2001. Considering that some outside directors may not be completely independent of firm management. To identify situations where real independence may be violated, annual reports for each firm-year are disclosed to identify corporate directors that are: (1) non-employee; non-employee, director or supervisor of subsidiary, (2) not over 1% or top 10 person shareholder, (3) non-spouse or immediate family of the prior two categories, (4) non-employee, director or supervisor of over 5% or top 5 institute shareholder, (5) non-director, supervisor, manager or over 5% shareholder of the company's business dealing party, (6) non-profession to provide finance, business, law service to the company or the affiliate within recent one year, or the profession institute's partner, director, supervisor or manager and the above person's spouse, (7) five years experience in business, finance, law or corporate operation.

Under the independence principles of corporate directors, this study defines an outside director as a director who is not employed by the firm or its subsidiary and non-spouse or immediate family of the above persons. Any outside director who doesn’t meet all the left six criteria is classified as "gray". Then researchers define independent directors as outside directors that are not "gray". Hence, outside directors are partitioned into gray directors and independent directors. As Regards the status of inside directors, corporate directors who don’t belong to outside directors is defined as inside directors.

Following the above prescription, Current statute claims that independent directors should possess the capacity of independence and competence. Owing to the board independent prescription is still an initial stage, at present TSE and OTC listing rules only demand IPO firms should introduce two independent directors and one independent supervisor on their board. Regarding TSE companies, Taiwan policy encourages them to enhance the function of board independence in a promontional way. This voluntary system may result in the limitations of collecting independent samples. Therefore, this study relaxes the standard of board independence and includes grays and outsiders to researchers' test sample. Furthermore, subject to the information of board independence is

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17 To wit, outside directors must satisfy both qualification (1) and qualification (3) required by TSE Listing Rules. Regarding the discrimination between outsiders and insiders, this study makes further checks in effect. First, the qualifications examination must be consistent with respect to the corporate directors come from the same firm. Second, if corporate directors have been classified as outsiders, then researchers check on the detailed information of “Education and Experience” and “Other Current Position” to make sure outsiders' related experience or position isn't compatible with insiders'.

18 Namely, corporate directors who have been outside directors only meet any one of the left six criteria.

19 In other words, independent directors have need to meet all the eight criteria.

20 If corporate directors fail to satisfy both qualification (1) and qualification (3) required by TSE Listing Rules, they are judged as insiders in this study.
Disclosed on an annual report at the beginning of 2001. Therefore, the sample of this study is confined in the year 2001 afterward to engage in a cross-sectional analysis.

Table 1 shows the sample construction. It comprehends non-finance-related observations for the year 2001 inclusive. Listed companies' financial data are gathered from the TEJ Databases. Consistent with extant literature, finance-related firms are excluded since the different disclosure requirements in these industries limit the magnitude of managerial discretion. The corporate governance data were manually collected from annual reports. Firms with insufficient data are excluded. Industry-year portfolios with less than thirty observations are dropped from the sample to allow more efficient estimation of the regression parameters. For the sample, researchers only include firms with enough data to calculate accruals measures. Additionally, researchers winsorize all variables used in the regressions at three standard deviations above and below the mean to reduce the undue influence of extreme values\(^2\). The final sample consists of 295 firms with complete data for analysis.

### Table 1: Sample Selection Criteria

<table>
<thead>
<tr>
<th>Number of firms</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial TSE sample (the exclusion of Finance-related firms, Others firms, Automobiles firms and Composite firms)</td>
<td>374</td>
</tr>
<tr>
<td>Firms with missing independent variables</td>
<td>(27)</td>
</tr>
<tr>
<td>National corporations (1722, 2412, 2609, 2610)</td>
<td>(4)</td>
</tr>
<tr>
<td>Outlier for variables at three standard deviations above and below the mean</td>
<td>(48)</td>
</tr>
<tr>
<td>Final test sample</td>
<td>295</td>
</tr>
</tbody>
</table>

\(^a\) Finance/Insurance firm (industry code: 28), Others firms (industry code: 99), Automobiles firm (industry code: 22) and Composite firm (industry code: 98).

The industry distribution of independent directors and independent supervisors among samples is presented at Table 2. On average, 59% of observations have brought independent members into their board. There are totally 403 independent members on TSE companies in terms of observed firms. This phenomenon of corporate governance practice reveals that a considerable of firms strengthen their internal governance devices by virtue of appointing independent directors and supervisors. In addition, the ratio of voluntarily introducing independent directors and supervisors is different across industries, notably it is the highest in the electric, machinery industry and the electron industry, which means that the employment of independent directors and supervisors hinges on the property of industry.

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\(^2\) The similar treatment of outlier is suggested by Rajgopal and Venkatachalam (1998) and Bartov et al. (2001).
V. EMPIRICAL RESULTS

Descriptive Statistics

Table 3 shows the summary statistics of all variables used in the regression. Panel A shows that AbAcc have a mean (median) of -0.0573 (-0.0423). Turning to the governance variables, as shown in Panel B of Table 3, inside directors average 73.22% of total board seats; outside directors average 26.78% and independent directors average 14%. These percentages imply that board compositions vary widely from firm to firm. Most notably, some firm boards are composed of completely one status of director. With regard to the majority definition of board independence, on average, 13% (1.69%) of firms achieve the majority principles of outside (independent) members. Namely, the corporate board dominated by outsiders is thinly scattered. In terms of other board characteristics, the largest board size observed is 21 numbers, and the smallest is 3 persons, the mean size is 9.29 directors. Also, 32% of the sample firms are characterized as the CEO and Board Chair positions occupied by the same person. The distribution of managerial ownership (Mgta) is between 0% and 29%, the average managerial stockholding is 5.65%. The average ownership level of foreign investors (Forei), securities investment trust enterprises (Trust) and securities firms (Broke) hold 1.99%, 0.06% - 0.24% of total shares outstanding of the sample firms respectively. Ultimately, as reported in Panel C of Table 3, the variations of the control variables are slight owing to the exclusion of outliers’ intervention.

Outside director representation is smaller in the sample of Taiwan firms than in Klein (2002) sample of U.S. firms. In Klein’s sample, the average representation of outside (or independent) directors is 77.5% (or 58.4%). The reason for the different results between the two countries may come from not only family business characteristics but also the theory of property rights. According to Liu and Yeh (1999) research, the basic spirits of Taiwan legislation before the 2001 amendment to the Company Law advocate that shareholder is charged with company management, which reflects the argument of stockholder theory. In contrast to western countries, whose legislation tends to be in obedience to the stakeholder theory. The stockholder theory induces directors to make an effort to run companies by requiring them holding considerable shares; the stakeholder theory introduces independent directors to monitor firm management on behalf of outside stakeholder. Therefore, the composition of Taiwan corporate board usually doesn’t lay great emphasis on the mechanism of independent directors.
### Table 2: The Installation Practices of Independent Directors and Supervisors in TSE Companies across Industry

<table>
<thead>
<tr>
<th>Industry Code</th>
<th>Industry Classification</th>
<th>The number of firms</th>
<th>The observations of established independent directors and supervisors</th>
<th>The percentage of established independent directors and supervisors</th>
<th>The members of established independent directors and supervisors</th>
<th>The average members of established independent directors and supervisors per firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Cement</td>
<td>7</td>
<td>4</td>
<td>57</td>
<td>6</td>
<td>1.50</td>
</tr>
<tr>
<td>12</td>
<td>Foods</td>
<td>13</td>
<td>7</td>
<td>54</td>
<td>13</td>
<td>1.86</td>
</tr>
<tr>
<td>13</td>
<td>Plastics</td>
<td>12</td>
<td>7</td>
<td>58</td>
<td>17</td>
<td>2.43</td>
</tr>
<tr>
<td>14</td>
<td>Textiles</td>
<td>34</td>
<td>15</td>
<td>44</td>
<td>33</td>
<td>2.20</td>
</tr>
<tr>
<td>15</td>
<td>Electric and Machinery Elec. Appliance and Cable</td>
<td>25</td>
<td>21</td>
<td>84</td>
<td>55</td>
<td>2.62</td>
</tr>
<tr>
<td>16</td>
<td>Chemicals</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>17</td>
<td>Glass and Ceramics</td>
<td>5</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>18</td>
<td>Papers</td>
<td>5</td>
<td>3</td>
<td>60</td>
<td>5</td>
<td>1.67</td>
</tr>
<tr>
<td>19</td>
<td>Steel and Iron</td>
<td>16</td>
<td>8</td>
<td>50</td>
<td>19</td>
<td>2.38</td>
</tr>
<tr>
<td>20</td>
<td>Rubbers</td>
<td>5</td>
<td>1</td>
<td>20</td>
<td>3</td>
<td>3.00</td>
</tr>
<tr>
<td>21-24</td>
<td>Electron</td>
<td>106</td>
<td>73</td>
<td>69</td>
<td>166</td>
<td>2.27</td>
</tr>
<tr>
<td>25</td>
<td>Construction</td>
<td>26</td>
<td>18</td>
<td>69</td>
<td>47</td>
<td>2.61</td>
</tr>
<tr>
<td>26</td>
<td>Transportation</td>
<td>4</td>
<td>2</td>
<td>50</td>
<td>3</td>
<td>1.50</td>
</tr>
<tr>
<td>27</td>
<td>Tourism</td>
<td>3</td>
<td>2</td>
<td>67</td>
<td>9</td>
<td>4.50</td>
</tr>
<tr>
<td>28</td>
<td>Wholesale and Retails</td>
<td>7</td>
<td>4</td>
<td>57</td>
<td>7</td>
<td>1.75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>295</strong></td>
<td><strong>174</strong></td>
<td><strong>59</strong></td>
<td><strong>403</strong></td>
<td><strong>2.32</strong></td>
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<tr>
<td>Variable</td>
<td>Mean</td>
<td>Standard deviation</td>
<td>Median</td>
<td>Max</td>
<td>Min</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
<td>--------------------</td>
<td>--------</td>
<td>-----</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>Panel A: Earnings Management Variable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AbAcc</td>
<td>-0.057349</td>
<td>0.099384</td>
<td>-0.04229</td>
<td>0.2817</td>
<td>-0.7908</td>
<td></td>
</tr>
<tr>
<td>Panel B: Corporate Governance Variable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outr</td>
<td>0.267858</td>
<td>0.216295</td>
<td>0.25</td>
<td>0.875</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Indep</td>
<td>0.14</td>
<td>0.16</td>
<td>0.11</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Grayr</td>
<td>0.125612</td>
<td>0.165324</td>
<td>0.076923</td>
<td>0.75</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Outm</td>
<td>0.13</td>
<td>0.33</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Indepm</td>
<td>0.0169</td>
<td>0.13</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>9.29</td>
<td>3.33</td>
<td>9</td>
<td>21</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Ceo</td>
<td>0.32</td>
<td>0.47</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Forei</td>
<td>0.019955</td>
<td>0.035948</td>
<td>0.002</td>
<td>0.2107</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Broke</td>
<td>0.002375</td>
<td>0.006164</td>
<td>0</td>
<td>0.039626</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Trust</td>
<td>0.000582</td>
<td>0.00195</td>
<td>0</td>
<td>0.0138</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Mgta</td>
<td>0.056543</td>
<td>0.065524</td>
<td>0.0311</td>
<td>0.29</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Panel C: Control Variable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five</td>
<td>0.79</td>
<td>0.41</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Lnas</td>
<td>15.65648</td>
<td>1.094233</td>
<td>15.56206</td>
<td>19.54158</td>
<td>13.27642</td>
<td></td>
</tr>
<tr>
<td>Leve</td>
<td>0.46108</td>
<td>0.160019</td>
<td>0.473</td>
<td>0.9638</td>
<td>0.0659</td>
<td></td>
</tr>
<tr>
<td>Tweni</td>
<td>0.19</td>
<td>0.39</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Btm</td>
<td>0.941754</td>
<td>0.669119</td>
<td>0.774052</td>
<td>3.991107</td>
<td>0.113851</td>
<td></td>
</tr>
<tr>
<td>Exti</td>
<td>0.042182</td>
<td>0.042562</td>
<td>0.027984</td>
<td>0.223955</td>
<td>0.00004224</td>
<td></td>
</tr>
<tr>
<td>Cfo</td>
<td>0.06434</td>
<td>0.082188</td>
<td>0.056603</td>
<td>0.363156</td>
<td>-0.18842</td>
<td></td>
</tr>
</tbody>
</table>

*AbAcc*: Abnormal accruals computed using the modified-Jones model after controlling firm performance; *Outr*: Percentage of outside directors on the board; *Indep*: Percentage of independent directors on the board; *Grayr*: Percentage of gray directors on the board; *Outm*: The value of one if the firms’ board has at least a majority of outside directors, and zero otherwise; *Indepm*: The value of one if the firms’ board has at least a majority of independent directors, and zero otherwise; *Size*: The number of board members; *Ceo*: The value of one if the board chairman is the CEO and zero otherwise; *Forei*: Ratio of institutional ownership to total ordinary shares outstanding; *Broke*: Ratio of securities firms’ ownership to total ordinary shares outstanding; *Trust*: Ratio of securities investment trust enterprises’ ownership to total ordinary shares outstanding; *Mgta*: Ratio of managers’ shareholdings (major officers and inside directors on the annual reports) to total ordinary shares outstanding; *Five*: coded as 1 if audited by Big 5 auditors and 0 otherwise; *Lnas*: Natural logarithm of beginning total assets; *Leve*: Ratio of total liabilities to total assets; *Tweni*: coded as 1 if the firm had two or more consecutive years of reported losses and 0 otherwise; *Btm*: Fraction of market-to-book value of equity; *Exti*: The absolute change in the current year’s income before extraordinary; *Cfo*: The cash flow from operation divided by lagged total assets.
Univariate Analysis

The Pearson (Spearman) correlation coefficients for the variables included in the regression are documented in the upper (lower) triangle of Table 4. As revealed in Table 4, the correlation coefficients between $|AbAcc|$ and corporate governance variables are relatively low and most of them are not statistically significant (the highest $\rho$ between $|AbAcc|$ and Size is -0.105). In regard to control variables, as expected, the correlation matrix supports the results of prior literatures. Turning to among independent variables, most of the absolute value of the correlation coefficients is quite smaller except for some variables standing proxy for board independence. In addition, this study also examines variance inflation factors (VIF) for the test variables for multicollinearity. Diagnostics indicate that multicollinearity is not a major problem in the specific regressions. None of the variables have a VIF value in excess of 10 which would indicate that multicollinearity may be influencing the efficiency of parameters estimates (a VIF value is more than 1 but less than 3 in all cases). Collectively, the potential multicollinearity is not a serious issue affecting research inferences.

In section III of hypotheses development, this study has mentioned that the factor of family board may have influence over the association between board characteristics and earnings management. Consistent with prior domestic literatures, researchers used the 50% cut-off point of family directors for decomposing firms into family owned and non-family owned. Using a sample of 69(226) family-controlled (non-family-controlled) firm observations over the period 2001, this study provides evidence that for both family-owned firm and management group. T-tests and Mann-Whitney-U-tests are performed to determine if abnormal accruals and other variables in the family-controlled firms are significantly different than those variables in the non-family-controlled firms (two-tailed for both tests). The results for the univariate tests for the two compared-groups appear in Table 5. As reported in Table 5, non-family-controlled firms have higher percentage of non-executive directors, which implies their boards are more likely independent universally. Concerning board size, family-controlled boards are significantly smaller than their counterparts, which prove that the power of controlling shareholders increases by setting a limit to adding more directors into firm board (Yeh et al. 2002). Besides, in terms of growth opportunity, firm size, financial Leverage and negative earnings performance, family-controlled firms’ characteristics are significantly different than non-family-controlled firms’. Finally, regarding other variables, the two compared-groups don’t apparently exist in difference.

Following researchers’ director classification scheme, this study further categorizes insiders into family directors according to the degrees of relationship of board member and major officers, which is disclosed on the annual report. Researchers define family directors as persons who are relation to chairman or chairman’s family and the corporate representatives appointed by the investment corporation whose main shareholder is the company itself, subsidiary or chairman’s family. This paper then determines family-controlled firms as their board structure composed of at least 50% of board members are family directors. Prior studies (Sheng et al. 1993; Chow et al. 1996; Lin 1998; Hsieh 1999; Yeh 1998) also adopted the 50% threshold for classifying firms as family owned and controlled.
Table 5: Comparison of Characteristics of Family-Controlled Firms and Non-Family-Controlled Firms in 2001 Partitioned by Family Directors

<table>
<thead>
<tr>
<th>Variables</th>
<th>Continuous variables</th>
<th>Board Structure</th>
<th>Mann-Whitney U-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>AbAcc</td>
<td>-0.056 (146.700)</td>
<td>-0.058 (148.400)</td>
<td>0.113 (0.910)</td>
</tr>
<tr>
<td>[AbAcc]</td>
<td>0.071 (143.490)</td>
<td>0.081 (149.380)</td>
<td>-0.869 (0.386)</td>
</tr>
<tr>
<td>Outr</td>
<td>0.097 (78.090)</td>
<td>0.320 (160.340)</td>
<td>-10.64*** (0.000)</td>
</tr>
<tr>
<td>Indepr</td>
<td>0.045 (94.080)</td>
<td>0.170 (164.460)</td>
<td>-8.721*** (0.000)</td>
</tr>
<tr>
<td>Grayr</td>
<td>0.052 (111.140)</td>
<td>0.148 (159.250)</td>
<td>-6.009*** (0.000)</td>
</tr>
<tr>
<td>Size</td>
<td>8.280 (119.850)</td>
<td>9.600 (156.600)</td>
<td>-2.934*** (0.002)</td>
</tr>
<tr>
<td>Mga</td>
<td>0.049 (139.500)</td>
<td>0.059 (150.600)</td>
<td>-1.316 (0.344)</td>
</tr>
<tr>
<td>Forei</td>
<td>0.021 (155.700)</td>
<td>0.019 (145.650)</td>
<td>0.397 (0.871)</td>
</tr>
<tr>
<td>Broke</td>
<td>0.062 (144.360)</td>
<td>0.002 (149.110)</td>
<td>-0.015 (0.477)</td>
</tr>
<tr>
<td>Trust</td>
<td>0.000 (134.640)</td>
<td>0.000 (152.030)</td>
<td>-0.824 (0.344)</td>
</tr>
<tr>
<td>Btm</td>
<td>0.705 (118.930)</td>
<td>1.014 (156.600)</td>
<td>-4.517*** (0.001)</td>
</tr>
<tr>
<td>Lnab</td>
<td>16.023 (176.270)</td>
<td>15.545 (139.370)</td>
<td>3.231*** (0.001)</td>
</tr>
<tr>
<td>Leve</td>
<td>49.489 (164.780)</td>
<td>45.076 (142.890)</td>
<td>2.016** (0.002)</td>
</tr>
<tr>
<td>Estn</td>
<td>0.047 (148.170)</td>
<td>0.041 (147.950)</td>
<td>0.902 (0.019)</td>
</tr>
<tr>
<td>Cfo</td>
<td>0.054 (136.190)</td>
<td>0.068 (151.610)</td>
<td>-1.610 (0.189)</td>
</tr>
<tr>
<td>Indicator variables</td>
<td>0.000 (129.500)</td>
<td>0.164 (153.650)</td>
<td>-6.637*** (0.000)</td>
</tr>
<tr>
<td>Outm</td>
<td>0.000 (145.500)</td>
<td>0.022 (148.760)</td>
<td>-2.256** (0.013)</td>
</tr>
<tr>
<td>Indepm</td>
<td>0.000 (145.890)</td>
<td>0.025 (148.640)</td>
<td>0.772 (0.771)</td>
</tr>
<tr>
<td>Ceo</td>
<td>0.768 (144.800)</td>
<td>0.800 (148.980)</td>
<td>-0.304 (0.019)</td>
</tr>
<tr>
<td>Five</td>
<td>0.333 (169.170)</td>
<td>0.146 (141.540)</td>
<td>3.030*** (0.001)</td>
</tr>
</tbody>
</table>

a AbAcc and [AbAcc]: Abnormal accruals (the absolute value of abnormal accruals) computed using the modified-Jones model after controlling firm performance; Outr: Percentage of outside (continued on next page)
directors on the board; Indep: Percentage of independent directors on the board; Gmayr: Percentage of gray directors on the board; Outm: The value of one if the firms' board has at least a majority of outside directors, and zero otherwise; Indepma: The value of one if the firms' board has at least a majority of independent directors, and zero otherwise; Size: The number of board members; Ceo: The value of one if the board chairman is the CEO and zero otherwise; Forei: Ratio of institutional ownership to total ordinary shares outstanding; Broke: Ratio of securities' ownership to total ordinary shares outstanding; Trust: Ratio of securities investment trust enterprises' ownership to total ordinary shares outstanding; Mgra: Ratio of managers' shareholdings (major officers and inside directors on the annual reports) to total ordinary shares outstanding; Five: coded as 1 if audited by Big 5 auditors and 0 otherwise; Ln: Natural logarithm of beginning total assets; Leve: Ratio of total liabilities to total assets; T woni: coded as 1 if the firm had two or more consecutive years of reported losses and 0 otherwise; Btm: Fraction of market-to-book value of equity; Extne: The absolute change in the current year's income before extraordinary; Cfo: The cash flow from operation divided by lagged total assets; 

The t-statistic is for the difference in means or proportions. The z-statistic of M-W-U test is for the difference between M-W-U values and its means. 

Multivariate Analysis-Results for Overall Firms

In this section, Table 6 reports the multivariate MLE regression results with the absolute value of abnormal accruals as the dependent variable and overall board characteristics variables and control variables as the independent variables. Regression 1-6 in Table 6 contains various specifications of board independence variables. The explanation power of these models in terms of adjusted $R^2$ is qualitatively identical. Since the dependent variable is bounded by zero, OLS will yield inefficient parameters estimate owing to the dependent variable losing the property of normal distribution (Klein 2002). Thus, researchers estimate the regression coefficients using maximum likelihood estimation (MLE) with White's heteroscedasticity-consistent standard errors. The following table indicates the empirical results of the hypotheses examined in this study.

**Hypothesis One-Board Independence**

According to hypothesis one, the more independent a board is, the smaller the absolute value of abnormal accruals is. Whatever way board independence is measured by, the results present that the percentage of non-executive directors is unrelated to absolute abnormal accruals. This finding obviously contradicts with previous research that illustrates a higher proportion of outsiders can make an attack on earnings management.

**Hypothesis Two-Board Size**

Regarding the relationship between board size and earnings management, researchers also find that the coefficient for board size above nine members is negative and significant at the 0.05 level. This result is counter to the general contention that small boards are more effective monitors than larger boards. One explanation for larger boards' effectiveness is that board extension may fetch a greater number of talented directors to a

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24Originally researchers conduct the analysis using overall board size instead of piecewise metric, all the coefficients of board size are significantly and negatively correlated with the dependent variable, which is qualitatively the same as the piecewise testing results. Therefore, for the sake of brevity, researchers report solely the results for piecewise linear splines.
board and they seem to help to limit earnings management. This finding is consistent with the idea that a larger board may be a better monitor than a smaller board (Dalton et al. 1999; Chotourou et al. 2001; Xie et al. 2003). In other words, the association between the two definitely exists in nonlinearity link. This finding supports the view that the extension of board size can reduce the influence of controlling shareholders on the firm and corporate boards are less inclined to commit a fraud in virtue of power divide and conditioning each other (Chen and Yeh 2002; Yeh et al. 2002; Wu 2003).

**Hypothesis Three-CEO-duality**

Concerning CEO-duality, the coefficient on the Ceodu variable isn’t significantly related to absolute abnormal accruals. This result implies that when the CEO also holds the board chairman, this combination doesn’t have an obviously favorable effect on fostering earnings manipulation. The reason behind this finding is that CEO-duality can alleviate the moral hazard and the agency conflict arisen from information asymmetry in a keen competition of Taiwan industry environment. The drawback of power concentration could be effectively solved as long as the duty arrangement is accompanied by restrained monitoring mechanisms (Commercial Times, 2004/07/16; Economic Daily Times, 2004/07/27).

**Hypothesis Four-Institutional Investors**

As regards the governing effect of institutional investors on earnings management, results reported in Table 6 indicate that the estimated coefficient of For ei is statistically significant and has the expected sign. However, the coefficients on the Broke and Trust variable are insignificant. This evidence supports the thoughts that, relative to securities firms’ investors and securities investment trust enterprises, the foreign ownership of institutional investors allows them to oversee managers’ behavior, ensuring that firm managers don’t overdo to exhibit the intent of manipulation earnings. These different findings also provide evidence that the influence of institutional investors on the earnings management behavior of managers hinges upon their types. Among institutional investors in Taiwan, Foreign investors are always deemed to be the most professional institutional owners. Their investment strategy lays stress on basic analysis and long-term investment instead of chasing stock return performance, which is completely different from the government’s helpmate type performed by securities firms’ investors and securities investment trust enterprises (the Database of Department of Economics, National Tsing Hua University, 2003/11/20; United Daily Times, 2004/05/23). Overall, this study views the evidence as consistent with foreign institutional investors serving as an active monitor.

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25 For example, corporate board bears the responsibility of material affairs decision and CEO is conscientious to the board.

26 If institutional ownerships are measured by aggregate shareholdings in place of individual shareholdings, the testing results reveal that the aggregate institutional ownerships are negatively associated to absolute abnormal accruals. But, because institutional owners differ in their behavior patern and overseeing motivations, researchers examine whether certain types of institutions influence investment strategy in a manner different from the results for aggregate institutional shareholdings.
Table 6: Piecewise Linear Regression Results of Absolute Value of Abnormal Accruals (|Δb Acc|) on Corporate Governance Variables—Overall Firms

<table>
<thead>
<tr>
<th>Variable</th>
<th>Predicted sign</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td></td>
<td>-0.0392</td>
<td>-0.0279</td>
<td>-0.0308</td>
<td>-0.0410</td>
<td>-0.0139</td>
<td>-0.0052</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.5617)</td>
<td>(0.6827)</td>
<td>(0.7640)</td>
<td>(0.5462)</td>
<td>(0.4229)</td>
<td>(0.9422)</td>
</tr>
<tr>
<td>Outr</td>
<td></td>
<td>0.0077</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.3914)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Indep</td>
<td></td>
<td>-0.0635</td>
<td>-0.0025</td>
<td>-0.0629</td>
<td>-0.0584</td>
<td>-0.0031</td>
<td>-0.0034</td>
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<tr>
<td></td>
<td></td>
<td>(0.3742)</td>
<td>(0.4041)</td>
<td>(0.4017)</td>
<td>(0.3297)</td>
<td>(0.3936)</td>
<td></td>
</tr>
<tr>
<td>Sizeh</td>
<td></td>
<td>0.0127</td>
<td>0.0207</td>
<td>0.0135</td>
<td>0.0224</td>
<td>0.0056</td>
<td>0.0038</td>
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<tr>
<td></td>
<td></td>
<td>(0.9577)</td>
<td>(0.9590)</td>
<td>(0.8902)</td>
<td>(0.9747)</td>
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<tr>
<td>Mgtal</td>
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<td>-0.0297</td>
<td>-0.0302</td>
<td>-0.0301</td>
<td>-0.0860</td>
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<tr>
<td></td>
<td></td>
<td>(0.5973)</td>
<td>(0.7253)</td>
<td>(0.7253)</td>
<td>(0.7253)</td>
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<td></td>
</tr>
<tr>
<td>Mgtam</td>
<td></td>
<td>-1.3642</td>
<td>-1.7250</td>
<td>-1.6624</td>
<td>-1.6000</td>
<td>-1.0907</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(0.0051)</td>
<td>(0.0050)</td>
<td>(0.0050)</td>
<td>(0.0050)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forci</td>
<td></td>
<td>-0.2365</td>
<td>-0.2483</td>
<td>-0.2378</td>
<td>-0.2304</td>
<td>-0.2412</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(0.0387)</td>
<td>(0.0418)</td>
<td>(0.0359)</td>
<td>(0.0394)</td>
<td>(0.0389)</td>
<td></td>
</tr>
<tr>
<td>Broke</td>
<td></td>
<td>-0.5151</td>
<td>-0.5289</td>
<td>-0.5382</td>
<td>-0.5940</td>
<td>-0.5191</td>
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<td>(0.1297)</td>
<td>(0.1290)</td>
<td>(0.1290)</td>
<td>(0.1290)</td>
<td>(0.1290)</td>
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<tr>
<td>Trust</td>
<td></td>
<td>0.0928</td>
<td>0.0777</td>
<td>0.3245</td>
<td>-0.3785</td>
<td>0.0355</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.4791)</td>
<td>(0.4714)</td>
<td>(0.4199)</td>
<td>(0.4137)</td>
<td>(0.4222)</td>
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</tr>
<tr>
<td>Ceo</td>
<td></td>
<td>-0.0025</td>
<td>-0.0004</td>
<td>-0.0014</td>
<td>0.0015</td>
<td>0.0009</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.3779)</td>
<td>(0.4910)</td>
<td>(0.4306)</td>
<td>(0.4275)</td>
<td>(0.4523)</td>
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<td>Boindep</td>
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<td>0.0409</td>
<td>0.0988</td>
<td>0.0064</td>
<td>0.0083</td>
<td>0.0069</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(0.0642)</td>
<td>(0.0997)</td>
<td>(0.4336)</td>
<td>(0.2788)</td>
<td>(0.1343)</td>
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</tr>
<tr>
<td>Lnas</td>
<td></td>
<td>0.0052</td>
<td>0.0045</td>
<td>0.0025</td>
<td>0.0055</td>
<td>0.0027</td>
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<td></td>
<td>(0.1979)</td>
<td>(0.2651)</td>
<td>(0.3719)</td>
<td>(0.4605)</td>
<td>(0.5124)</td>
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</tr>
<tr>
<td>Leve</td>
<td></td>
<td>0.0011</td>
<td>0.0011</td>
<td>0.0011</td>
<td>0.0011</td>
<td>0.0012</td>
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<tr>
<td></td>
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<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
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<tr>
<td>Twron</td>
<td></td>
<td>0.0073</td>
<td>0.0049</td>
<td>0.0071</td>
<td>0.0034</td>
<td>0.0045</td>
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<tr>
<td></td>
<td></td>
<td>(0.2647)</td>
<td>(0.3306)</td>
<td>(0.2693)</td>
<td>(0.3485)</td>
<td>(0.3471)</td>
<td></td>
</tr>
<tr>
<td>Btm</td>
<td></td>
<td>0.0002</td>
<td>0.0028</td>
<td>0.0005</td>
<td>0.0033</td>
<td>0.0031</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(0.9834)</td>
<td>(0.7905)</td>
<td>(0.9577)</td>
<td>(0.6994)</td>
<td>(0.7306)</td>
<td></td>
</tr>
<tr>
<td>Extni</td>
<td></td>
<td>0.4293</td>
<td>0.4265</td>
<td>0.4343</td>
<td>0.4305</td>
<td>0.4398</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td></td>
</tr>
<tr>
<td>Cfo</td>
<td></td>
<td>0.3943</td>
<td>0.3962</td>
<td>0.3940</td>
<td>0.3999</td>
<td>0.3968</td>
<td>0.3971</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
</tr>
</tbody>
</table>

Adjusted R^2: 22.52% 22.95% 21.34% 22.74% 21.34% 21.66%

Wald Statistic: 174.9737 174.7526 182.3190 173.9823 185.7234 185.7417

Sample is for 295 Taiwan firms listed on the TSE in 2001.

(continued on next page)
The test is significant at the 10% (*), 5% (**), and 1% (***) level respectively, where there are predictions on the sign of the coefficient estimates according to that prediction, the p-values are reported on a one-tailed test basis, otherwise two-tailed tests are used. P-values are in the parentheses.

d The parameters are estimated by maximum likelihood estimation.

Hypothesis Five-Managerial Shareholdings

Finally, in respect of managerial disciplining mechanisms, the piecewise linear regression reveals that the variable coefficient for the proportion of managerial ownership greater than 25% is negatively related to the abnormal accruals. To be more specific, at levels of ownership less than 5% and between 5% and 25% ownership, the effect seems to be statistically insignificant. To wit, managerial shareholdings acting as a disciplinary device is only shown at levels of ownership more than 25%. The empirical evidence gives credence to the view that management’s interests are increasing aligned with those of its shareholders at these levels (Jensen and Meckling 1976; Dhaliwal et al. 1982; Warfield et al. 1995; Klein 2002).

Of the control variables, higher financial leverage, larger cash flow and greater earnings performance variability are associated with a greater level of absolute value of abnormal accruals. These results are generally consistent with theoretical expectations and prior literature (Bartov et al. 2001; Klein 2002). However, researchers find no significant relationship between earnings management and firm size, consecutive years of reported negative income, firm’s growth opportunities and auditor quality. The above discussions and analyses are based on the results for firms as a whole. But as mention was made of family business nature, the effectiveness of corporate governance devices may vary with the structure of family board. Hence, the next section will describe how researchers use the test of family-controlled board to explore whether different composition of board has a determinant impact of corporate governance on earnings management.

Multivariate Analysis-Results for Firms by Different Family-owned Characteristics

In this section, researchers will further discuss the effect of the family board on the research issues. Claessens et al. (2000) show that the family-controlled firm is common in
the Taiwan stock market. A substantial portion of Taiwan listed companies is family controlled and some are closely in connection with each other. A high proportion of their directors are also the constituency of the major or controlling shareholders (Yeh et al. 2002). The nomination of independent directors in family controlled firms is likely to be dominated more by the petticoat connection of the controlling families. This apron strings relationship easily result in the likelihood of directors’ support for firm management’s philosophy and policies. In the presence of family-controlled board, outside directors’ independent reputation and governing roles may be damaged severely (Ching et al. 2002). In order to explore the impact of family-controlled firms on the issue of earnings management, this paper divide the whole samples into family-controlled firms and non-family-controlled firms. Researchers partition sample observations according to whether the family member held 50% or more of the corporate boards. If family directors are specified above half of the board seats, then firms are classified as family-controlled firms. Table 7 and Table 8 separately present the regression results between the non-family-controlled firms and the family-controlled firms.

Making a comparison between Table 7 and Table 8, surprisingly, board independence monitoring devices are surely swayed by the level of the family directors. Researchers find that $|A_{acb}|$ is significant and negatively related to the proportion of independent directors in the non-family-controlled firms. By contrast, in the cases of family-controlled firms, and yet researchers find that the percentage of outside and independent directors has a positive relation with absolute abnormal accruals. Unexpectedly, the monitoring effect of outside directors disappears. One of explanations is that managers subject to family-controlled board more incline to manipulate earnings (Huang 1995; Hsieh 1999), and this practice cause them to have greater incentive to employ more outside directors in order to liberating market participants from doubts about earnings management. However, outside or independent directors could not fulfill the governing function owing to family directors having authority over the management of company (Chien 1996; Davis et al. 1997; Lin 1998). Hence, the test results show that the association between the two exists in positive link.

With respect to the effect of board size, basically the findings of non-family-controlled firms are the same as overall sample. In the cases of family-controlled firms, but yet researchers find that the coefficients for board size in three piecewise linear splines become insignificant. This discrepant result exactly reveals that board size in family-controlled firms doesn’t demonstrate apparent monitoring function.

About another measuring indicator of board independence, the coefficient of the CEO-duality variable lacks statistical significance in the two subgroups. This result implies that when the CEO also holds the board chairman, this duty design doesn’t have an obviously favorable effect on fostering earnings manipulation.

---

27 In Table 8 of family-controlled sample, because all firms have more than 50% of inside directors on their boards and all of the managerial ownership is not more than 25%, to wit, the variable of $Outm$, $Indepm$ and $Mgtah$ cannot exist in the regression and this reduced form will result in dropping model 5 and model 6 with excluding the variable of $Mgtah$. 
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Non-family-controlled sample is for 226 Taiwan firms listed on the TSE in 2001. The non-family-controlled firms are defined as their board structure composed of not more than 50% of board members are family directors.

AbAcc: The absolute value of abnormal accruals computed using the modified-Jones model after controlling firm performance; Outr: Percentage of outside directors on the board; Indep: Percentage of independent directors on the board; Omr: The value of one if the firm’s board has at least a majority of independent directors, and zero otherwise; Outm: 0 if board size $< 7$, board size minus 7 if $7 \leq$ board size $< 9$ (second quartile), 2 if board size $\geq 9$; Indepm: 0 if board size $< 7$, board size minus 9 if board size $\geq 9$; Mgtal: managerial ownership if managerial ownership $< 0.05$, 0.05 if managerial ownership $\geq 0.05$; Mgtam: 0 if managerial ownership $< 0.05$, managerial ownership minus 0.05 if $0.05 \leq$ managerial ownership $< 0.25$, 0.2 if managerial ownership $\geq 0.25$; Mgtah: 0 if managerial ownership $< 0.25$, managerial ownership minus 0.25 if managerial ownership $\geq 0.25$; Forci: Ratio of institutional ownership to total ordinary shares outstanding; Broke: Ratio of securities firms’ ownership to total ordinary shares outstanding; Trust: Ratio of securities investment trust enterprises’ ownership to total ordinary shares outstanding; Leve: Ratio of total liabilities to total assets; Tran: The absolute change in the current year’s income before extraordinary items divided by lagged total assets; Cfo: The cash flow from operation divided by lagged total assets.

The parameter are estimated by maximum likelihood estimation.

As regards the results of institutional investors, the findings for non-family-controlled firms are similar to those of overall sample. The foreign investors still maintain an overseeing role. However, in respect of family-controlled firms, the coefficient on the Broke variable is significantly negative. Researchers interpret this to imply that the trading behavior of foreign owners comparatively focuses on the specific companies with transparently operating style and strong corporate governance systems. By contrast, foreign owners are unwilling to choose family-controlled firms as their portfolios because of weak information disclosure (Business Next, 2002/02/15). But domestic securities firms may easily understand the management tendency of some controlling family, and this advantage causes them to willingly make an investment in family-controlled firms. Overall, The results posit that institutional investors are consistent with active monitors.

Concerning managerial ownership, the results for non-family-controlled firms are identical with those of full sample. Namely, the evidence supports the view that managers’ interests are in alignment with those of outside shareholders at ownership more than 25%. However, with respect to the family-controlled firms, empirical results don’t reveal that the role of managerial ownership is in clear association with earnings management behavior.

Taken together, results suggest that the effectiveness of corporate governance ultimately depends on specific board structure. It is clear that the presence of family-controlled firms will have an unfavorable effect on governing firm management, which would cause most of corporate governance mechanisms to be invalid including the existing independent directors and supervisors system. As regards the control variables, the results also bear resemblance to those of the entire sample. It is unnecessary to make a superfluous statement here.
Table 8: Piecewise Linear Regression Results of Absolute Value of Abnormal Accruals (|AbAcc|) on Corporate Governance Variables

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| Adjusted R² | 37.44% | 27.83% | 38.19% | 37.46% | 37.46% |
| Wald Statistic (p-value) | 102.0528 | 83.5980 | 92.5330 | 97.2831 |
| N            | 69     | 69     | 69     | 69     | 69     |

Family-controlled sample is for 69 Taiwan firms listed on the TSE in 2001. The family-controlled firms are defined as their board structure composed of at least 51% of board members are family directors. Because all firms have more than (continued on next page)
50% of inside directors on their boards and all of the managerial ownership is not more than 25%, to wit, the variable of Outm, Indepm and Mgtah cannot exist in the regression and this reduced form will result in dropping model 5 and model 6 with excluding the variable of Mgtah.

b $|\text{AbAcc}|$: The absolute value of abnormal accruals computed using the modified-Jones model after controlling firm performance; Outr: Percentage of outside directors on the board; Indepr: Percentage of independent directors on the board; Grayr: Percentage of gray directors on the board; Size: board size if board size < 7 (first quartile), 7 if board size ≥ 7; Sizel: board size minus 7 if board size < 7; Sizh: 0 if board size < 7, board size minus 9 if board size ≥ 9; Mgtal: managerial ownership if managerial ownership < 0.05, 0.05 if managerial ownership ≥ 0.05; Mgtam: 0 if managerial ownership < 0.05, managerial ownership minus 0.05 if 0.05 ≤ managerial ownership < 0.25, 0.2 if managerial ownership ≥ 0.25; Freq: Ratio of institutional ownership to total ordinary shares outstanding; Broke: Ratio of securities firms' ownership to total ordinary shares outstanding; Trust: Ratio of securities investment trust enterprises' ownership to total ordinary shares outstanding; Ceo: The value of one if the board chairman is the CEO and zero otherwise; Five: coded as 1 if audited by Big 5 auditors and 0 otherwise; Lnas: Natural logarithm of beginning total assets; Leve: Ratio of total liabilities to total assets; Twnl: coded as 1 if the firm had two or more consecutive years of reported losses and 0 otherwise; Bmt: Fraction of market-to-book value of equity; Extnt: The absolute change in the current year's income before extraordinary items divided by lagged total assets; Cfo: The cash flow from operation divided by lagged total assets.

c The test is significant at the 10% (*), 5% (**), and 1% (***) level respectively, where there are predictions on the sign of the coefficient estimates according to that prediction, the p-values are reported on a one-tailed test basis, otherwise two-tailed tests are used. P-values are in the parentheses.

d The parameters are estimated by maximum likelihood estimation.

Robustness checks
This study also conducts further tests in all cases to assess whether different variable measurement affects the level of earnings management. First, researchers re-ran the tests reported in this study using an alternative metric for firm size measured by lagged net sales in place of lagged total assets, with almost identical results. Secondly, this paper carries out another audit quality checks with Big-three auditors in lieu of Big-five auditors, most of the testing results of Big-three CPA firms find that research inferences are basically unaltered. In sum, the results of sensitivity checks demonstrate that the empirical findings are robust.

VI. CONCLUDING REMARKS AND LIMITATIONS
This study aims at examining the impact of board composition and ownership structure on earnings management by firms. Results provide some evidence of accrual management related to board characteristics and shareholding dispensation. Perhaps it is predictable that these empirical results reveal the recent changes in Taiwan corporate governance policy have failed to thoroughly eliminate possible earnings management activity. Regarding the overseeing function of board independence, relatively little empirical evidence exists in favor of the outside directors-as-monitors view except for the role of independent directors in non-family-controlled firms. As for other corporate governance devices, this study finds that managerial ownership and board size are associated with the magnitude of earnings management being subject to non-family-controlled firms. These evidences support the idea that a larger board may be a better monitor than a smaller board and managerial shareholdings acting as a disciplinary device is only shown at levels of ownership more than 25%. Additionally, researchers also find that earnings management occurs less in companies whose ownership structure interfered by specific types of institutional investors (e.g., foreign institutional investors).

28 For the sake of brevity, and because the results bear a resemblance to those already reported, researchers don't present the findings for the sensitive analyses.
investors or securities firms). With respect to CEO-duality, researchers obtain scarcely empirical evidence finding the association between CEO-duality and the absolute value of abnormal accruals. To summarize, empirical results strongly demonstrate that the production a marked effect of corporate governance pivotally depends on specific board construction. The more a controlling family intervenes in board operation, the weaker benefits corporate governance yields.

In Taiwan, fraudulent financial reporting usually causes investors a great deal of wealth losses due to lacking of strong corporate governance mechanisms. The general public frequently falls distrust of the integrity of financial statements and the independence of corporate board. The empirical findings undoubtedly provide lessons for Taiwan regulators, investors and practitioners that an accentuation in corporate governance devices of non-family-controlled firms could have notable consequences for improving the quality of financial statements.

One caveat of this study is that its sample is only drawn from a single period and this evidence may not be generalizable to the population. In accordance with TSE Listing Rules, the information of board independence is disclosed on an annual report at the beginning of 2001. Given the time limitation of data collection, the sample of this study is confined in the year 2001 to engage in a cross-sectional analysis. Considering that a time span of one period may be too short for researchers to draw complete conclusions about the implementing effect of board independence systems. Future research under extending observational periods and test sample would be fruitful towards acquiring a better understanding of the association between independent directors and earnings management activity.

(Submitted July 2003; Accepted October 2004)

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董事會結構特徵與盈餘管理  
—台灣家族控制企業因素之影響

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摘要：過去，受到國際上接連發生幾起重大公司財務報導不實事件的影響，使得企業財務報導的可靠性遭到嚴重質疑，而董事會結構及其獨立性對財務報導可靠性的影響，再度成為各界討論的話題。因此，本研究目的旨在探討董事會結構及其獨立性與盈餘管理(Earnings Management)之間的關係，藉以了解董事會的獨立性，是否可以提升財務報導的可靠性，並進一步探討家族控制企業因素，對上述關係之影響。

為重拾市場對企業財務報導可信度信心，我國證期會為推動公司治理制度，健全企業經營體質，於民國91年2月，分別著手修訂上市(櫃)審查準則及相關補充規定，積極推動設置獨立董監事制度，而且新修訂之公司法第192條第1項，業已取消董事應具備股東資格之限制，希望藉由聘請具有公正客觀之專業人士擔任企業外部董事，使董事會成員間形成良性制衡，以提高董事會的決策品質、經營效率及財務報導的可靠性。此外，為了配合獨立董監事制度實施，證期會於90年修訂「公開發行公司年報應行記載事項準則」，要求所有上市公司應自90會計年度起，需於年報中揭露董監事是否符合獨立性標準，並需採用統一格式，詳細揭露董監事親屬關係之資訊。本研究乃根據90會計年度各公司年報中揭露之董監事獨立性標準，並參引審查準則補充規定第十七條規定獨立性標準，衡量各公司董事會特徵及其獨立性，探討董事會特徵及其獨立性與盈餘管理程度之關聯性。

本研究箇引傳統盈餘管理相關文獻，以異常應計數的絕對值（Abnormal Accruals，文後以$|\text{AbAcc}|$代表之）作為衡量盈餘管理的代理變數，檢視295家上市公司有關董事會獨立性、規模、董監事涉入業務程度、機構法人持股與管理當局持股等董事會組成結構特徵對管理當局盈餘管理的影響。鑑於台灣普遍存在控制家族經營的企業型態，而此一家族控制企業因素，對董事會之運作有重大的影響，可能影響上述各董事會特徵與盈餘管理之間的關聯性，
故本研究進一步考量台灣特殊控制家族因素對經理人盈餘管理行為的影響。此外，國外相關文獻指出董事會規模及管理當局持股比率與管理當局從事盈餘管理之行為並非線性關係，故本研究亦將一併探討之。

依據相關文獻及理論，並參酌國內公司治理現況，本研究建立下列五項研究假說：

假說一：董事會之獨立性愈強，管理當局從事盈餘管理的程度愈小。

假說二：董事會規模與管理當局從事盈餘管理的程度有關。

假說三：董事長同時兼任總經理與管理當局從事盈餘管理的程度有正向關係。

假說四：外部機構法人持股與管理當局從事盈餘管理的程度有負向關係。

假說五：管理當局持股比率與管理當局從事盈餘管理程度有關。

在實證測試時，本研究主要係以多變量迴歸模型，在控制其他影響因素下，分析代表董事會結構及獨立性之實驗變數與\(|\text{AbAcc}|\)之間的關係。多變量迴歸模型如下：

\[
\begin{align*}
|\text{AbAcc}| &= \beta_0 + \beta_1 \text{Boindep}_i + \beta_2 \text{Size}_i + \beta_3 \text{Sizem}_i + \beta_4 \text{Sizeh}_i + \beta_5 \text{Ceo}_i + \beta_6 \text{Forei}_i + \beta_7 \text{Broke}_i \\
&+ \beta_8 \text{Trust}_i + \beta_9 \text{Mgtal}_i + \beta_{10} \text{Mgta}_i + \beta_{11} \text{Mgtch}_i + \beta_{12} \text{Boindep}_i \ast \text{Five}_i + \beta_{13} \text{Lnas}_i \\
&+ \beta_{14} \text{Leve}_i + \beta_{15} \text{Twoni}_i + \beta_{16} \text{Btm}_i + \beta_{17} \text{Extni}_i + \beta_{18} \text{Cfo}_i + \epsilon_i
\end{align*}
\]

式中各變數定義如下：

\[|\text{AbAcc}| = \text{第 } i \text{ 公司調整公司績效後之異常應計數取絕對值；}
\]

\[\text{Boindep}_i = \text{第 } i \text{ 公司之董事會獨立性變數（在分析時，將分別以 Outr 、Indepr 、Grayr 、Outm 及 Inckpm 代表之）；}
\]

\[\text{Size}_i = \text{第 } i \text{ 公司董事會規模在全部樣本第 } 1 \text{ 四分位以下之人數（即董事會規模在七人以下之人數）；}
\]

\[\text{Sizem}_i = \text{第 } i \text{ 公司董事會規模介於全部樣本第 } 1 \text{ 四分位與第 } 2 \text{ 四分位之間的人數（即董事會規模在七人以上九人以下之人數）；}
\]

\[\text{Sizeh}_i = \text{第 } i \text{ 公司董事會規模超過全部樣本第 } 2 \text{ 四分位以上之}
\]
人數（即董事會規模在九人以上之人數）；

\[ Ceo_i = \text{第}i\text{家公司董事長是否兼任總經理之虛擬變數；若是設為} 1\text{，否則為} 0; \]

\[ Forei_i = \text{第}i\text{家公司機構法人外資之持股比率；} \]

\[ Broke_i = \text{第}i\text{家公司機構法人自營商之持股比率；} \]

\[ Trust_i = \text{第}i\text{家公司機構法人信託之持股比率；} \]

\[ Mgtal_i = \text{第}i\text{家公司業務當局持股在5%以下之持股比率；} \]

\[ Mgtam_i = \text{第}i\text{家公司業務當局持股在5%至25%之間的持股比率；} \]

\[ Mgtah_i = \text{第}i\text{家公司業務當局持股超過25%以上之持股比率；} \]

\[ BoIndep_i \times Five_i = \text{第}i\text{家公司的審計品質（公司財務報表委由前五大會計師事務所查核者設為} 1\text{）對董事會獨立性影響之效果；} \]

\[ Lnas_i = \text{第}i\text{家公司之期初總資產取自然對數；} \]

\[ Leve_i = \text{第}i\text{家公司之負債比率；} \]

\[ Twoni_i = \text{第}i\text{家公司有連續二年以上負淨利者設為} 1\text{；否則為} 0; \]

\[ Btm_i = \text{第}i\text{家公司之期初權益市值對權益帳面價值比率；} \]

\[ Extn_i = \text{第}i\text{家公司以前一期總資產減除後非常項目前淨利變動絕對值；} \]

\[ Cfo_i = \text{第}i\text{家公司營業活動現金流量，以前一期總資產減除之；} \]

\[ \epsilon_i = \text{第}i\text{家公司之殘差項；} \]

在董事會獨立性（BoIndep）的衡量方面，由於相關文獻相當分歧，故本研究採用以下二種董事會獨立性。第一是外部董事占全體董事會之席次比率，以Outr代表之（Beasley, 1996；Klein, 2002）。在董事會成員組成結構上，國外文獻普遍分類為獨立董事（outsiders）、灰色董事（affiliated or gray directors）、內部董事（insiders）三類（Weisbach, 1988；Byrd and Hickman, 1992；Brickley et al., 1994；Klein, 2002）。為了進一步探討獨立董事對盈餘管理之影響，本研究依據「台灣證券交易所股份有限公司有價證券上市審查準則補充規定」第十七條第一項第一款至第六款與第二項所載各項條件，將外部董事區分為獨立董事（以Indepr代表之）和灰色董事（以Grayr代表之）。第二種衡量方式則是依主要多數獨立原則，以虛擬變數的方式衡量之，即外部董事（以Outm代表之）（或獨立董事，以Indepm代表之）占全體董事會之席次比率過半數者設1，否則為0（Dechow et al., 1996；Klein, 2002）。

上述之多變量迴歸式除應用於全部樣本外，亦將分別應用於家族控制及非家族控制之兩個子樣本（依同一家族占董事會席次是否過半為標準，將樣本區分為家族控制企業與非家族控制企業），藉以探討家族控制企業因素對因變數與實驗變數間關係之影響。
實證結果發現，董事會的監督機制受到公司是否為家族控制企業的影響很大，如果公司是屬於家族控制企業，整體而言，董事會的各項監督機制不會有太明顯的效果。但如果公司是屬於非家族控制企業，則本研究發現，當獨立董監事席次比率愈高，愈能抑制管理當局盈餘操縱的行為。而董事會人數在超過九人以上的情況下，董事會才能發揮監督作用，且董事會規模愈大，監督功能愈大。管理當局持股比率在超過25％以上時，管理當局持股愈高才愈具有自律的效果。最後，外資法人持股比率愈高時，也愈能發揮對管理當局監督的功能。至外，最近被熱烈討論的董事長同時兼任總經理是否對公司治理產生不利影響，本文的實證結果並未發現董事長同時兼任總經理，對財務報表品質有明顯不利的影響。

雖然國內已有文獻探討董事會特徵對管理當局盈餘管理之影響，但可能由於過去董（監）事成員之背景資料並非為公開資訊，使研究者無法較客觀或精確地衡量董事會之特徵，故實證結論相當分歧。此外，獨立董監事制度的推行是一項新的政策措施，其成效是各界討論的熱門議題，然而國內尚缺乏相關之研究結果。本研究使用各公司於年報中所揭露之董監事資料，除了可以較精確地衡量董事會之特徵外，也彌補國內有關獨立董監事文獻之罅漏，相信應能提供金融業、企業及投資人評估實行獨立董監事預期成效及相關法令修正之參考。

關鍵字：公司治理、獨立董事及獨立監察人、異常應計數、盈餘管理、家族控制企業
Industry Specialists, Audit Fees and Auditor Size: Evidence from Taiwan*

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ABSTRACT: This study investigates the effect of industry specialists on audit fees in Taiwan. The empirical results show that auditor specialists charge higher audit fees, indicating that auditor specialists provide quality-differentiated services. Further evidence demonstrates that the Big 5 audit firms also charge higher fees, indicating that auditor size could be a proxy in measuring audit quality. When the sample is grouped into electronics industry and non-electronics industries, specialist fee effects in the electronics industry are much significant than those in non-electronics industries.

Keywords: Industry Specialist, Audit Fees, Auditor Size.

Data Availability: Data used in this study are available upon request. The data will be provided on condition of anonymity.

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I. INTRODUCTION

Specialization in the audit market is critical for the continued survival of the audit firms, and specialization is one of the five top issues impacting the CPA profession in the 21st century (AICPA, 1998; Elicker III, 1998). Recently, large audit firms have restructured along industry lines in order to address the increasing importance of the role of industry specialization in the audit market (see Gramling and Stone, 2001 for a literature review). These ongoing changes have likely affected the pricing of audit services. The purpose of this study is to investigate the effect of auditor industry specialists on audit pricing in the Taiwan audit market.

One audit fee study (i.e., Su, 2000) in Taiwan examined the relation between audit fees and auditor size, and found that the Big Three audit firms charge a fee premium. This study, like other fee studies, such as Palmrose (1986) and Francis (1984), also investigates whether the Big 5 audit firms, rather than the Big Three audit firms used in Su (2000), charge a fee premium in the Taiwan audit market.

The sample used in this study is selected from the Taiwan Economic Journal (TEJ), which includes the companies listed in the Taiwan Stock Exchange (TSE) and Over-the-Counter (OTC). Since audit fee information is not publicly available in Taiwan, audit fee questionnaires were sent to those listed companies. Using audit fee regression models similar to Simunic (1980), and Craswell et al. (1995), this study reports evidence that auditor specialists charge higher fees, consistent with quality-differentiated services. Further evidence demonstrates that the Big 5 audit firms charge higher fees, indicating that auditor size could be a proxy in measuring the audit quality.

The main contribution of this study is to incorporate the effect of industry specialists, in addition to the auditor size effect, on audit fees that had never been explored in the Taiwan audit market and to examine whether Big 5 audit firms develop the strategy of specialization. Our results provide the evidence of specialist fee premium in Taiwan. Our results also support the argument in Su (2000) that auditor size is a dimension of audit quality.

The remainder of this paper is organized as follows. The next section presents a discussion of the theoretical framework and related research associated with the effect of specialists on audit fees, followed by the development of the hypotheses. Section four describes the research design and sample description. Section Five discusses the empirical test results, and a summary of the study is provided in the final section.

II. THEORETICAL FRAMEWORK AND RELATED RESEARCH

Background

Professional auditing standards require audit firms to understand the client’s industry and business (AICPA, 1993). Audit firms restructured along industry service lines, first implemented by KPMG Peat Marwick (Emerson, 1993), in order to find their niche in focal industries as well as to deal with the growing emphasis in globalization and an increasingly sophisticated marketplace. Audit firms can develop industry expertise in order to accomplish multiple objectives to better serve their clients’ needs (Gramling and
Stone, 2001), and thus increase market share in their focal industries. For instance, auditor industry expertise can help increase the demand for audit or non-audit services within the focal industries, improve efficiency through economy of scale resulting from concentrating resources and technology developments in focal industries, and help differentiate audit market products.

Quality Differentiation

There are two countervailing theories related to the effects of specialists on audit fees. One such theory is based on audit quality, and suggests that quality-differentiated auditors should be able to charge a fee premium. Industry specialization can be thought of as a dimension of audit quality (DeAngelo, 1981; Craswell et al. 1995). Audit firms can invest in developing industry expertise, establishing reputation, and differentiating themselves from other auditors by providing quality-differentiated services. As a result, they may be able to charge a fee premium reflecting a return on investment in industry expertise, consistent with economic theory of product differentiation (Shapiro, 1983). Using the industry market share as a differentiation strategy, Mayhew and Wilkins (2003) argue that dominant auditor specialists with bargaining power can differentiate themselves from competitors and thus demand a fee premium for their higher value audit services. They document that dominant auditor specialists earn an IPO fee premium over non-dominant specialists.

DeAngelo (1981) suggests that audit quality is related to firm size. She argues that large audit firms are more likely to be independent because they receive a smaller percentage of total firm revenues from a given client. Although the primary emphasis of her argument is on audit firm size, she also suggests that importance of industry specialists. In contrast, Titman and Trueman (1986) provide a definition of auditor quality that is not based on size. They suggest that auditors with expertise in information processing and with knowledge of industry conditions are more likely to provide quality-differentiated services that reduce information risk.

There is limited evidence of higher audit fees for industry specialist auditors. Craswell, Francis and Taylor (1995) find that Big 8 specialist auditors in Australia earn higher fees compared to Big 8 nonspecialists. However, Ferguson and Stokes (2000) do not find evidence of specialist fee premiums following the mergers that reduce the Big 8 to the Big 6. Palmose (1986) does not find evidence of higher fees for industry specialist auditors in the U.S. audit market. However, Mayhew and Wilkins (2003) find that specialists with dominant market shares are able to charge higher fees for IPO companies.

Although this research focuses on industry specialists within the Big 5 for publicly-traded companies, there is some evidence of higher fees for non-Big 5 specialists in other markets. Ward, Elder and Kattelus (1994) find that a non-Big 5 firm charges higher fees for audits of Michigan local governments. Cullinan (1998) finds that non-Big 5 specialists charge higher fees in the pension plan audit market.

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1 DeAngelo (1981) defines audit quality as “the market assessed joint probability that a given auditor will both (a) discover a breach in the client’s accounting system, and (b) report the breach” (p. 186).

2 Titman and Trueman (1986) define auditor quality as: “the accuracy of information auditor supplied to investors; the information provided by a higher-quality auditor allows investors to make a more precise estimate of the firm’s value” (p.160)
Economies of Scale

The other effect of specialists on audit fees is economies of scale. The economies of scale theory suggests that fee discounts can be offered due to economies of scale achieved through market share gain and passed along to the client. Given industry regulation, audit firms claiming to be specialists have incentives to become familiar with the requirements of regulations to attract more clients within the industry. Arnett and Danos (1979, pp. 10-11) argue that economies of scale could exist for the larger CPA firms whose clients are in regulated industries. Few studies have directly examined whether industry specialists result in scale economies. Mayhew and Wilkins (2003) document that specialist auditors that do not have dominant market shares offer fee discounts to attract potential clients, consistent with the existence of scale economies.

Lower fees have been found for non-Big 5 specialists. DeFond, Francis and Wong (2000) demonstrate that KWTF, a non-Big 6 market leader in the property industry in Hong Kong, charges lower audit fees for clients. This could indicate that KWTF must cut prices in order to draw clients or indicate clients' preference for the lower-priced audit services available from a non-Big 6 industry specialists. Chase (1999) finds that a non-Big 6 specialist charges significantly lower fees for audits of Virginia counties.

To the authors' knowledge, in-depth research on the relation of auditor industry specialists and audit fees in the Taiwan audit market has never been undertaken. This study examines whether the auditor specialist fee premium exists in the Taiwan audit market. This study also investigates whether the Big 5 fee premium exists in the Taiwan audit market.

III. DEVELOPMENT OF RESEARCH HYPOTHESES

Model of Specialist Pricing and Research Hypotheses

Theories of audit quality and economies of scale make opposite predictions of the effects of specialists on audit fees, which may explain the mixed results found in previous studies. We formalize these arguments into a model of the effect of specialists on audit fees to support our hypotheses regarding the effect of specialists. The first two variables on the right-side of the equation represent price effects of specialists, and the second two-variables represent cost effects. The signs above the variables represent their expected effect on audit fees.

Specialist Pricing = \( f(\text{Audit Quality}, \text{Bargaining Power}, \text{Variable Costs}, \text{Fixed Costs}) \)

Auditing is expected to be a normal good, such that higher quality is associated with higher fees. Carcello, Hermanson and McGrath (1992) find that specialization is valued by clients and financial statement users. Accordingly, specialization should result in the ability to charge higher fees, unless the specialist auditor enjoys economies of scale and

---

3 According to Benston (1985), the first type of scale economy results from the size and geographic dispersion of auditees, and the second type is related to development and support of staff specialization. Large audit firms with more investment in developing expertise, employee training, and maintaining expertise will be more likely to have scale economies.
these are competed away. The second pricing term represents the ability of specialist auditors to charge higher fees due to increased bargaining power. Mayhew and Wilkins (2003) find that specialists with dominant market positions are able to charge higher fees. We do not take a position whether dominant specialists have increased bargaining power, or whether they provide higher levels of quality that result in higher fees, but include the separate term for model completeness.

The argument of economies of scale is based on the presence of fixed costs. However, specialist auditors also likely incur variable costs in applying industry-specific knowledge to clients. If specialists incur additional costs and these costs result in higher quality that clients are willing to pay for, specialization should result in higher fees. Finally, the economies of scale argument is based on the presence of fixed costs associated with developing industry specific knowledge, resulting in the potential for economies of scale.

The net effect of specialists on audit fees is uncertain because quality effect and scale economies effect offset each other. If quality effect dominates, industry specialist auditors will charge higher fees (e.g. Craswell et al. 1995; Cullinan, 1998; DeFond et al. 2000). If scale economies effect dominates, industry specialist auditors will offer fee discounts (e.g. Francis and Simon, 1987; Pearson and Trompeter, 1994). Furthermore, the industry segment of Taiwan audit market may not be big enough for audit specialists to develop sufficient scale economies. Accordingly, our first hypothesis predicts that industry specialist auditors will be able to charge higher fees (all hypotheses are all in alternative form):

**Hypothesis 1:** Auditor industry specialists charge fee premia over industry non-specialists.

Francis (1984) and Palmrose (1986) reported that the Big 8 audit firms earn fee premium over non-Big8 firms by providing quality-differentiated services in Australia and U.S. markets. Su (2000) showed the Big 3 firms charge higher fees in both large and small auditee segments in Taiwan market. So we expect that the Big 5 audit firms in Taiwan earn a fee premium over non-Big 5 audit firms.

**Hypothesis 2:** The Big5 audit firms charge higher audit fees over non-Big5 firms.

**IV. RESEARCH DESIGN**

We use a audit fee regression model similar to those used in prior studies (Simunic, 1980; Craswell et al. 1995). This study, following Hogan and Jeter (1999), uses

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4 The additional costs might increase fixed costs, then increase audit fees. We refer such fixed cost increase to audit quality for distinguishing fixed cost in economies of scale.

5 Prior fee studies in various countries also found that the Big 5 fee premium such as Chan et al. (1993) in the United Kingdom, Anderson and Zeghal (1994) in Canada, Gul (1999) in Hong Kong, and Simon et al. (1992) in Singapore.

6 The authors appreciate the suggestions from an anonymous reviewer to incorporate related variables to make this audit fee regression model more complete for the Taiwan audit market. For example, we include INITIAL (1 representing changing auditors in 2000, 0 otherwise) in the audit fee regression model. The results show that the coefficient of INITIAL is negative and not statistically significant.
asset-based industry market share as a measure of industry specialization, and auditor industry specialist is defined as market leaders with market share greater than 20% of audit services within a client specific industry. This 20% cutoff for Big 5 audit firms is based on modification of the Craswell et al. (1995) 10% rule applied to Big 8 audit firms, given the mergers that have reduced the Big 8 to the Big 5. We use audit fee regression model to examine the effect of industry specialists on audit fees and whether the Big 5 audit firms charge higher fees for their clients in the Taiwan audit market.

\[
\ln(\text{FEE}) = a_0 + a_1 \ln(\text{ASSET}) + a_2 \text{SUB} + a_3 \text{FOREIGN} + a_4 \text{DE} + a_5 \text{ROI} + a_6 \text{ARINV} + a_7 \text{Loss} + a_8 \text{Big 5} + a_9 \text{SPEC} + a_{10} \text{Big 5} * \text{SPEC} + u
\]  

Where (with predict sign inside parenthesis)

\[
\begin{align*}
\ln(\text{FEE}) & : \text{natural logarithm of total audit fees,} \\
\ln(\text{ASSET}) & : \text{natural logarithm of assets, (+)} \\
\text{SUB} & : \text{square root of the number of subsidiaries, (+)} \\
\text{FOREIGN} & : \text{ratio of number of foreign subsidiaries to total subsidiaries, (+)} \\
\text{DE} & : \text{ratio of long-term debt to total assets, (+)} \\
\text{ROI} & : \text{ratio of earnings before interest and tax to total assets, (+)} \\
\text{ARINV} & : \text{ratio of inventories and receivables to total asset, (+)} \\
\text{Loss} & : \text{indicator variable, 1 = loss in the past three years, (+)} \\
\text{Big 5} & : \text{indicator variable, 1 = Big 5 audit firms, 0 = otherwise. (+)} \\
\text{SPEC} & : \text{indicator variable, 1 = auditor with market share greater than 20% for firms in client-specific industry, 0 = otherwise. (+)} \\
\text{Big 5} * \text{SPEC} & : \text{the cross-term, Big 5} * \text{SPEC}. (+)
\end{align*}
\]

7 The asset-based market share (MS) of industry k audited by auditor i can be calculated as follows.

\[
\text{MS}_{ik} = \frac{\sum_{j=1}^{J_{ik}} \sqrt{A_{ijk}}}{\sum_{i=1}^{I_k} \sum_{j=1}^{J_{ik}} \sqrt{A_{ijk}}}
\]

where

\[
\begin{align*}
A_{ijk} & = \text{total assets of client firm } j \text{ in industry } k \text{ audited by auditor } i \\
i & = 1,2,\ldots,I \text{ an index for audit firms} \\
j & = 1,2,\ldots,J \text{ an index for client firms} \\
k & = 1,2,\ldots,K \text{ an index for client industries} \\
I_k & = \text{the number of audit firms } i \text{ in industry } k \\
J_{ik} & = \text{the number of clients served by audit firm } i \text{ in industry } k
\end{align*}
\]

8 Prior audit fee studies (e.g., Simunic, 1980) exclude the banking or financial service industry for their sample selection, because some control variables (e.g., current or quick ratio) are not available for those industries. For the pooled industry regression, this study excluded those control variables and included only variables that are common to all industries as shown in audit fee regression model 1.

9 There are other variables that might affect audit fees, for example, initial engagements (Craswell and Francis’s, 1999), audit opinion (Francis, 1984), IPO gross proceeds (Willenborg, 1999). But there are very few auditees that changed auditors in 2000 or didn’t receive clean opinion. And there are no IPO auditees for our 258 sample. So we excluded these variables for our analyses.
Audit fee is defined as the costs paid to the external auditor by client and does not include salaries paid to internal auditors, as in Simunic (1980). The natural logarithm of audit fees is used as the dependent variable to improve the linear fit of the data and is consistent with prior research (e.g., Francis, 1984; Palmrose, 1986; Craswell et al. 1995).

Additional variables control for cross-sectional differences in factors that affect audit fees such as auditee size, audit complexity, and audit risk (Simunic, 1980; Craswell et al. 1995). The natural logarithm of total assets (\(\ln TA\)) controls for client size, and is expected to have a positive relation to audit fees. The square root of the number of subsidiaries (\(\sqrt{SUB}\)) and number of foreign subsidiaries (\(FOREIGN\)) are used to measure the diversification of the client and to control for audit complexity, and are also expected to yield a positive coefficient. The long-term debt to total assets ratio (\(DE\)) is used to control for audit risk and should be positively related to audit fees. Francis (1984) showed that high \(DE\) ratio representing high financial and audit risk and thus the coefficient of \(DE\) should be positive. Auditor-auditee risk-sharing is represented by auditee profitability (\(ROI\)), quantity of accounts with high audit risk (\(ARINV\)) and the existence of a loss in the previous three years (\(Loss\)). When the auditee’s \(ROI\) increases, audit fees are expected to be lower. If the auditee has large receivable account and inventories account, audit risk increases and then audit fees are expected to be higher. However, when auditees suffer a loss in the prior three years, audit firms are expected to charge higher audit fees.

The experimental variable \(SPEC\) is used to measure the effects of industry specialists on audit fees. The coefficient of \(SPEC\) is expected to be positive based on differential audit services provided by industry specialists. Further, the experimental variable \(Big 5\) is used to measure whether the \(Big 5\) fee premium exists, where Su (2000) documented that there is a positive relationship between audit fees and auditor size in the Taiwan audit market. Therefore, the coefficient of \(Big 5\) is expected to be positive. Furthermore, we add the cross-term, \(Big5*SPEC\), to investigate the marginal effect of specialists between \(Big5\) auditors and Non-\(Big5\) auditors. In latter additional tests, we also follow Su (2000), and replace the \(Big5\) with \(Big3\) to examine whether the \(Big 3\) auditor charge a fee premium for their clients. We are also interested in the effect of specialists in different industry types.10

Sample Selection and Market Share Measures11

The sample firms are selected from the public companies listed in Taiwan Security Exchange (TSE) and Over-The-Counter Exchange (OTC) for year 2000. The financial data, basic company information, and its auditor are obtained from Taiwan Economic

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10 In tests of industry types, the \(Big5\), \(Big3\), and \(Big5*SPEC\) variables are not included in the audit fee regression model, since the purpose of this regression model is to examine the fee effect of auditor specialists.

11 Concerning the representativeness of the sample, late responses (96 observations and are defined as the questionnaires returned for the second request) and early responses (162 observations and are defined as the questionnaires returned for the first request) are compared to see whether nonresponse bias is a major concern to the validity of this study, given the assumption that late responses are similar to nonresponses (see Kanuk and Berenson, 1975). A t-test is applied to examine whether there is any significant difference between the mean scores of the variables in the pooled industries. The results indicate that there are no significant differences between the means of the variables in all industries.
Journal (TEJ) database. The audit fees and number of subsidiaries are gathered from questionnaires mailed to the Chief Financial or Accounting Officer of companies selected. Here are the criteria for sampling:

(1) The companies must have complete financial data (e.g., assets, sales, DE ratio, ROI ratio).

(2) The fiscal year of companies ends on Dec. 31.

The number of sample firms for the mail survey is 925. Table 1 reports the breakdown of mail survey and responses. The questionnaire was mailed in early March 2002 followed by second requests to non-respondents in early April 2002. Overall, 270 responses were received. After deleting 12 responses with incomplete information, the usable responses are 258 and the overall response rate is around 28%. If the finance and securities industries are excluded and 3 responses with no ARINV ratio are deleted, the sample is 224.

<table>
<thead>
<tr>
<th>Industry groups</th>
<th>TSE Sample firms</th>
<th>TSE Sample responses</th>
<th>OTC Sample firms</th>
<th>OTC Sample response</th>
<th>Overall Sample firms</th>
<th>Overall Sample response</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Foods</td>
<td>28</td>
<td>8</td>
<td>3</td>
<td>0</td>
<td>31</td>
<td>8</td>
<td>25.81%</td>
</tr>
<tr>
<td>Plastics</td>
<td>23</td>
<td>9</td>
<td>8</td>
<td>1</td>
<td>31</td>
<td>10</td>
<td>32.26%</td>
</tr>
<tr>
<td>Textiles</td>
<td>59</td>
<td>18</td>
<td>15</td>
<td>6</td>
<td>74</td>
<td>24</td>
<td>32.43%</td>
</tr>
<tr>
<td>Electric&amp;Machinery</td>
<td>31</td>
<td>12</td>
<td>18</td>
<td>7</td>
<td>49</td>
<td>19</td>
<td>38.78%</td>
</tr>
<tr>
<td>Electrical</td>
<td>16</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>18</td>
<td>3</td>
<td>16.67%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>28</td>
<td>11</td>
<td>22</td>
<td>8</td>
<td>50</td>
<td>19</td>
<td>38.00%</td>
</tr>
<tr>
<td>Glass &amp; Ceramics</td>
<td>7</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Paper &amp; Pulp</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Steel &amp; Iron</td>
<td>33</td>
<td>11</td>
<td>13</td>
<td>8</td>
<td>46</td>
<td>19</td>
<td>41.30%</td>
</tr>
<tr>
<td>Rubber</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>3</td>
<td>30.00%</td>
</tr>
<tr>
<td>Automobile</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Electronics</td>
<td>18.5</td>
<td>32</td>
<td>170</td>
<td>49</td>
<td>355</td>
<td>81</td>
<td>22.82%</td>
</tr>
<tr>
<td>Constructions</td>
<td>37</td>
<td>8</td>
<td>30</td>
<td>7</td>
<td>67</td>
<td>15</td>
<td>22.39%</td>
</tr>
<tr>
<td>Transportations</td>
<td>17</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>25</td>
<td>8</td>
<td>32.00%</td>
</tr>
<tr>
<td>Tourism</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>12</td>
<td>3</td>
<td>25.00%</td>
</tr>
<tr>
<td>Finance</td>
<td>53</td>
<td>24</td>
<td>4</td>
<td>2</td>
<td>57</td>
<td>26</td>
<td>45.61%</td>
</tr>
<tr>
<td>Wholesale &amp; Retail</td>
<td>11</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>14</td>
<td>2</td>
<td>14.29%</td>
</tr>
<tr>
<td>Security</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>5</td>
<td>19</td>
<td>5</td>
<td>26.32%</td>
</tr>
<tr>
<td>Others</td>
<td>22</td>
<td>7</td>
<td>14</td>
<td>6</td>
<td>36</td>
<td>13</td>
<td>36.11%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>588</td>
<td>153</td>
<td>337</td>
<td>105</td>
<td>925</td>
<td>258</td>
<td>27.89%</td>
</tr>
</tbody>
</table>

We use auditor’s market share in client-specific industry as the proxy of auditor industry specialist. The market shares (MS) with the asset-base are summarized in the Appendix.
V. RESULTS

Table 2 reports sample descriptive statistics on a pooled industry basis. For information completeness, Table 2 also presents the descriptive statistics based on different samples and industry types. The sample is divided into electronics (81) versus non-electronics (177) in Panel A, because the electronics industry is the largest and principal industry in Taiwan. The average audit fee for the 258 (224) responses is $2,418,900 (2,216,800) New Taiwan Dollar (NTD), and the average audit fee is higher than the overall mean for electronics industries ($3,076,800 NTD). Table 2 also reports that about 30% of the responding companies are audited by specialist auditors. Actually, most specialists are Big5 auditors. On Panel B of Table 2, the sample is further divided as Big5 (auditors are Big5) and NonBig5 (auditors are NonBing5). The average firm size and average audit fees ($2,681,900 NTD) are higher in Big5 group.

Table 3 presents a matrix of correlation coefficients among the variables used for the pooled industry regression. As expected, the correlation between LnFee and LnTA, a proxy for firm size, is high and significant at the 0.01 level. Big 5 and SPEC are positively correlated. Further, Big5 and SPEC are all positively and significantly correlated with LnFee. Similarly, LnTA is positively correlated with SUB, DE ratio and SPEC, negatively correlated with ARINV, indicating that larger companies have more subsidiaries, higher level of debt and less accounts receivables and inventories, and more specialists hired. More subsidiaries might represent more foreign subsidiaries and lead to higher audit fees. Companies with loss in previous three years have higher DE ratio and lower ROI.

Table 4 reports the full-sample empirical results for industry specialists and the Big 5 auditors (Panel A for n=258, Panel B for n=224). Table 4 also reports that the explanatory power of our audit fee regression model (adjusted R²) is nearly 30% and all F values are statistically significant. The test of hypothesis H1 focuses on the regression coefficient of the experimental variable SPEC. As expected, the sign is significantly positive at p<0.01. This result indicates that industry specialists charge a fee premium in the Taiwan audit market, consistent with dominance of quality effect. This implies that industry specialists in Taiwan did not develop enough economies of scale to offset the increased cost due to providing differentiated services.

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12 The sample excluding financial services industries (n=31) in Table 2 should be 227. However, there are 3 sample missing ARINV data, and therefore the sample excluding financial services for the empirical tests is reduced to 224.

13 Potential specification problems are evaluated through checking multicollinearity and heteroscedasticity. From the tests performed, multicollinearity and heteroscedasticity (from the White test results) does not appear to be a problem in the audit fee regression models. Results are qualitatively unchanged when observations identified as potential outliers are excluded from the analysis.
Table 2: Sample Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Pooled data</th>
<th>Pooled data W/O Financial Services</th>
<th>Electronics n=81</th>
<th>Non-electronics n=177</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=258</td>
<td>n=224</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Audit Fees</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Ten Thousands)</td>
<td>241.89</td>
<td>221.68</td>
<td>307.68</td>
<td>211.79</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Millions)</td>
<td>44970.48</td>
<td>10566.78</td>
<td>12246.11</td>
<td>59946.04</td>
</tr>
<tr>
<td><strong>LnFEE-Mean</strong></td>
<td>5.18</td>
<td>5.12</td>
<td>5.28</td>
<td>5.14</td>
</tr>
<tr>
<td>(Std. Dev)</td>
<td>(0.68)</td>
<td>(0.66)</td>
<td>(0.82)</td>
<td>(0.60)</td>
</tr>
<tr>
<td><strong>LnTA</strong></td>
<td>15.50</td>
<td>15.06</td>
<td>14.9</td>
<td>15.77</td>
</tr>
<tr>
<td>(1.77)</td>
<td>(1.29)</td>
<td>(0.39)</td>
<td>(1.86)</td>
<td></td>
</tr>
<tr>
<td><strong>ARINV</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.32)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FOREIGN</strong></td>
<td>0.39</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.40)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SUB</strong></td>
<td>1.66</td>
<td>1.75</td>
<td>1.58</td>
<td>1.70</td>
</tr>
<tr>
<td>(1.29)</td>
<td></td>
<td></td>
<td>(1.13)</td>
<td>(1.35)</td>
</tr>
<tr>
<td><strong>DE</strong></td>
<td>0.08</td>
<td>0.09</td>
<td>0.07</td>
<td>0.09</td>
</tr>
<tr>
<td>(0.10)</td>
<td></td>
<td></td>
<td>(0.08)</td>
<td>(0.11)</td>
</tr>
<tr>
<td><strong>ROI</strong></td>
<td>0.05</td>
<td>0.06</td>
<td>0.11</td>
<td>0.03</td>
</tr>
<tr>
<td>(0.10)</td>
<td></td>
<td></td>
<td>(0.10)</td>
<td>(0.09)</td>
</tr>
<tr>
<td><strong>LOSS</strong></td>
<td>0.34</td>
<td>0.33</td>
<td>0.36</td>
<td>0.33</td>
</tr>
<tr>
<td>(0.47)</td>
<td></td>
<td></td>
<td>(0.48)</td>
<td>(0.47)</td>
</tr>
<tr>
<td><strong>BIG5</strong></td>
<td>0.7</td>
<td>0.76</td>
<td>0.93</td>
<td>0.70</td>
</tr>
<tr>
<td>(0.42)</td>
<td></td>
<td></td>
<td>(0.26)</td>
<td>(0.46)</td>
</tr>
<tr>
<td><strong>BIG3</strong></td>
<td>0.54</td>
<td>0.52</td>
<td>0.63</td>
<td>0.50</td>
</tr>
<tr>
<td>(0.50)</td>
<td></td>
<td></td>
<td>(0.49)</td>
<td>(0.50)</td>
</tr>
<tr>
<td><strong>SPEC</strong></td>
<td>0.31</td>
<td>0.29</td>
<td>0.42</td>
<td>0.25</td>
</tr>
<tr>
<td>(0.46)</td>
<td></td>
<td></td>
<td>(0.50)</td>
<td>(0.44)</td>
</tr>
</tbody>
</table>

(continued on next page)
Table 2 (continued)

<table>
<thead>
<tr>
<th></th>
<th>n=258 (Pooled data)</th>
<th>n=224 (Pooled data W/O Financial Services)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>BIG5 (n=199)</td>
<td>NonBIG5 (n=59)</td>
</tr>
<tr>
<td><strong>Audit Fees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Ten Thousands)</td>
<td>268.19</td>
<td>153.21</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Millions)</td>
<td>46131.06</td>
<td>41056.00</td>
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<tr>
<td><strong>LnFEE-Mean</strong></td>
<td>5.26</td>
<td>4.92</td>
</tr>
<tr>
<td>(Std. Dev)</td>
<td>(0.71)</td>
<td>(0.49)</td>
</tr>
<tr>
<td><strong>LnTA</strong></td>
<td>15.55</td>
<td>15.32</td>
</tr>
<tr>
<td></td>
<td>(1.79)</td>
<td>(1.71)</td>
</tr>
<tr>
<td><strong>ARINV</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.32</td>
<td>0.31</td>
</tr>
<tr>
<td><strong>FOREIGN</strong></td>
<td>0.41</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>(0.39)</td>
<td>(0.40)</td>
</tr>
<tr>
<td><strong>SUB</strong></td>
<td>1.71</td>
<td>1.50</td>
</tr>
<tr>
<td></td>
<td>(1.29)</td>
<td>(1.27)</td>
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<tr>
<td><strong>DE</strong></td>
<td>0.08</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.08)</td>
</tr>
<tr>
<td><strong>ROI</strong></td>
<td>0.06</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.11)</td>
</tr>
<tr>
<td><strong>LOSS</strong></td>
<td>0.32</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>(0.47)</td>
<td>(0.50)</td>
</tr>
<tr>
<td><strong>BIG3</strong></td>
<td>0.70</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.46)</td>
<td>(0.00)</td>
</tr>
<tr>
<td><strong>SPEC</strong></td>
<td>0.39</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(0.49)</td>
<td>(0.13)</td>
</tr>
</tbody>
</table>

LnFee = natural logarithm of total audit fees, LnTA = natural logarithm of total assets, ARINV = ratio of inventories and receivables to total assets, FOREIGN = ratio of number of foreign subsidiaries to total subsidiaries, SUB = square root of the number of subsidiaries, DE = ratio of long-term debt to total assets, ROI = ratio of earnings before interest and tax to total assets, LOSS = indicator variable, 1 = loss in the past three years, Big 5 indicator variable, 1 = Big 5 audit firms, 0 = otherwise. Big 3 = indicator variable, 1 = Big 3 auditor in client-specific industry, 0 = otherwise. SPEC = indicator variable, 1 = specialists in industries, using 20% rule.
### Table 3: Matrix of Correlation Coefficients (p-value)

**Pearson Correlation**

#### Panel A (n=258, Pooled data)

<table>
<thead>
<tr>
<th></th>
<th>LnFEE</th>
<th>LnTA</th>
<th>SUB</th>
<th>FOREIGN</th>
<th>DE</th>
<th>ROI</th>
<th>LOSS</th>
<th>BIG5</th>
<th>SPEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnFEE</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LnTA</td>
<td>0.44 ***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUB</td>
<td>0.21 ***</td>
<td>0.18 ***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOREIGN</td>
<td>0.04</td>
<td>-0.17</td>
<td>0.37 ***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td>0.06</td>
<td>0.16 ***</td>
<td>0.20 ***</td>
<td>-0.01</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROI</td>
<td>0.05</td>
<td>-0.08</td>
<td>0.00</td>
<td>0.22 ***</td>
<td>-0.08</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOSS</td>
<td>-0.12 *</td>
<td>0.07</td>
<td>0.04</td>
<td>-0.10 *</td>
<td>0.15 **</td>
<td>-0.35 ***</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIG5</td>
<td>0.21 ***</td>
<td>0.05</td>
<td>0.07</td>
<td>0.08</td>
<td>0.04</td>
<td>0.14 **</td>
<td>-0.08</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>SPEC</td>
<td>0.26 ***</td>
<td>0.15 ***</td>
<td>0.10</td>
<td>-0.05</td>
<td>0.08</td>
<td>0.00</td>
<td>0.08</td>
<td>0.34 ***</td>
<td>1.00</td>
</tr>
</tbody>
</table>

#### Panel B (n=224, Pooled data W/O Financial Services)

<table>
<thead>
<tr>
<th></th>
<th>LnFEE</th>
<th>LnTA</th>
<th>SUB</th>
<th>FOREIGN</th>
<th>DE</th>
<th>ROI</th>
<th>LOSS</th>
<th>ARINV</th>
<th>BIG5</th>
<th>SPEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnFEE</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LnTA</td>
<td>0.45 ***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SUB</td>
<td>0.31 ***</td>
<td>0.51 ***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOREIGN</td>
<td>0.12 *</td>
<td>-0.05</td>
<td>0.35 ***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td>0.12 *</td>
<td>0.45 ***</td>
<td>0.16 **</td>
<td>-0.08</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROI</td>
<td>0.07</td>
<td>-0.06</td>
<td>-0.02</td>
<td>0.21 ***</td>
<td>-0.09</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOSS</td>
<td>-0.08</td>
<td>0.16 **</td>
<td>0.06 **</td>
<td>-0.09</td>
<td>0.15 **</td>
<td>-0.36 ***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARINV</td>
<td>-0.14 **</td>
<td>-0.27 ***</td>
<td>-0.14 **</td>
<td>0.10</td>
<td>-0.33 ***</td>
<td>0.13 *</td>
<td>-0.08</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIG5</td>
<td>0.18 **</td>
<td>0.08</td>
<td>0.05</td>
<td>0.10</td>
<td>0.05</td>
<td>0.14 **</td>
<td>-0.05</td>
<td>0.04</td>
<td>1.00</td>
<td></td>
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<tr>
<td>SPEC</td>
<td>0.25 ***</td>
<td>0.23 ***</td>
<td>0.09</td>
<td>-0.03</td>
<td>0.10</td>
<td>-0.01</td>
<td>0.12 *</td>
<td>-0.08</td>
<td>0.33 ***</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*(*)(**) Significant at the 0.10(0.05)(0.01) level, one-tailed test where appropriate.

LnFee = natural logarithm of total audit fees, LnTA = natural logarithm of total assets, ARINV = ratio of inventories and receivables to total asset, FOREIGN = ratio of number of foreign subsidiaries to total subsidiaries, SUB = square root of the number of subsidiary, DE = ratio of long-term debt to total assets, ROI = ratio of earnings before interest and tax to total assets, LOSS = indicator variable, 1 = loss in the past three year, SPEC = indicator variable, 1 = specialists in industries, using 20% rule, Big 5: indicator variable, 1 = Big 5 audit firms, 0 = otherwise.
### Table 4: Industry Specialist and Big5 Fee Premium
(Dependent variable: LnFee)

<table>
<thead>
<tr>
<th>Panel A (Pooled data)</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=258</td>
<td>n=258</td>
<td>n=258</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>2.36 (7.40)**</td>
<td>2.56 (7.73)**</td>
<td>2.46 (7.59)**</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>0.16 (8.54)**</td>
<td>0.16 (7.94)**</td>
<td>0.16 (8.12)**</td>
</tr>
<tr>
<td>FOREIGN (+)</td>
<td>0.06 (0.63)</td>
<td>0.10 (1.10)</td>
<td>0.09 (0.94)</td>
</tr>
<tr>
<td>SUB (+)</td>
<td>0.07 (1.70)**</td>
<td>0.05 (1.50)*</td>
<td>0.06 (1.50)*</td>
</tr>
<tr>
<td>DE (+)</td>
<td>-0.09 (-0.25)</td>
<td>-0.10 (-0.26)</td>
<td>-0.12 (-0.34)</td>
</tr>
<tr>
<td>ROI (-)</td>
<td>0.08 (0.17)</td>
<td>0.14 (0.28)</td>
<td>0.06 (0.12)</td>
</tr>
<tr>
<td>LOSS (+)</td>
<td>-0.20 (-2.55)**</td>
<td>-0.23 (-2.87)**</td>
<td>-0.22 (-2.74)**</td>
</tr>
<tr>
<td>BIG5 (+)</td>
<td>0.27 (3.38)**</td>
<td>0.17 (2.09)**</td>
<td></td>
</tr>
<tr>
<td>SPEC (+)</td>
<td>0.31 (3.31)**</td>
<td>0.12 (1.06)</td>
<td></td>
</tr>
<tr>
<td>BIG5*SPEC</td>
<td>0.14 (1.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj. R(^2)</td>
<td>0.27</td>
<td>0.28</td>
<td>0.29</td>
</tr>
<tr>
<td>F-value</td>
<td>12.93***</td>
<td>14.05***</td>
<td>11.34***</td>
</tr>
</tbody>
</table>

*(**)(***) Significant at the 0.10(0.05)(0.01) level, one-tailed test where appropriate.

(continued on next page)
### Table 4 (continued)

**Panel B (Pooled data W/O Financial Services)**

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>n=224</td>
<td>n=224</td>
<td>n=224</td>
</tr>
<tr>
<td>Intercept</td>
<td>1.42</td>
<td>1.70</td>
<td>1.63</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>(2.67)***</td>
<td>(3.28)***</td>
<td>(3.14)***</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>0.24</td>
<td>0.23</td>
<td>0.23</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>(6.13)***</td>
<td>(5.93)***</td>
<td>(5.93)***</td>
</tr>
<tr>
<td>ARINV</td>
<td>-0.23</td>
<td>-0.20</td>
<td>-0.22</td>
</tr>
<tr>
<td>LnFee</td>
<td>(-1.01)</td>
<td>(-0.90)</td>
<td>(-0.97)</td>
</tr>
<tr>
<td>LnTA</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>(0.40)</td>
<td>(0.45)</td>
<td>(0.46)</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>0.17</td>
<td>0.19</td>
<td>0.17</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>(1.90)**</td>
<td>(2.18)**</td>
<td>(2.01)**</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>-0.63</td>
<td>-0.57</td>
<td>-0.62</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>(-1.18)</td>
<td>(-1.13)</td>
<td>(-1.20)</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>0.10</td>
<td>0.16</td>
<td>0.09</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>(0.21)</td>
<td>(0.34)</td>
<td>(0.19)</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>-0.18</td>
<td>-0.20</td>
<td>-0.19</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>(-2.11)**</td>
<td>(-2.36)***</td>
<td>(-2.28)**</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>0.20</td>
<td>0.25</td>
<td>0.13</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>(2.48)***</td>
<td>(2.54)***</td>
<td>(1.51)*</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>SPEC (+)</td>
<td>0.25</td>
<td>-0.05</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>(SPEC (+))</td>
<td>(SPEC (+))</td>
<td>(-0.37)</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>Big5 (+)</td>
<td>0.20</td>
<td>0.13</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>(Spec (+))</td>
<td>(Spec (+))</td>
<td>(1.51)*</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>Big5*SPEC</td>
<td>0.25</td>
<td>0.26</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>(Big5*SPEC)</td>
<td>(Big5*SPEC)</td>
<td>(1.58)*</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>Adj. R^2</td>
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<td>0.28</td>
</tr>
<tr>
<td>LnTA (-)</td>
<td>F-value</td>
<td>9.87***</td>
<td>10.44***</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>F-value</td>
<td>8.56***</td>
<td>8.56***</td>
</tr>
</tbody>
</table>

**Notes:**

* (***) Significant at the 0.10 (0.05) (0.01) level, one-tailed test where appropriate.

LnFee = natural logarithm of total audit fees,

LnTA = natural logarithm of total assets,

ARINV = ratio of inventories and receivables to total asset,

FOREIGN = ratio of number of foreign subsidiaries to total subsidiaries,

SUB = square root of the number of subsidiaries,

DE = ratio of long-term debt to total assets,

ROI = ratio of earnings before interest and tax to total assets,

LOSS = indicator variable, 1 = loss in the past three year,

SPEC = indicator variable, 1 = specialists in industries, using 20% rule,

Big5 = indicator variable, 1 = Big 5 auditor, 0 = otherwise,

Big5*SPEC = the cross-term, Big5*SPEC.
The regression coefficient of the Big 5 is positive and statistically significant at 
p<0.01, which implies that the Big 5 auditors charge fee premiums in the Taiwan audit 
market. The result is consistent with prior fee studies, such as Palmrose (1986), and 
Francis (1984). The last column of Table 4 reports the empirical test results for the fee 
effects by the Big 5 industry specialists. For n=258, only Big5 effect is significant at 
p<0.05. For n=224, Big5 and Big5*SPEC are significant at p<0.1, indicating that Big5 
auditor specialists charge a fee premium for their clients. The results from these two 
samples are broadly consistent.

To the authors’ knowledge, only Su (2000) examines the relationship between the 
auditor size and audit fees in the Taiwan audit market. However, she categorized the large 
audit firms into the Big 3 and the non-Big 3 to examine whether the Big 3 auditors charge 
higher audit fees. Therefore, the current study adds the new variable SPEC to test 
whether the Big 3 auditors charge a fee premium for the full sample and for both the 
large and small auditees. In Table 5, specialist auditors and the Big 3 auditors charge a fee 
premium for their clients, but the coefficient of SPEC is more significant than that of 
BIG3. Su (2000) demonstrated that BIG3 auditors charged higher fees. We further show 
that BIG3 specialist auditors charge higher fees than BIG3 non-specialist auditors. We 
further partition the entire 258 (224) sample into 3 groups of 86 (75) firms based on 
firm’s total assets. We then rerun the regression to test the Big 3 fee effect for the large 
auditees and the small auditees. The test results are reported in the second and third 
columns. The regression coefficients of the Big 3 and SPEC for the large auditees and the 
small auditees are all positive, but not significant. Following Su’s (2000) explanation, it 
could be severe price competition in small and large auditee submarkets.

---

14 In contrast with Su (2000), the current study uses the asset-based market share measure to define industry 
specialist, and define the Big 3 auditor on a specific industry basis, given the specialists calculated in every 
industry Big 3 are also Big 5 audit firms.

15 We define the BIG3 auditors as the auditors with the first, second and third largest market shares in every 
industry. By this definition, we found that all specialist auditors are BIG3 auditors. So SPEC indicates 
BIG3×SPEC in Table 5.

16 The insignificant results might be also due to the highly correlation between BIG3 and SPEC.
Table 5: Big3 Fee Premium  
(Dependent variable: \( \ln \text{Fee} \))

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n = 258 )</td>
<td>( n = 86 ) (large auditees)</td>
<td>( n = 86 ) (small auditees)</td>
</tr>
<tr>
<td>Intercept</td>
<td>2.53</td>
<td>2.37</td>
<td>0.38</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>0.16</td>
<td>0.16</td>
<td>0.32</td>
</tr>
<tr>
<td>SUB (+)</td>
<td>0.05</td>
<td>0.08</td>
<td>0.05</td>
</tr>
<tr>
<td>DE (+)</td>
<td>-0.11</td>
<td>0.38</td>
<td>-1.66</td>
</tr>
<tr>
<td>FOREIGN (+)</td>
<td>0.10</td>
<td>-0.02</td>
<td>0.15</td>
</tr>
<tr>
<td>ROI (-)</td>
<td>0.14</td>
<td>2.23</td>
<td>-0.71</td>
</tr>
<tr>
<td>LOSS (+)</td>
<td>-0.22</td>
<td>-0.25</td>
<td>-0.18</td>
</tr>
<tr>
<td>BIG3 (+)</td>
<td>0.09</td>
<td>0.13</td>
<td>0.06</td>
</tr>
<tr>
<td>SPEC (+)</td>
<td>0.26</td>
<td>0.10</td>
<td>0.14</td>
</tr>
<tr>
<td>Adj. ( R^2 )</td>
<td>0.29</td>
<td>0.34</td>
<td>0.18</td>
</tr>
<tr>
<td>F-value</td>
<td>12.41***</td>
<td>4.95***</td>
<td>2.07**</td>
</tr>
</tbody>
</table>

*(**)(***)* Significant at the 0.10(0.05)(0.01) level, one-tailed test where appropriate.  
(continued on next page)
Table 5 (continued)

Panel B (Pooled data W/O Financial Services)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Coefficient (t-statistics) n=224</th>
<th>Coefficient (t-statistics) n=75(large auditees)</th>
<th>Coefficient (t-statistics) n=75(small auditees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.69 (3.25)***</td>
<td>1.23 (0.91)</td>
<td>0.40 (0.22)</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>0.23 (5.87)***</td>
<td>0.24 (2.79)***</td>
<td>0.34 (2.54)***</td>
</tr>
<tr>
<td>ARINV (+)</td>
<td>-0.23 (-1.06)</td>
<td>0.37 (1.02)</td>
<td>-0.66 (-1.88)**</td>
</tr>
<tr>
<td>SUB (+)</td>
<td>0.02 (0.42)</td>
<td>0.02 (0.33)</td>
<td>0.03 (0.45)</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>0.19 (2.20)***</td>
<td>0.10 (0.45)</td>
<td>0.20 (1.53)</td>
</tr>
<tr>
<td>DE (+)</td>
<td>-0.60 (-1.20)</td>
<td>-0.27 (-0.36)</td>
<td>-2.13 (-2.38)***</td>
</tr>
<tr>
<td>ROI (-)</td>
<td>0.17 (0.35)</td>
<td>1.73 (2.15)**</td>
<td>-0.51 (-0.98)</td>
</tr>
<tr>
<td>LOSS (+)</td>
<td>-0.19 (-2.24)***</td>
<td>-0.23 (-1.53)*</td>
<td>-0.19 (-1.54)*</td>
</tr>
<tr>
<td>BIG3 (+)</td>
<td>0.10 (1.42)*</td>
<td>0.09 (0.51)</td>
<td>0.09 (0.76)</td>
</tr>
<tr>
<td>SPEC</td>
<td>0.19 (1.96)***</td>
<td>0.18 (0.99)</td>
<td>0.16 (1.12)</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.28</td>
<td>0.33</td>
<td>0.25</td>
</tr>
<tr>
<td>F-value</td>
<td>9.41***</td>
<td>3.49***</td>
<td>2.38**</td>
</tr>
</tbody>
</table>

* ** *** Significant at the 0.10 (0.05) (0.01) level, one-tailed test where appropriate.

LnFee = natural logarithm of total audit fees,
LnTA = natural logarithm of total assets,
ARINV = ratio of inventories and receivables to total assets,
FOREIGN = ratio of number of foreign subsidiaries to total subsidiaries,
SUB = square root of the number of subsidiaries,
DE = ratio of long-term debt to total assets,
ROI = ratio of earnings before interest and tax to total assets,
LOSS = indicator variable, 1 = loss in the past three years,
Big3 = indicator variable, 1 = Big 3 auditor in client-specific industry, 0 = otherwise.
SPEC = Big3 x SPE, indicator variable, 1 = specialists in industries, using 20% rule.
The control variables also have an effect on audit fees\textsuperscript{17}. As expected, $\ln TA$ is positively and significantly related with $\ln Fee$, which indicates that auditee size is a major variable in explaining the variation in audit fees. This is consistent with previous studies, such as Simunic (1980), and Palmrose (1986). $\text{SUB}$ also has a significantly positive effect on audit fees for the sample $n=258$, which contrasts with the insignificant and negative results in Su (2000). In contrast, $\text{DE}$ and $\text{ROI}$ have an insignificant but opposite sign. $\text{LOSS}$ has a significantly negative sign, which is not as expected. The possible explanation may be that auditors in Taiwan would consider whether the clients afford high audit fees. Based on a clients' financial condition, auditors may employ a discrimination policy in pricing. The clients would ask for fees discounts if they suffered loss in the past. In order to maintain their client in the future audit engagements, the auditor might lose bargaining power and give special discounts. If the auditor charges the prescribed or even higher audit fees, the client could not afford it and may switch to another auditor. So, auditors would rather discount the audit fees and transfer the loss to clients with better financial condition. This might also explain why the coefficient of $\text{ROI}$ is positive, as Su(2000) has described\textsuperscript{18}, and $\text{LOSS}$ is negatively correlated with $\text{ROI}$.

**Additional Analyses**

We further partition the 258 (224) samples into 3 groups of 86 (75) firms based on their total assets in order to examine the industry specialist fee effect and the Big 5 auditors fee effect for the large and small auditees. The results are reported in Table 6. For the large 86 (75) auditees subgroup, the coefficient of the Big 5 auditors is positive and statistically (marginally) significant at $p<0.01$ ($p<0.1$), and the coefficient of $\text{SPEC}$ is marginally significant at $p<0.10$ (large 75 auditees not significant). For the small auditees' subgroup, the coefficient of the Big5, however, is positive but insignificant. The coefficient of SPEC is still marginally significant at $p<0.10$. Overall, the Big 5 auditors and industry specialist auditors charge higher audit fees for their large auditees, but only industry specialists charge higher audit fees for their small auditees.

\textsuperscript{17} The discussions of the control variables are limited to Table 4, since the test results in other tables are broadly consistent.

\textsuperscript{18} Su (2000) stated, “…..the affordability of paying audit fees increases when the auditees have a higher profitability.”
Table 6: Additional Tests for Big5 premium  
(Dependant variable: LnFee)

Panel A (n=258, Pooled data)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
<th>Coefficient (t-statistics)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=86 (large auditees)</td>
<td>n=86 (large auditees)</td>
<td>n=86 (small auditees)</td>
<td>n=86 (small auditees)</td>
</tr>
<tr>
<td>Intercept</td>
<td>2.19 (2.95)**</td>
<td>2.40 (3.11)**</td>
<td>0.68 (0.40)</td>
<td>0.52 (0.31)</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>0.16 (4.22)***</td>
<td>0.16 (3.95)*****</td>
<td>0.30 (2.47)***</td>
<td>0.31 (2.58)***</td>
</tr>
<tr>
<td>SUB (+)</td>
<td>0.07 (1.29)</td>
<td>0.08 (1.45)*</td>
<td>0.05 (0.96)</td>
<td>0.05 (0.86)</td>
</tr>
<tr>
<td>FOREIGN (+)</td>
<td>-0.01 (-0.04)</td>
<td>0.01 (0.05)</td>
<td>0.13 (1.06)</td>
<td>0.15 (1.22)</td>
</tr>
<tr>
<td>DE (+)</td>
<td>0.33 (0.60)</td>
<td>0.32 (0.56)</td>
<td>-1.70 (-2.64)***</td>
<td>-1.69 (-2.64)***</td>
</tr>
<tr>
<td>ROI (-)</td>
<td>1.91 (2.44)***</td>
<td>2.27 (2.90)***</td>
<td>-0.70 (-1.10)</td>
<td>-0.68 (-1.09)</td>
</tr>
<tr>
<td>LOSS (+)</td>
<td>-0.21 (-1.61)*</td>
<td>-0.26 (-1.93)**</td>
<td>-0.21 (-1.45)*</td>
<td>-0.19 (-1.34)*</td>
</tr>
<tr>
<td>BIG5 (+)</td>
<td>0.40 (2.74)***</td>
<td>0.06 (0.46)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPEC (+)</td>
<td></td>
<td>0.17 (1.45)*</td>
<td></td>
<td>0.17 (1.39)*</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.37 (2.57)***</td>
<td>0.33 (5.58)***</td>
<td>0.15 (2.04)*</td>
<td>0.17 (2.34)**</td>
</tr>
<tr>
<td>F-value</td>
<td>6.57 (0.09)***</td>
<td>5.58 (0.01)***</td>
<td>2.04 (0.05)</td>
<td>2.34 (0.01)</td>
</tr>
</tbody>
</table>

*(**)(****) Significant at the 0.10(0.05)(0.01) level, one-tailed test where appropriate.  
(continued on next page)
Table 6 (continued)

Panel B (n=224, Pooled data W/O Financial Services)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Coefficient (t-statistics) n=75 (large auditees)</th>
<th>Coefficient (t-statistics) n=75 (large auditees)</th>
<th>Coefficient (t-statistics) n=75 (small auditees)</th>
<th>Coefficient (t-statistics) n=75 (small auditees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.83 (0.77)</td>
<td>1.26 (1.01)</td>
<td>1.36 (0.72)</td>
<td>0.68 (0.36)</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>0.26 (3.02)**</td>
<td>0.24 (1.00)</td>
<td>0.27 (0.36)</td>
<td>0.32 (0.36)</td>
</tr>
<tr>
<td>ARINV(+)</td>
<td>0.32 (3.02)**</td>
<td>0.39 (1.02)</td>
<td>-0.63 (-1.83)**</td>
<td>-0.59 (-1.83)**</td>
</tr>
<tr>
<td>SUB (+)</td>
<td>0.01 (0.20)</td>
<td>0.02 (0.36)</td>
<td>0.03 (0.50)</td>
<td>0.03 (0.50)</td>
</tr>
<tr>
<td>FOREIGN (+)</td>
<td>0.06 (0.24)</td>
<td>0.10 (0.43)</td>
<td>0.18 (1.46)*</td>
<td>0.20 (1.56)*</td>
</tr>
<tr>
<td>DE (+)</td>
<td>-0.54 (-0.67)</td>
<td>-0.24 (-0.33)</td>
<td>-2.05 (-3.45)**</td>
<td>-2.14 (-3.65)**</td>
</tr>
<tr>
<td>ROI (-)</td>
<td>1.59 (2.50)**</td>
<td>1.72 (2.71)**</td>
<td>-0.53 (-0.76)</td>
<td>-0.52 (-0.76)</td>
</tr>
<tr>
<td>LOSS (+)</td>
<td>-0.19 (-1.29)</td>
<td>-0.25 (-1.51)*</td>
<td>-0.21 (-1.39)*</td>
<td>-0.20 (-1.39)*</td>
</tr>
<tr>
<td>BIG5 (+)</td>
<td>0.25 (1.44)*</td>
<td>0.05 (0.38)</td>
<td>0.22 (1.63)*</td>
<td>0.22 (1.56)*</td>
</tr>
<tr>
<td>SPEC (+)</td>
<td></td>
<td>0.22 (1.26)</td>
<td></td>
<td>0.21 (1.56)*</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.32 (0.32)</td>
<td>0.32 (0.32)</td>
<td>0.21 (0.21)</td>
<td>0.24 (0.24)</td>
</tr>
<tr>
<td>F-value</td>
<td>3.89***</td>
<td>3.95***</td>
<td>2.21**</td>
<td>2.63**</td>
</tr>
</tbody>
</table>

*(**)(***): Significant at the 0.10(0.05)(0.01) level, one-tailed test where appropriate.

LnFee = natural logarithm of total audit fees, LnTA = natural logarithm of total assets, ARINV = ratio of inventories and receivables to total asset, FOREIGN = ratio of number of foreign subsidiaries to total subsidiaries, SUB = square root of the number of subsidiaries, DE = ratio of long-term debt to total assets, ROI = ratio of earnings before interest and tax to total assets, LOSS = indicator variable, 1 = loss in the past three year, SPEC = indicator variable, 1 = specialists in industries, using 20% rule, Big5 = indicator variable, 1 = Big 5 auditor, 0 = otherwise.

For examining the effect of industry specialists on audit fees in various industry types, we divided the 258 samples into the electronics industry (81 companies) and non-electronics industries (177 companies) to test the pricing behavior for auditor.
industry specialists. The results are summarized in Table 7. Interestingly, auditor specialists in the electronics industry have more positive effect on audit fees than auditor specialists in non-electronics industries, because the coefficient of SPEC in electronics industry is more statistically significant than that of SPEC in non-electronics industry.

Table 7: Fee Premium: Industry Type  
(Dependent variable: LnFee)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Electronics Industry</th>
<th>Non-electronics Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient (t-statistics)</td>
<td>Coefficient (t-statistics)</td>
</tr>
<tr>
<td>n=81</td>
<td>n=177</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.58 (-0.70)</td>
<td>2.76 (8.24)***</td>
</tr>
<tr>
<td>LnTA (+)</td>
<td>0.41 (6.38)***</td>
<td>0.14 (7.03)***</td>
</tr>
<tr>
<td>SUB (+)</td>
<td>-0.06 (-0.74)</td>
<td>0.07 (1.64)*</td>
</tr>
<tr>
<td>FOREIGN (+)</td>
<td>0.00 (0.01)</td>
<td>0.12 (1.05)</td>
</tr>
<tr>
<td>DE (+)</td>
<td>-1.42 (-1.26)</td>
<td>-0.07 (-0.17)</td>
</tr>
<tr>
<td>ROI (-)</td>
<td>-0.33 (-0.43)</td>
<td>-0.28 (-0.46)</td>
</tr>
<tr>
<td>LOSS (+)</td>
<td>-0.44 (-2.59)***</td>
<td>-0.22 (-2.44)***</td>
</tr>
<tr>
<td>SPEC (+)</td>
<td>0.46 (2.80)***</td>
<td>0.13 (1.37)*</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.49</td>
<td>0.27</td>
</tr>
<tr>
<td>F-value</td>
<td>10.04***</td>
<td>9.00***</td>
</tr>
</tbody>
</table>

*(**)(***) Significant at the 0.10(0.05)(0.01) level, one-tailed test where appropriate.

LnFee = natural logarithm of total audit fees, 
LnTA = natural logarithm of total assets, 
SUB = square root of the number of subsidiaries, 
DE = ratio of long-term debt to total assets, 
ROI = ratio of earnings before interest and tax to total assets, 
LOSS = indicator variable, 1 = loss in the past three years, 
SPEC = indicator variable, 1 = specialists in industries, using 20% rule.

19 According to Weiss and Klass (1986), finance, insurance, securities, and transportation are classified into regulated industries, and the others are categorized into non-regulated industries.
Sensitivity analyses for testing the effect of industry specialists are conducted by using a higher (i.e., 25%) market share measure and by using a lower (i.e., 15%) market share measure. The test results vary as to the different levels (i.e., higher 25% vs. lower 15%) of the market share measure. SPEC variable is significant at p<0.01 when the market share measure is lower (15%), but insignificant with higher market share measure (25%). That is, different measures of industry specialization have different validities as to the relationship between industry specialists and audit fees.

VI. CONCLUSION

This study investigates auditor pricing issues that have never been explored in the context of the Taiwan audit market. This study provides evidence of industry specialist effect on the audit fees in Taiwan. Compared with Su (2000), the current study also finds evidence of a Big 5 fee premium, which is consistent with prior audit fee studies in other countries, such as the U.S. and Australia. Further, the current study provides additional evidence that the auditor specialist fee effect in the electronics industry is higher than the specialist fee effect in non-electronic industries.

The limitation of this study is related to the data availability, since the audit fee data in Taiwan is still not publicly accessible. When the audit fees are publicly available as in the U.S., Australia and Hong Kong, the empirical test results will be more convincing. The other limitation is related to the measurement of industry specialization at the firm level. When small audit firm makes significant investments in their focal industries and develops a reputation for industry expertise, the small audit firm that has audit teams with a substantial amount of industry expertise can be called upon in the course of an audit. However, the small audit firm has a small market share in that industry, and does not qualify as an industry specialist by assets-based (or sales-based or clients-based) industry market share measures (Gramling and Stone 2001). Kwon (1996) measures auditor industry specialization as the percentage of an audit firm’s total revenue generated by clients in an industry to that firm’s total audit revenue across all industries it serves. The measure used by Kwon (1996) will be a better proxy of industry specialists. However, the audit firm’s industry revenue information must be obtained before empirical analyses, because it is proprietary.

(Submitted September 2002; Accepted July 2004)

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20 The t statistic is 3.17 for sample size n=258 by using lower market share measure (15%); the t statistic is 0.05 by using higher market share measure (25%).

21 In United States, the Securities and Exchange Commission (SEC) require firms to disclosure the audit fees and non-audit fees in proxy statements filed on or after February 5, 2001. The authors expect that the Securities and Futures Commission in Taiwan R.O.C. to have similar rules to enhance auditor independence, especially after the fiascos of Enron, and WorldCom.
REFERENCES
Kwon, S. 1996. The impact of competition within the client’s industry on the auditor


### APPENDIX

**Asset-based Specialist (MS)**

<table>
<thead>
<tr>
<th>Industry Groups</th>
<th>Auditor Specialist</th>
<th>Asset-based (%)</th>
<th>Industry Groups</th>
<th>Auditor Specialist</th>
<th>Asset-based (%)</th>
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</thead>
<tbody>
<tr>
<td>Foods</td>
<td>AA</td>
<td>6.13</td>
<td>Chemicals</td>
<td>KPMG</td>
<td>14.05</td>
</tr>
<tr>
<td></td>
<td>KPMG</td>
<td>17.34</td>
<td>EY</td>
<td>PWC</td>
<td>14.05</td>
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<tr>
<td></td>
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<td>27.75</td>
<td>DT</td>
<td>EY</td>
<td>8.82</td>
</tr>
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<td>EY</td>
<td>3.54</td>
<td>DT</td>
<td>Others*</td>
<td>40.99</td>
</tr>
<tr>
<td></td>
<td>DT</td>
<td>22.40</td>
<td>Steel &amp; Iron</td>
<td>AA</td>
<td>29.48</td>
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<tr>
<td></td>
<td>Others*</td>
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<td>KPMG</td>
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<tr>
<td>Plastics</td>
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<td>PWC</td>
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<td>PWC</td>
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<td>DT</td>
<td>3.80</td>
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<tr>
<td></td>
<td>EY</td>
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<td>Others*</td>
<td>30.55</td>
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</tr>
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<td>Rubber</td>
<td>AA</td>
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<td></td>
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<td>KPMG</td>
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<td>PWC</td>
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<td>EY</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PWC</td>
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<td>DT</td>
<td>0.00</td>
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</tr>
<tr>
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<td>GRCC**</td>
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<td>17.74</td>
<td></td>
</tr>
<tr>
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<td>DT</td>
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<td></td>
<td>DT</td>
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<td>8.66</td>
<td></td>
</tr>
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<td></td>
<td>Others*</td>
<td>24.65</td>
<td>Constructions</td>
<td>AA</td>
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<tr>
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Note: *: Market shares of non-Big5 auditors altogether, **: Market of shares of non-Big5 auditors individually greater than 20%.
審計產業專家、審計公費與會計師事務所規模：台灣審計市場之實證

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理論上，產業專家對公費的影響並不確定，若品質效果大於規模經濟效果，則產業專家對公費的影響則為正向(Craswell et al. 1995; Cullinan, 1998; DeFond et al. 2000); 若規模經濟效果大於品質效果，則產業專家對公費的影響則為負向(Francis and Simon, 1987; Pearson and Trompeter, 1994)。由於台灣個別產業的審計市場規模不似美國、澳洲大，故本文預測產業專家的品質效果強於規模經濟效果，因此產業專家對公費的影響為正。

假說一：在台灣的審計市場中，產業專家對公費的影響為正向。


假說二：在台灣的審計市場中，五大事務所對公費的影響為正向。

在實證分析上，本文以文獻上常使用的公費迴歸模型(Simunic, 1980; Craswell et al. 1995)進行分析。主要變數有產業專家(SPEC)及五大事務所(Big 5)，實證結果顯示（表四）產業專家變數(SPEC)顯著為正，顯示產業專家對高費之影響為正，意即台灣的審計產業專家並無發展足夠的規模經濟以降低公費，品質效果強於規模經濟效果，因此在公費上有收取溢酬。五大事務所(Big 5)對公費之影響顯著為正，同時是五大又是產業專家之事務所(Big
5*SPEC)，對公費之影響亦顯著為正，表示五大且為產業專家之事務所所收取的公費高於五大但非產業專家之事務所。

迴歸模型中亦包含其他控制變數，控制審計工作的複雜程度與審計風險，如：客戶總資產(LnTA)、客戶的分支機構數(SUB)、過去三年損益曾經虧損(LOSS)、存貨與應收帳款對總資產之比率(ARINV)、國外分支機構數對總分支機構樹枝比率(FOREIGN)、長期負債對總資產比率(DE)、稅前息前盈餘對總資產比率(ROI)。其中，客戶總資產(LnTA)之係數顯著為正，顯示受查客戶的規模是影響公費的主要變數之一，這與Simunic (1980)和Palmrose (1986)的研究結果一致。客戶的分支機構數(SUB)之係數亦顯著為正，過去三年損益曾經虧損(LOSS)的客戶對公費呈顯著負影響，這與一般預期是正向影響恰為相反。可能的原因是由於客戶基於財務窘況希望降低公費，事務所又希望獲得續任留住客戶，因而事務所在公費的計價上往往會妥協於客戶而給予折扣。因這類客戶所損失的公費收入，事務所可能會轉嫁在財務狀況良好的客戶上，這也可以解釋為何迴歸模型中ROI（稅前息前盈餘對總資產比率）的係數為正。

本文額外依循蘇裕惠(2000)之研究，以三大事務所(Big 3)定義為大事務所重新分析，所得之結果（表五）與前述結果相似。此外，本文將樣本分為電子業與非電子業，再分別進行實證分析。結果顯示，電子業的產業專家收取的公費溢酬高於非電子業的產業專家。

以往對國內審計公費之研究尚未探討產業專家之影響，大多注重會計師事務所規模會影響公費。本文加入產業專家之變數於研究中，希望對台灣審計市場的公費型態有更深入的分析，並檢視大事務所朝產業專業化發展的策略。本文的實證結果驗證產業專家及事務所規模對公費皆為正向影響。

關鍵字：審計產業專家、會計師事務所規模、審計公費
Mandatory Rotation and Auditor Independence – An Analysis of Auditor’s Reputation Effect∗

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Hung-Chao Yu
National Chengchi University
Shih-Tsung Chiu
National Taipei University

ABSTRACT: This study investigates the potential effects of mandatory rotation on auditor independence via side payments and auditor reputation. We find out that the effectiveness of mandatory rotation on auditor independence is positively associated with the magnitude of future audit-fee premium, normal audit profit, and the probability of a bad state. Without these conditions, a mandatory rotation mechanism may have negative effects on auditor independence. Our aim in this study is to provide some important policy implications to inform the current regulation debate on mandatory auditor rotation. Specifically, the future audit fee premium, normal audit profit, and the probability of a bad state jointly determine the effectiveness of mandatory rotation mechanism.

Keywords: Auditor Independence, Mandatory Rotation, Opportunistic Behavior, Reputation Effect.

∗ We are grateful for the comments received from the three anonymous referees. We also appreciate the comments and suggestions received from workshop participants at the National Taipei University, National Taiwan University, the 2002 International Accounting Theory and Practice Conference (Taipei, Taiwan), and the 2002 American Accounting Association Annual Meeting (San Antonio, US), and from Chungheuy Huang, Martin Wu, Wei-Min Sheng, Yeh Shu, and Zoe-Vonna Palmorese. Financial support from the National Science Council is gratefully acknowledged (Project No. NSC 89-2416-H033-026). All remaining errors are our own.

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I. INTRODUCTION

To protect investors by improving the accuracy and reliability of corporate disclosures after the prominent Enron and WorldCom events, President Bush signed into law the Sarbanes-Oxley Act of 2002 (hereafter referred to as the SOX Act), changing forever the financial reporting landscape for finance professionals. Some requirements in the SOX Act will deeply affect the auditing profession. For example, the section (203) (j) of the SOX Act prohibits a registered public accounting firm from providing audit services to an issuer if the lead audit partner has performed audit services for that issuer in each of the five previous fiscal years of that issuer. Furthermore, the section (207) (a) of the SOX Act recommends the Comptroller General of the United States conduct a study and review of the potential effects of requiring the mandatory rotation of registered public accounting firms. In this paper, we analytically examine the possible effect of auditor’s reputation on the effect of mandatory rotation in improving auditor independence.

Rave statements attested by independent auditors historically have been a major way to provide information to outside shareholders. Independence requires the auditor to act with integrity and objectivity both in mental attitude and in appearance. In operational terms, independence ensures that those who perform an audit engagement should be mentally objective when collecting, investigating and reporting on information. The Public Oversight Board Panel on Audit Effectiveness emphasizes that independence is “fundamental to the reliability of auditor’s reports” (POB 2000, 109). In fact, auditor independence has long been regarded as a cornerstone of the public accounting profession (Mednick 1997; AICPA 1999; Levitt 2000). However, since many audit failures have been attributed to a lack of independence (e.g., the prominent Enron case), mandatory auditor rotation has been frequently discussed by regulators in the U.S. as an alternative mechanism for improving auditor independence and reducing audit failures (e.g., U.S. Senate’s Metcalf Report 1977; AICPA’s Cohen Report 1978; SEC 1994; POB 2002; U.S. Senate’s Sarbanes Bill 2002). In testimony before the House of Representatives Committee on Energy and Commerce on February 6, 2002, Professor Baruch Lev points out that

1 According to a special report in Business Week (1/28/2002, “Accounting in Crisis”), Andersen had provided both external and internal audits since the mid-1990s. In effect, Andersen was working on the accounting systems and controls with one hand and attesting to the numbers they produced with the other. An even worse thing is that Enron’s own in-house financial team was dominated by former Andersen partners. In 2000, Enron paid Andersen $25 million in audit fees and another $27 million in consulting fees and for other work. In fact, Enron was Andersen’s largest client in Houston and Andersen devoted more than 100 staffers to Enron’s audit engagement. Business Week (1/28/2002) further cites one former Andersen staff member’s statement: “There were so many people in the Houston office who had their fingers in the Enron pie... If they had somebody who said we can’t sign this audit, that person would get fired.”

2 According to Section 207 of the Public Company Accounting Reform and Investor Protection Act of 2002 (the Sarbanes Bill), mandatory rotation refers to the “imposition of a limit on the period of years in which a particular registered public accounting firm may be the auditor of record for a particular issuer.”
Auditors' rotation is very low; quite frequently auditors serve the same company 10-20 years, or more (much of the auditors' rotation, as is, is due to frequent mergers and acquisitions by companies rather than to inadequate service.) Such close arrangements and relationships between auditors and auditees are manifestly inconsistent with independent, effective and high quality auditing services.

In fact, many European countries have adopted mandatory auditor rotation as a solution to the independence problem (Buijink et al. 1996). While the public practice has been debated over mandatory rotation since the 1970s (e.g., Winters 1976; Hoyle 1978; Bates et al. 1982; Stevens 1990; Petty and Cuganesan 1996; Vanasco 1996; Brody and Moscove 1998), academia neglected this issue until recent years. More important, the recent expansion of the scope of assurance services (see AICPA's Committee Report on New Assurance Services 1997) may provide auditors with incentives to bias their reports in favor of management. In addition, the Public Company Accounting Reform and Investor Protection Act of 2002, passed on July 15, 2002 to strengthen the independence of auditors, also requires a study and review of the potential effects of mandatory rotation of registered public accounting firms (p.77). Therefore, it is necessary and crucial to investigate the impact of mandatory rotation on auditor independence. Besides, in July 2003, the International Federation of Accountants (hereafter IFAC) issued a report, Rebuilding Public Confidence in Financial Reporting, which treats familiarity as helpful in the audit process to produce greater understanding and improved ability to identify and evaluate risks. However, IFAC also recognizes that excess familiarity may result in auditors' complacency or hesitancy to challenge appropriately and thereby reduces the level of skepticism necessary for an effective audit (IFAC 2003).

In fact, article 30 of Corporate Governance Best-Practice Principles for TSE/GTSM Listed Companies (in Taiwan) also asks for

In the event that the company engages the same auditor without replacement for several years consecutively... the company shall review the necessity of replacing the auditor, and shall submit to the board the conclusion of such review.

In general, there are two potential benefits (beyond normal audit fees) an auditor may gain from compromising his independence: the quasi rents accrued in future

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3 See Catanach and Walker (1999) for a detailed discussion on the world-wide debate over mandatory auditor rotation. Catanach and Walker (1999) also propose that a complete examination of auditor rotation should consider the interactions among auditor tenure, audit quality (which is further affected by auditor's ability to detect misstatements and fraud and professional ethics in performing audit procedures), the economic incentives of providing auditing services, and audit market structure. In addition, Dopuch, King, and Schwartz (2001) discuss the current debate of mandatory rotation and auditor independence in the U.S.
engagements and manager’s side payment to the auditor in the current period.\(^4\) DeAngelo (1981) indicates that client-specific quasi rents an incumbent auditor can earn in future periods will lessen independence. In other words, the existence of future quasi rents constitutes an “incentive” to induce the auditor to compromise his independence. Based on this notion, Dopuch et al. (2001) experimentally finds that mandatory rotation can improve auditor independence (measured by the frequency of auditor-subjects’ biased report) because the auditor will not be able to earn his future client-specific rents after a compulsory termination of an audit engagement. In contrast, Lee and Gu (1998) argues that if the board of directors, rather than the manager, has the right to hire or dismiss the auditor, then even though the auditor may sacrifice his independence to earn a side payment in the current period, he may also be dismissed by the board of directors and, therefore, lose all future quasi rents. In this setting, the existence of future quasi rents constitutes a “threat” that may sustain auditor’s independence. Following Lee and Gu (1998)’s argument, if a mandatory rotation mechanism is implemented, this “threat” will disappear after a mandatory rotation. Hence, in the last period of an audit engagement, the auditor tends to compromise his independence to exchange a huge amount of side payment. This “side payment effect” plays an important role in the analysis of the effectiveness of mandatory rotation, especially at the last period of an audit engagement.

Prior analytical and experimental studies have addressed the potential negative effects of mandatory rotation on audit quality in an “end game” setting. For example, Elitzur and Falk (1996) find that the levels of planned audit quality are negatively influenced by an auditor rotation requirement because the planned audit quality will diminish over time. On the other hand, Arrunada and Paz-Ares (1997) indicate that mandatory auditor rotation may lead to an increase in audit cost and price through the destruction of assets and the distortions of competition. Summer (1998) concludes 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 in the last period of an audit engagement. In contrast, Dopuch et al. (2001) experimentally show that mandatory rotation can improve auditor independence because of the auditor’s inability to earn future rents after the termination of an audit engagement. These prior studies suffer two major deficiencies. First, they ignore the side payment effect at the “end game” of an audit engagement. Second, they omit the auditor’s action after the compulsory termination of an audit engagement. In practice, the terminated auditor has to find new clients to efficiently utilize his existing human resources and audit facilities. More important, if the terminated auditor has built good reputation in providing independent audit service to his predecessor client, the auditor should be able to receive a higher audit fee premium from the new clients. In other words, under a mandatory rotation

\(^4\) Even though the manager-auditor side payments are generally prohibited, Lee and Gu (1998) indicates that side payment can take several forms, some of which are prima facie legal (e.g., the auditor is appointed by the manager on behalf of the shareholders, and the manager can use the appointment itself as a side payment to sway auditor) and some of which may be legally justified (e.g., grant the auditor consulting contracts). Generally speaking, preventing or detecting side payments can be legally difficult and expensive. See footnote 5 (p.536) of Lee and Gu (1998) for detailed discussions about potential side payments between the manager and auditor.
environment, an auditor’s reputation in independence determines the level of future quasi rents he can earn from new clients. The main purpose of this study is to extend prior studies by explicitly examining the effects of side payment and auditor reputation on the effectiveness of mandatory rotation in improving auditor independence.

To address the issue of interest, we develop a two-period game model in which there are three players: one limited-liability manager who needs to raise funds from outside parties, one creditor who provides the fund to the manager, and one auditor who attests the information disclosed by the manager. While at the end of the first period the auditor is subjected to a mandatory rotation, the auditor resigns from the audit market at the end of the second period. In this setting, if the auditor has good reputation in independence at the end of the first period, the creditor will make a posterior belief about the auditor’s independence using auditor’s report and other public information. Therefore, the auditor can charge an audit fee premium at the beginning of the second period. We develop sequential equilibrium to analyze the impacts of auditor reputation on the usefulness of mandatory rotation in improving auditor independence.

The remainder of this study is organized as follows. Section 2 presents the model setting. Section 3 develops and demonstrates different players’ strategic behaviors and equilibrium. The paper concludes with a discussion of analytical findings and implications in section 4.

II. THE MODEL

In our two-period model, the first period denotes the period prior to the mandatory rotation and the second period represents the period after the rotation (in which the

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5 According to AccountingWeb’s report up to June 15, 2002, majority of the former Andersen clients announced to switch to other Big 5 firms. See http://www.forbes.com/2002/03/13/0313andersen.html for a complete list of the Andersen defections of clients.

6 Geiger and Raghunandan (2002) empirically show 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. This conclusion may not be appropriate because, under the current auditing environment (in which there is no mandatory rotation), a continuance or termination of an audit engagement is endogenously determined by the auditor’s or the client’s own economic decisions, but is not exogenously determined by a mandatory rotation rule. Therefore, Geiger and Raghunandan (2002) suffer a severe “sample-selection” bias. In fact, there is no naturally-occurring data based on which we can directly examine the effectiveness of mandatory rotation. To our opinion, Geiger and Raghunandan’s (2002) empirical results do detect the association between auditor tenure and audit failure, but do not provide rigorous evidence on the feasibility of mandatory auditor rotation. For this reason, we believe that the effectiveness of mandatory rotation is still an open question, which deserves further study. Besides, Johnson et al. (2002) and Myers et al. (2003) empirically examine the association between auditor tenure and discretionary accruals.

7 Dye (1993) indicates that auditing plays both an information role and an insurance role for the capital markets. Hogan (1997) provides evidence to support the information role of auditing. In contrast, Baber, Kumar, and Verghese (1995), Memon and Williams (1994) and Willenborg (1999) find support of the insurance role of auditing. Since the insurance role is not directly related to auditor’s independence, we only focus on the information role of auditing.
auditor has to find a new client). Figure 1 depicts the time line of our sequential game model. Suppose at the beginning of the first period, a firm has a valuable investment that yields a positive expected net present value in excess of the initial investment amount $I$ (without loss of generality, we normalize $I$ to $1$). Because the firm does not have readily available internal funds, its risk-neutral manager must immediately acquire capital from an outside creditor; otherwise the investment will be lost. The risk of the investment (which may be either high, denoted by $H^R$, or low, denoted by $L^R$) is private information of the manager. To simplify our analysis, assume the prior probabilities $\Pr(H^R)$ and $\Pr(L^R)$ are common knowledge and equal $\frac{1}{2}$. The outcome of the investment depends on the state of nature, which is unobservable to the manager and creditor. The \textit{ex ante} common knowledge probability of a bad state is $\lambda$ and the \textit{ex ante} probability of a good state is $1 - \lambda$. For model simplicity and tractability, we assume that at the end of period 1, the firm may be one of two possible statuses: either it survives as a \textit{going-concern} (denoted by $Y$) or it goes into \textit{bankruptcy} (denoted by $N$). The firm remains a going-concern if: (1) the state of the nature is good and the investment is undertaken, or (2) the state of the nature is bad, but the risk of the investment is low. Under these two conditions, the creditor will receive a payoff of the full amount of principal and interest with probability one. On the other hand, the firm will go into bankruptcy if the state is bad and the risk of the investment is high. In this situation, we assume the creditor will receive nothing. The basic setting here is similar to Dye (1993, 1995), Narayanan (1994), Schwartz (1997), Hillegeist (1999), Zhang and Thoman (1999), Radhakrishnan (1999), and Pae and Yoo (2001).

To borrow the needed money at an acceptable cost of capital, the firm’s manager privately submits a disclosure regarding the anticipated cash flow of the investment to the auditor for attestation. The auditor receives a flat audit fee $F$ to examine whether the uncertainty of the anticipated cash flow is consistent with the manager’s disclosure by collecting audit evidence with a total cost $C$. Based on the audit evidence, the auditor issues an audit report $R \in \{A, D\}$, where $A$ denotes an \textit{agree} report (i.e., an unqualified opinion) and $D$ denotes a \textit{disagree} report (i.e., a qualified opinion), to the creditor.

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\[8\] In practice, a firm may raise external funds from equity, debts, or both. In our study, however, we model the mandatory rotation issue using debt financing because focusing on creditors provides us with a chance to create a situation in which the auditor may compromise his independence by negotiating with the manager and receive a portion of savings in cost of capital as side payment.
The risk of the investment (which may be either high, denoted by $H^R$, or low, denoted by $L^R$) is private information to the manager. Assume the prior probability is common knowledge and $\Pr(H^R) = \Pr(L^R) = 1/2$.

There are two types of auditor: a high independent auditor (denoted by $H^I$) who always reports in accordance with his audit findings, and a low independent auditor (denoted by $L^I$) who may collude with the manager due to his opportunistic behavior. While the auditor type is private information to the auditor, the creditor knows that an auditor is of $H^I$ type with a prior common knowledge belief $q_1$ (assume $q_1$ is strictly positive).

The state of nature is unobservable to the manager and creditor. The ex ante common knowledge probability of a bad state is $\lambda$ and the ex ante probability of a good state is $1 - \lambda$. The firm will go into bankruptcy if the state is bad and the risk of the investment is high.

Since in our model the limited-liability manager intends to borrow money and undertake the investment, he has no incentive to disclose $H^R$ because a $H^R$ disclosure will hinder the manager from raising any funds from the creditor.

This study defines $\sigma_1$ to be the probability that a $L^I$ type auditor issues a disagreed report at period 1 when the audit evidence indicates that the risk of the investment is high. Therefore, in equilibrium, $\sigma_1 = 0$ ($\sigma_1 = 1$) implies that a $L^I$ type auditor is totally not independent (extremely independent) and $0 < \sigma_1 < 1$ represents that the $L^I$ type auditor will adopt a strictly mixed strategy. In addition, the model assumes that a $H^I$ type auditor will always issue a disagreed (an agreed) report when the audit evidence reveals that the risk of the investment is high (low). In contrast, a $L^I$ type auditor will issue a disagreed report when the audit evidence reveals that the risk of the investment is high with probability $\sigma_1$ and will issue an agreed report when the true risk of the investment is low. The audit technology is assumed to be two-sided perfect.

The creditor will require a payoff $R_A$ if the auditor issues an A report, and require a payoff $R_D$ if the auditor issues a D report.

At the end of period 1, the firm may be one of two possible statuses: either survives as a going-concern (denoted by $Y$) or goes bankruptcy (denoted by $N$). The firm remains as a going-concern if: (1) the state of the nature is good and the investment is undertaken, or (2) the state of the nature is bad, but the risk of the investment is low. The firm will go into bankruptcy if the state is bad and the risk of the investment is high.
There are two types of auditor in our model: a high independent auditor (denoted by $H^I$) who will always report in accordance with his audit findings, and a low independent auditor (denoted by $L^I$) who may collude with the manager due to his opportunism. While the auditor type is private information to the auditor, the creditor knows that an auditor is of $H^I$ type with a prior common knowledge belief $q_1$ (assume $q_1$ is strictly positive). Define $\sigma_i$ to be the probability that a $L^I$ type auditor will issue a disagree report at period 1 when the audit evidence indicates that the risk of the investment is high (assume $0 < \sigma_i < 1$). Therefore, in equilibrium, $\sigma_i = 0$ ($\sigma_i = 0$) implies that a $L^I$ type auditor is totally not independent (extremely independent) and $0 < \sigma_i < 1$ represents that the $L^I$ type auditor will adopt a strictly mixed strategy. Note that, in our model, the limited-liability manager intends to borrow money and undertake the investment. Hence, he has no incentive to disclose $H^R$ because a $H^R$ disclosure will hinder the manager from raising any funds from the creditor. Therefore, disclosing $L^R$ becomes the manager's dominant strategy and, in turn, the auditor will issue an unqualified (qualified) audit report if she agrees (disagrees) with the financial report. We assume that a $H^I$ type auditor will always issue a disagree (an agree) report when the audit evidence reveals that the risk of the investment is high (low). In contrast, a $L^I$ type auditor will issue a disagree report when the audit evidence reveals that the risk of the investment is high with probability $\sigma_i$ and will issue an agree report when the true risk of the investment is low.

Prior studies in the area of auditor's legal liability have assumed a one-sided error in audit technology (e.g., Schwartz 1997; Hilgeleisten 1999) because audit failure is measured in terms the auditor's accepting a client's false disclosure. However, in our model the auditor's independence is measured by auditor's reporting toward manager's $L^R$ disclosure, given the audit evidence indicates that the risk of the investment is high. Since cases where audit failure originates from the audit technology instead of lack of independence is not considered in our model, a two-sided perfect audit technology can simplify the model setting so that we can concentrate on auditor's independent behavior. In essence, our assumption of two-sided perfect audit technology should not affect the

---

9 We dichotomize auditor types into $H^I$ and $L^I$ based on Koford and Penno's (1992) type model, in which agents are generally one of two types: "ethical" (fully honest) or "economic" (willing to tell any lie necessary to maximize wealth). In addition, Newman et al. (2001) assumes two possible types of auditees, fraudulent and honest.

10 In fact, a manager whose best strategy is to disclose $H^R$ will not play the game.

11 We ignore the penalty for manager's lying behavior for two reasons. First, overlooking manager's reputation improves the tractability and simplicity of the model, so we can focus on the effect of auditor's reputation on the effectiveness of a mandatory rotation mechanism. Second, our analytical results will still be valid even if we incorporate the penalty for manager's untruthful disclosure, as long as the expected investment return is high enough to motivate the manager to undertake the investment project.

12 We assume that the auditor's legal liability remains constant over the overall periods of an audit engagement. Therefore, our analytical results should remain unchanged if we incorporate legal liability into our model. One may argue that an extremely large legal penalty may prevent the auditor from compromising his independence. We rule out this scenario because the enforcement of such an extremely large penalty is practically infeasible.
generalization of our analysis results.

Assume a competitive debt market where the expected rate of return is normalized to zero, the creditor observes only the audit report \( R \in \{ A, D \} \) issued by the auditor and exogenously determines the cost of capital based on her updated belief that the risk of the investment is low. *Ceteris paribus*, an A report will lead to a lower cost of capital. In our model setting, the creditor always provides the funds necessary to the manager. However, the cost of capital charged by the creditor will depend on the audit report.

**Lemma 1**: In the first period, the creditor will use the auditor’s report to update her belief about the risk of the investment to be:

\[
\Pr(H|D) = 1, \quad \Pr(L|A) = \frac{1}{1 + (1 - q_i)(1 - \sigma_i)}.
\]

*Proof*: See Appendix.

Lemma 1 indicates that \( (1 - q_i)(1 - \sigma_i) < 1 \) holds for all positive \( q_i \). Therefore, the *posterior* belief \( \Pr(L|A) \) is greater than the *prior* belief \( \Pr(L) = \frac{1}{2} \). This lemma implies that, as long as the creditor believes that there are some auditors who are independent (i.e., \( q_i \neq 0 \)), the auditor’s A report shall be informative to the creditor. This argument is true even for zero \( \sigma_i \).

In period 1, if the auditor issues an A report, the payoff required by the creditor will be \( R_i(A) \); otherwise the creditor will require a payoff of \( R_i(D) \). Therefore, the difference between \( R_i(D) \) and \( R_i(A) \) reflects the effect of auditor’s “favorable” report on firm’s savings in cost of capital.

**Lemma 2**: If the \( L^r \) type auditor adopts a mixed strategy (i.e., \( 0 \leq \sigma_i \leq 1 \)), the high risk firm’s expected savings in cost of capital will be:

\[
\frac{\lambda \cdot (1 - \sigma_i)(1 - \sigma_i)}{1 + (1 - q_i)(1 - \lambda)(1 - \sigma_i)} \geq 0.
\]

*Proof*: See Appendix.

Lemma 2 demonstrates that, after realizing how the creditor updates her *posterior* belief about the risk of the investment, a \( L^r \) type auditor may still agree with manager’s \( L^r \) disclosure, given the audit evidence reveals that the true risk of the investment is high, so that the manager can save a positive amount of cost of capital. In this situation, the \( L^r \) type auditor may compromise his independence by negotiating with the manager and receive a portion \( \gamma \) (assume \( 0 < \gamma < 1 \)) of the expected cost savings as a side payment.

The creditor will determine the required cost of capital based on her *posterior* belief \( q_2 \) about the auditor’s independence using the *prior* belief \( q_i \), the auditor’s report, and the final status of the firm. The manager then decides whether the cost of capital charged by the creditor is sufficiently low to undertake the new investment. Finally, the firm’s true status is realized and the resulting payoffs are divided between the manager and creditor.
based on a pre-specified debt contract.

At the end of the first period, the auditor is subjected to a mandatory rotation. If the auditor has good reputation in independence at the end of period 1, the auditor can charge an audit fee premium at the beginning of the second period from a new client. The basic setting in period 2 is similar to that in period 1. The auditor will resign from the audit market at the end of the second period.

III. THE EQUILIBRIUM ANALYSIS

The End Game Effect on Mandatory Rotation

As mentioned above, one major deficiency of prior mandatory rotation studies is that they assume the auditor will earn a zero economic rent after the compulsory termination of an audit engagement, regardless of his reputation in independence. Under this assumption, the auditor’s reputation earned in the first period is totally unrelated to his future quasi rents from new audit engagements after the mandatory rotation. In this situation, the first period in our model can be regarded as an “end game” specified in prior studies. Based on this reasoning, we develop the following Proposition 1:

**Proposition 1:** If period 1 in our model represents the end game and auditor’s reputation plays no role in his future quasi rents, the players’ equilibrium strategies are:

1. **Creditor:**
   - Equilibrium belief: \( \Pr(H^1|D) = 1 \) and \( \Pr(L^1 | A) = \frac{1}{2-q_i} \).
   - Equilibrium strategy:
     - \( R_i(D) = \frac{1}{1-\lambda} \)
     - \( R_i(A) = \frac{1}{1-\lambda \cdot (1-q_i)} \).

2. **L^1 type auditor’s equilibrium strategy:** \( \sigma_i \equiv 0 \).

*Proof:* See Appendix.

Proposition 1 shows that, if we treat the first period as an end game and ignore the effect of the auditor’s reputation on his future audit pricing, mandatory rotation will harm the \( L^1 \) type auditor’s independence because \( \sigma_i \equiv 0 \). Proposition 1 shows that, if we treat the first period as an end game and ignore the effect of auditor’s reputation on his future audit pricing, mandatory rotation will harm the \( L^1 \) type auditor’s independence because \( \sigma_i \equiv 0 \). Specifically, we claim that auditor’s independence in a *no-mandatory-rotation-setting* is higher than that in a *mandatory-rotation-setting*. The reason for this is that the \( L^1 \)-type auditor still has an incentive to maintain independence because he will lose the future quasi rents when he attaches a clean opinion to a fraudulent financial report. In particular, since lack of independence constitutes audit failure, instead of imperfect audit technology, in our model, it implies that every audit failure is due to the problem of independence. Furthermore, while auditor’s independence \( \sigma_i \equiv 0 \) in a final period of an audit engagement in the *mandatory-rotation-setting*, it is
reasonable to argue that auditor’s independence in any period of a no-mandatory-rotation-setting will not be weaker compared to that in a final period of an audit engagement in the mandatory-rotation-setting.

This conclusion is inconsistent with Dopuch et al. (2001), which finds that mandatory rotation can improve independence. The reason underlying this inconsistency is that Dopuch et al. (2001) does not consider the side payment effect at the “end game” of an audit engagement. Proposition 1 further implies that the feasibility of a mandatory rotation mechanism is not by itself a cost-benefit problem; rather, one should also consider the auditor’s career concerns regarding his obtaining new audit engagements and future quasi rents. In the next section, we will take this issue into account in our analysis.

**Analysis of Period 2**

In our two-period model, the auditor is subjected to a mandatory rotation at the end of the first period. If the creditor’s revised belief that an auditor is of H type is higher than $q_1$ at the end of period 1, the auditor can set his audit price at $F + M$ (where $M$ denotes a positive audit fee premium) at the beginning of period 2. Given the $L$ type auditor’s mixed strategy $\sigma$, define $Pr(A_1)$ and $Pr(D_1)$ as the probabilities that the auditor will issue an $A$ and $D$ report, respectively, in period 1. We first develop the following Lemma 3:

**Lemma 3:** At the first period, the probability that the auditor will issue an $A$ or $D$ report, given the $L$ type auditor’s mixed strategy $\sigma$, will be:

$$Pr(A_1) = \frac{1 + (1 - q_1) \cdot (1 - \sigma)}{2}, \quad Pr(D_1) = \frac{q_1 + (1 - q_1) \cdot \sigma}{2}.$$ 

*Proof:* See Appendix.

Note that in our model we assume that audit technology is two-sided perfect and the prior probability that the risk of the investment is high is $\frac{1}{2}$. Therefore, if there is no auditor independence problem, the probability of auditor’s issuing $A$ or $D$ report should both equal $\frac{1}{2}$. However, Lemma 3 indicates that, when we incorporate the $L$ type auditor’s opportunistic behavior into consideration, the probability of auditor’s issuing an $A$ report is higher than $\frac{1}{2}$ and the probability of auditor’s issuing an $D$ report is lower than $\frac{1}{2}$. This is what auditor’s independence plays a role in our model.

---

13 Catanach and Walker (1999) discuss the pros and cons of mandatory auditor rotation. Proponents of mandatory rotation claim that it will prevent long-term auditor-client relationships that could impair auditor independence and objectivity. On the other hand, the arguments against mandatory rotation include: (a) the implementation costs (e.g., startup costs for auditor to familiarize the client’s company, lost in audit efficiency) may exceed the limited gain perceived, (b) the auditor’s understanding of client’s business, operations, and internal control systems would be limited to only a few years, (c) auditor rotation may reduce auditor’s incentives to invest in specific industries, (d) the client may face disruptive, time-consuming, and expensive process of selecting new auditor, (e) the client may be forced to accept a lower quality auditor who is a generalist if fewer auditors invest in specialized industries. Therefore, prior discussions seem to treat mandatory rotation as a tradeoff between its cost and benefit.
While the creditor knows that an auditor is of \( H \) type with a prior common knowledge belief \( q_1 \), she will update this belief using two types of new information at the end of period 1: the auditor’s report \((A\) or \(D)\) and firm’s final status \((Y\) or \(N)\). Therefore, we have the following Lemma 4:

**Lemma 4:** After observing the auditor’s report and firms’ final status at the end of the first period, the creditor’s updated posterior belief that an auditor is of \( H \) type will be:

\[
\begin{align*}
(1) \Pr(H^I \mid D, N) &= \frac{q_1}{\left[q_1 + \sigma_1 \cdot (1-q_1)\right]}, \\
(2) \Pr(H^I \mid D, Y) &= \frac{q_1}{\left[q_1 + \sigma_1 \cdot (1-q_1)\right]}, \\
(3) \Pr(H^I \mid A, N) &= 0, \\
(4) \Pr(H^I \mid A, Y) &= \frac{q_1}{1 + \lambda \cdot (1-\sigma_1) \cdot (1-q_1)}.
\end{align*}
\]

**Proof:** See Appendix.

Lemma 4 implies three possible categories of auditor’s reputation in independence at the end of period 1. First, since \( q_1 + \sigma_1 \cdot (1-q_1) \) is less than one, (1) and (2) of Lemma 4 indicate that, as long as the auditor issues a \( D \) report, the creditor’s posterior belief that the auditor is of \( H \) type is higher than her prior belief \( q_1 \), regardless of the final status of the firm. In these two cases, the auditor will gain a “better reputation” in independence. In contrast, (3) of Lemma 4 shows that, if the auditor issues an \( A \) report and the final status of the firm is \( N \), the creditor knows that the auditor is of \( H \) type with zero probability. In this case, the auditor will be labeled as of “no reputation” in independence and, therefore, we assume there is no audit demand on this type of auditor in period 2. Finally, (4) of Lemma 4 demonstrates that, if the auditor issues an \( A \) report and the final status of the firm is \( Y \), since \( \lambda \cdot (1-\sigma_1) \cdot (1-q_1) \) is greater than zero, the creditor’s posterior belief that the auditor is of \( H \) type is lower than her prior belief \( q_1 \). In this case, the auditor will receive a “worse reputation” in independence. Note that under (3) of Lemma 4 the auditor’s true type will be fully revealed to the creditor. However, when an uninformed creditor observes an \( A \) report and a \( Y \) status, she knows that this scenario may come from two possible situations: one in which a \( H \) or \( L \) auditor truthfully reports that the risk of the investment is low, and one in which a \( L \) auditor dishonestly reports that the investment risk is low but the realized state of nature turns out to be good. Because of the mix of these two situations, the creditor’s posterior belief that an auditor is of \( H \) type is lower than her prior belief \( q_1 \). In our model, these three categories of auditor reputation (i.e., “better,” “no,” and “worse” reputation) further constitute the creditor’s “new” prior belief that the auditor is of \( H \) type at the beginning of period 2.

Antecedent theory and empirical evidence in the audit fee studies have found that audit fee is an increasing function of auditor reputation (e.g., Beatty 1989; Francis and Stokes 1986; Palmrose 1986a; Simunic 1980; Simunic and Stein 1987). Since auditor’s reputation affects the credibility of his report, and the credibility of auditor’s report in
turn influences the firm’s cost of capital, it is reasonable to assume that creditor’s *posterior* belief about an auditor’s independence determines his audit fee in period 2. To facilitate our subsequent discussions, we define the audit fee levels in the “better reputation,” “worse reputation,” and “no reputation” categories to be $F + M$, $F$, and zero, respectively, at the beginning of period 2. Therefore, the economic profit a $L^I$ type auditor may earn under these three categories will be $(F + M - C)$, $(F - C)$, and zero, respectively.\(^{14}\) We believe that an examination of the impact of auditor reputation on audit fees is crucial to our understanding of the effectiveness of mandatory rotation on auditor independence.

We now analyze different players’ equilibrium strategies in period 2 under three different categories of auditor reputation specified in Lemma 4. Using backward induction, we can find players’ equilibrium behavior in period 1.

**Auditor who gains a “better reputation”**

Let the upright arrow $\uparrow$ denotes the case in which the auditor gains a “better reputation” in independence at the beginning of period 2 (labeled by a subscript 2). The following Lemma 5 describes the creditor’s *posterior* belief function, reaction function to auditor’s report, and firm’s expected savings in cost of capital (given the $L^I$ type auditor adopts a mixed strategy).

**Lemma 5:** Let $\sigma^\uparrow_2$ denotes the reporting strategy of a $L^I$ type auditor who gains a “better reputation” in period 2, we have:

- **Creditor:**
  
  *Posterior* belief function: $\Pr(H^R | D)^\uparrow_2 = 1$ and
  
  $$\Pr(L^R | A)^\uparrow_2 = \frac{1}{1 + \frac{\sigma_1(1 - q_1)(1 - \sigma^\uparrow_2)}{q_1 + \sigma_1(1 - q_1)}}.$$

  *Reaction function:* $R_2(D^\uparrow) = \frac{1}{1 - \lambda}$ and $R_2(A^\uparrow) = \frac{1}{1 - \lambda} \cdot \frac{q_1 + \sigma_1 \sigma^\uparrow_2 (1 - q_1)}{q_1 + \sigma_1 (1 - q_1)}$.

- **Firm’s expected savings in cost of capital:**
  
  \[
  \frac{\Lambda \cdot (1 - \sigma^\uparrow_2) \cdot \Pr(L^R | A)^\uparrow_2}{1 - \Lambda \cdot [1 - \Pr(L^R | A)^\uparrow_2]} \geq 0.
  \]

**Proof:** See Appendix.

Since the $L^I$ type auditor gains a better reputation at the beginning of period 2, he can charge an audit fee $F + M$. In addition, he can also earn a $\gamma$ ($0 < \gamma < 1$) portion of the

\(^{14}\) We ignore the auditor’s start-up costs of providing auditing service to new clients because these costs will weaken the effectiveness of a mandatory rotation mechanism, which has been discussed and documented in Catanach and Walker (1999) and Arrunsda and Paz-Ares (1997). Overlooking these costs can facilitate our discussions on other factors that may adversely affect the effectiveness of mandatory rotation.
potential high risk firm’s cost savings in period 2. Therefore, this \( L^1 \) type auditor’s optimal reporting strategy \( \sigma_{2}^\uparrow \) should maximize the following profit function:

\[
\max_{0 \leq \sigma_{2} \leq 1} (F + M - C) + \gamma \cdot \frac{\lambda \cdot (1 - \sigma_{2}^\uparrow) \cdot \Pr(L^R \mid A)^\uparrow}{1 - \lambda \cdot [1 - \Pr(L^R \mid A)^\uparrow]}.
\]

**Proposition 2**: In period 2, the subgame perfect Nash equilibrium of the creditor and the \( L^1 \) type auditor gaining a “better reputation” in period 1 is:

1. **Creditor**:
   - Equilibrium belief: \( \Pr(H^R \mid D)^\uparrow = 1 \) and \( \Pr(L^R \mid A)^\uparrow = \frac{1}{1 + \sigma_{1}(1 - q_{1})} \cdot \frac{q_{1} + \sigma_{1}(1 - q_{1})}{q_{1}} \).
   - Equilibrium strategy: \( R_{2}(D)^\uparrow = \frac{1}{1 - \lambda} \) and \( R_{2}(A)^\uparrow = \frac{1}{1 - \lambda \cdot \frac{q_{1}}{q_{1} + \sigma_{1}(1 - q_{1})}} \).

2. **\( L^1 \) type auditor’s equilibrium strategy in period 2**: \( \sigma_{2}^\uparrow \equiv 0 \).

*Proof*: See Appendix.

Proposition 2 shows that, even though the \( L^1 \) type auditor gains a better reputation in period 1, he may still compromise his independence in period 2. Note that we obtain this result because in our model setting the auditor will resign from the audit market at the end of period 2. If the auditor resigns at the end of period \( N \), where \( N \) is any period after period 2, he will still sacrifice his independence in period \( N \). Therefore, our result that \( \sigma_{2}^\uparrow \equiv 0 \) can not be interpreted as a lower audit quality in early years of an audit engagement, as indicated in prior studies in the area of auditor liability (e.g., Palmrose 1986b, 1991; Geiger and Raghunandan 2002).

Let \( E(\Pi_{2}^\downarrow) \) denotes the \( L^1 \) type auditor’s expected profit in period 2, plugging Proposition 2 into equation (1) gives the following Lemma 6:

**Lemma 6**: The \( L^1 \) type auditor’s expected profit in period 2 is:

\[
E(\Pi_{2}^\downarrow) = (F + M - C) + \gamma \cdot \frac{\lambda \cdot [q_{1} + \sigma_{1}(1 - q_{1})]}{q_{1} + \sigma_{1}(1 - q_{1})(2 - \lambda)}.
\]

*Proof*: See Appendix.

**Auditor who receives a “worse reputation”**

Similar to the previous section, let the downright arrow \( \downarrow \) denotes the case in which the auditor receives a “worse reputation” in independence at the beginning of period 2. The following Lemma 7 again describes the creditor’s posterior belief function, reaction function to auditor’s report, and firm’s expected savings in cost of capital.

**Lemma 7**: Let \( \sigma_{2}^\downarrow \) denotes the reporting strategy of a \( L^1 \) type auditor who receives
a “worse reputation” in period 2, we have:

(1) Creditor: 
Posterior belief function:
\[
\Pr(H^R | D)^\downarrow_2 = 1,
\]
\[
\Pr(L^R | A)^\downarrow_2 = \frac{1}{1 + \left[\frac{1 + \lambda \cdot (1 - \sigma_1)(1 - q_1) - q_1}{1 + \lambda \cdot (1 - \sigma_1)(1 - q_1)}\right] \cdot (1 - \sigma_2^\downarrow)}.
\]

Reaction function:
\[
R_2(A^\downarrow) = \frac{1}{1 - \lambda}.
\]

\[
R_2(C^\downarrow) = \frac{1}{1 - \lambda} \cdot \frac{[1 + \lambda \cdot (1 - \sigma_1)(1 - q_1) - q_1] \cdot (1 - \sigma_2^\downarrow)}{1 + [\lambda(1 - \sigma_1)(1 - q_1)] + \left[1 + \lambda(1 - \sigma_1)(1 - q_1) - q_1\right] \cdot (1 - \sigma_2^\downarrow)}.
\]

(2) Firm’s expected savings in cost of capital:
\[
\frac{\lambda \cdot (1 - \sigma_2^\downarrow) \cdot \Pr(L^R | A)^\downarrow_2}{1 - \lambda \cdot \left[1 - \Pr(L^R | A)^\downarrow_2\right]} \geq 0.
\]

**Proof:** See Appendix.

Because the \(L^I\) type auditor receives a worse reputation at the end of period 1, he can only charge an audit fee of \(F\) from a new client in period 2. Since the \(L^I\) type auditor can still earn a \(\gamma (0 < \gamma < 1)\) portion of firm’s cost savings in period 2, his optimal reporting strategy \(\sigma_2^\downarrow\) should maximize the following expected profit function:\(^{15}\)

\[
\max_{0 \leq \sigma_2^\downarrow \leq 1} \left( F - C \right) + \gamma \cdot \frac{\lambda \cdot (1 - \sigma_2^\downarrow) \cdot \Pr(L^R | A)^\downarrow_2}{1 - \lambda \cdot \left[1 - \Pr(L^R | A)^\downarrow_2\right]}.
\]

**Proposition 3:** The subgame perfect Nash equilibrium of the creditor and a \(L^I\) type auditor receiving a “worse reputation” is:

(1) Creditor:
Equilibrium belief: \(\Pr(H^R | D)^\downarrow_2 = 1\) and
\[
\Pr(L^R | A)^\downarrow_2 = \frac{1}{1 + \left[\frac{1 + \lambda \cdot (1 - \sigma_1)(1 - q_1) - q_1}{1 + \lambda \cdot (1 - \sigma_1)(1 - q_1)}\right] \cdot (1 - \sigma_2^\downarrow)}.
\]

Equilibrium strategy: \(R_2(D^\downarrow) = \frac{1}{1 - \lambda}\),

---

\(^{15}\) One may argue that the portion of side payment a \(L^I\) type auditor can share should not be the same under different “reputation” scenarios. However, as long as the \(\gamma\) under a “better reputation” case is higher than that under the “worse reputation” case, our analysis is still valid and appropriate.
\[ R_2(A^L) = \frac{1}{1 - \lambda \cdot \frac{1 + [\lambda \cdot (1 - \sigma_i)(1-q_i)] - q_i}{2(1 + [\lambda \cdot (1 - \sigma_i)(1-q_i)] - q_i)}. \]

(2) \( L^I \) type auditor’s equilibrium strategy in period 2: \( \sigma_2^L \equiv 0 \).

**Proof:** See Appendix.

Proposition 3 indicates that, if the \( L^I \) type auditor receives a “worse reputation” in period 1, he will still be able to compromise his independence at the second period. Similarly, this result is derived from our model setting that the auditor will resign from the audit market at the end of period 2. Let \( E(\Pi_2^L) \) denotes the \( L^I \) type auditor’s expected profit in period 2, plugging Proposition 3 into equation (2) gives the following Lemma 8:

**Lemma 8:** The \( L^I \) type auditor’s expected profit in period 2 is:

\[ E(\Pi_2^L) = (F - C) + \gamma \cdot \frac{\lambda \cdot [1 + \lambda \cdot (1 - \sigma_i)(1-q_i)]}{(2 - \lambda) \cdot [1 + \lambda \cdot (1 - \sigma_i)(1-q_i)] - q_i(1 - \lambda)}. \]

**Proof:** See Appendix.

**Auditor who has “no reputation”**

In this situation, since the auditor has been fully revealed as a \( L^I \) type auditor and has lost all his reputation, he is unable to find any new audit engagements in period 2. Therefore, the \( L^I \) type auditor’s quasi rents in the second period will be zero.

Note that, since prior studies in mandatory rotation ignore the effect of auditor’s reputation on his finding new clients and determining future audit fees after the termination of an audit engagement, their analyses fall into our “no reputation” case because auditor’s future quasi rents are assumed to be zero. While prior studies have found that mandatory rotation can improve auditor independence because an auditor has a strong incentive to resist clients’ pressure (Dopuch et al. 2001), we further find that, since a terminated auditor has to find new clients, and the ability to find new clients and the bargaining power of obtaining a favorable audit fee depends on the auditor’s reputation for independence before termination, mandatory rotation may motivate the auditor to remain independent at the last period of an audit engagement before compulsory rotation. This “reputation effect” to the effectiveness of mandatory rotation is important but has been overlooked in prior studies.

**Analysis in Period 1**

Using backward induction, we can find a \( L^I \) type auditor’s expected two-period total payoff function as follows:

\[ \Pi = (F - C) + \gamma \cdot \frac{\lambda \cdot (1 - \sigma_i)}{1 + (1-q_i)(1-\lambda) \cdot (1 - \sigma_i)} + \frac{1}{2} \Pr(A|L^B) \cdot E(\Pi_2^L). \]
The first line of equation (3) denotes the sum of a \( L^{1} \) type auditor’s payoff from his “normal” audit profit \( (F-C) \) plus side payment in period 1. The second line represents the auditor’s expected payoff due to his “worse reputation” when the true risk of investment in period 1 is low (assume \( \text{Pr}(L^{R}) = \frac{1}{2} \)) and the auditor issues an \( A \) report (assume \( \text{Pr}(A|L^{R}) = 1 \)). The third line of equation (3) consists of two parts. The first part is a \( L^{1} \) auditor’s expected payoff when the true risk of investment in period 1 is high and he gains a “better reputation” by issuing a \( D \) report with probability \( \sigma_{i} \). The second part is the auditor’s expected payoff when he issues an \( A \) report, with \( \lambda \) probability of having a bad state (in which case the auditor receives nothing due to his “no reputation”) and \( 1-\lambda \) probability of having a good state (in which case the auditor receives \( E(\Pi_{2}^{1}) \) due to his “worse reputation”).

Let \( \Pi_{1} \) and \( \Pi_{2} \) denote the \( L^{1} \) type auditor’s expected payoffs in periods 1 and 2, respectively, we can decompose equation (3) into two parts by periods:

\[
\Pi_{1} = (F-C) + \gamma \cdot \frac{\lambda \cdot (1-\sigma_{i})}{1+(1-q_{i})(1-\lambda) \cdot (1-\sigma_{i})} .
\]  

\[
\Pi_{2} = \frac{E(\Pi_{2}^{1})}{2} + \sigma_{i} \cdot E(\Pi_{2}^{1}) + (1-\sigma_{i}) \cdot (1-\lambda) \cdot E(\Pi_{2}^{1}) .
\]

To facilitate our discussions, we first use Lemma 2 to define the side payment \( (SP) \) in period 1 as follows:

\[
SP_{1} = \gamma \cdot \frac{\lambda \cdot (1-\sigma_{i})}{1+(1-q_{i})(1-\lambda) \cdot (1-\sigma_{i})} .
\]

Since the side payment a \( L^{1} \) type auditor may receive in period 2 depends on his reputation at the end of period 1, we have two possible measures of side payment in period 2: (a) the auditor gain a “better reputation” (denoted by \( \uparrow \)), in which case the side payment equals (see Lemma 6):

\[
SP_{2}^{\uparrow} = \gamma \cdot \frac{\lambda \cdot [q_{i} + \sigma_{i}(1-q_{i})]}{q_{i} + \sigma_{i}(1-q_{i})(2-\lambda)} ,
\]

and (b) the auditor receives a “worse reputation” (denoted by \( \downarrow \)), in which case the side payment is (see Lemma 8):

\[
SP_{2}^{\downarrow} = \gamma \cdot \frac{\lambda \cdot [1+\lambda(1-\sigma_{i})(1-q_{i})]}{(2-\lambda) \cdot [1+\lambda(1-\sigma_{i})(1-q_{i})]-q_{i}(1-\lambda)} .
\]
Plugging equations (4-1), (4-2), and (4-3) into equations (3-1) and (3-2) gives
\[ \Pi_1 = (F - C) + SP_1, \quad E(\Pi_2^\dagger) = (F + M) - C + SP_2^\dagger, \quad \text{and} \quad E(\Pi_2^\ddagger) = (F - C) + SP_2^\ddagger. \]
Therefore, equation (3) can be rewritten as:
\[
\Pi = (F - C) + SP_1 + \frac{(F - C) + SP_2^\dagger}{2} + \sigma_1[(F + M) - C + SP_2^\dagger] + (1 - \sigma_1)\cdot(1 - \lambda)\cdot[(F - C) + SP_2^\ddagger] - \frac{2}{2}.
\] (5)

In order to analyze the \( L^I \) type auditor’s optimal reporting strategy, we replace the \( L^I \) type auditor’s decision variable \( \sigma_1 \) by zero and one (labeled by superscripts \( \sigma_1 \equiv 0 \) and \( \sigma_1 \equiv 1 \), respectively) into equation (5) to compute his total expected payoffs under these two extreme cases. If the auditor chooses a pure strategy of not reporting truthfully (i.e., \( \sigma_1 \equiv 0 \)), his expected total payoff will be:
\[
\Pi_{\sigma_1=0} = \left[2(F - C) - \frac{1}{2}\cdot\lambda\cdot(F - C)\right] + SP_1^{\sigma_1=0} + (1 - \frac{1}{2}\cdot\lambda)\cdot SP_2^{\sigma_1=0,\dagger}.
\] (6)

Note that the terms inside the bracket represent the expected two-period audit profit, which equals the two-period normal audit profit minus the audit profit when the state of nature is bad (with probability \( \frac{1}{2} \)) and the risk of the investment is high (with probability \( \lambda \)). If fact, \( \lambda/2 \) is right the probability that the auditor receive “no reputation” at the end of period 1. In addition, the second term on the right hand side of equation (6) is the side payment the auditor will receive in period 1 if his reporting strategy is \( \sigma_1 \equiv 0 \). In the last term, \( 1 - (\lambda/2) \) represents the probability that a \( L^I \) type auditor can still “survive” in period 2 and \( SP_2^{\sigma_1=0,\dagger} \) denotes the side payment a \( L^I \) type auditor with reporting strategy \( \sigma_1 \equiv 0 \) and receiving a “worse reputation” at the end of period 1 may earn in period 2. Therefore, \( [1 - (\lambda/2)]\cdot SP_2^{\sigma_1=0,\dagger} \) measures the auditor’s expected side payment he will earn in period 2 when he adopts a reporting strategy \( \sigma_1 \equiv 0 \) in period 1. To facilitate our following analysis, we define \( [1 - (\lambda/2)]\cdot SP_2^{\sigma_1=0,\dagger} \) as \( E_1(SP_2^{\sigma_1=0}) \).

In contrast, if the auditor chooses a pure strategy of reporting truthfully (i.e., \( \sigma_1 \equiv 1 \)), his expected total payoff will be:
\[
\Pi_{\sigma_1=1} = 2(F - C) + M + \frac{SP_2^{\sigma_1=1,\dagger} + SP_2^{\sigma_1=1,\ddagger}}{2}.
\] (7)

In equation (7), the first term on the right hand side indicates that a \( L^I \) type auditor can earn a normal audit profit \( (F - C) \) from both periods with probability one because of
his honest reporting strategy $\sigma_1 = 1$. The second term represents the audit fee premium $M$ the auditor will receive when the risk of investment is high (with probability $\frac{1}{2}$) and he reports truthfully. In the bracket on the right hand side of equation (7), $SP_2^{\sigma_1=\downarrow}$ denotes the side payment a $L^I$ type auditor with truthful reporting and receiving a “worse reputation” at the end of period 1 may earn in period 2. Similarly, $SP_2^{\sigma_1=\uparrow}$ represents the side payment the auditor with truthful reporting and receiving a “better reputation” at the end of period 1 may earn in period 2. Since $\Pr(H^R) = \Pr(L^R) = \frac{1}{2}$, the term $(SP_2^{\sigma_1=\downarrow} + SP_2^{\sigma_1=\uparrow})/2$ measures the auditor’s expected side payment he will earn in period 2 when he adopts a truth-telling strategy in period 1. Again, to facilitate our following analysis, we define $(SP_2^{\sigma_1=\downarrow} + SP_2^{\sigma_1=\uparrow})/2$ as $E(SP_2^{\sigma_1=\cdot})$.

To find the $L^I$ type auditor’s optimal reporting strategy, we can calculate the difference between $\Pi^{\sigma_1=\downarrow}$ and $\Pi^{\sigma_1=\uparrow}$. If $(\Pi^{\sigma_1=\downarrow} - \Pi^{\sigma_1=\uparrow})$ equals zero, the auditor will adopt a mixed strategy between reporting truthfully and dishonestly. If $(\Pi^{\sigma_1=\downarrow} - \Pi^{\sigma_1=\uparrow})$ is greater than zero, on the other hand, the auditor will adopt a truth-telling pure strategy in period 1. Finally, if $(\Pi^{\sigma_1=\downarrow} - \Pi^{\sigma_1=\uparrow})$ is less than zero, the auditor will adopt a pure strategy of always compromising his independence. These lead to the following Proposition 4:

**Proposition 4:** The $L^I$ type auditor’s equilibrium reporting strategy $\sigma_1^*$ in period 1:

1. If $[E(SP_2^{\sigma_1=\downarrow}) - E(SP_2^{\sigma_1=\uparrow})] + \frac{M}{2} + \frac{1}{2} \cdot \lambda \cdot (F - C) = SP_1^{\sigma_1=\uparrow}$, $0 < \sigma_1^* < 1$.
2. If $[E(SP_2^{\sigma_1=\downarrow}) - E(SP_2^{\sigma_1=\uparrow})] + \frac{M}{2} + \frac{1}{2} \cdot \lambda \cdot (F - C) > SP_1^{\sigma_1=\uparrow}$, $\sigma_1^* = 1$.
3. If $[E(SP_2^{\sigma_1=\downarrow}) - E(SP_2^{\sigma_1=\uparrow})] + \frac{M}{2} + \frac{1}{2} \cdot \lambda \cdot (F - C) < SP_1^{\sigma_1=\uparrow}$, $\sigma_1^* = 0$.

**Proof:** It is straightforward from the difference between equations (7) and (6).

Proposition 4 suggests that the effectiveness of mandatory rotation on auditor independence can be examined through an investigation of the impact of auditor reputation on future audit fee premium $M$, normal audit profit $(F-C)$, and the probability of bad state $\lambda$. For example, the right hand part of (1), (2), and (3) of Proposition 4 (i.e., $SP_2^{\sigma_1=\cdot}$) represents the side payment the $L^I$ type auditor may earn in period 1 if he compromises his independence in period 1. In contrast, the three parts on the left hand side of Proposition 4 denote the auditor’s *incremental benefit* of maintaining his independence. First, the bracket terms $E(SP_2^{\sigma_1=\downarrow}) - E(SP_2^{\sigma_1=\uparrow})$ measure the incremental side payment the auditor can earn in period 2 if he reports truthfully in the first period. Second, the term $M/2$ is the expected audit fee premium the auditor will receive in period 2 when $\Pr(H^R)$ equals $\frac{1}{2}$ in period 1. Therefore, an increase in $M$ will motivate a $L^I$ type auditor to maintain independent more often in period 1. This result
suggests that, in deciding whether mandatory rotation is still effective at the last period of an audit engagement, the regulatory body should take the market’s determination of audit fee premium into consideration. In particular, if market’s premium paid to a good reputation auditor is high enough, mandatory rotation shall be successful even at the last period of an audit engagement.

Finally, \((\lambda/2)(F - C)\) represents the loss in normal audit profit the auditor can “avoid” when the state of nature is bad (with probability \(\frac{1}{2}\)) and the risk of the investment is high (with probability \(\lambda\)). Obviously, an increase in normal audit profit \((F - C)\) and the probability of bad state \(\lambda\) both have positive effects on the \(L^I\) type auditor’s maintaining independence. The magnitude of normal audit profit matters because it represents the profit “lower bound” a \(L^I\) type auditor can earn if he does not collude with the manager. Therefore, if the normal profit is not high enough, the auditor’s maintaining independence will not become his profit-maximizing decision. This result indicates that, under an audit market in which normal audit profit is compressed toward zero, a mandatory rotation mechanism could hurt the auditor’s independence.

The probability of a bad state \(\lambda\) also have a positive effect on the \(L^I\) type auditor’s independence because, if the auditor is labeled as “no reputation” at the end of period 1, he has no chance to receive the normal audit profit in period 2. In addition, the benefit for the \(L^I\) type auditor to collude with the manager is to gain a side payment in period 1. The cost of this collusion, however, depends on the state of nature. If the state is good, the auditor receives a “worse reputation” in period 2 because he agrees with the manager’s \(L^R\) disclosure but the firm remains as a going-concern at the end of period 1. On the other hand, if the state turns out to be bad, the auditor gets “no reputation” in period 2 because the firm goes into bankruptcy but the auditor issues an A report. In other words, if the probability of a bad state \(\lambda\) increases, the auditor’s dishonest A report in period 1 increases his probability of receiving nothing in period 2. That is, the higher the \(\lambda\), the higher the auditor’s cost of dishonest report. Therefore, higher \(\lambda\) may induce higher auditor independence. This result implies that the end game effect of mandatory rotation tends to be less severe in high risk industries such as financial institutions, high-tech, and waste management.

IV. SUMMARY AND CONCLUSIONS

Although the public reporting is a public interest activity in which all the participants in the process should bear responsibilities, there are many accounting and auditing reforms, including mandatory rotation, designed to rebuild public confidence in financial reporting after the Enron-Andersen event. This study examines how rotation might affect auditor independence through his reputation effect.

In general, there are two potential benefits an auditor may gain from compromising his independence: one is the client-specific quasi rents the auditor can earn in future engagements, and the other one is a side payment paid by the manager in the current engagement period. In addition, a terminated auditor’s reputation in independence will

\[\text{DeAngelo (1981), Magee and Tseng (1990), and Lee and Gu (1998) have assumed that the audit market is competitive and auditor’s normal profit is zero.}\]
affect his opportunities of finding new clients and receiving comparable audit fee level after compulsory termination. The main purpose of this study is to investigate the effects of side payments and auditor reputation on the effectiveness of mandatory rotation in improving auditor independence. The analytical results from a two-period sequential game model reveal that, if we ignore the effect of auditor reputation on his future audit fee determination, mandatory rotation will adversely affect the auditor’s independence in the last period before rotation. This result further implies that the feasibility of a mandatory rotation mechanism should consider the auditor’s career concerns regarding his obtaining new audit engagements and future quasi rents. If we consider the effect of auditor’s reputation on finding new clients and obtaining favorable audit fee level, however, we show that the effectiveness of mandatory rotation on auditor independence can be improved through an increase in future audit fee premium, normal audit profit, or the probability of a bad state. Without these conditions, a mandatory rotation mechanism may have negative effects on auditor independence.

Our analytical results have several policy implications. First, since the severer the agency problems, the stronger the audit demand, firms with higher agency costs are willing to pay more audit fee premium. Therefore, mandatory rotation seems to be more effective to firms whose agency costs are high. Second, because normal audit profits will generally be compressed in a highly competitive audit market, the effectiveness of a mandatory rotation mechanism may be weaker in an audit market where price competition is overly high. Third, the “end game” effect of mandatory rotation tends to be severe in low risk industries. This result implies that, when implementing a mandatory rotation mechanism, the policy makers should take the variations among different industries’ risks into their evaluation of such a mechanism. Finally, in our “short-term” two-period model, the creditor will update her belief that an auditor is of H⁰ type from prior belief q₁ to posterior belief q₂ at the end of period 1. If we see from a “long-term” perspective, however, the updated posterior belief may converge to a constant. In this situation, the auditor’s type will be fully revealed to the creditor. In other words, a mandatory rotation mechanism may strengthen the auditor’s motivation to build up his reputation in independence, which in turn forces auditors with “no reputation” to quit the audit market because they will never be able to find new clients.

The Enron debacle has triggered a hot debate over the implementation of a mandatory rotation as an alternative mechanism to increase auditor’s independence. In general, the overall pros and cons of mandatory auditor rotation centers on its costs and benefits. For example, in his testimony before the Senate Banking Committee in February 2002, John Biggs, member of the POB, claimed that auditor rotation can reduce the financial incentives for the audit firm to placate management and mitigate the problem of cross-selling other services (POB 2002, 28). Speaking at the Senate Oversight hearings in March 2002, however, James Copeland, CEO of Deloitte & Touche, spoke out against mandatory rotation due to its potential costs and risks. Beyond these debates, our study further shows that the feasibility and effectiveness of a mandatory rotation mechanism are not by themselves a simple cost-benefit problem; rather, the policy makers should also consider other factors such as the magnitude of audit fee premium, normal audit profit, and the probability of a bad state.

There are other ways of extending this study. For example, our analytical model
only focuses on the auditor’s independent behavior in the last period before mandatory rotation. A more complete analysis of the effectiveness of mandatory rotation should incorporate the overall periods of an audit engagement. In addition, the auditor’s legal liability is not considered in our model setting. One may integrate different legal regimes (negligence vs. strict) and damage apportionment rules (joint-and-several vs. proportionate) into the model and see how auditor’s independence can be enhanced in the last period before mandatory rotation. Finally, since mandatory rotation substantially affects the demand for and supply of auditing services, future research may explore how a mandatory rotation mechanism could influence present and potential auditors’ career planning decisions.

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REFERENCES


APPENDIX

Proof of Lemma 1:
Let \( \Pr(D)_1 \) and \( \Pr(A)_1 \) denote the probability that the auditor will issue a \( D \) and \( A \) report, respectively, in period 1. Given two-sided perfect audit technology, we have:

\[
\Pr(H^R \mid D)_1 = \frac{\Pr(H^R) \cdot \Pr(D \mid H^R)_1}{\Pr(H^R) \cdot \Pr(D \mid H_R)_1 + \Pr(L^R) \cdot \Pr(D \mid L^R)_1} = 1, \quad \text{and}
\]

\[
\Pr(L^R \mid A)_1 = \frac{\Pr(L^R) \cdot \Pr(A \mid L^R)_1}{\Pr(L^R) \cdot \Pr(A \mid L^R)_1 + \Pr(H^R) \cdot \Pr(A \mid H^R)_1} = \frac{1}{2} \cdot \frac{1}{1 + \frac{1}{2} \cdot (1 - q_t) \cdot (1 - \sigma)}
\]

Q.E.D.

Proof of Lemma 2:
(1) When the auditor issues a \( D \) report in period 1, the creditor’s expected payoff is:

\[
\Pr(L^R \mid D)_1 \cdot R_1(D) + \Pr(H^R \mid D)_1 \cdot [(1 - \lambda) \cdot R_1(D) + \lambda \cdot 0] - 1 = 0.
\]

From Lemma 1, we have:

\[
R_1(D) = \frac{1}{1 - \lambda}.
\]

(A2-1)

(2) When the auditor issues a \( A \) report in period 1, the creditor’s expected payoff is:

\[
\Pr(L^R \mid A)_1 \cdot R_1(A) + \Pr(H^R \mid A)_1 \cdot [(1 - \lambda) \cdot R_1(A) + \lambda \cdot 0] - 1 = 0.
\]

\[
R_1(A) = \frac{1}{\Pr(L^R \mid A)_1 + (1 - \lambda) \cdot \Pr(H^R \mid A)_1} = \frac{1}{\Pr(L^R \mid A)_1 + (1 - \lambda) \cdot [1 - \Pr(L^R \mid A)_1]}
\]

\[
= \frac{1}{1 - \lambda [1 - \Pr(L^R \mid A)_1]}
\]

(A2-2)

(3) \( R_1(D) - R_1(A) = \frac{\lambda \cdot \Pr(L^R \mid A)_1}{(1 - \lambda) \cdot (1 - \lambda) \cdot [1 - \Pr(L^R \mid A)_1]} \).

(4) If the \( L^I \) type auditor adopts a mixed strategy (i.e., \( 0 \leq \sigma \leq 1 \)), the firm’s expected savings in cost of capital will be:

\[
(1 - \lambda) (1 - \sigma) [R_1(D) - R_1(A)] = \frac{\lambda \cdot (1 - \sigma) \cdot \Pr(L^R \mid A)_1}{1 - \lambda \cdot [1 - \Pr(L^R \mid A)_1]} = \frac{\lambda \cdot (1 - \sigma) \cdot [1 - \Pr(L^R \mid A)_1]}{1 + (1 - q_t)(1 - \lambda) \cdot (1 - \sigma)} \geq 0.
\]

Q.E.D.

Proof of Proposition 1:
A \( L^I \) type auditor will choose a reporting strategy \( \sigma \) to maximize his objective
function:
\[
\max_{\sigma_i} \left( F - C \right) + \gamma \cdot \frac{\lambda \cdot (1 - \sigma_i)}{1 + (1 - q_i) (1 - \lambda) \cdot (1 - \sigma_i)}.
\]

Differentiating the auditor’s objective function with respect to \(\sigma_i\) gives:
\[
\frac{\partial}{\partial \sigma_i} \left[ \frac{\lambda (1 - \sigma_i)}{1 + (1 - \lambda) (1 - q_i) (1 - \sigma_i)} \right] = \frac{-\lambda}{\left[ 1 + (1 - \lambda) (1 - q_i) (1 - \sigma_i) \right]^2} < 0.
\]

Kuhn-Tucker condition indicates that the optimal \(\sigma_i\) is zero. Plugging this result into \((A2-1)\) and \((A2-2)\) gives Proposition 1.

Q.E.D.

Proof Lemma 3:
\[
\Pr(D) = \Pr(H^I) \cdot \Pr(D | H^I) + \Pr(L^I) \cdot \Pr(D | L^I)
\]
\[
= q_i \cdot \frac{1}{2} + (1 - q_i) \cdot \frac{1}{2} \cdot \sigma_i = \frac{q_i + (1 - q_i) \cdot \sigma_i}{2}.
\]

\[
\Pr(A) = \Pr(H^I) \cdot \Pr(A | H^I) + \Pr(L^I) \cdot \Pr(A | L^I)
\]
\[
= q_i \cdot \frac{1}{2} + (1 - q_i) \cdot \left[ \frac{1}{2} + \frac{1}{2} \cdot (1 - \sigma_i) \right] = \frac{1 + (1 - q_i) \cdot (1 - \sigma_i)}{2}.
\]

Q.E.D.

Proof of Lemma 4:

1. Because
\[
\Pr(H^I | D, N) = \frac{\Pr(H^I) \cdot \Pr(D, N | H^I)}{\Pr(D, N)}
\]

where
\[
\Pr(H^I) = q_i,
\]
\[
\Pr(D, N) = \Pr(H^I) \cdot \Pr(H^R, D | H^I) \cdot \Pr(N | D, H^R)
\]
\[
+ \Pr(L^I) \cdot \Pr(H^R, D | L^I) \cdot \Pr(N | D, H^R)
\]
\[
= q_i \cdot \frac{1}{2} \cdot \lambda + (1 - q_i) \cdot \sigma_i \cdot \frac{1}{2} \cdot \lambda = \frac{1}{2} \cdot \lambda \cdot [q_i + \sigma_i \cdot (1 - q_i)],
\]
\[
\Pr(D, N | H^I) = \frac{1}{2} \cdot \lambda.
\]

Therefore,
\[
\Pr(H^I | D, N) = \frac{\Pr(H^I) \cdot \Pr(D, N | H^I)}{\Pr(D, N)} = \frac{q_i}{[q_i + \sigma_i \cdot (1 - q_i)]}.
\]
(2) Because \( \Pr(H^I \mid D, Y) = \frac{\Pr(H^I) \cdot \Pr(D, Y \mid H^I)}{\Pr(D, Y)} \)

where
\[
\Pr(H^I) = q_i,
\]
\[
\Pr(D, Y) = \Pr(H^I) \cdot \Pr(H^R, D \mid H^I) \cdot \Pr(Y \mid D, H^R) + \Pr(L^I) \cdot \Pr(H^R, D \mid L^I) \cdot \Pr(Y \mid D, H^R)
\]
\[
= q_i \cdot \frac{1}{2} \cdot (1 - \lambda) + (1 - q_i) \cdot (1 - \lambda)\]
\[
= \frac{1}{2} \cdot (1 - \lambda) \cdot [q_i + \sigma_i \cdot (1 - q_i)],
\]
\[
\Pr(D, Y \mid H^I) = \frac{1}{2} \cdot (1 - \lambda).
\]
Therefore
\[
\Pr(H^I \mid D, Y) = \frac{\Pr(H^I) \cdot \Pr(D, Y \mid H^I)}{\Pr(D, Y)} = \frac{q_i \cdot \frac{1}{2} \cdot (1 - \lambda)}{\frac{1}{2} \cdot (1 - \lambda) \cdot [q_i + \sigma_i \cdot (1 - q_i)]}
\]
\[
= \frac{q_i}{[q_i + \sigma_i \cdot (1 - q_i)]}
\]

(3) \( \Pr(H^I \mid A, N) = 0 \) (because audit technology is two-sided perfect).

(4) Because \( \Pr(H^I \mid A, Y) = \frac{\Pr(H^I) \cdot \Pr(A, Y \mid H^I)}{\Pr(A, Y)} \)

where
\[
\Pr(H^I) = q_i,
\]
\[
\Pr(A, Y) = \Pr(H^I) \cdot \Pr(A, Y \mid H^I) + \Pr(L^I) \cdot \Pr(A, Y \mid L^I)
\]
\[
= q_i \cdot \frac{1}{2} + (1 - q_i) \cdot \frac{1}{2} \cdot (1 - \sigma_i) \cdot \lambda = \frac{1}{2} \cdot [1 + \lambda \cdot (1 - \sigma_i) \cdot (1 - q_i)].
\]
\[
\Pr(A, Y \mid H^I) = \frac{1}{2}
\]
Therefore,
\[
\Pr(H^I \mid A, Y) = \frac{\Pr(H^I) \cdot \Pr(A, Y \mid H^I)}{\Pr(A, Y)} = \frac{q_i \cdot \frac{1}{2}}{\frac{1}{2} \cdot [1 + \lambda \cdot (1 - \sigma_i) \cdot (1 - q_i)]}
\]
\[
= \frac{q_i}{1 + \lambda \cdot (1 - \sigma_i) \cdot (1 - q_i)}.
\]

Q.E.D.
Proof of Lemma 5:

(1) By Lemma 1, we have \( \Pr(H^R \mid D)^\uparrow_2 = 1 \).

(2) By Lemma 1, we have \( \Pr(L^R \mid A)^\uparrow_2 = \frac{1}{1 + [1 - \Pr(H^I \mid D, N)] \cdot (1 - \sigma^\uparrow_2)} \).

By (1) and (2) of Lemma 4, we have:

\[
\Pr(L^R \mid A)^\uparrow_2 = \frac{1}{1 + \left[1 - \frac{q_i}{q_i + \sigma_i(1-q_i)} \right] \cdot (1 - \sigma^\uparrow_2)} = \frac{1}{1 + \frac{\sigma_i(1-q_i)(1-\sigma^\uparrow_2)}{q_i + \sigma_i(1-q_i)}}.
\]

Note that, if we define \( k = \sigma_i \cdot (1-q_i) \) and \( \alpha = k \div (q_i + k) \), \( k \) and \( \alpha \) are all non-negative.

Therefore, we have:

\[
\Pr(L^R \mid A)^\uparrow_2 = \frac{1}{1 + \frac{k(1-\sigma^\uparrow_2)}{q_i + k}} = \frac{1}{1 + \alpha - \alpha \sigma^\uparrow_2}.
\]

That is,

\[
\frac{\partial}{\partial \sigma^\uparrow_2} \Pr(L^R \mid A)^\uparrow_2 = \frac{\alpha}{(1 + \alpha - \alpha \sigma^\uparrow_2)^2} > 0.
\]

(3) Similar to the proof of Lemma 2, we can show that:

\[
R^\downarrow_2(A^\uparrow) = \frac{1}{1 - \lambda \cdot [1 - \Pr(L^R \mid A)^\uparrow_2]} = \frac{1}{1 - \lambda \cdot \left[1 - \frac{\sigma_i \cdot (1-q_i) \cdot (1-\sigma^\uparrow_2)}{q_i + \sigma_i(1-q_i)}\right]} = \frac{1}{1 - \lambda \cdot \frac{q_i + \sigma_i \sigma^\uparrow_2(1-q_i)}{q_i + \sigma_i(1-q_i)}}.
\]

Q.E.D.

Proof of Proposition 2:

A \( L' \) type auditor will choose a reporting strategy \( \sigma^\uparrow_2 \) to maximize his objective function:

\[
\max_{\sigma^\uparrow_2} (F + M) - C + \gamma \cdot \frac{\lambda \cdot (1-\sigma^\uparrow_2) \cdot \Pr(L^R \mid A)^\uparrow_2}{1 - \lambda \cdot [1 - \Pr(L^R \mid A)^\uparrow_2]}.
\]

Differentiating the auditor’s objective function with respect to \( \sigma^\uparrow_2 \) gives. By Lemma 5, we know that:
\[ \Pr(L^R | A)_2^\uparrow = \frac{1}{1 + \alpha - \alpha \sigma_2^\uparrow} \text{ and } \frac{\partial}{\partial \sigma_2} \Pr(L^R | A)_2^\uparrow = \frac{\alpha}{(1 + \alpha - \alpha \sigma_2^\uparrow)^2}. \]

Since \( k = \sigma_1 \cdot (1 - q_1) \) and \( \alpha = k / (q_1 + k) \), we have \( 0 \leq \alpha < 1 \). To facilitate our proof, let \( P \) denote \( \Pr(L^R | C)_2^\uparrow \) and \( P' \) denote \( \partial \Pr(L^R | C)_2^\uparrow / \partial \sigma_2^\uparrow \). Therefore, we have \( P' = P^2 \cdot \alpha \). Using this relation, we can rewrite the auditor’s objective function as follows:

\[
\max_{0 \leq \gamma \leq 1} (F + M) - C + \gamma \cdot \frac{\lambda}{1 - \lambda}(1 - \sigma_2^\uparrow) \cdot P.
\]

Because \( 0 < \lambda < 1 \), \( P \geq 0 \), \( 0 \leq \sigma_2^\uparrow \leq 1 \), and \( P' \geq 0 \) (by Lemma 5), we know that \( (1 - \lambda + \lambda P) \), \( \lambda P' \), and \( \lambda P - \lambda \sigma_2^\uparrow P \) are all non-negative. Therefore, if \( \lambda P' - \lambda P - \gamma \sigma_2^\uparrow P' \) is negative, the first-order condition of the auditor’s rewritten objective function must be negative. By Kuhn-Tucker condition, we can have the auditor’s optimal reporting strategy to be \( \sigma_2^\uparrow = 0 \).

Now, we need to check if \( \lambda P' - \lambda P - \gamma \sigma_2^\uparrow P' \) is negative. Using the relation \( P' = P^2 \cdot \alpha \) defined above, we have:

\[
\lambda P' - \lambda P - \gamma \sigma_2^\uparrow P' = \lambda P^2 \cdot \alpha - \lambda P - \gamma \sigma_2^\uparrow P^2 \cdot \alpha = \lambda P(P \alpha - 1 - \sigma_2^\uparrow P \alpha \uparrow) = -\lambda P[1 - P \alpha(1 - \sigma_2^\uparrow)] \leq 0
\]

Plugging this result into Lemma 5 gives Proposition 2.

Q.E.D.

Proof of Lemma 6:

Using the notations \( k \) and \( \alpha \) in Lemma 5 again and plugging the optimal \( \sigma_2^\uparrow = 0 \) specified in Proposition 2 into \( \Pr(L^R | A)_2^\uparrow = \frac{1}{1 + \alpha - \alpha \sigma_2^\uparrow} \) gives \( \Pr(L^R | A)_2^\uparrow = \frac{1}{1 + \alpha} \), which implies:

\[
E(\Pi_2^\uparrow) = (F + M) - C + \gamma \cdot \frac{\lambda}{1 - \lambda}(1 - P)
\]

\[
= (F + M) - C + \gamma \cdot \frac{1 + \alpha}{1 + \alpha}(1 + \alpha)(1 - \lambda) = (F + M) - C + \gamma \cdot \frac{\lambda}{1 + \alpha(1 - \lambda)}
\]

Plugging \( k = \sigma_1 \cdot (1 - q_1) \) and \( \alpha = k / (q_1 + k) \) into the above equation gives:

\[
\frac{\lambda}{1 + \alpha(1 - \lambda)} = \frac{\lambda}{1 + \frac{k}{q_1 + k}(1 - \lambda)} = \frac{\lambda}{1 + \frac{\sigma_1(1 - q_1)}{q_1 + \sigma_1(1 - q_1)(1 - \lambda)} = \frac{\lambda q_1 + \lambda \sigma_1(1 - q_1)}{q_1 + \sigma_1(1 - q_1)(2 - \lambda)}
\]

Q.E.D.
Proof of Lemma 7:
(1) By Lemma 1, we have:
\[ \Pr(H^R | D)_T^\perp = 1 \quad \text{and} \quad \Pr(L^R | A)_T^\perp = \frac{1}{1 + [1 - \Pr(H^I | A, Y)] \cdot (1 - \sigma^\perp_2)}. \]

Plugging (4) of Lemma 4 into \( \Pr(L^R | A)_T^\perp \) gives:
\[ \Pr(L^R | A)_T^\perp = \frac{1}{1 + [1 - \frac{q_1}{1 + m} \cdot (1 - \sigma^\perp_2)] (1 - \sigma^\perp_2)}. \]

(2) Let \( m = \lambda (1 - \sigma^\perp_1) (1 - q_1) \), where \( 0 \leq m \leq 1 \), therefore, we have:
\[ \Pr(L^R | A)_T^\perp = \frac{1}{1 + [1 - \frac{q_1}{1 + m} \cdot (1 - \sigma^\perp_2)] (1 - \sigma^\perp_2)}. \]
\[ \frac{\partial}{\partial \sigma^\perp_2} \Pr(L^R | A)_T^\perp = \frac{1 + m - q_1}{[1 + \frac{m - q_1}{1 + m} \cdot (1 - \sigma^\perp_2)]^2} \]
\[ = \frac{(1 + m - q_1) \cdot (1 + m)}{[1 + m \cdot (1 + m - q_1) \cdot (1 - \sigma^\perp_2)]^2} > 0. \]

(3) Similar to the proof of Lemma 2,
\[ R_2(A^\perp) = \frac{1}{1 - \frac{\lambda}{1 - \Pr(L^R | A)_T^\perp}} = \frac{1}{1 - \frac{\lambda}{1 + \frac{m - q_1}{1 + m} \cdot (1 - \sigma^\perp_2)}} \]
\[ = \frac{1}{1 - \frac{1 + m - q_1 \cdot (1 - \sigma^\perp_2)}{1 + m \cdot (1 + m - q_1) \cdot (1 - \sigma^\perp_2)}}. \]

Plugging \( m = \lambda (1 - \sigma^\perp_1) (1 - q_1) \) into the above equation give \( R_2(A^\perp) \).

Q.E.D.

Proof of Proposition 3:
A \( L' \) type auditor will choose a reporting strategy \( \sigma^\perp_2 \) to maximize his objective function:
\[ \max_{\sigma^\perp_2} (F - C) + \gamma \cdot \frac{\lambda \cdot (1 - \sigma^\perp_2) \cdot \Pr(L^R | C)_T^\perp}{1 - \frac{\lambda}{1 - \Pr(L^R | C)_T^\perp}}. \]

Similar to the proof in Proposition 2, we can have the auditor \’s optimal reporting.
strategy to be $\sigma^{\perp}_2 \equiv 0$. Plugging this result into Lemma 7 gives Proposition 3.

Q.E.D.

**Proof of Lemma 8:**

Using the optimal $\sigma^{\perp}_2 \equiv 0$ specified in Proposition 2 and $m = \lambda(1 - \sigma_i)(1 - q_i)$ in Lemma 7, we can rewrite the auditor’s expected profit in period 2 as:

$$E(\Pi^\perp_2) = (F - C) + \gamma' \cdot \frac{\lambda \cdot \Pr(L^R | C)^\perp_2}{1 - \lambda \cdot \Pr(L^R | C)^\perp_2}$$

$$= (F - C) + \gamma' \cdot \frac{\lambda(1 + m)}{2(1 + m) - q_i} = (F - C) + \gamma' \cdot \frac{\lambda(1 + m)}{2(1 + m) - q_i}$$

$$= (F - C) + \gamma' \cdot \frac{\lambda(1 + m)}{(2 - \lambda)(1 + m) - q_i(1 - \lambda)}.$$ 

Plugging $m = \lambda(1 - \sigma_i)(1 - q_i)$ into the above equation gives $E(\Pi^\perp_2)$.

Q.E.D.
強制性輪調與會計師獨立性之分析

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摘要: 美國因恩隆公司等企業所發生的財務醜聞衍生了公眾對於公司治理改革的討論與需求，其中與審計研究最直接相關的主題即為強制性會計師輪調。除了原已規定的五年強制性會計師合夥人輪調之外，在 2002 年的沙賓法案第 207 段中，也責成美國的資信局研究會計師事務所輪調的可行性與影響。本文主要目的即在於以賽局模型討論影響會計師事務所輪調成效的重要因素。

事實上，無論係分析性或是實證研究，過去的文獻對會計師輪調的研究與討論都稍嫌不足。就實證研究而言，在一個「非強制性輪調」環境下，所有利用會計師任期與審計品質所做的關聯性研究，均因更換會計師為企業的自願性決定，是以研究者所蒐集的會計師任期很可能因為「選擇性偏誤」的問題，而造成無法將研究成果直接推論到一個「強制性輪調」的環境。而就分析性研究而言，因為審計品質本身同時涉及到會計師發現問題的能力與誠實報導的機率，且輪調議題又使得研究者的模型設定無法在一個單期的環境中予以簡化地討論。換言之，在一個多期的分析環境中，會計師的名譽與公費間的關聯性也必須要內生化地處理，這些因素均使得「會計師輪調」的學術討論更形困難。

一般而言，贊成強制性輪調制度者均認為，會計師與客戶間長期的合作關係會傷害審計功能的獨立性與客觀性。在此認知下，藉由會計師輪調的制度，提高審計功能的實質獨立性；並透過不同審計專業人員的查核，提高財務報表簽證的形式獨立性。除此之外，在強制性輪調的管制下，查核人員也有較高的誘因抗拒來自管理當局的不當壓力。亦即，強制性輪調制度的核心優點在於透過輪調制度的建立，提昇公眾對審計獨立性的認知，進而對審計品質產生正面的助益。Stevens (1990) 與美國參院商業委員會均支持系統性的強制性輪調可以有效提高審計品質的論點。此外，以色列、西班牙與義大

雖然強制性輪調有上述的優點，然而，亦有許多學者從實際運作此制度之社會成本可能過高的角度切入，而對強制性輪調持反對的看法。以下彙總 Arrunada and Paz-Ares (1997) 與 Catanach and Walker (1999) 關於反對強制性輪調的主要觀點：(1) 為了了解新客戶，會使得後的繼任會計師不斷重覆發生可觀的初次查核成本，因而使得客戶的查帳公費增加；(2) 強制性輪調會傷害審計市場的競爭；(3) 原任會計師無法將專屬於其查核客戶的相關知識有效地傳遞給繼任會計師；(4) 輪調制度會降低會計師對其客戶專屬性投資的意願；(5) 由於不熟悉新客戶，使得在審計合約的前一、二年常發生審計失敗；(6) 對某些特殊行業的查核，可能僅有少數具特殊行業審計專業的會計師事務所方能勝任，輪調制度反而會迫使客戶必須選擇審計服務品質較低的會計師事務所；(7) 客戶需定期耗費搜尋適任新會計師的成本；(8) 除了會計師輪調的制度外，同業複核的評鑑以及事後法律訴訟成本的壓力等，均係能有效提昇審計獨立性的其他工具；(9) 過去有關會計師更換所能傳遞予公眾資訊內涵的效果，會因強制性輪調的施行而產生不利的影響。因此，這些研究均主張審計專業並不絕對需要強制性輪調的管制措施。

基於上述學術研究的結論可知，傳統對於「強制性輪調」的討論，係將此制度視為一個單純的成本效益問題。亦即，在其他條件不變的情況下，強制性輪調可以提昇審計品質；然而，因為同時伴隨著許多增額的社會成本，實質上也會減損強制性輪調制度的社會效益。因此，輪調制度的優劣與否，可以視為一在「獨立性」與「交易成本」間取捨的問題。

然而，本研究之基本目的，並不專在比較會計師處於「有強制性輪調」或「無強制性輪調」的不同制度下，其獨立性的高低，而係在於一個「強制性輪調」已為既定政策的前提下，討論有那些應特別注意的地方。其基本概念如下：首先，Nature 決定了投資風險（高風險或低風險）、會計師類型（高獨立性或低獨立性）、以及產業情境（好或壞）。需要融資的企業經理人給付審計公費並編製財務報表，受雇會計師進行查核工作並對財務報表表示意見（接受或拒絕）；而財務報表使用者則利用會計師的查核報告決定其必要報酬率，爾後經理由進行投資。此時，第一期的賽局結束，市場參與者會利用企業的實際財務狀況與先前的會計師意見，決定該會計師的「名聲」水準。在本期的賽局結束後，原任會計師於該公司的任期也同時結束。第二期，該會計師則在審計市場尋找新客戶。此時，市場「更新」後的該會計師名聲會影響
此會計師：(1)找到新客戶的機率；以及(2)次期的公費水準。賽局的均衡指出
(詳細證明參見正文)，如果一般的審計公費水準不高、名聲對於會計師的公
費溢價影響不大，以及產業屬於好情境的機率很高時，強制性輪調制度對於
會計師的獨立性並沒有正面的影響。反之，則得以提高強制性輪調制度的有
效性。

值得注意的是，由於強制性輪調制度所牽涉與可討論的影響因素非常
多，故本研究也忽略了許多重要的審計議題。具體而言，專業性 (會計師發
現問題能力的高低) 以及獨立性 (發現問題後誠實報導的機率) 共同決定了
審計品質。其中，「專業性」的問題又可以區分為「事前」不同會計師專業能
力的高低，以及「查核工作進行時」個別會計師之查核投入水準的多寡。理
論上，前述三項因素都應該被完整地引入分析模型中。然而，就筆者所知，
鮮少有分析性研究同時將這些因素一併納入模型中。舉例而言，Schwartz
出法律責任對於經理人財務報告策略的影響，會深遠地影響不同法律制度下
審計失敗率的高低。這些研究均僅分析「查核工作進行時的查核努力」，而忽
略了「事前」不同會計師的專業能力差異以及會計師獨立性水準的影響。此
外，Lee and Gu (1998)為了討論低價競標對於會計師獨立性的影響，其分析
過程也簡化了「查核努力水準」與「專業能力差異」等問題。所以，基於模
型設定與求解的方便起見，本研究對於該等因素也予以忽略。這些研究限制
尚需後續研究進一步加以討論。

關鍵字：會計師獨立性、強制性輪調、投機行為、聲譽效果
The Study of Earnings Management Detecting Models: A Case of Firms in Financial Distress

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ABSTRACT: The main purpose of this research is to evaluate the earnings management detecting ability of five commonly used accruals models: the DeAngelo Model, the Healy Model, the Industry Model, the Cross-sectional Jones Model and the Cross-sectional Modified Jones Model, for examining the association between discretionary accruals and financial distress. Research sample in this study is composed of two groups: distressed companies and non-distressed companies. The former group contains full-delivery stocks listed in Taiwan Stock Exchange between 1993 and 2001; the latter group consists of matched listed firms by industry and firm size. Both univariate tests and multiple OLS regression analyses are used to examine the relationship between earnings management and financial distress. Regression analyses indicate that the DeAngelo Model and Healy Model can better detect earnings management behavior by distressed firms than the other three models in the between-group tests. Findings from additional tests show that the Cross-sectional Jones Model and the Cross-sectional Modified Jones Models are not sensitive to the firm's performance.

Keywords: Earnings Management, Financial Distress, Discretionary Accruals, Accruals Estimation Models.

Data Availability: Data used in this study are available from public source identified in this study.

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I. INTRODUCTION

In recent decades, there has been ample literature related to earnings management. Earnings management refers to the manipulation of certain accounting methods or procedures by management in order to have the accounting profit achieve the intended goal (Schipper 1989; Healy and Wahlen 1999). There are many ways for management to manage earnings, such as changing the business operation (e.g. by altering shipment schedules and speeding up or deferring maintenance), selling long-term assets or investments, changing accounting methods, and using accounting accruals. Among these ways of earnings management, manipulating the accounting accruals raises less awareness, costs less, and is easy to manipulate; consequently, it is often the focus of the studies on earnings management. However, a great difficulty researchers need to deal with is how to distinguish the discretionary portion of manipulation by the management. There are a variety of accruals estimation models proposed by the previous studies, from the more previous DeAngelo model and Healy Model to the recent Jones Model and the Modified Jones Model; the latter is often referred to by researchers. Dechow et al. (1995) compared the five different estimation models of discretionary accruals (the above four and the Industrial Model), in terms of their ability to detect the behavior of earnings management, by imitative manipulation within randomly-selected samples, and they found that the Modified Jones Model had a better detection ability. Bartov et al. (2000) also evaluated seven different models of discretionary accruals in terms of the ability to examine audit qualifications, and they found that the Cross-sectional versions of the Jones Model and the Modified Jones Model are better than their time-series counterparts.

The published research focusing on earnings management in Taiwan is limited. Hence, although the Jones Model and the Modified Jones Model are very often referred to in related studies, it still remains a question which model is more appropriate for the Taiwanese accounting data or is better in terms of detecting ability. One of the few studies found is conducted by Wang (1995) to compare and evaluate the Healy Model, the DeAngelo Model, and the Jones Model by artificially manipulating accounting accruals within randomly-selected samples.

The current study focuses on comparing the earnings management models of companies with financial distress. The financial distress of enterprises has attracted great attention from government and the public. After the Asia financial crisis in 1997, there were also several local financial storms taking place the next year, during which many enterprises underwent financial or management crisis. In addition, the 921 earthquake in 1999 shook many domestic enterprises. Further, in 2001, the sign of the global economic recession emerged along with 911 event, which greatly affected the U.S economy and society; all of these confronted the domestic economy with severe difficulties, which inevitably resulted in the bankruptcy of many enterprises. It is found that some enterprises went bankrupt due to their inherent weakness, while others were because of assets theft or

1 The seven different models are the DeAngelo Model, the Healy Model, the Industry Model, and both the time-serial and cross-sectional versions of Jones and Modified Jones Model.
accounting scandal, both of which had severe influences on the stockholders, creditors, and society.

Most of the studies in Taiwan focused on building the early warning models for enterprises, while a few aimed at analyzing the accounting choice of the enterprises with financial distress. These studies indicated that enterprises with financial distress had started to take advantage of discretionary accruals to manage earnings before the financial crisis broke out. In terms of the specific components of accruals, it is also found that the managers of the enterprises tended to manipulate earnings upward before the financial difficulty took place (Lin et al. 1997; Peng and Yeh 2001).

The current study focuses on the enterprises with financial distress, aiming at comparing the ability to detect earnings management of the estimation models of discretionary accruals, which are commonly adopted by the related literature. The estimation models employed by prior earning management studies indeed varied among different topics examined. As a result, there has been no conclusion as to which model is better. Hence, it is expected that the results from the current study can provide local researchers with useful reference about the choice of accrual estimation model for the study in earnings management.

The structure of this study is organized as follows: the next section following this introduction is the literature review on earnings management detection models and the accounting choices of enterprises with financial distress. Section 3 reports the methodology, including the models of discretionary accruals, the sample selection procedure, variables measurement and analysis method. Section 4 provides the results and analyses, and the final section is the conclusion.

II. LITERATURE REVIEW

Studies reviewed in this section include two parts: earnings management detection models and the accounting choices and earnings management of distressed firms.

Earnings Management Detection Models

In comparison with other earnings management tools, discretionary accruals are easier to manipulate but difficult to be detected. Thus, it has become the most common tool examined in prior studies. However, it is difficult for researchers to separate the discretionary portion of accruals. Prior studies have proposed many different models to estimate the discretionary components of accruals. DeAngelo (1986) and Healy (1985) tested for earnings management by comparing lagged or mean total accruals (details of the models will be formally defined in the following section). Jones (1991) proposed a model that relaxes the assumption that nondiscretionary accruals are constant. Different from the DeAngelo Model and the Healy Model, her model attempts to control for the effect of changes in a firm’s economic circumstances on nondiscretionary accruals. To eliminate the conjecture tendency of the Jones Model to measure discretionary accruals with error when discretion is exercised over revenues, Dechow et al. (1995) proposed a modified version of the model developed by Jones (1991). Another well-known model proposed by Dechow and Sloan (1991) was named the Industry Model. This model
assumes that variations in the determinants of nondiscretionary accruals are common across firms in the same industry. Others include the Cross-section version of Jones or Modified Jones Model (Becker et al. 1998), cash flows adjusted Jones Model (Jeter and Shivakumar 1999), and performance matched model (Kothari et al. 2004).

The Cross-sectional Modified Jones Model is one of the most popular detection models adopted by researchers in Taiwan (see, Shian-Hou 2000; Lin et al. 2002). Both the Cross-sectional Jones Model and the Cross-sectional Modified Jones Model are commonly used detection models in unpublished theses. For instance, following research methodology in Subramanyam (1996), Cheng (2000) examined the pricing of discretionary accruals and the relation between that and a firm’s future performance using the Cross-sectional Modified Jones Model. The results showed a positive association between discretionary accruals and subsequent firm performance.

Using simulations, Dechow et al. (1995) evaluated the relative performance of five earnings management detection models, which are the DeAngelo Model, the Healy Model, the Jones Model, the Modified Jones, and the Industry Model. They showed that the Modified Jones Model provides the most powerful test of earnings management. Bartov et al. (2000) evaluated seven different models to detect earnings management by examining the association between discretionary accruals and audit qualifications and found that only the Cross-sectional Jones and Cross-sectional Modified Jones Model are consistently able to detect earnings management. However, only one study has ever investigated the similar issue in Taiwan. Wang (1995) replicated the study by Dechow et al. (1995), assessing the relative ability of the Healy Model, the DeAngelo Model and the Jones model to detect earnings management using quarterly data of listed companies in Taiwan from September 1990 to June 1995. The empirical results, however, were mixed.

**Accounting Choices of Distressed Firms**

Extant theories on troubled firms with persistent earnings problems predicted that managers tend to use income increasing accounting choices to avoid loan default or for job security purpose (Gilson 1989; DeFond and Jiambalvo 1994). On the other hand, there also exists evidence that an income decreasing policy may be adopted due to careful monitoring by auditors, lenders and/or labor unions (Jones 1991; DeAngelo et al. 1994; Chartitou and Lambertides 2003).

DeAngelo et al. (1994) investigated accounting choices in financially troubled firms that reduced dividends and assessed whether accounting choices of troubled firms with binding debt covenants differ from those of troubled firms without such binding constraints. Surprisingly, they found that distressed firms exhibit statistically significant income decreasing discretionary accruals and that there are no notable differences across firms with and without binding covenants. More recently, Rosner (2003) examined whether failing firms manipulated earnings upward prior to their bankruptcy relative to nonfailing firms. The empirical results supported his hypothesis.

Chartitou and Lambertides (2003) examined the behavior of earnings management of 455 U.S. firms that filed for bankruptcy during the 1986-2001 period. Consistent with the findings by DeAngelo et al. (1994), results indicated that there exists a downward earnings management in the years prior to bankruptcy. Peltier-Rivest (1999) provides a comprehensive analysis of the determinants of accounting choices for an explicit sample
of trouble firms, which are defined as those that experienced three consecutive losses and reduced dividends. The results showed that firms in financial distress have incentives to adopt income-decreasing accounting choices in the year of nonroutine executive change.

Only a few studies examined accounting choices by distressed firms using Taiwanese data. Using the full-delivery stocks and their matching firms listed in Taiwan Stock Exchange between 1976 and 1994 as a sample, Lin et al. (1997) examined whether managers manipulate earnings in the face of financial distress. Their results showed that distressed firms tend to manage earnings upward. More specifically, managers in distressed firms are more likely to employ accounts receivable and inventory as income increasing manipulation tools. Peng and Yeh (2001) found managers in distressed firms used discretionary accruals to manipulate earnings upward two years prior to being financially distressed. Peng (2004) also documented earnings manipulation behavior although the results showed manipulation directions are different across years prior to bankruptcy.

III. RESEARCH METHODOLOGY

Discretionary-Accruals Models

Five competing discretionary-accruals models examined in this study are described below.\textsuperscript{2}

1. The DeAngelo Model

The DeAngelo (1986) Model uses the prior period's total accruals scaled by lagged total assets ($ACRU_{t-1}$) as the measure of nondiscretionary accruals for the current period. Thus the model for nondiscretionary accruals ($NDA_t$) is\textsuperscript{3}

$$NDA_t = ACRUS_{t-1}$$  \hspace{1cm} (1)

The discretionary accruals ($DA_t$) is the difference between total accruals scaled by lagged assets ($ACRU_t$) in the event year $t$ and $NDA_t$. That is, DeAngelo (1986) assumes that NDA follows a random walk process.

2. The Healy Model

Healy (1985) uses the mean of total accruals from the estimation period as the measure of nondiscretionary accruals for the current period. Thus, the model for nondiscretionary accruals in the event year $t$ ($NDA_t$) is

$$NDA_t = \left(1/n\right) \sum_{\tau = t-n}^{t-1} ACRUS_{\tau}$$  \hspace{1cm} (2)

where $NDA_t$ is nondiscretionary accruals in year $t$; $n$ is the number of years in the estimation period; and $\tau$ is a specific-year in the estimation period ($t-n$, $t-n+1$, ..., $t-1$). The discretionary portion is the difference between total accruals in the event year scaled by lagged total assets and $NDA_t$. Briefly speaking, the DeAngelo Model is a special case of the Healy Model. The DeAngelo Model assumes that NDA follows a random walk.

\textsuperscript{2} In addition to these five models, previous studies have shown other estimation models. For example, time-series Jones or modified Jones model; performance matched Jones or modified Jones model (Kothari et al. 2004); components model (Thomas and Zhang 2002); and the KS model (Kang and Sivamakrishnan 1995). Due to lack of time-series data, we only compare five competing discretionary accruals model and the other four modified models (formally discussed in the sensitivity analysis section).

\textsuperscript{3} In this study, total accruals are deflated by lagged total assets.
process, whereas the Healy Model assumes that NDA follows a mean-reverting process.

3. The Jones Model

To control for the effects of changes in a firm’s economic circumstances on nondiscretionary accruals, Jones (1991) proposed the following model to estimate nondiscretionary accruals:

\[ NDA_t = \alpha_0 \left( \frac{1}{TA_{t-1}} \right) + \alpha_1 (\Delta REV_t / TA_{t-1}) + \alpha_2 (PPE_t / TA_{t-1}) \]  

where \( \Delta REV_t \) is the change of revenues between year \( t \) and year \( t-1 \); \( PPE_t \) is gross property plant and equipment at the end of year \( t \); \( TA_{t-1} \) is total assets at the end of year \( t-1 \), and \( \alpha_0, \alpha_1 \) and \( \alpha_2 \) are firm-specific parameters. \( \alpha_0, \alpha_1 \) and \( \alpha_2 \) are obtained from the following model

\[ ACRUS_t = \alpha_0 \left( \frac{1}{TA_{t-1}} \right) + \alpha_1 (\Delta REV_t / TA_{t-1}) + \alpha_2 (PPE_t / TA_{t-1}) + e_t \]  

Regression coefficients \( \alpha_0, \alpha_1, \) and \( \alpha_2 \) are the estimators of \( \alpha_0, \alpha_1 \) and \( \alpha_2 \); \( ACRUS_t \) denotes total accruals scaled by lagged total assets in period \( t \) and \( e_t \) is the residual terms. The discretionary accruals are the difference between \( ACRUS \) and NDA, which also are the residual terms of equation 3b.

Different from Jones (1991) firm specific time-series model, Becker et al. (1998) and Bartov et al. (2000) suggested the cross-sectional estimation process. The estimation processes are similar except that coefficients in equation 3b are estimated by industry instead of specific firms.

4. The Modified Jones Model

Dechow et al. (1995) proposed a new version of the Jones model (the Modified Jones Model) in the empirical analysis. The modification is designed to eliminate the conjectured tendency of the Jones Model to measure discretionary accruals with error when discretion is exercised over revenues. In the modified model, nondiscretionary accruals are estimated during the event year (i.e., during periods in which earnings management is hypothesized) as

\[ NDA_t = \alpha_0 \left( \frac{1}{TA_{t-1}} \right) + \alpha_1 (\Delta REV_t - \Delta AR_t) / TA_{t-1} + \alpha_2 (PPE_t / TA_{t-1}) \]  

Where \( \Delta AR_t \) is the change of accounts receivable between year \( t \) and \( t-1 \) and other variables are defined the same as in the Jones Model. The discretionary portion of accruals is the difference between total accruals deflated by lagged assets and NDA. Similar to Jones Model, two commonly used Modified Jones Models are time-series Modified Jones Model and Cross-sectional Modified Jones Model.

5. The Industry Model

Dechow and Sloan (1991) suggested that the variation in the determinants of nondiscretionary accruals is common across firms in the same industry. The Industry Model for nondiscretionary accruals is

\[ NDA_t = \gamma_0 + \gamma_1 \text{MEDIAN}_j(ACRUS_{t-1}) \]  

Similar to the previous models, \( NDA_t \) is nondiscretionary accruals in year \( t \) scaled by lagged total assets; \( \text{MEDIAN}_j(ACRUS_{t-1}) \) is the median of total accruals scaled by lagged assets for the same industry; and \( \gamma_0 \) and \( \gamma_1 \) are the firm specific parameters which are estimated from OLS on the observations in the estimation period. Discretionary accruals are the difference between total accruals scaled by lagged total assets and NDA.
Sample and Data

The sample firms of this study are separated into two parts, distressed firms (testing sample) and matched firms (control sample), and both are in a firm/year type. Distressed firms are those stocks listed in the Taiwan Stock Exchange (TSE) during 1993-2001 and classified as full-delivery stocks due to the reasons in the Operating Rules of the Taiwan Stock Exchange Corporation Article 49 (non-financial reasons were eliminated, e.g., in the same article, items 2, 4, 5 and 7). Distressed firms without proper matched firms at the year of financial distress were then deleted from the sample. In addition, the financial institutions firms classified as composite industry and other industry were also excluded because computing discretionary accruals for firms in these industries is problematic. Matched firms were selected from the same industry based on total assets (i.e., with the closest one) and the year of financially distressed.

Research data in this study were collected from the Taiwan Economic Journal (TEJ) data files (both financial data file and distressed firms’ data file) and “The Summary of Distressed Listed Companies” published by the Taiwan Stock Exchange. According to TSE, 57 companies have become financially distressed during 1993-2001, of which 52 are industrial companies. It was found that most of our samples are traditional companies, such as food companies (10), textile companies (9) and steel companies (7). An interesting finding is that there exists time clustering in 1999 (18) and 2001 (15), which might result from the Asian financial crisis in 1997 and the economic depression in 2001. After deleting 22 distressed firms that did not meet our sample selection criteria, the final sample examined consists of 35 firms (see Table 1). These distressed firms were then matched with 35 non-distressed firms from the same industry based on total assets and the year of financial distress.

Estimation of Discretionary Accruals

The estimation periods are three years prior distress-year in the Healy Model, the Cross-sectional Modified Jones Model, the Modified Jones Model and the Industry Model. Using the Healy Model as an example, if year 2001 is the distress-year then nondiscretionary accruals would be equal to the mean of total accruals from 1998 through 2000, and discretionary accruals would be the difference between total accruals and nondiscretionary accruals. As to the measure of total accruals, it is equal to the difference between net income before irregular items and operating cash flows. As indicated earlier,
managers in distressed firms are likely to use discretionary accruals to manipulate earnings upward (i.e., $DA_{\text{distressed firms}} > DA_{\text{nondistressed firms}}$). On the other hand, they may also use discretionary accruals to manipulate earnings downward, due to pressure from auditors or creditors. Also, new management team are likely to take an earnings bath by writing down assets or by increasing provisions for future cost or losses (i.e., $DA_{\text{distressed firms}} < DA_{\text{nondistressed firms}}$). As a result, it is difficult to predict the sign of earnings management by managers in distressed firms. To improve model-detecting power, we therefore use the absolute value of discretionary accruals as a proxy of earnings management in our study. That is, we expect that $|DA|_{\text{distressed firms}} > |DA|_{\text{nondistressed firms}}$.

**Model and Statistical Methods**

Both univariate tests (t-test, Wilcoxon two-sample test and contingency-table) and multivariate regression analyses are used to evaluate the ability of various models to detect the association between discretionary accruals and financial distress.

First, we estimate the absolute value of discretionary accruals ($\text{ABSDA}$) by distressed and non-distressed samples in each model and conduct t-tests and Wilcoxon two-sample tests to assess the relative ability of the various discretionary accruals models to detect earnings management in distressed firms. Secondly, we also examine whether the absolute values of discretionary accruals are higher in distressed firms than non-distressed firms in the year of distress and three years prior to the distress year. We then combine distressed and non-distressed firms into one sample, and assign them into two groups on the basis of the absolute value of discretionary accruals: firms with lower discretionary accruals ($\text{LOW}$) and firms with higher discretionary accruals ($\text{HIGH}$). We then conduct contingency-table tests on the lower and higher level of discretionary accruals. A discretionary accruals model that successfully separates earnings into nondiscretionary earnings and discretionary accruals should generate a relatively high number of non-distressed firms assigned to the firms with low discretionary accruals and a relatively high number of distressed firms assigned to the firms with high discretionary accruals.

We also use multivariate regression analyses with control variables to examine the magnitude of earnings management between distressed and non-distressed firms in the year of distress and three years prior to that. We ran the following OLS regressions:

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8 It is not uncommon to find that companies reported huge losses or suddenly made a large downward adjustment in their financial predictions just one or two years before becoming full-delivery stocks. For instance, The Top Construction & Development Company announced they suffered huge losses in 1998 (EPS $–7.37$) and their stocks were classified as full-delivery stocks in 1999. The Corner Corporation announced a surprised write-down modification about their 1998 financial reports (EPS $-1.88$) in 1999, and was classified as full-delivery stocks in 2001. In 1999, The Shin Yen Company downward adjusted their earnings prediction in 1998, from positive to negative (EPS $–3.55$), and was classified as full-delivery stocks in 2001. In 1996, the Sanfu Motor Industrial Company suddenly announced they suffered huge losses of nearly five hundred and seventy million NT dollars (EPS $–2.6$) in 1995, and was then classified as the full-delivery stock in 1997. These cases may imply signs of financial difficulty or a downward earnings management exists in the years prior to financial distress.

9 We also conduct further analysis of the manipulative behavior three years prior to the distress and in the year of the distress respectively in the sensitivity analysis section.
\[ ABSDA_t = \alpha_0 + \alpha_1 (LOGASSET)_t + \alpha_2 (OCF)_t + \alpha_3 (LEV)_t + \alpha_4 (ACRUS)_{t-1} + \alpha_5 (ACRUS)_t + \alpha_6 (FAIL)_t + \epsilon_t \]  
\[ ABSDA_t = \beta_0 + \beta_1 (LOGASSET)_t + \beta_2 (OCF)_t + \beta_3 (LEV)_t + \beta_4 (ACRUS)_{t-1} + \beta_5 (FAIIL)_t + \beta_6 (FAIL \times NFYEAR)_t + \beta_7 (NFYEAR) + \epsilon_t \]  

Where,

- \( ABSDA_t \): The absolute value of discretionary accruals in year \( t \).
- \( LOGASSET_t \): Log total assets in year \( t \).
- \( OCF_t \): Operating cash flows divided by total assets of previous fiscal year end.
- \( LEV_t \): Total liabilities divided by total assets.
- \( ACRUS_t \): Total accruals in year \( t \) (deflated by lagged total assets).
- \( ACRUS_{t-1} \): Total accruals in the previous year (deflated by lagged total assets).
- \( FAIL_t \): Dummy variable, 1 for distressed firm, 0 otherwise.
- \( NFYEAR_t \): Dummy variable, 1 for non-distressed year, 0 otherwise.
- \( FAIL \times NFYEAR_t \): Interaction of \( FAIL \) and \( NFYEAR \).

Size (\( LOGASSET \)) and leverage (\( LEV \)) may be associated with discretionary accruals, because size may surrogate for numerous omitted variables and high leverage may be connected with debt covenant violation (DeFond and Jiambalvo 1994; Becker et al. 1998). Dechow (1994) has documented a negative relation between cash flows and accruals even in the presumed absence of any systematic earnings management. In addition, current total accruals scaled by lagged total assets (\( ACRUS_t \)) and prior period total accruals also scaled by lagged total assets (\( ACRUS_{t-1} \)) are included to control for the accruals-generating potential and mean-reverting effect.

The sign of the coefficient of \( \beta_6 \) in equation 6 is expected to be positive. That is, ceteris paribus, managers in distressed firms are more likely to use discretionary accruals to manipulate earnings up or down than managers in non-distressed firms. The coefficient of \( \beta_6 \) in equation 7 is expected to examine the interaction of \( FAIL \) and \( NFYEAR \). The sum of the coefficient \( \beta_6 \) and \( \beta_7 \) is expected to be greater than zero. That is, comparing to the managers in matched firms, managers in distressed firms are more likely to use discretionary accruals to manipulate earnings up or down prior to being financially distressed.

**IV EMPIRICAL RESULTS**

**Descriptive Statistics**

Table 2 shows that except for prior period total accruals (\( ACRUS_{t-1} \)), most of the variables are significantly different between distressed and non-distressed firms. The mean of total assets of distressed and non-distressed firms are not much different, NT$8,366,042 (in thousands) and NT$6,764,919 (in thousands) in distressed and
non-distressed firms, respectively. However, a Wilcoxon two-sample test shows that there is a significant size difference between these two samples. As a result, the log of total assets is incorporated into the multivariate analysis as an additional control variable. As expected, the mean of operating cash flows ($OCF$) in distressed firms, nearly 4 percent of prior period total assets, is negative. On the contrary, the mean of operating cash flows in non-distressed firms, also nearly 4 percent of prior period total assets, is positive. In addition, distressed firms have higher leverage ($LEV$), with mean of 65 percent of total assets, than that of non-distressed firms, with mean of 50 percent of total assets. Total accruals scaled by lagged total assets ($ACRUS_t$) are both negative in distressed and non-distressed firms; however the former group presents much higher variation.

**Univariate Analyses**

Tables 3 through Table 5 are findings in univariate analyses. Table 3 reports that the absolute values of discretionary accruals in distressed firms are significantly higher than that in non-distressed firms in all five models ($p<0.01$).\(^{10}\) Table 4 shows that the absolute values of discretionary accruals are significant higher in distressed firms than that in non-distressed firms in distressed year and one year prior to distressed year (median tests in Panel A and t tests in Panel B). That is, consistent findings in all five models show that managers in distressed firm are more likely to use discretionary accruals to manipulate earnings upward or downward starting at least one year before being financially distressed. For two years and three years prior to the year of distress, we find that the absolute values of discretionary accruals are still higher in distressed firms. However, only the DeAngelo Model and the Healy Model can detect earnings management consistently in these two periods.\(^{11}\) Table 5 reports the finding from contingency-table tests. It shows that the absolute values of discretionary accruals in distressed firms are significant higher than that in non-distressed firms in all models ($p<0.001$ in all models). Overall, findings in univariate analysis show that all of the five models can detect earning management in distressed firms. However, the DeAngelo Model and the Healy Model tend to have better detecting power than other models for the period three years before the distressed year.\(^{12}\)

\(^{10}\)Discretionary accruals (not the absolute values) in distressed firms are much lower than that in non-distressed firms, especially in the DeAngelo Model, the Healy Model and the Industry Model (significant at the 1% level).

\(^{11}\)For further analysis of the sign effect of discretionary accruals, we also divided discretionary accruals into two groups by their signs of discretionary accruals (positive, $DA^+$ or negative, $DA^-$). We find consistently in all five models that discretionary accruals are significant higher in distressed firms than non-distressed firms as discretionary accruals are positive, especially in one year before the distress-year. Conversely, discretionary accruals in distressed firms are lower than in non-distressed firms, as discretionary accruals are negative ($DA^-$), especially in distress-year and one year before being financially distressed. These findings support our conjecture that managers in distressed firms are more likely to use discretionary accruals to manipulate earnings upward or downward.

\(^{12}\)Different findings were shown in Bartov et al. (2000). They found that only the Cross-sectional Jones Model and the Cross-sectional Modified Jones Model are consistently able to detect the association between discretionary accruals and audit qualifications.
Regression Analyses

Table 6 and Table 7 exhibit the multiple regression findings. From Table 6, we find that testing variables (FAIL) are positive in all but Cross-sectional Jones Model. The coefficients are significant at the conventional level in the DeAngelo Model (p=0.012), the Healy Model (p=0.023) and the Industry Model (p=0.097). The explanatory power is higher for the DeAngelo Model and the Healy Model (adjusted R^2=0.208 and 0.213, respectively). Like the findings in Warfield et al. (1995), size (LOGASSET) is negatively but insignificantly correlated with the absolute value of discretionary accruals in all models. Operating cash flows (OCF) are significantly negative in the DeAngelo Model, the Healy Model and the Industry Model (p=0.022, 0.024 and 0.044, respectively). It also shows that there is positive association between prior period total accruals and the absolute value of discretionary accruals. However, it is significant only in the Healy Model (p=0.048). The coefficients of LEV are positive in all five models, but not significant at any conventional level.

To further investigate the ability of these models to detect earnings management in pre-distressed years, we add one distress-year dummy variable (NFYEAR) and the interaction of distressed firms (FAIL) and distress-year dummy in Table 7. It shows that the coefficients of FAIL*NFYEAR are positive in all five models. However, they are significantly positive only in the Cross-sectional Jones Model and the Cross-sectional Modified Jones Model (p=0.064 and 0.075, respectively). On the other hand, the sum of the coefficient of β6 and β8 are significantly positive in the DeAngelo Model, the Healy Model and the Industry Model (p=0.032, 0.028 and 0.090, respectively). That is, these three models can better detect distressed firms' earnings management occurred prior to the year of financial distress. The coefficient of FAIL is significant only in the Cross-sectional Modified Jones Model but in the wrong sign. Findings in most of the control variables are similar to those in Table 6.

Sensitivity Analyses

Dechow et al. (1995) indicated that the measurement errors resulted from estimating discretionary accruals may be related to the efficacy of the company. Moreover, Teoh et al. (1998) also stressed the importance of controlling firms’ operating performance when examining the earnings management. In order to control the effects of individual companies’ efficacy, the current study adds returns on total assets to the Cross-sectional Jones Model and the Cross-sectional Modified Jones Model, aiming at re-estimating the discretionary accruals and yielding further analysis. The results are similar to the findings on the Cross-sectional Jones and the Cross-sectional Modified Jones Model in Table 7. Moreover, according to theory of contract, the insiders’ ownership may influence the earnings management behavior (Warfield et al., 1995). Hence, ownership structure variable (OWN) is included in the regressions in Table 7 to compare various estimation models’ ability to detect financial distress. The results show that the coefficients of OWN are negative in all models except for the DeAngelo Model, which is consistent with

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13 In order to conserve space, detailed results in this section are not reported.
14 We use the average stock ownership by directors and supervisors to proxy for the insiders’ ownership.
findings by Warfield et al. (1995). Unlike the results in Table 7, however, the sum of the coefficients of \( \text{FAIL} \) and \( \text{FAIL} \times \text{NFYEAR} \) does not achieve any traditionally significant level.

The third sensitivity analysis attempts to control for the possible existence of high positive correlation between discretionary and non-discretionary accruals (Guay et al. 1996). To achieve this purpose, we repeat the multivariate analysis in Table 6 by using a modified matched sample, which was matched based on year, industry and total accruals instead of total assets. This procedure reduced the sample size to 264 distinct firm/year data. The results are consistent with the findings in Table 6, i.e., distressed firms tend to have higher absolute value of discretionary accruals in all five models. Besides that, it is found that the coefficient of \( \text{FAIL} \) is positive and significant under the DeAngelo and the Healy Models. As to the test for coefficients of \( \text{FAIL} \) and \( \text{FAIL} \times \text{NFYEAR} \), \( (\beta_6 + \beta_8) \), no significance was found in any model.

The fourth sensitivity analysis is designed to reduce the bias that may result from the estimation of discretionary accruals by using DeAngelo Model and the Healy Model, where prior total accruals, which may have been manipulated, are used to predict the discretionary accruals. In the case of the DeAngelo Model, to examine this issue, instead we used the matched firm’s (by returns on total assets) total accruals in prior year as the proxy for distressed firm’s non-discretionary accruals. The results indicate that the modified DeAngelo Model and the modified Healy Model can still detect the manipulation of the distressed firms, which is similar to the findings in Table 6. Finally, we conduct the regression analysis by year, aiming at clarifying the company’s manipulation during and before the financial crisis. For the analysis of the distressed year, we use the absolute value of the discretionary accruals to proxy for the dependent variable. For years prior to the distress, the discretionary accruals is adopted instead. It is found that only the modified DeAngelo Model can detect the earnings management by distressed firms in distress year (the coefficient of \( \text{FAIL} \) is positive at 10% significant level). Under the DeAngelo, the Healy, and the Industry Model, the coefficients of \( \text{FAIL} \) are negative and significant in non-distressed years (significant at the 1% level under the Healy Model), which indicates that these three models can detect that the distressed companies had downward manipulated earnings before the financial crisis broke out.
V. CONCLUSION

The current study focuses on the detection ability of earnings management behavior of financially distressed firms by comparing five commonly cited discretionary accruals estimation models. Based on the results of regressions, the DeAngelo Model and Healy Model have better detection ability, which is inconsistent with what was found by Bartov et al. (2000). One possible reason for this discrepancy may be that the two studies have examined different research topics; another reason may be that the sample firms of this study are mainly from the electronics industry, which results in the minimal efficacy of the Cross-sectional Jones Model and the Modified Cross-sectional Jones Model.

As to the sensitivity tests, it is found that adding performance variables to the Cross-sectional Jones Model and the Modified Cross-sectional Jones Model, adopting total accounting accruals as a matching criterion, or re-evaluating the DeAngelo Model and the Healy Model with performance matched firm's total accruals lead to similar findings. It is also found that the detecting ability of these five models does not improve after the ownership structure variable is added to the regression model.

The current study only focuses on the enterprises with financial distress. The future studies may attempt to use simulation analysis, as in Dechow et al. (1995) and Kothari et al. (2004), to minimize the possibility of overestimating (type I error) or underestimating (type II error) the detection ability of the models. Due to data availability, this study only collected thirty-five distressed companies (approximately 61% of the population) over a four-year sample period. The future studies may improve the robustness of the tests by expanding both the sample size and sample period.

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盈餘管理偵測模式比較研究：以國內財務困難公司為例

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摘要：盈餘管理係指管理當局運用某些會計方法或程序，使會計盈餘達到其預定之目標。管理當局在進行盈餘管理時可供使用的工具不少，其中應計數(accruals)之操弄較不易被察覺，操作容易，成本低，因此被認為普遍存在，亦成為盈餘管理文獻研究之重點。但如何辨識可裁決性應計數(discretionary accruals)卻是研究者面臨之難題。


國內盈餘管理文獻較常採用之應計數估計模式為Jones模式與修正後Jones模式，惟何種模型較適合國內會計資料或偵測能力較佳，尚乏深入之探討。僅王脩斐(民84)以隨機樣本配合人為操弄應計數之方式，比較與評估Healy模式、DeAngelo模式與Jones模式的優劣。

本研究擬以財務困難公司為比較盈餘管理偵測模式之測試對象。長久以來企業之財務困難(financial distress)問題一直是政府機構及投資大眾所關注的焦點。國內有關財務困難之研究，以建立企業的財務預警模式為主，但也有多篇分析財務困難公司之會計選擇。近期的研究結果顯示，困難公司發生財務危機前即開始利用裁決性應計數操縱盈餘；如以個別應計項目衡量，亦發現公司經理人在財務困難發生前，傾向於向上操縱盈餘(如林嬋娟等民
本研究擬比較國內外文獻常使用的五種裁決性應計數估計模式，其偵測國內財務困難公司盈餘管理之能力。財務困難公司瀕臨財務危機時，其經理人可能為了工作保全或避免違反債務契約規定，利用會計方法向上操縱盈餘 (DeFond and Jiambalvo 1994)；亦可能為了說服投資人接受股利減少的政策，或工會接受薪資抑減的建議 (Jones 1991; DeAngelo et al. 1994) 而向下操縱盈餘。因此實證分析時係以裁決性應計數取絕對值為測試變數。

本研究以國內上市公營業細則第四十九條情事營業細則第四十九條情事為研究對象，採配對樣本，樣本單位為公司/年度。財務困難公司樣本係選自 82 年至 90 年間，因財務困難而有台灣證券交易所營業細則第四十九條情事取決於財務困難年度資產總額最接近之上市公司。但不包含金融保險業、綜合產業及其他產業，另剔除在變更交易年度無行業別相同及資產規模相近之配對樣本的財務困難公司。財務正常公司樣本則為與前述財務困難公司之行業別相同、變更交易年度資產總額最接近之上市公司。

證券交易所公佈之 82 至 90 年間國內曾發生財務困難公司共有 57 家，且多集中在食品、紡織與鋼鐵等傳統產業。就財務困難發生年度觀察，明顯集中在 88 年與 90 年，此與 1997 年亞洲金融風暴有關。最後財務困難公司及財務正常公司樣本各有 35 家，每家公司選取財務困難年度以及前三年之資料，共計 280 個公司年樣本。

迴歸分析結果顯示，測試變數 FAIL（虛擬變數，困難公司設為 1，反之則為 0）在五種估計模式下為正，但僅於 DeAngelo 模式、Healy 模式與產業模式下達 5% 或 10%統計顯著水準。而整體模型解釋能力則以 DeAngelo 模式與 Healy 模式較佳。本研究另加入財務困難年度虛擬變數 (NFYEAR，財務困難年度設為 1，反之則為 0) 以及 FAIL 與 NFYEAR 兩變數之交乘項 (FAIL*NFYEAR)。比較分析何種估計模式較能偵測出財務困難公司於財務困難年度前之操縱損益情形。結果發現，FAIL*NFYEAR 之係數於五種估計模式下為正，但僅於 Jones 模式與橫斷面修正後 Jones 模式下達統計顯著水準 (p 值分別為 0.064 與 0.075)。另，本研究亦發現，DeAngelo 模式、Healy 模式與產業模式較能察覺財務困難公司發生財務困難前三年之盈餘管理行為。

本研究進行下列四個敏感度分析，首先為控制個別公司績效的影響，另加入公司之稅後息前資產報酬率於橫斷面 Jones 與修正後 Jones 模式中，重新估計裁決性應計數，結果與前述之發現類似。其次，由契約理論可知，公司內部人員持股多寡會影響到經理人操縱盈餘的誘因與行為 (Warfield et
al. 1995)。因此於迴歸分析中另加入股權結構變數(OWN)，結果顯示，除DeAngelo模式外，股權結構之迴歸係數均顯著為負值，與Warfield et al. (1995)的預期相符。第三，鑑於裁決性應計數與總應計數間呈顯著正相關(Guay et al. 1996)，為了解除此項關聯對研究結果的影響，本研究採財務困難年度同產業公司之總應計數配對的方式重新分析。結果發現財務困難公司在五種模式下仍呈現出較高的裁決性應計數(取絕對值)，而多變量分析結果則顯示DeAngelo與Healy兩種估計模式的偵測能力略優於其他三種模式。測試變數及FAIL係數與FAIL*NYEAR係數和之檢定,則在各種估計模式下統計上均未達顯著水準。第四個敏感度測試則考量採DeAngelo與Healy模式估計裁決性應計數時需使用前期或前數期之應計數，而該應計數可能已包含被操縱的損益影響，以致造成引入估計的偏誤。為減少此偏誤造成的影響，本研究乃嘗試修正非裁決性應計數的替代變數。以DeAngelo模式為例，樣本公司之非裁決性應計數改以事件前一年稅後息前報酬率最接近公司之應計數作為替代變數，再進一步計算裁決性應計數。結果發現修正後之DeAngelo模式與Healy模式仍可偵測出財務困難公司之操弄行為，惟財務困難發生前的偵測則不明顯。

最後，為釐清財務困難公司於財務困難年度以及發生財務困境前的操弄行為，進一步將財務困難年度與發生財務困境前之資料分別進行迴歸分析。進行財務困境年度之分析時係以裁決性應計數絕對值為被解釋變數，但財務困境前之分析則係以裁決性應計數為被解釋變數。由於裁決性應計數與前期之總應計數高度相關，因此迴歸模型以裁決性應計數為控制變數。結果發現，僅修正後之DeAngelo模式可偵測出財務困難公司之盈餘管理行為；而財務困難發生前之偵測部分，採DeAngelo模式、Healy模式與產業模式下皆可偵測出財務困難公司於發生財務困境前即向下操縱盈餘。

綜合言之，多變量分析結果顯示，與配對樣本公司比較時，DeAngelo模式與Healy模式之偵測能力較佳，此項發現與Bartov et al. (2000)的研究結果並不相同。一方面可能是探討的主題不同，另一方面則可能是本研究樣本公司中除電子業外其他產業之公司偏少，致使採橫斷面Jones或橫斷面修正後Jones模式估計時效果不佳。敏感性測試結果顯示，在橫斷面Jones模式與橫斷面修正後Jones模式中加入績效變數及採總應計數配對比較或以績效配對方式重新估計DeAngelo與Healy模式，其迴歸分析結果與前述發現類似。而於迴歸模式中加入股權結構變數後，發現五種估計模式之偵測能力並未改善。

本研究僅以財務困難公司為例，探討五種估計應計數模式偵測盈餘管理之能力，未來研究可採模擬分析的方式進行（例如Dechow et al. 1995或
Kothari et al. 2004)，以降低高估（型 I 誤差）或低估（型 II 誤差）模型之
偵測能力。在樣本方面，未來如能更廣泛蒐集困難公司資料，包括公司時間
序列資料，可增進研究結果之可信度。另外本研究係採困難公司與正常公司
1 對 1 的配對樣本方式进行比較分析，而此種配對方式可能會造成偵測結果
高估的傾向。

關鍵字：盈餘管理、財務困難、裁決性應計數、應計數估計模式
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