SHOULD THE 4 BIG REPLACE THE BIG 4? AN EXAMINATION OF AUDIT QUALITY USING INTERNAL AUDIT

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Abstract

Prior research has linked audit quality with large audit firms. Consequently, a dichotomous variable, Big N/non-Big N has traditionally proxied for audit quality. Applying a different measure of audit quality than audit fee, this study investigates whether a single dummy variable for Big N is an appropriate proxy for audit quality in explaining differences in the existence of clients' internal audit (IA) function. Results indicate that the existence of clients' IA function is not consistent among Big 4 firms. This has important research implications for the universal use of a Big N dummy variable as a measure for audit quality.

Keywords: Audit Quality, Big 4, Internal Audit, Corporate Governance and Intra-Big N Differences

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1. Introduction

Research over the last three decades has consistently linked audit quality with large international audit firms(Hay et al., 2006), often proxied by the ability of these large audit firms to charge a fee premium (Simunic, 1980). These studies offer a variety of plausible reasons for the observation of a fee premium. For example, it is proposed that audit clients have a heterogeneous demand for audit quality, considering the costs and benefits accruing from a quality audit whereby larger audit firms service clients with a need for a higher quality audit (Blokdijk et al., 2006, DeAngelo, 1981, Francis et al., 1999, Palmrose, 1988, Teoh and Wong, 1993).

It is suggested that audit quality increases with audit firm size. This is arguably because: of differences in loss function faced by large firms compared to their smaller counterparts; larger audit firms have lower litigation rates than smaller audit firms; stock price reaction is higher for clients of larger firms when positive unexpected earnings are announced; and larger audit firms are more likely to be able to restrict their clients' income-increasing discretionary accruals than are smaller audit firms (Becker et al., 1998, Behn et al., 2008, Choi et al., 2005, Jeong and Rho, 2004).

Given the evidence differentiating audit firms by size, researchers have systematically used Big N audit firm/non-Big N audit firm as an indicator variable to proxy for audit quality, even though the acknowledged group of large audit firms has halved from eight to four since the late 1970s.Given the changes over time in the number of large audit firms, we use the term N to denote the number of large firms at a given point in time. For instance, at the time of the study by Simunic (1980), the Big 8 accounting firms were Arthur Andersen & Co., Arthur Young & Co., Coopers & Lybrand, Deloitte Haskins & Sells, Ernst & Winney, Peat Marwick Mitchell, Price Waterhouse and Touche Ross. Subsequent to two major mergers in 1989—Ernst & Winney merged with Arthur Young & Co. to become Ernst & Young while Deloitte Haskins & Sells merged with Touche Ross to become Deloitte Touche Ross—the Big 8 firms were reduced to the Big 6. As a result of another merger in 1998—Coopers & Lybrand with Price Waterhouse to form PricewaterhouseCoopers—the Big 6 were reduced to the Big 5. Finally, the dissolution of Arthur Andersen & Co. in 2002 as a result of the Enron aftermath reduced the Big 5 to the Big 4. Researchers have also continued to hold the same assumption about the relationship between audit firm size and audit quality over the past three decades and, while this assumption may be supported by empirical results, audit research so far has ignored intra-Big N audit firm structural differences that could result in variation of audit

quality across those large audit firms. This study, therefore, attempts to bridge this gap in seeking to answer whether a single dummy variable for the Big N is an appropriate proxy for audit quality, or whether there are intra-Big N differences.

A major contribution of our study, therefore, is that we examine possible differences in audit quality among the now Big 4. As the number of large audit firms has declined, we expect these remaining four to make greater effort to differentiate themselves from each other. One way these external audit firms can differentiate themselves is to be associated with clients that have a more favourable view on risk management (and the associated existence of an internal audit [IA] function) given the strategic role IA now plays in enhancing internal controls and reporting quality of the audit client. Prior research supports the view that the external audit process is more robust when it incorporates the work of an internal auditor thereby increasing audit quality (Goodwin-Stewart and Kent, 2006a, Hay et al., 2008, Hay et al., 2006, Spira and Page, 2003).

The importance of IA has been elevated in recent years following the unravelling of well-publicised corporate scandals. The Australian Securities Exchange (ASX) Corporate Governance Council's Principles of Good Corporate Governance and Best Practice Recommendations of 2007 have reinforced the view that the role of the internal auditor reflects the increasing focus on corporate governance and risk management rather than the traditional narrow focus on internal controls. Recent research on the aftermath of corporate collapses and the ensuing corporate governance reforms has reported a change in the relationship between internal and external audit from a substitutive to a complementary one (Carey et al. 2000a; Spira & Page, 2003;Goodwin-Stewart & Kent 2006a, 2006b; Abbott et al. 2007). This suggests that high quality auditors are more likely to be associated with clients with an IA function.

Given that the primary objective of the study is to investigate the existence of intra-Big N structural differences and the resulting association with audit quality—that is, considering the importance of IA within the overall framework of audit quality—the following research question is adopted:

3BRQ: Are there intra-Big 4 differences in audit quality considering the complementary nature of internal audit and external audit?

Our final sample comprises 272 of the largest publicly listed firms in Australia. These firms were chosen because, given their size, they were most likely to be both impacted by the ASX Principles of Good Corporate Governance and have an IA function. Data was collected from annual reports as at their respective reporting dates in 2005 and downloaded from Aspect Huntley FinAnalysis, which is an online electronic repository for such publicly available secondary data.

Our results indicate that firms which employed a Big 4 auditor were more likely to have an IA function, both as an overall group and for each constituent firm. This is in line with expectations and, therefore, compatible with the findings of prior research that the Big N effect is consistent across all relevant audit practices. However, the results indicate that the relationship between auditor and client IA might not be consistent across all Big 4 audit firms, with KPMG significantly more likely to have clients with IA than the other Big 4 firms (see Table 4). Results from our logistic regression analysis indicate that assuming asingle Big4 effect on IA existence in client firms might well be spurious—that is, the Big 4 dummy variable is not a consistent proxy for the characteristics of all its constituent members. While Big 4 (relative to non-Big 4) was a significant predictor of IA existence, this significance was not consistent among the 4 Big accounting practices in Australia (again, relative to the non-Big 4). All control variables that were significant in the Big 4 model were also significant in the 4 Big model, with only slight changes in p-values. There were no control variables significant in the 4 Big model that were not significant in the Big 4 model. Our analysis finds that the Ernst & Young (EY) and Deloitte Touche Tohmatsu (Deloitte) dummies were not significant determinants of client firms having an IA function, yet both the PricewaterhouseCoopers (PWC) and KPMG dummies were (see Tables 4 & 7). We also found that PWC and KPMG charged higher audit fees than EY and Deloitte, suggesting the existence of structural differences between the Big 4.

The results imply differences in the audit approaches of the members of the Big 4 vis-à-vis IA and therefore, potentially, audit quality. There may be an attempt to systematically conduct the audit with a different methodology or a differentiating policy on client selection. Assuming these differences lead to variations in the level of audit quality within the Big 4, this has important research implications in terms of the continued use of a Big N dummy variable to proxy for audit quality. We also ran extension tests using audit fees as the dependent variable since audit fees has been used extensively in the literature as a proxy for audit quality. Results indicate that the Big 4 dummy variable has a significant association with audit fees, as found in prior studies. In addition, each of the four firms comprising the Big 4 also showed a significant association with audit fees. These results imply that in certain circumstances, for instance when using audit fee as the indicator for audit quality, using a proxy dummy variable of the Big 4 is justified. However, when taking into account the multi-dimensional perspective on audit quality

(such as the existence of IA function), care needs to be taken not to ignore intra-Big N effects.

Each of the Big 4 accounting firms makes strategic individual decisions impacting on their audit quality. They decide whether to maximise audit quality via superior audit procedures (therefore reflecting an audit fee premium) or through a combination of superior audit procedures complemented by the existence of IA (which recently focuses more on corporate governance and risk management issues rather than the traditional focus on internal controls and compliance matters).

The rest of the paper is organised as follows. The next section reviews the literature and develops the hypothesis. Thereafter, we explain the empirical methodology, describe the data and report the results. We then conclude with a discussion of the implications and opportunities for future research.

2. Literature review and hypothesis development

2.1. Measuring Audit Quality

Audit quality is defined as the probability that the auditor will both detect and report a breach in the contract to provide fair accounting information (Watts and Zimmerman, 1986). However, given that audit quality is difficult to observe, users have to evaluate it using proxy measures (DeAngelo, 1981) such as the auditor's reputation, membership with professional societies and employment with large-scale audit firms (Watts and Zimmerman, 1986).

Prior research shows that audit quality differs systematically between Big N and non-Big N firms and, as a result, accounting researchers normally use a Big N indicator variable to control or test for differences in audit quality. For example, Teoh and Wong (1993) argued that the earnings response coefficients of Big 5 clients were significantly higher than those of non-Big 5 clients, suggesting that Big 5 auditors provided a higher quality audit service than non-Big 5 auditors.

Palmrose (1988) compared litigation activities of independent auditors to assess litigation as a means of making distinctions among auditors in terms of audit quality. Palmrose's sample (n=472) encompassed audit services rendered by both Big 8 and large non-Big 8 audit firms for the 26 year period from 1960 through 1985 in the US market. The results indicated that auditors with relatively low (high) litigation activity represent higher (lower) quality suppliers. This result is consistent with the notion that the Big N are quality-differentiated auditors.

Krishnan (2003) examined the existence of a link between audit quality and the pricing of discretionary accruals using a sample of US firms covering a 10 year period from 1989 to 1998. Findings indicated that the association between stock returns and discretionary accruals was higher for firms audited by Big 6 auditors than for firms audited by non-Big 6 auditors. Overall, the results suggest that a higher audit quality is associated with Big N (Big 6) auditors and this is reflected in the security returns of clients of Big N auditors.

Jeong and Rho (2004) also investigated the association between discretionary accruals and Big 6 and non-Big 6 auditors in a Korean setting. They hypothesized no significant difference in discretionary accruals between Big 6 and non-Big 6 clients when there was low incentive for auditors to provide high-quality audits (as was the case in Korea). Using a sample of 2,117 firm-year observations listed on the Korean Stock Exchange for the period 1994 to 1998, their empirical results showed no statistically significant difference between the discretionary accruals of firms that changed from Big 6 auditor to non-Big 6 auditor and vice-versa. Consistent with other studies in Korea (and their hypotheses), this was inconsistent with findings from studies on audit quality in other countries. Jeong and Rho (2004) suggested that the inconsistent results between audit quality studies in Korea and other countries could be due to different incentives which exist for Korean auditors to provide high or low quality audits given Korea's different economic and institutional environment. Similarly, Khurana and Raman (2004) point out that investors' perception of financial reporting quality increases with perceived audit quality.

Using a random sample of 600 incorporated societies (ISs) in New Zealand and 380 usable sets of financial statements, Hay and Davis (2004) examined auditor choice and auditor quality. However, finding limited support for ISs preferring Big 5 audit firms when they have more need for a higher quality audit, the authors conceded that their results were not generalizable to larger firms and that anecdotal evidence from partners in Big 5 firms suggested they preferred not to be involved in non-profit entity audits.

Focussing on analyst earnings forecast properties, Behn, Choi and Kang (2008) investigated whether audit quality was associated with the predictability of accounting earnings. Using a sample of US firms from 1996 through 2001 with 3,749 firm-year observations, the evidence showed that analysts' earnings forecast accuracy was higher and that the forecast dispersion was smaller for firms audited by a Big 5 auditor. Hence, Behn, Choi and Kang (2008) suggested that Big N (Big 5) auditors did provide higher quality audits and that this was significantly associated with better forecasting performance by analysts.

In general, it is maintained that external auditor monitoring improves the quality of accounting earnings by minimizing the difference between a client's reported economic circumstances and the

unobservable underlying situation of the client (Wallace, 1984). The monitoring role played by the IA function and its impact on audit quality is discussed in the following section.

2.2. Internal Audit's Growing Role in Audit Quality

According to Gay and Simnett (2007), the traditional view of IA is that it is an independent appraisal function which evaluates the adequacy and effectiveness of controls within a firm. This has evolved in many firms such that the IA function is now seen as an assurance and consulting service which promotes the understanding of risk exposures and control strategies (Leung et al., 2007). More recently, in the aftermath of well-publicised corporate collapses, the role of IA has broadened to encompass risk management and corporate governance (Brody & Lowe 2000; Carey et al. 2006b). Internal auditors can assist companies by providing assurance that their risk exposures are properly identified and managed (Leithhead, 1999, Walker et al., 2003). Hence, IA should play a key role in monitoring a company's risk profile and in identifying areas where risk management practices can be improved (Lindow and Race, 2002).

There is extensive research on the importance of an internal control function as part of an effective corporate governance structure. Prior IA research has evaluated: objectivity issues (Brody and Kaplan, 1996, Brody and Lowe, 2000, Church and Schneider, 1991, Church and Schneider, 1992); the interaction between internal and external audit (Brody et al., 1998, Carey et al., 2000a, Felix et al., 2001, Lampe and Sutton, 1994, Stein et al., 1994); the trend to outsource IA functions (Caplan and Kirschenheiter, 2000, Widener and Selto, 1999); and the relationship between IA and the audit committee (Raghunandan et al., 2001). However, existing research exploring the determinants of IA is limited, primarily due to the difficulty of accessing potentially sensitive corporate information and meeting with and interviewing key stakeholders. Wallace and Kreutzfeldt (1991) examined the characteristics associated with the existence of an IA function using a sample of Arthur Andersen & Co (AA) clients in 1983. The authors found that company size, decentralization, industry (regulated or not), auditor tenure, audit committee existence, EDP control and pressure to achieve goals were significantly related to the presence of an IA function. In addition, findings revealed that the number and magnitude of errors requiring adjustment by the external auditor were considerably lower for companies that had an IA function compared to those that did not. This emphasizes the important role IA plays in enhancing overall audit quality.

Carey et al. (2000b) used an agency cost framework to examine the demand for internal and external auditing by 186 Australian family-owned companies, particularly focusing on whether internal auditing supplemented or substituted external audit work. They examined firm size and debt plus agency variables measuring separation of ownership from control (the proportion of non-family representation on the board plus the proportion of non-family management of the firm) and found that none of these variables were significantly associated with the existence of IA. All but the size of firms were, however, significantly associated with the use of internal audit.

Using data from 217 American public companies, Carcello et al. (2005) found evidence that companies with greater IA budgets were larger, had more debt, were in the financial services and utility industries, maintained greater inventory levels, had greater operating cash flows and had an audit committee that monitored the IA budget. Overall, their results suggest that IA investment is associated with companies' risks and ability to pay for monitoring and auditing characteristics and that IA and external audit are complements rather than substitutes.

Combining an agency framework and a dataset from surveyed and publicly available Australian data from 2000, Goodwin-Stewart and Kent (2006b) found the existence of IA to be significantly positively associated with the presence of a risk management committee, the role played by the risk manager, the presence of an independent board chairperson and the presence of an audit committee. Additional analysis of firms with internal auditing revealed the number of IA staff to be positively associated with the presence of a Big 5 auditor. These findings are consistent with an increased demand for higher quality auditing by audit committees and by firms that make greater use of IA, suggesting that firms that engage in increased internal monitoring through the use of IA also demand higher quality external auditing. This provides further support for the complementary relationship between external audit and the IA function.

Most recently, Coram et al. (2008) investigated whether organizations with an IA function are more likely to detect and self-report fraud than those without. Their findings indicate that companies with an IA function are more likely than those without such a function to detect and self-report fraud. The importance of this study extends beyond reinforcing the function of IA in detecting fraud and advocates the usefulness of IA as part of an overall effort to improve internal monitoring and enhance the corporate governance structure within the organization. Hay, Knechel and Ling (2008), using a combination of public and company-specific

information for New Zealand publicly listed firms, have found that measures of internal auditing, corporate governance and concentration of ownership are all positively related to audit fees. This is consistent with the argument that controls within firms (including IA) complement external audit to increase overall monitoring.

As demonstrated by recent research—post-Enron and post-worldwide corporate governance reforms—the relationship between internal and external audit has evolved from a substitutive to a complementary one (Abbott et al., 2007, Carey et al., 2000a, Goodwin-Stewart and Kent, 2006a, Goodwin-Stewart and Kent, 2006b, Spira and Page, 2003). This suggests that high quality auditors are more likely to be associated with clients with an IA function. Hence, firms more committed to a strong corporate governance culture are likely to engage in greater levels of IA as well as being prepared to pay for a higher quality external audit.

Clearly, the existence of an IA function has a significant impact on a firm's ability to strengthen controls and prevent and detect fraud and financial statement errors and, therefore, can enhance external audit effectiveness and, by association, audit quality. This is because external auditors rely on the IA function in a firm to detect weaknesses in controls and to prevent and detect fraud (Carcello et al., 2005, Felix et al., 2001). This is probably due to the external auditor's greater awareness and familiarity with the role that IA plays in enhancing audit effectiveness (and thereby quality) through the strengthening of client controls, preventing and detecting fraud and financial statement errors (Goodwin and Seow, 2002). This potentially allows the external auditor to divert their audit procedures/effort to other areas in order to maintain or even improve overall audit quality.

In Australia, recent reforms to the *Corporations Act 2001* and the Corporate Governance Council's Recommendations have strongly emphasized the importance of good corporate governance (ASX Corporate Governance Council, 2003). Given the importance of IA as part of good corporate governance, these changes are likely to enhance its role in the Australian audit environment (Coram et al. 2008). In the face of the global scale of corporate scandals and related regulatory responses, we also predict that the benefit of IA in enhancing audit quality should transcend international boundaries.

As a result of the complementary relationship between IA and external audit along with the multi-dimensional view of audit quality, the following hypotheses are proposed:

H1: There is a positive association between the auditor being a Big 4 firm and the audit clienthaving an IA function.

H2: There is positive association between each of the Big 4 firms and having audit clients with an IA function.

3. RESEARCH METHOD

3.1. Sample

Data was gathered from secondary sources, specifically the annual reports of the top 300 publicly listed companies in Australia (by market capitalization) as at their respective reporting dates in 2005. Since one of the major drivers of company performance is the need to maximise shareholder value (Balvers et al., 1990), this measure is best reflected by the market capitalization of a firm.

The annual reports were downloaded from FinAnalysis. Of the 300 companies that met the initial criteria, twelve (12) were excluded on the grounds that they were financial institutions (Simunic, 1980), eight (8) were excluded as they reported their results in non-Australian denominated currencies and eight (8) were excluded because their annual report was unobtainable. Panel A of Table 1 outlines the selection process, presenting information by quartiles (based on market capitalization) for the final sample of 272 firms.

The ASX Corporate Governance Council's Principles of Good Corporate Governance and Best Practice Recommendations of 2003 require companies, amongst other things, to establish a sound system of risk oversight and internal control. Specifically, Recommendation 7.1 requires the Board of Directors of a company (or an appropriate board committee) to establish policies on risk oversight and management. As part of this process, the recommendation explicitly identifies the IA function of a firm as being ideally placed to assist in analysing the effectiveness of the firm's risk management and internal compliance and control system (ASX Corporate Governance Council, 2003). As a result of this requirement for companies to indicate the mechanism used to manage risksin their annual report, it is possible to identify firms which have an IA function to assist them in managing their risks(that is, a dichotomous variable) and firms who choose to use the Board of Directors or another board committee to manage these risks (as at 2005).

Panel B of Table 1 reveals the number of firms in each of the four quartiles which had an IA function, with the chi-square two-tailed p-value of 0.000 showing that larger firms were more likely to have had that function with the proportion of firms having an IA function decreasing as firm size decreases. With only 55 percent of the sample having an IA function, coupled with variation of IA existence across the quartiles, the sample selected was used with confidence in subsequent testing.

Table 1. Sample selection by market capitalisation, internal audit existence and audit firm

Panel A	1st Quartile Largest	2nd Quartile	3rd Quartile	4th Quartile Smallest	Total
Initial number of firms	75	75	75	75	300
Less financial institutions	8	4	-	-	12
Less overseas denominated currencies	7	1	-	-	8
Less unobtainable data	7	-	1	-	8
Usable sample	53	70	74	75	272
Panel B					
Existence of an IA function in usable sample					
Firms with	44	48	31	27	150
Firms without	9	22	43	48	122
Firms with (%)	83%	69%	42%	36%	55%
Chi-square test	χ^2 = 38.118, two-tailed p value = 0.000				
Panel C					
Deloitte Touche Tomatsu clients	3	11	11	7	32
with IA (%)	2 (67%)	6 (55%)	5 (45%)	3 (43%)	16 (50%)
Ernst and Young clients	11	14	25	21	71
with IA (%)	10 (91%)	11 (79%)	8 (32%)	7 (33%)	36 (51%)
KPMG clients	16	17	13	13	59
with IA (%)	16 (100%)	14 (82%)	7 (54%)	6 (46%)	43 (73%)
PricewaterhouseCoopers clients	20	22	14	22	78
with IA (%)	15 (75%)	14 (64%)	9 (64%)	9 (41%)	47 (60%)
Chi-square test (clients)	χ^2 = 13.612, two-tailed p value = 0.137				
Chi-square test (with IA)	χ^2 = 4.562, two-tailed p value = 0.871				
All Big 4 clients	50	64	63	63	240
with IA (%)	43 (86%)	45 (70%)	29 (46%)	25 (40%)	142 (59%)
Non-Big 4 clients	3	6	11	12	32
with IA (%)	1 (33%)	3 (50%)	2 (18%)	2 (17%)	8 (25%)
Chi-square test (clients)	χ^2 = 4.571, two-tailed p value = 0.206				
Chi-square test (with IA)	Cannot be calculated (50% of cells have expected value less than 5)				
All firms firms	53	70	74	75	272
with IA (%)	44 (83%)	48 (69%)	31 (42%)	27 (36%)	150 (55%)

Finally, as this study is based on the effectiveness of the Big 4 proxy of audit quality, Panel C of Table 1 shows the number of clients and clients with an IA function for each of the Big 4 audit practices, the Big 4 practices as a whole and the non-Big 4 audit practices (all by quartile). The panel reveals that there was no systematic difference in client size (by quartile) across the four Big 4 practices, both for all clients and clients with IA (chi-square two-tailed p-value of 0.137 and 0.871, respectively). Similarly, comparison of client size (by quartile) between Big 4 and non-Big 4 practices revealed no significant difference (chi-square two-tailed p-value of 0.206). A similar comparison could not be done for clients with IA as small values in half the cells meant that the chi-square statistic lacked empirical validity.

3.2. Variables of Interest and Multivariate Models Used

IA determination models used in prior research have included a variety of variables to control for cross-sectional differences associated with firm size, firm complexity, firm risk, audit firm characteristics and other relevant measures (Carcello et al. 2005; Goodwin-Stewart & Kent 2006b). The models have provided good explanatory power and been robust across countries, industries and time periods. These prior IA determination models have been used as the basis for selecting the independent variables used in this study (see Table 2). Some of the variables are subject to square root or logarithmic transformation to provide a better linear fit.

Table 2. Details of all variables

Explanatory variable (proxy measure)	Definition of proxy measure	Expected direction of relationship	Prior use as IA determinant by…
Firm size			
ASSETSLN	Natural log of total assets as at year-end	+	Carcello et al. (2005), Goodwin-Stewart and Kent(2006b)
Firm complexity			
SUBSIDSR	Square root of number of subsidiaries	+	Carcello et al. (2005)
NBS	Natural log of 1 plus number of business segments	+	Carcello et al. (2005), Goodwin-Stewart and Kent(2006b)
Risk			
DEBT	Non-current liabilities divided by total assets.	+	Carcello et al. (2005), Carey et al. (2000b), Goodwin-Stewart and Kent(2006b)
RECEIVABLE	Total receivables divided by total assets.	+	Carcello et al. (2005)
INVENTORY	Total inventory divided by total assets.	+	Carcello et al. (2005)
CFOAVTAS	Cash from operations divided by average total assets.	+	Carcello et al. (2005)
Audit firm characteristics			
BIG4	A dummy variable given the value of 1 when a Big 4 auditor is used and 0 otherwise.	+	Goodwin-Stewart and Kent(2006b)
DELOITTE	A dummy variable given the value of 1 when the firm is audited by Deloitte Touche Tomatsu and 0 otherwise.	+	
EY	A dummy variable given the value of 1 when the firm is audited by Ernst and Young and 0 otherwise.	+	
KPMG	A dummy variable given the value of 1 when the firm is audited by KPMG and 0 otherwise.	+	
PWC	A dummy variable given the value of 1 when the firm is audited by PricewaterhouseCoopers and 0 otherwise.	+	
Other characteristics			
PERACIND	The percentage of independent directors on the audit committee.	+	Goodwin-Stewart and Kent(2006b)
PERACFEX	The percentage of audit committee members with accounting and finance expertise.	+	Goodwin-Stewart and Kent(2006b)
FINANCIALS	A dummy variable given the value of 1 if the company is in the financials industry and 0 if otherwise.	-	Carcello et al. (2005), Goodwin-Stewart and Kent(2006b)

To assess the relationship between IA and the variables identified in Table 2, the following logistic model will be fitted:

IA=f(ASSETSLN, SUBSIDR, NBS, DEBT, RECEIVABLE, INVENTORY, CFOAVTAS, PERACIND, PERACFEX, FINANCIALS, BIG)(1)

where BIG *will be measured by either BIG4 or by EY, PWC, KPMG and DELOITTE.* Subsequently, measures of audit fees (TOTAUDFELN - natural logarithm of total audit fees) and non-audit fees (NONAUDITSR - square root of other services fees) will be included to determine if these impact the logistic model. The sensitivity of this model to different measures of the control constructs will also be checked. Firm size will be alternatively proxied by SALESLN (natural logarithm of sales), EMPLOYSR (square root of the number of employees) and a principal components factor (SIZEFACTOR) derived from assets, sales and employees (per Carey et al., 2000b); firm complexity will be adjusted by replacing *NBS* with NGS (geographical segments); and risk will be assessed by replacing *DEBT* with QUICK (current assets less inventory, divided by current liabilities) and *CFOAVTAS* with ATURN (asset turnover).

4. RESULTS

4.1. Descriptive Statistics

Table 3 shows the descriptive statistics for all the variables used in this study. The table shows that total assets of the companies in the sample averaged $2 billion, ranging from a minimum of $19.1 million to a maximum of $43 billion (not reported in the table). The number of subsidiaries ranged from zero to 781 (not reported in the table) with a mean of 37 and a 'high' standard deviation of 65. This variation in subsidiaries, however, was not necessarily a function of diversification, with most of the firms having only two business segments (not reported in the table).

Table 3. Descriptive statistics

	Mean	Standard deviation	Median
Firm size			
Total assets as at year-end ($millions)	2 014	4 405	679
ASSETSLN	20.38	1.42	20.34
Firm complexity			
Total number of subsidiaries as at year-end	37	65	18
SUBSIDSR	4.91	3.62	4.24
Total number of business segments	2	2	2
NBS	1.11	0.45	1.10
Risk			
DEBT	24%	19%	23%
RECEIVABLE	12%	12%	9%
INVENTORY	9%	12%	2%
CFOAVTAS	9%	15%	8%
Other characteristics			
PERACIND	75%	26%	75%
PERACFEX	24%	14%	25%
Audit firm characteristics			
Total audit fees ($000s)	789	1 403	327
TOTAUDFELN	12.79	1.27	12.70
Other services fees ($000s)	176	333	73
NONAUDITSR	310.73	282.37	270.88

The mean debt ratio (24%) and its standard deviation (19%) did not suggest that the sampled companies had solvency problems (in general) although the maximum value found was 116 percent (not reported in the table). Similarly, while the (unreported) minimum and maximum levels for receivables and inventory highlighted firms at both ends of the liquidity spectrum, the means of 12 percent and 9 percent (respectively) do not show high levels of audit risk.

Table 3 also reveals that the proportion of audit committee members meeting the test of independence was 75 percent (ranging from zero to 100%, not reported in the table), which is not far from the oft argued ideal of 100 percent. However, some concern needs to be expressed that, on average, only 24 percent of audit committee members had tertiary trained accounting and finance expertise.

Finally, Table 3 reports mean sample audit fees of just under $800 000 with a surprisingly 'low' standard deviation of $1.4 million given a (unreported) minimum of $14 900 and maximum of $11.4 million. Other service fees also ranged widely (from zero to $3 million, not reported in the table), with the average amount paid by firms to their auditors for non-audit services being approximately $176 000. Separate calculation of the proportion of non-audit fees relative to total fees revealed that a little more than a quarter of fees (26%) charged by audit practices came from non-audit services.

4.2. Chi-square Tests

Chi-square tests were completed for the dichotomous experimental and control variables collected in this study to examine their relationship with IA. Table 4 shows that firms which employed a Big 4 auditor were more likely to have an IA function, both in total (one-tailed p-value of 0.000) and for each of the constituent firms: Deloitte (one-tailed p-value of 0.020); EY (one-tailed p-value of 0.008); KPMG (one-tailed p-value of 0.000); and PWC (one-tailed p-value of 0.000). This is in line with the expectations expressed in Table 2 and, therefore, compatible with prior researchers' views that the Big N effect is consistent across all relevant practices.

Nonetheless, even while providing support for the use of the Big 4 variable, Table 3 gives a first clue that the relationship between auditor and client IA might not be consistent across all Big 4 audit practices, with KPMG significantly more likely to have had clients with IA than the other Big 4 practices (two-tailed p-value of 0.014). Separate (Chi-square) Big 4 practice by practice tests (not shown in the table) revealed that KPMG was also significantly more likely to have clients with IA compared to Deloitte (two-tailed p-value of 0.029) or EY (two-tailed p-value of 0.010), but not compared to PWC (two-tailed p-value of 0.123). However, PWC was not significantly more likely to have clients with IA than Deloitte (two-tailed p-value of 0.323) or EY (two-tailed p-value of 0.241), nor did Deloitte and EY significantly differ (two-tailed p-value of 0.947).

Table 4 also reports that firms in the financial sector were significantly less likely to have an IA function (one-tailed p-value of 0.003), consistent with the expected direction of the relationship noted in Table 2.

Table 4. Chi-Square tests and dichotomous variables

	With IA		Without IA	
Audit firm variables				
Big 4	142	95%	99	81%
Non-Big 4	8	5%	23	19%
Total	150		122	
Chi-square test	χ^2 = 12.177, one-tailed p value = 0.000			
DELOITTE	16	67%	16	40%
Non-Big 4	8	33%	24	60%
Total	24		40	
Chi-square test	χ^2 = 4.267, one-tailed p value = 0.020			
EY	36	82%	35	59%
Non-Big 4	8	18%	24	41%
Total	44		59	
Chi-square test	χ^2 = 5.956, one-tailed p value = 0.008			
KPMG	43	84%	16	40%
Non-Big 4	8	16%	24	60%
Total	51		40	
Chi-square test	χ^2 = 19.308, one-tailed p value = 0.000			
PWC	47	85%	31	56%
Non-Big 4	8	15%	24	44%
Total	55		55	
Chi-square test	χ^2 = 11.282, one-tailed p value = 0.000			
DELOITTE	16	11%	16	16%
Other Big 4	126	89%	82	84%
Total	142		98	
Chi-square test	χ^2 = 1.284, two-tailed p value = 0.257			
EY	36	25%	35	36%
Other Big 4	106	75%	63	64%
Total	142		98	
Chi-square test	χ^2 = 2.989, two-tailed p value = 0.084			
KPMG	43	30%	16	16%
Other Big 4	99	70%	82	84%
Total	142		98	
Chi-square test	χ^2 = 6.091, two-tailed p value = 0.014			
PWC	47	33%	31	32%
Other Big 4	95	67%	67	68%
Total	142		98	
Chi-square test	χ^2 = 0.057, two-tailed p value = 0.812			
Other control variables				
Financials	26	16%	39	32%
Chi-square test	χ^2 = 7.922, one-tailed p value = 0.003			

4.3. Correlations

Table 5 presents a correlation matrix reporting Pearson listwise correlation coefficients for the continuous variables used in the study. Unsurprisingly, firm size was found to be significantly positively correlated to subsidiary and business segment numbers and to the debt ratio (two-tailed p-values all being 0.000). Consistent with many prior studies (Choi et al., 2005, Davis et al., 1993, Hay et al., 2006, Simunic, 1980, Taylor and Baker, 1981), audit fee was significantly positively correlated to all the firm size, complexity and risk variables in Table 5 (mostly with two-tailed p-values of 0.000) and was significantly negatively related to the proportion of independent directors on the audit committee (two-tailed p-value of 0.030). The proportion of receivables to total assets was significantly positively associated with a similar ratio for inventory, subsidiary numbers and business segment numbers (two-tailed p-values all being 0.000). Examination of correlations with non-audit fee showed most followed the same pattern as for audit fee (the inventory ratio and cash flow from operations to assets were not significant, two-tailed p-values of 0.526 and 0.635, respectively) with the addition of a significant positive correlation for the proportion of audit committee members with accounting and finance expertise (two-tailed p-value of 0.011). All other significant correlations in Table 5 were consistent with prior beliefs.

Table 5. Pearson correlation matrix

	Pearson's r (two-tailed p-value)										
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
Firm size variables											
ASSETSLN [1]	1.000										
Firm complexity variables											
SUBSIDSR [2]	0.548 (0.000)	1.000									
NBS [3]	0.373 (0.000)	0.506 (0.000)	1.000								
Risk variables											
DEBT [4]	0.464 (0.000)	0.241 (0.000)	0.101 (0.098)	1.000							
RECEIVABLE [5]	0.000 (0.994)	0.266 (0.000)	0.340 (0.000)	-0.121 (0.046)	1.000						
INVENTORY [6]	-0.035 (0.570)	0.055 (0.363)	0.171 (0.005)	-0.083 (0.172)	0.260 (0.000)	1.000					
CFOAVTAS [7]	0.021 (0.729)	0.041 (0.502)	0.022 (0.721)	-0.040 (0.512)	0.181 (0.003)	-0.008 (0.899)	1.000				
Other characteristics variables											
PERACIND [8]	-0.111 (0.068)	-0.142 (0.019)	-0.146 (0.016)	-0.079 (0.194)	-0.028 (0.645)	0.050 (0.415)	-0.069 (0.259)	1.000			
PERACFEX [9]	0.119 (0.051)	0.067 (0.273)	0.049 (0.421)	-0.050 (0.408)	-0.008 (0.900)	-0.017 (0.775)	-0.040 (0.510)	-0.047 (0.438)	1.000		
Audit firm fees											
TOTAUDFELN [10]	0.693 (0.000)	0.668 (0.000)	0.563 (0.000)	0.301 (0.000)	0.293 (0.000)	0.172 (0.004)	0.135 (0.026)	-0.132 (0.030)	0.114 (0.060)	1.000	
NONAUDITSR [11]	0.559 (0.000)	0.548 (0.000)	0.474 (0.000)	0.226 (0.000)	0.139 (0.022)	0.039 (0.526)	0.029 (0.635)	-0.119 (0.049)	0.154 (0.011)	0.652 (0.000)	1.000

4.4. T-tests

T-tests were completed for the continuous variables collected in this study. The objective in undertaking t-tests was to examine the relationship between IA and these continuous variables to determine if firms with IA significantly differed from those without IA.

An overall review of Table 6 shows a number of significant relationships depending on whether a firm has an IA function or not. Given our prior conjecture, the fact that our measure for firm size and both continuous measures for firm complexity had a significant relationship with IA is not surprising (all one-tailed p-values of 0.000). Unexpectedly, however, only the *DEBT* risk measure proved significant (although the other three were in the anticipated direction). In terms of other characteristics, the percentage of independent directors on the audit committee (*PERACIND*) failed to significantly differ between the firms with and without IA, but the variable measuring audit committee expertise (*PERACFEX*) was found to have a significant and expected positive relationship with IA (one-tailed p-value of 0.006). Our transformed measures of audit and non-audit fees were also found to be significantly positively associated with IA (both with two-tailed p-values of 0.000).

The results of the bivariate testing suggest that a number of variables (both dichotomous and continuous) have statistically significant relationships with the existence of an IA function within a firm. For example, Table 6 reveals that, on a bi-variate basis, the percentage of audit committee members that have accounting and finance expertise is statistically significantly positively related to the existence of an IA function. However, it is important to realise that the results of multivariate testing will have the greatest bearing on the statistical significance of IA variable and any audit quality measure. This is because multivariate testing not only examines the significance of the relationship between the experimental variable (in this case, Big 4 or 4 Big) and the dependent variable (in this case, IA) but, more importantly, controls for the effects of a number of other independent variables on this relationship.

Table 6. T-tests and continuous variables

	Mean scores			
	with IA	without IA	t-statistic	one-tailedp-value
Firm size variables				
ASSETSLN	20.923	19.714	7.806	0.000
Firm complexity variables				
SUBSIDSR	5.958	3.627	5.743	0.000
NBS	1.219	0.978	4.585	0.000
Risk variables				
DEBT	0.270	0.196	3.354	0.000
RECEIVABLE	0.127	0.113	0.964	0.168
INVENTORY	0.094	0.076	1.151	0.125
CFOAVTAS	0.099	0.076	1.315	0.095
Other characteristics variables				
PERACIND	0.734	0.757	-0.713	0.238
PERACFEX	0.256	0.213	2.503	0.006
Audit firm characteristics				
TOTAUDFELN *	13.293	12.165	8.136	0.000
NONAUDITSR *	382.900	221.996	5.142	0.000

* No direction was predicted for the effect of this variable, hence, the p-values are for a two-tailed test.

4.5. Logistic Regression Results

Table 7 reports our main results where we have controlled for the effects of client firm size (*ASSETSLN*), client firm complexity (*SUBSIDSR*, *NBS*) and risk (*DEBT*, *RECEIVABLE*, *INVENTORY*), other auditee attributes (*PERACIND*, *PERACFEX*, *FINANCIALS*) and the audit and non-audit fee the auditee pays (Panel B only; TOTAUDFELN, NONAUDITSR). The results shown in Panel A of Table 7 supportthe suspicions noted earlier that claims of asingle Big4 effect on IA existence in client firms might well be spurious, and that a simple Big 4 variable may not be a consistent proxy for the actions of its constituent members. After allowing for the same control variables noted above, Big 4 (relative to non-Big 4) is significant (one-tailed p-value of 0.013 in Panel A; one-tailed p-value of 0.049 in Panel B) but this significance is not consistent for the 4 Big accounting practices in Australia (again, relative to the non-Big 4).All control variables that were significant in the Big 4 model were also significant in the 4 Big model, with some slight changes in p-values. There were no control variables significant in the 4 Big model that were not significant in the Big 4 model.Our analysis finds the EY and Deloitte dummies do not significantly explain whether client firms have an IA function, yet both the PWC and KPMG dummies do. This result was robust to the inclusion of measures for audit and non-audit fees (Panel B of Table 7) and to numerous variations of the control variables for client firm size, complexity and risk (not reported).

This finding was also robust to the substitution of alternative control measures for firm size, complexity and risk discussed earlier (for example, SALESLN used instead of *ASSETSLN*, NGS instead of *NBS* and QUICK instead of *DEBT*) and to the addition of further control variables not previously applied in the IA determinants literature, such as length of auditor tenure (LENGTH01 - dummy variable for more or less than 7 years), existence of a reported loss in the previous three years (LOSS) and return on assets (ROA - earnings before interest and tax divided by total assets).These robustness tests are not reported in the interests of brevity, but can be obtained from the authors.

Finally, given the multitude of studies that have established a positive relationship between Big N and audit fees (for example Choi et al., 2005, Davis et al., 1993, Gerrard et al., 1994), the generalizability of the Big 4 relative to the 4 Big was examined using audit fees as the dependent variable (TOTAUDFELN). Applying the same control variables as shown in Table 2to a linear regression model, it was found that Big 4 did significantly explain variation in audit fees (as expected) and, in addition, each of the 4 Big measures were also significant at the 0.05 level. These results suggest that there is no price differentiation among the 4 Big. This extension testing shows that, while the use of intra-Big N variables significantly explains audit quality measured by IA, it does not extend to audit quality measured by audit fees. Results are consistent with Big 4 product differentiation rather than monopolistic pricing. Product differentiation is

achieved by the 4 Big in varying approaches and motivations towards attracting or selecting clients with an IA function.

Table 7. Predicting IA existence

Panel A: Without audit and non-audit fees		BIG 4		4 BIG	
Expected direction		Beta	one-tail p-value	Beta	one-tail p-value
Constant *		-15.737	0.000	-11.997	0.000
ASSETSLN	+	0.691	0.000	0.673	0.000
SUBSIDSR	+	0.023	0.359	0.027	0.335
NBS	+	0.576	0.075	0.496	0.114
DEBT	+	-0.504	0.717	-0.474	0.705
RECEIVBL	+	-0.550	0.654	-0.709	0.692
INVENTRY	+	0.964	0.204	0.970	0.206
CFOAVTAS	+	1.311	0.111	1.263	0.123
PERACIND	+	0.187	0.371	0.089	0.439
PERACFEX	+	1.678	0.050	1.465	0.078
FINANCIALS	-	-1.010	0.003	-1.048	0.003
BIG4	+	1.088	0.013		
DELOITTE	+			0.819	0.090
EY	+			0.856	0.058
KPMG	+			1.449	0.006
PWC	+			1.160	0.015
Nagelkerke pseudo-r^2		0.346		0.354	
% with IA predicted accurately		78.0%		78.0%	
% without IA predicted accurately		63.9%		61.5%	
Total % predicted accurately		71.7%		70.6%	
Panel B: With audit and non-audit fees		BIG 4		4 BIG	
Expected direction		Beta	one-tail p-value	Beta	one-tail p-value
Constant *		-17.794	0.000	-14.432	0.000
ASSETSLN	+	0.565	0.000	0.545	0.001
SUBSIDSR	+	-0.005	0.530	0.000	0.497
NBS	+	0.480	0.125	0.395	0.179
DEBT	+	-0.446	0.694	-0.406	0.678
RECEIVBL	+	-1.081	0.769	-1.280	0.804
INVENTRY	+	0.576	0.316	0.549	0.323
CFOAVTAS	+	1.102	0.155	1.028	0.175
PERACIND	+	0.203	0.362	0.086	0.441
PERACFEX	+	1.702	0.051	1.488	0.079
FINANCIALS	+	-0.884	0.010	-0.916	0.009
TOTAUDFELN *	?	0.409	0.064	0.425	0.056
NONAUDITSR *	?	-0.001	0.713	-0.001	0.686
BIG4	+	0.987	0.049		
DELOITTE	+			0.723	0.124
EY	+			0.742	0.091
KPMG	+			1.401	0.008
PWC	+			1.036	0.029
Nagelkerke pseudo-r^2		0.358		0.368	
% with IA predicted accurately		79.3%		77.3%	
% without IA predicted accurately		65.6%		63.9%	
Total % predicted accurately		73.2%		71.1%	

* No direction was predicted for the effect of this variable, hence, the p-values are for a two-tailed test.

4.6. Additional Tests

In order to test the robustness of our results, we performed additional testing to examine the association between audit fees and the variables in our original model. In other words, we replaced the dependent variable (IA existence) with the natural log of audit fees. This was done to confirm that Big 4 audit firms continue to be associated with an audit fee premium. The results reported in Table 8 suggest that not only is the Big 4 positively associated with audit fees, each Big 4 firm is positively significantly associated with audit fees. This provides assurance that the Big 4 are able to all charge an audit fee premium and are hence thought to provide a quality audit.

In addition to this, we analysed the difference in audit fees charged by the two audit firms that were more highly associated with clients that have an IA function (PWC and KPMG) and the two audit firms that were associated with clients where the IA function was less prevalent (Deloitte and EY). We found in a tests of means that PWC and KPMG charged audit fees that were, on average, statistically higher than audit fees charged by Deloitte and EY (significant at the 95% confidence level on a two-tailed test). These additional tests suggest that while Big 4 firms are still a proxy for audit quality, as evidenced in their ability to charge an audit fee premium, considerations also need to be made for intra-Big 4 differences when it comes to other aspects of audit quality such as the importance placed on the IA function and the ability to charge higher fees when associated with a more stringent view of internal controls and risk management as a whole.

Table 8. Predicting Natural logarithm of Total audit fee

		BIG 4		4 BIG	
Expected direction		Beta	one-tail p-value	Beta	one-tail p-value
Constant *		2.537	0.002	2.570	0.002
ASSETSLN	+	0.426	0.000	0.422	0.000
SUBSIDSR	+	0.073	0.000	0.076	0.000
NBS	+	0.527	0.000	0.542	0.000
DEBT	+	-0.109	0.916	-0.123	0.912
RECEIVBL	+	1.256	0.001	1.248	0.001
INVENTRY	+	0.962	0.004	0.988	0.003
CFOAVTAS	+	0.656	0.014	0.696	0.011
PERACIND	+	-0.054	0.935	-0.029	0.969
PERACFEX	+	0.193	0.259	0.207	0.246
FINANCIALS	-	-0.380	0.001	-0.379	0.001
IA *		0.150	0.126	0.153	0.122
BIG4	+	0.409	0.002		
DELOITTE	+			0.400	0.012
EY	+			0.398	0.005
KPMG	+			0.323	0.023
PWC	+			0.482	0.001
F-statistic (p-value)		54.406 (0.000)		43.412 (0.000)	
R		0.846		0.847	
Adjusted R^2		70.3%		70.1%	

* No direction was predicted for the effect of this variable, hence, the p-values are for a two-tailed test.

5. Conclusion and future research

The results of this study provide new insights into the notion of audit quality and Big N audit firms against a backdrop of renewed focus on more robust corporate governance practices. Corporate governance-based regulations and recommendations place a renewed focus on IA to deliver better internal monitoring and increase the detection and prevention of fraud, hence improving overall audit quality. We postulate that since corporate governance thought and practice has emerged at the forefront of corporate policy and strategy while the number of large audit firms has dwindled, there must be a re-examination of what drives audit quality in the new era.

While we report results that are consistent with well-established literature on audit quality, we also provide evidence suggesting caution be taken in relying on the assumption that all Big N firms are homogenous in their provision of audit services. As the number of Big N audit firms decreases, we suggest that, in order for them to remain competitive, there is an increasingly greater need for the remaining firms to differentiate themselves from other large firms. A potential consequence of successful differentiation within the Big N would be firms having differentiated client bases. This is one potential reason why two of the four firms in our sample (PWC and KPMG) are more significantly associated with the existence of IA compared to Deloitte and EY.

The key contribution of this study is that it is the first to consider differences among the Big N firms by examining an alternative measure for audit quality, namely IA. The results provide evidence supporting intra-Big N differences in relation to IA usage by clients, but extension tests revealed these significant intra-Big N differences did not appear for the most common measure of audit quality, being audit fees. Future use of Big N as a proxy for audit quality should, therefore, be viewed cautiously as differences in the constituent members of the Big N may mask 'true' results.

While the overall findings of our study appear robust, they are subject to certain limitations that provide opportunities for further research. First, the study focuses on the top 300 public companies from a market capitalisation perspective and, therefore, may not be generalizable to other smaller public companies or to private firms. Future research could expand the scope of this study by examining the next largest 300 firms on the ASX. Second, the dichotomous experimental variable used in the study (existence of an IA function) might not be an ideal measure of IA usage if its lacks sensitivity. The size of the IA budget could be used in future research. In addition, differentiation between in-house versus outsourced IA functions could also be made. Lastly, all information has been collected from annual reports, limiting the amount and type of data available.

Despite these limitations, however, this study sheds light on the necessity for continuous and extended validation of measures used to proxy variables of research interest. In terms of the specifics of this paper, audit researchers should not assume that the Big 4 proxy has the same empirical effect as the intra-Big N (4 Big) proxies when assessing audit quality.

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