What Determines Incumbent Auditors' Information Systems Design And Implementation Consulting Fees?

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Abstract

This study examines determinants of demand for incumbent auditors' information systems design and implementation consulting services. While there was no evidence on how the services may affect auditor independence, opponents of allowing the service argue that auditors who provide the financial information systems consulting services may lower audit quality, reducing investor confidence in markets. The results indicate that while R&D expenditures, auditors' industry specialization, and auditor tenure are positively associated with demand for the information systems consulting, there is no evidence that accounting discretion and audit committee effectiveness are associated with demand for the information systems consulting.

1.   Introduction

*T*his study examines determinants of the purchase of auditors' financial information systems design and implementation consulting services by SEC audit clients. The SEC issued its auditor independence rules in November 2000, requiring disclosure of audit, the information systems design and implementation consulting, and other non-audit fees. Prior to the regulation, there were heated debates as to whether auditors should be allowed to provide the information systems consulting services for their audit clients. The SEC and investors were concerned about negative impact of auditors' information consulting services on auditor independence.

Former SEC Chairman Arthur Levitt criticized audit firms for using auditing as "a loss-leader retained as a foot in the door for higher-fee consulting services" (Levitt 1996). In particular, the financial information systems consulting was one of the most contentious areas during the rule setting among regulators and auditors. In the end, instead of prohibiting the information systems consulting, the SEC decided to require firms to disclose audit and non-audit fees to their auditors, effective on February 5, 2001. Furthermore, the new rule requires that the firms separately disclose auditors' information systems consulting (design and implementation) fees. Utilizing data obtained from the new mandatory disclosure, this study examines five determinants of demand for auditors' information systems consulting services. Particularly, the association between demand for incumbent auditors' information systems consulting services and research and development expenditures, auditor industry specialization, auditor tenure, managers' accounting discretion, and audit committee effectiveness are examined.

This study contributes to the understanding of the underlying mechanism in what determines demand for auditors' information systems design and implementation consulting services. Regulators and financial statement users will also find this information useful in assessing the impact of the above-discussed factors on demand for auditors' information systems consulting. The results indicate that demand for the information systems consulting services is positively associated with firms' investment in research and development, auditor industry specialization, and auditor tenure. However, neither managers' accounting discretion nor audit committee effectiveness is significantly associated with demand for the information systems consulting services.

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The following section develops empirical hypotheses to investigate determinants of auditors' information consulting services. This is followed by a discussion of the research design and the test results. The last section concludes the paper.

2.   Development of Hypotheses

As non-audit services continued to increase throughout the 1990s, the POB (Public Oversight Boards) formed the Panel on Audit Effectiveness in 1997, which issued a report in August 2000 making various recommendations for improving auditor independence. In addition, NYSE and NASDAQ formed the Blue Ribbon Committee (BRC) on Improving the Effectiveness of Corporate Audit Committees. The BRC recommended that the audit committee actively review all economic relationships between the external auditors and management. The SEC (2000a) expressed concern that increased fees from consulting and other services could increase the pressure on auditors to compromise their independence. After much consideration, the SEC incorporated the committees' recommendations in its auditor independence rules in November 2000 (SEC 2000b, SEC 2000c). In particular, the rule requires that firms separately disclose financial information systems design and implementation consulting (hereafter the ISC) fees from audit and other non-audit fees paid to incumbent auditors. However, thorough examination of what determines demand for incumbent auditors' ISC services has never been conducted. In this paper, five potential factors that affect demand for incumbent auditors' ISC are examined.

First, investment in research and development improves firm value (Sougiannis 1994). Davern and Kauffman (2000) also argue that implementation of information technology enhances productivity. Lucas *et al*. (1996) find that the introduction of a financial system at Merrill Lynch improves customer service and reduces costs. Banker *et al*. (2001) argue that appropriate use of information technology generates organizational innovations and redesigned business process. They find that investment in information technology is positively associated with productivity improvement. Organizational innovation and redesigning business process increase demand for ISC. Firms making a large contribution to the innovation process and research and development activities are likely to have higher demand for the ISC. Thus, it is hypothesized that there is a positive association between demand for the ISC services and research and development investment.

H1:   Demand for auditors' information systems consulting is positively associated with investment in research and development.

Auditors with industry expertise provide their auditees with superior services and higher quality audits (Palmrose 1986; Craswell *et al*. 1995; DeFond *et al*. 2000). In addition, Taylor (2000) finds that industry specialist auditors assess auditees' inherent risk significantly less than non-industry specialist auditors due to greater knowledge and expertise. He also finds that specialist auditors are more confident about the appropriateness of their inherent risk assessments compared with non-specialist auditors. Thus, auditees who contract with industry specialist auditors are more likely to seek the ISC services from their auditors. Thus, it is hypothesized that auditors' industry specialization is positively associated with demand for the ISC services.

H2:   Demand for auditors information systems consulting is positively associated with the level of client auditors' industry specialization.

The AICPA (1992) argues that auditors' expertise increases with auditor tenure and points out that the costs of providing services will decrease as auditors become more familiar with their clients. Thus, demand for auditors' information systems consulting services may be influenced by how long an auditor is retained in an engagement. As auditors have contracted with client firms for a longer period, auditors will be better able to identify potential information systems areas to improve. In support, St. Pierre and Anderson (1984) and Geiger and Raghunandan (2002) find that auditors of new clients commit more errors and experience higher legal risk than other auditors. In addition, two contracting parties with a common goal are expected to develop a long-term relationship (Greenberg and Baron 1997). Meixner and Welker (1988) also suggest that interaction between two contracting parties increases as tenure increases. Thus, as client managers have developed long-term relationship with their external auditors, client managers are likely to rely more on their auditors' advice over information systems. Subsequently, client managers may have greater demand for the ISC from their longer-term relationship auditors. Thus, positive association is expected between demand for the information systems consulting and auditor tenure. Thus, the following hypothesis will be examined.

H3:   Demand for auditors' information systems consulting is positively associated with tenure of client auditor.

Shockley (1981) argues that external auditors providing non-audit services have higher risk of losing independence than those not providing non-audit services. Knapp (1985) also argues that the purchase of management advisory services is negatively associated with auditor independence. The SEC originally considered banning the ISC services because auditor independence may be impaired as a result of the ISC services. However, firms were eventually required to provide only fee disclosure. The SEC believed that the disclosure would enable investors and the board of directors to judge for themselves whether auditor independence is impaired (Chung and Kallapur 2001). Consistent with the prior concern, if the ISC impairs auditor independence, client managers may have higher demand for ISC services with the hope of increasing accounting discretion. To examine whether client managers' accounting discretion is positively associated with demand for auditors' ISC, the following hypothesis is examined.

H4:   Demand for auditors' information systems consulting is positively associated with discretionary accruals.

Audit committees are directly responsible for determining audit fees and independence arrangements. Menon and Williams (1994) and Beasley and Salterio (2001) argue that audit committees that do not include employees and gray directors and are active are effectively monitoring managers' activities.[1] In relation to H4, if an increase in accounting discretion is one of the reasons for higher demand for the ISC, independent and active audit committees are expected to curtail demand for the ISC from firms' incumbent auditors. In order to examine whether effective audit committees reduce demand for the ISC from their incumbent auditors, the following hypothesis is examined.

H5:   Demand for auditors' information systems consulting is negatively associated with audit committee effectiveness.

3.   Research Design

3.1.   Measures of Variables

Auditors' information systems design and implementation consulting, audit, and other non-audit fees are collected from the proxy statements available in the SEC's EDGAR database. As explanatory variables, the square root of client firms' research and development expenditures is used. To examine whether auditors' industry specialization is positively associated with demand for auditors' ISC services, *MKSHARE* is included representing auditors' industry market share. *MKSHARE* is computed using the proportion of client firms' sales revenue in an industry in a year. This proportion is computed using Compustat's research and active data, consisting of 20,941 firms.[2] In this study, auditor tenure, *AUDTEN*, is the number of years that an auditor remains with the same client firm, beginning with 1981. Values of this variable range from a low of 1 to a high of 20.

To proxy for client managers' accounting discretion, discretionary accruals (*DACCR*) estimated using the Modified Jones model (Dechow *et al.* 1995). Dechow *et al.* (1995) and Bartov *et al.* (2001) show that the Modified Jones model is superior to other models for measuring discretionary accruals and detecting earnings management. Model parameters are estimated using cross-sectional rather than time-series data because this mitigates problems due to data unavailability for some estimation periods and structural changes in firms over time. It allows the model to control for changing economic conditions and events that affect discretionary accruals over time, as well as examine samples of firms with a short history reducing survivorship bias. For each firm i, for each year, discretionary accruals (DACCR) are estimated by subtracting the predicted level of non-discretionary accruals (NDAP) from total accruals (TA), i.e., *DACCR i = TAi - NDAPi*.[3] If managers' incentives to increase accounting discretion are a potential reason for higher demand for the information systems consulting services (like SEC's and investors' concern), a positive association between demand for the ISC services and *DACCR* is expected. Independent and active audit committees are more likely to limit management's ability to benefit themselves at the expense of shareholders. Consistent with Abbott and Parker (2000, 2001), audit committee effectiveness is defined based on independence and activity (i.e., coded 1 if audit committees comprised entirely of outside, independent directors that meet at least twice annually, 0 otherwise).

This study controls for several factors (hereafter collectively called *CNTRL*). More complex firms may have greater demand for the ISC. In order to control for the complexity, number of business segments is utilized. Parkash and Venable (1993) suggest that demand for nonaudit services is expected to reflect knowledge spillovers

from joint engagements. In order to control for any potential knowledge spillover effect from other services to the ISC services, the log of all fees other than information consulting fees paid to incumbent auditors are included. Lang and Lundholm (1993) suggest that large firms have incentives to disclose financial information more accurately to avoid litigation, which suggests that demand for the ISC may be positively associated with client size. To control for firm size, the log of total assets is included. Firm size may also control for client complexity (Copley *et al*. 1994). Chan *et al*. (1993) suggest that there be a causal relationship between client profitability and fees (both audit and non-audit fees) paid to auditors and find a significantly negative association between fees paid to auditors and return on equity. Thus, return on equity is included to control for the profitability.

3.2.   Empirical Model

The following regression model is then used to test hypotheses H1 and H5:

$$ITFEE_i = \alpha 0 + \beta 1\ R\&D_i + \beta 2\ INDSPLST_i + \beta 3\ AUDTEN_i + \beta 4\ DACCR_i + \beta 5\ ACEFF_i + \sum_{k} \alpha_k CNRTL_{ki} + \varepsilon_i$$

All variables in the regression are as defined previously. If client managers' demand for information systems consulting increases significantly due to research and development activities, $\beta 1$ will be positive and statistically significant. If industry specialization and auditor tenure increase demand for auditors' ISC services, positive and statistically significant $\beta 2$ and $\beta 3$ are expected. If client managers' demand for information systems consulting increases significantly in order to increase accounting discretion, $\beta 4$ will be positive and significant. Finally, if effective audit committees have reason to believe that auditors' ISC services compromise auditor independence, managers' demand for auditors' ISC services will be curtailed by effective audit committees and therefore $\beta 5$ is expected to be negative and significant.

4.   Empirical Tests

4.1.   Sample Selection

The sample selection begins by selecting all active firms (excluding ADRs) on Standard and Poor's Compustat database that have contracted with an auditor and that have fiscal year end from October 2000 though March 2001. Financial institutions are eliminated (i.e., those in SIC 6000 through 6999). Next, the sample is required to have all variables used in the regression, which reduces the sample to 1,631. Finally, the sample is also required to disclose fees paid to incumbent auditors and audit committee characteristics in their proxy statements, which leaves the final sample of 1,081. The proxy statements in the EDGAR database of the SEC website is used to collect the fees and audit committee characteristics.

4.2   Descriptive Statistics

Descriptive statistics for variables used in the regression are presented in TABLE 1. For the 1,081 sample firms, the table shows that the mean of the ISC fees is $0.434 million. Mean value of log other fees (i.e., audit and other fees combined) are $0.311 million. The Table also shows that mean of the square root of research and development expenditures are 4.413 million, mean auditor market share is 23 percent, mean auditor tenure is 7.3 years and about 50 percent of client firms have effective audit committees. TABLE 2 presents the Pearson correlation matrix, which shows that there are generally no large correlations between the variables.[4]

Table 1
Data Collection and Descriptive Statistics

Panel A. Data Collection Procedures

Procedures	N
All Active Firms in Compustat (Excluding ADR)	9,488
Auditors in 2000 and 1999 in Compustat	7,538
Fiscal Year End (Jan~Mar 2001, Oct~Dec 2000)	6,030
Excuding Financial Institution	5,286
Availability of Financial/Auditor Variables	1,631
Availability of Proxy Statement	1,081

Panel B. Descriptive Statistics
N = 1,081

Variables	Mean	Median	Std.
ITFEE	0.4348	0.0000	2.9309
R&D	4.4128	0.0000	7.9701
INDSPLST	0.2338	0.2108	0.1361
AUDTEN	7.3774	5.0000	6.6604
DACCR	-0.0006	-0.0005	0.5014
ACEFF	0.5032	1.0000	0.5002
COMPLXY	2.7438	3.0000	1.8379
OTHFEES	0.3109	0.1881	1.2302
SIZE	7.2713	7.0826	1.4724
ROE	1.3160	4.1610	30.3421

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Variable definitions:
ITFEE =   Information systems design and implementation consulting fees paid to incumbent auditors.
R&D =   Square root of research and development expenditures.
INDSPLST =   Auditors' industry market share, measured based on clients' sales revenue.
AUDTEN =   Auditor tenure, which is the number of years that an auditor remains with the same client firm.
DACCR =   Abnormal accruals measured based on the Modified Jones Model (Dechow *et al.* 1995).
ACEFF =   Audit committee effectiveness, which is 1 for firms that do not have employee or gray directors in their audit committees and meet at least twice during the year, and 0 otherwise.
COMPLXY =   Number of business segments.
OTHFEES =   Natural log of audit and other fees combined paid to auditors.
SIZE =   Natural log of total assets.
ROE =   Return on equity.

Table 2
Pearson Correlation Among Independent Variables
N = 1,081

	INDSPLST	AUDTEN	DACCR	ACEFF	COMPLXY	OTHERFEES	SIZE	ROE
R&D	0.0323	0.0748	-0.0356	0.0657	0.1093	0.3687	0.2813	-0.0102
	(0.287)	(0.013)	(0.242)	(0.030)	(0.000)	(0.000)	(0.000)	(0.735)
INDSPLST		-0.0097	-0.0159	0.0125	0.0610	0.2109	0.1894	0.0006
		(0.749)	(0.600)	(0.679)	(0.044)	(0.000)	(0.000)	(0.983)
AUDTEN			0.0177	0.0254	0.1285	0.1106	0.1375	0.0696
			(0.560)	(0.402)	(0.000)	(0.000)	(0.000)	(0.021)
DACCR				-0.0284	0.0584	0.0060	-0.0462	0.3351
				(0.349)	(0.054)	(0.842)	(0.128)	(0.000)
ACEFF					-0.0449	0.1027	0.0879	-0.0082
					(0.139)	(0.000)	(0.003)	(0.787)
COMPLXY						0.3761	0.3475	0.0678
						(0.000)	(0.000)	(0.025)
OTHERFEES							0.7619	0.0203
							(0.000)	(0.503)
SIZE								0.0969
								(0.001)

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(p-value) is based on a two-tailed test.

Variable definitions:

_R&D_ =	**Square root of research and development expenditures.**
INDSPLST =	Auditors' industry market share, measured based on clients' sales revenue.
AUDTEN =	Auditor tenure, which is the number of years that an auditor remains with the same client firm.
DACCR =	Abnormal accruals measured based on the Modified Jones Model (Dechow *et al.* 1995).
ACEFF =	Audit committee effectiveness, which is 1 for firms that do not have employee or gray directors in their audit committees and meet at least twice during the year, and 0 otherwise.
COMPLXY =	Number of business segments.
OTHFEES =	Natural log of audit and other fees combined paid to auditors.
SIZE =	Natural log of total assets.
ROE =	Return on equity.

4.3. Regression Results

TABLE 3 provides results of the regression using information systems consulting fees as the dependent variable. Consistent with the predictions, the coefficient of *R&D* is significant at all conventional levels, suggesting that firms spending more on research and development have higher demand for information systems consulting services. The coefficient on *INDSPLST* is positive and statistically significant at one percent level of testing, which is consistent with the expectation of positive association between industry expertise and demand for the ISC services. The coefficient on *AUDTEN* is also positive and statistically significant at five percent level of testing, suggesting that managers whose auditor has a long lasting relationship have higher demand for the ISC services.

The coefficients of most interest to regulators are $\beta 4$ and $\beta 5$, which are statistically insignificant. Inconsistent with the SEC and investors' concern, no association is found between client discretionary accruals and demand for the ISC services, suggesting that managers' reporting aggressiveness and audit committee effectiveness are not associated with demand for the ISC services. This may imply that effective audit committees are not concerned about a potential negative effect on auditor independence originated from purchasing auditors' ISC services. With regard to the *CNTRL* variables (number of business segments, other fees paid to auditors, firm size, and return on equity), a statistically significant coefficient on firm size is found. However, the number of business segment proxying for complexity, other fees paid to auditors, and return on equity are not statistically significant.[5]

Table 3
Determinants of Demand for Incumbent Auditors' Information Systems Consulting Services

$$ITFEE_i = \alpha 0 + \beta 1\ R\&D_i + \beta 2\ INDSPLST_i + \beta 3\ AUDTEN_i + \beta 4\ DACCR_i +$$

$$\beta 5\ ACEFF_i + \sum_k \alpha_k CNRTL_{ki} + \varepsilon_i$$

Variables	Expected Signs	Estimated Coefficients (t-value) N = 1,081
Intercept		-1.9593
		(-2.98)***
R&D	+	0.0793
		(6.93)***
INDSPLST	+	1.7282
		(2.71)***
AUDTEN	+	0.0218
		(1.69)**
DACCR	+	0.1512
		(0.84)
ACEFF	-	0.1606
		(0.94)
COMPLXY	+	0.0560
		(1.11)
OTHFEES	+	0.1405
		(1.24)
SIZE	+	0.1657
		(1.83)**
ROE	-	-0.0031
		(-1.05)
F-value for Model		14.88***
Adjusted R^2		0.1037

Significance of t-value is based on an one-tailed test. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Variable definitions:
ITFEE =   Information systems design and implementation consulting fees paid to incumbent auditors.
R&D =   Square root of research and development expenditures.
INDSPLST =   Auditors' industry market share, measured based on clients' sales revenue.
AUDTEN =   Auditor tenure, which is the number of years that an auditor remains with the same client firm.
DACCR =   Abnormal accruals measured based on the Modified Jones Model (Dechow *et al.* 1995).
ACEFF =   Audit committee effectiveness, which is 1 for firms that do not have employee or gray directors in their audit committees and meet at least twice during the year, and 0 otherwise.
COMPLXY =   Number of business segments.
OTHFEES =   Natural log of audit and other fees combined paid to auditors.
SIZE =   Natural log of total assets.
ROE =   Return on equity

4.4.   Sensitivity Tests

One concern with the above test is whether the results were driven by a relatively large proportion of sample that did not purchase the information systems consulting services while purchasing other services. While 99 percent of the sample firms reported positive non-audit fees, 86 percent of the sample firms reported zero ISC services fees. In order to examine if large proportion of the sample firms that reported zero information systems consulting

fees may have affected the results, a logit regression is conducted. Firms that have reported positive ISC fees are matched with the firms that have provided fee data, but have reported zero ISC fees, based on two digit SIC industry code, auditor, and size of assets. The logit regression shows qualitatively similar results to the OLS regression.

Table 4
Logit Estimates: Determinants of Demand for Incumbent Auditors' Information Systems Consulting Services

$$D\_ITFEE_i = \alpha 0 + \beta 1\ R\&D_i + \beta 2\ INDSPLST_i + \beta 3\ AUDTEN_i + \beta 4\ DACCR_i +$$

$$\beta 5\ ACEFF_i + \sum_k a_k CNRTL_{ki} + \gamma_i$$

Variables	Expected Signs	Estimated Coefficients (Chi-square) N = 298
Intercept		-0.9303 (5.97)***
R&D	+	0.0275 (4.47)**
INDSPLST	+	1.8138 (2.78)**
AUDTEN	+	0.0309 (2.98)**
DACCR	+	0.6124 (1.19)
ACEFF	-	-0.2539 (1.05)
COMPLXY	+	0.0335 (0.27)
OTHFEES	+	0.1957 (2.97)**
ROE	-	-0.0191 (2.23)*
Chi-square for the Model		27.55***

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Significance of Chi-Square is based on an one-tailed test. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Variable definitions:

D_ITFEE =   The dependent variable coded 1 for firms with positive information systems design and implementation consulting fees paid to incumbent auditors, and 0 for no information systems fees.

R&D =   Square root of research and development expenditures.

INDSPLST =   Auditors' industry market share, measured based on clients' sales revenue.

AUDTEN =   Auditor tenure, which is the number of years that an auditor remains with the same client firm.

DACCR =   Abnormal accruals measured based on the Modified Jones Model (Dechow *et al.* 1995).

ACEFF =   Audit committee effectiveness, which is 1 for firms that do not have employee or gray directors in their audit committees and meet at least twice during the year, and 0 otherwise.

COMPLXY =   Number of business segments.

OTHFEES =   Natural log of audit and other fees combined paid to auditors.

ROE =   Return on equity.

Several additional tests for sensitivity analysis are performed and the results are summarized below. First, due to high correlation between other fees paid to auditors (*OTHERFEE*), and firm size (*SIZE*) ($\rho=0.76$), the results after eliminating one of these variables are examined. As expected, dropping one of these two variables slightly improves the statistical significances of other variables; however, the results are qualitatively unchanged. Variance influence factors (VIF) and condition indices (Belsley *et al*. 1980) indicated that multicollinearity among the explanatory variables was not a problem.

Second, when dichotomous variables of industry specialization are used instead of industry market share by auditors, the results are qualitatively the same. Third, when the absolute value of discretionary accruals instead of signed value of discretionary accruals is used, the results are qualitatively unchanged. Several different definitions of audit committee effectiveness are also examined. For example, three meetings instead of two meetings are required to define effective audit committees, which provides qualitatively similar results.

5. Conclusion

This study examines determinants of demand for incumbent auditors' information systems design and implementation consulting services. The results indicate that demand for the information systems consulting services is positively associated with the firms' research and development expenditures, which is consistent with the expectation that firms investing resources in information technology to enhance productivity also have higher demand for ISC services to improve information systems. Consistent with prior expectation, in general, there is higher demand for information systems consulting services toward industry specialist auditors and auditors with a long-term relationship. However, no association was found between demand for the information systems consulting services and client managers' accounting discretion or their audit committee effectiveness. The lack of significance for discretionary accruals and audit committee effectiveness may suggest that providing information systems consulting services by auditors may not necessarily reduce auditor independence. Collectively, the results may be consistent with Arrunada (1999) arguing that non-audit services can create client dependence on the auditor, rather than auditor dependence on the client.

While auditors' information systems consulting was of great interest to regulators and investors, there have been no empirical studies examining the association between various client and auditor characteristics and demand for the information systems consulting services. This study, therefore, contributes by providing useful information to both practitioners and policy makers on determinants of demand for incumbent auditors' information systems consulting services. This study is possibly relevant to a current debate among policy makers and auditors as to whether all or a part of non-audit services should be banned.

6. Suggestions For Future Research

Future research may increase the sample size particularly for firms that purchase both the information systems consulting services and other audit services. Other factors that have not been considered in this paper such as macro economic factors may also be related to demand for the information systems consulting. Therefore, the results should be interpreted subject to this caveat. In addition, due to data limitation, recurring and non-recurring information systems consulting services are not considered in this paper.[6] More research is also needed to examine how auditors' information systems consulting services affect other quality aspects of financial reporting, such as number of restatements and going concern opinions, and litigation against auditors. 📖

Notes

1. Audit committee members are considered gray directors if they are former employees of the company, relatives of officers, persons having business relationships with the firm, such as lawyers and investment bankers, or have any other types of affiliations.
2. Based on Palmrose (1986), an industry specialist is also defined as an auditor with the greatest market share or one with market share exceeding 15 percent within a two-digit SIC industry code. Another measure follows Abbott and Parker (2000) and Franz *et al*. (1998) who classify two-digit SIC code industries into 12 focus industries and define an industry specialist as one with the greatest market share or one with market share exceeding 15 percent within that grouping. Because results using both measures are qualita-

tively similar, only the results using continuous market share as a proxy for industry specialization are reported.

3. Total accruals (TA) are: $TA_i = (\Delta CA_i - \Delta CL_i - \Delta CASH_i + \Delta STD_i - DEP_i) / A_{it-1}$, where ΔCA is the change in current assets from t-1 to t; ΔCL the change in current liabilities; $\Delta CASH$ the change in cash and cash equivalents; ΔSTD the change in debt included in current liabilities; DEP the depreciation and amortization expense; and A_{t-1} the total assets at t-1. Using all firms on Compustat, for each year and two-digit SIC code we estimate the following model to obtain parameters a1, a2 and a3: $TA_i = a1 (1/A_{it-1}) + a2 (\Delta REV_i) + a3\ PPE_i + \varepsilon_i$, where ΔREV is the revenues in year t less revenues in year t-1 scaled by total assets at t-1, PPE is the gross property plant and equipment in year t scaled by total assets at t-1 and ε is the residual of the regression. We require that there be at least 15 observations (firms) in each industry-year regression. Next, using the estimated parameters a1, a2 and a3 we compute NDAPi for the subset of Compustat firms in our sample as follows: $NDAP_i = a1 (1 / A_{it-1}) + a2\ (\Delta REV_i - \Delta REC_i) + a3\ PPE_i$ where ΔREC is the net receivables in year t less net receivables in year t-1 scaled by total assets at t-1 and all other variables are as defined previously.

4. An exception is the correlation between *SIZE* and *OTHERFEES* (ρ=0.76), which reduces the statistical significance of these coefficients (Studenmund 1992, p. 264). Further analysis for the effect of high correlation and multicollinearity is conducted in sensitivity tests section.

5. White's (1980) heteroskedasticity test indicates that the regression does not have heteroskedasticity problem.

6. For example, Parkash and Venable (1993) suggest the separation of recurring from nonrecurring non-audit services to examine the effect of knowledge spillovers from joint engagements.

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