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Efficiency and Audit Fees: Evidence from the U.S. Manufacturing Firms

[1]Qian Long Kweh*, [1]Yee Chuann Chan and [2]Wei-Kang Wang
[1]College of Business Management & Accounting
Universiti Tenaga Nasional, Putrajaya Campus, 43000 Kajang, Selangor, Malaysia.
[2]Accounting Department, Yuan Ze University, 135, Yuan-Tung Road,
Chung-Li, TW, 32003, Taiwan.
*Corresponding e-mail: qlkweh@gmail.com

Abstract

This study examines the association between firm efficiency and audit fees for the period from 2004 to 2009. In the first stage, data envelopment analysis (DEA) technique is used to evaluate the level of efficiency of the U.S. manufacturing firms. Next, the DEA efficiency score is included as an explanatory variable in the audit fees model of this study. This study provides empirical evidence that firm efficiency is significantly and negatively related to audit fees, suggesting that firm efficiency is an effective determinant of audit fees. The negative relation supports the view that more efficient firms pay lower audit fees. In sum, firms can improve their efficiency to get lower audit fees due to the lower audit risk exposure.

Keywords*: Audit fees, Data Envelopment Analysis, Firm efficiency, Manufacturing firms*

1. INTRODUCTION

Audit fees are jointly determined between an audit firm and its auditee. Intuitively, the auditors would seek greater audit fees, whereas their auditees would negotiate for lower possible audit fees. In the United States, Securities and Exchange Commission (SEC) registrants were required to disclose audit fees and non-audit fees since 2001. There was a sharp increase in the audit fees in 2004 due to the required compliance with Sarbanes-Oxley Act of 2002 (SOX) (Ciesielski and Weirich, 2006; Cheffers and Whalen, 2011) and the ratios of audit fees to revenue had been fluctuating during the period 2002-2009 (Cheffers and Whalen, 2011). Therefore, understanding fee drivers is a way to ensure that the audit services are fairly priced (Corporate Executive Board, 2005).

The audit fees literature can be traced back to the seminal work of Simunic (1980), which presents a model to explain the various determinants of audit fees. Since then, there have been an extensive list of audit fees literature focusing on the determinants of audit fees particularly, client characteristics such as client size (Firth, 1985; Simon, 1985), complexity (Joshi and Al-Bastaki, 2000), profitability (Simunic, 1980; Low *et al*., 1990; Walker and Casterella, 2000), risk (Simunic and Stein, 1996; Bell *et al*., 2001), corporate governance structure (Collier and Gregory, 1996; O'sullivan, 1999), and auditor characteristics such as auditor size (Palmrose, 1986; Choi *et al*., 2010).

Client attributes consisting of size, profitability, complexity, inherent risk, leverage, form of ownership, internal control, governance, and industry do influence audit fees (Hay *et al.,* 2006). Using data envelopment analysis (DEA), Dopuch *et al.* (2003) and Knechel *et al.* (2009) study the relative efficiency of audit production by the audit firm. However, the impact of firm efficiency on audit fees from the company point of view has never been studied in any audit fees model. This motivates us to extend the audit fees literature. While previous studies have applied profitability such as return on assets as an independent variable to explain audit fees, this study further tests whether audit fees are influenced by firm efficiency.

To measure firm efficiency, this study employs DEA, which is a widely used linear-programming-based composite tool. With the computed efficiency scores of financial measures aggregation, DEA is more advantageous than traditional performance measures; it provides additional information as compared to ratios that are with subjectivity issue and problematic interpretation (Feroz *et al*., 2003). Using DEA, auditee attributes can be combined to assess a firm's efficiency. An OLS estimation model is used in the second stage to analyze the impact of firm efficiency on audit pricing.

The remaining sections of this study are organized as follows. Section 2 presents literature review and the main hypothesis. Section 3 describes research methodology and data collection procedure. Section 4 shows the results. Section 5 provides conclusion, contributions, and limitations.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Hay *et al.* (2006) report that audit fees studies have served different purposes since the existence of Simunic's (1980) audit pricing model. This remark is interesting because it implies that the determinants of audit fees are important for both auditors and auditees. In spite of the purpose, they further find that the typical ordinary least square (OLS) estimation model is used to examine the determinants of audit fees. Likewise, an OLS model is constructed based on prior literature too in this paper.

It could be claimed that almost all published empirical results show that among the predictor variables included, client size is the most important factor that determine audit fees (see for example: Simunic, 1980; Firth, 1985; Pong and Whittington, 1994; Hay *et al.,* 2006). Besides, it has been reported that the common explanatory factors considered by prior studies have been client complexity, and risk (Simunic and Stein, 1996; Menon and Williams, 2001). In general, research has found that there are positive associations between audit fees and these variables (Walker and Casterella, 2000). From this passage, it is clear that client characteristics are the basic predictor variables for an audit fees model.

The proxy for business risk in the audit fees literature is commonly client risk (Bell *et al.,* 2001). Johnstone and Bedard (2004) illustrate that audit firms possibly perform screening since they are risk avoiding. Furthermore, high business risk increases the number of audit hours and thus the final total billing amounts (Bell *et al.,* 2001). Client risk, in addition to client size, could therefore be the next important driver of audit fees.

Client profitability is one of the measures of client risk since auditors' loss exposure is negatively related to the financial performance (Simunic, 1980). Walker and Casteralla (2000) offer a detailed account on the effect of auditee's profitability on audit pricing. Their results show that the client's profitability affects the fees offered to new engagements. This suggests that auditors are managing their exposure to audit risk by adjusting audit fees. Hay *et al.* (2006) find mixed results for the relationship between profitability ratio measure and audit fees from 37 sets of analyses. However, their meta-analysis shows a significant negative overall result as it would be expected.

Nikkinen and Sahlström (2004) examine the relationships between audit fees and manager ownership, and between audit fees and free cash flow in several countries. They find that agency theory can be used to explain audit fees. Jensen and Meckling (1976) define "an agency relationship as a contract under which owners (the principals) engage managers (the agents) to perform some service on their behalf which involves delegating some decision making authority to the agent". The discretion for the managers in managing the firm might lead to suboptimal decisions (Jensen, 1986; Christie and Zimmerman, 1994; Rediker and

Seth, 1995). To ensure that the managers align their interests with owners' interests, firms hire auditors to reduce the information asymmetry between them (Chow, 1982). With the increased monitoring and transparency needed, the managers are less likely to make opportunistic decisions.

Efficiency is rather more important than opportunism (Christie and Zimmerman, 1994). Since the managers are held more accountable through the monitoring, they would instead choose to improve the overall firm efficiency and thus the profitability in order to continue enjoying their performance-based compensation. In other words, knowing that firm efficiency will lead to profitability – the true economic reality, the managers would hence emphasize the firm efficiency. Firm efficiency could indeed be the proxy for profitability measure. High efficiency signifying high profitability can be translated into lower risk exposure for the auditors and thus lower audit fees. Incorporating firm efficiency into the audit fees model is an area where no empirical investigation has been performed.

Judging from the above, it can be expected that the auditors are exposed to less risk, if the managers increase the firm efficiency just like the concept of profitability (Simunic, 1980; Hay *et al.,* 2006). Extending prior research, firm efficiency is included as the new additional explanatory variable for audit fee model in this paper. This study tests the hypothesis, stated in alternative form, as follows:

H_1: Firm efficiency is negatively associated with audit fees, ceteris paribus.

3. RESEARCH DESIGN

3.1 Data Collection

Prior studies suggest that audit fees differ among industries (Simunic, 1980; Palmrose, 1986). Hay *et al.* (2006) argued that manufacturers, with extensive inventory and receivables, are generally harder to audit, and thus the audit fees for manufacturing firms should be higher. They showed an overall significant positive meta-result for the impact of industry on audit fees. For these reasons, this study focuses the sample size on the U.S. manufacturing firms (determined by SIC code: 2000 – 3990). Besides, it is also to meet the requirement of DEA that necessitates homogenous sample firms – manufacturing firms alone. The sample period is limited to 6-year period from 2004 to 2009 to eliminate any confounding SOX effects.

Audit fees data obtained from Audit Analytics are merged with financial data collected from Compustat (13,054 firm-year observations). This study next focuses on the U.S. domiciled auditees operating primarily in manufacturing sector with all relevant data available in Audit Analytics and Compustat for fiscal years ended between June 30, 2004 and May 31, 2010 (9,293 firm-year observations). Limiting the auditee sample to only the U.S. domiciled firms can control for international differences in audit production functions (Doogar *et al.,* 2010). Also, there must be no missing values. This study further limits the sample to firms listed on AMEX, NASDAQ, and NYSE; and that reduces the final sample to 5,723 observations.

3.2 Research methodology

To explore the research question, DEA approach and OLS regression model are used. Firstly, DEA approach is applied to obtain an efficiency score for each sample firm. With the computed firm efficiency score, OLS regression is run in the second stage to determine the degree of the influence of the firm efficiency on determination of audit fees. The two methodologies are explained in the next two following sections, respectively.

3.2.1 Measuring firm efficiency – DEA

A manufacturing firm can be operating at increasing returns to scale, decreasing returns to scale or constant returns to scale rather than merely constant returns to scale. Since Banker *et al.* (1984) (BCC) model allows for variable returns to scale (VRS) that relaxes the restriction of constant returns to scale (CRS), this study uses input-oriented BCC model to amass several input and output variables to derive a single performance measure, viz. the efficiency score. The VRS model forms a convex hull of intersecting planes which envelope the data points more tightly than the CRS conical hull and thus provides greater technical efficiency scores than using the CRS model (Coelli *et al.,* 1998). The BCC input-oriented model for *n* DMUs, *m* outputs, and *s* inputs to evaluate the efficiency of DMUs is shown as follows:

$$\text{Min } z_0 = \theta - \varepsilon\left(\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+\right) \quad (1)$$

Subject to:

$$\sum_{j=1}^{n} x_{ij}\lambda_j + s_i^- = \theta x_{io},\ i = 1,2,...,m; \quad (2)$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j - s_r^+ = y_{ro},\ r = 1,2,...,s; \quad (3)$$

$$\sum_{j=1}^{n} \lambda_j = 1 \quad (4)$$

$$\lambda_j, s_i^-, s_r^+ \geq 0,\ j = 1,2,...,n. \quad (5)$$

where z_0 is the efficiency score for DMU_0, λ is the weight assigned by DEA. DMU_0 is considered as BCC-efficient efficient if and only if $z_0 = 1$ and the slack variables, s_i^- and s_r^+, are equal to zero.

Based on prior literature (Parkan and Wu, 1999; Liu and Wang, 2009), this study utilizes three input variables – employees (*EMP*), cost of goods sold (*COGS*), and selling, general and administrative expenses (*SGA*); and two output variables – Sales (*Sales*), and operating cash flows (*OCF*) to calculate DEA efficiency scores. The untabulated correlation results show that all of the variables are positively and significantly related (p-value < 0.01). This means that an increase in inputs would result in an increase in outputs. Therefore, the assumption for DEA on the characteristics of 'isotonicity' relations is fulfilled (Golany and Roll, 1989).

3.2.2 Audit fees regression model

To test the association between firm efficiency and audit fees, the following unbalanced panel data model, based on prior audit fees literature (Hay *et al.,* 2006), is employed:

$$LNAFEE = \beta_0 + \beta_1 EFF + \beta_2 LNTA + \beta_3 INVTA + \beta_4 RECTA + B_5 ROA + \beta_6 LOSS + \beta_7 LEV + \beta_8 CRATIO + \beta_9 BIG4 + \beta_{10} DEC + \varepsilon \quad (6)$$

where the definitions for the variables are provided in Table 1. Although bias might be introduced due to inaccurate estimate of audit fees or the disclosed audit fees included non-audit fees payment, Chan *et al*. (1993) who interviewed the audit partners confirmed that the disclosed audit fees could be used with some confidence. Following past literature, the log of audit fees[1] is taken as the dependent variable.

Table 1: Definitions of variables used in audit fees model

Variable	Definition	Predicted Sign
Dependent Variable:		
LNAFEE	Natural log of audit fees	
Independent Variable:		
EFF	Efficiency score from DEA	–
LNTA	Natural log of total assets	+
INVTA	Inventory divided by total assets	+
RECTA	Account receivables divided by total assets	+
ROA	Return on total assets	–
LOSS	Dummy variable (coded 1 if firm incurred loss in current year)	+
	Debt divided by total assets	
LEV	Current assets divided by current liabilities	+
CRATIO	Dummy variable (coded 1 if auditor is one of the following:	–
BIG4	E&Y, Deloitte, KPMG or PwC)	+
	Dummy variable (coded 1 if auditee fiscal year end is	
DEC	December 31)	+

Table 2 reports the Pearson correlations among variables applied in audit fees model. Efficiency score (*EFF*) is significantly and positively correlated with the natural logarithm of audit fees (LNAFEE). The Pearson correlation coefficient between *EFF* and natural log of total asset (*LNTA*) is 0.60, significant at 1% level; this shows that large firms are more efficient than small firms. However, the correlation between *EFF* and *ROA* is low. Except for the correlations between *LNTA* and *BIG4* as well as that between *ROA* and *LOSS*, other correlations among variables are low, suggesting non-existence of multicollinearity problem in the multivariate analysis.

[1] The dependent variable for audit fees model could be either audit fees deflated by total assets (Simunic, 1980) or the natural log of audit fees (see for example: Gul, 1999; O'sullivan, 1999; Carcello, Hermanson, Neal, and Riley Jr, 2002; Charles, Glover, and Sharp, 2010).

Table 2: Pearson correlation coefficients for audit fees model variables

Variable	*LNFEE*	*EFF*	*LNTA*	*INVTA*	*RECTA*	*ROA*	*LOSS*	*LEV*	*CRATIO*	*BIG4*	*DEC*
LNFEE	1.00										
EFF	0.43***	1.00									
LNTA	0.87***	0.60***	1.00								
INVTA	-0.22***	-0.16***	-0.28***	1.00							
RECTA	-0.12***	-0.08***	-0.20***	0.33***	1.00						
ROA	0.17***	0.31***	0.25***	0.09***	0.11***	1.00					
LOSS	-0.19***	-0.30***	-0.26***	-0.08***	-0.09***	-0.60***	1.00				
LEV	0.17***	0.10***	0.18***	-0.14***	-0.13***	-0.19***	0.12***	1.00			
CRATIO	-0.30***	-0.17***	-0.29***	0.01	-0.17***	-0.05***	0.05***	-0.18***	1.00		
BIG4	0.55***	0.17***	0.52***	-0.21***	-0.12***	-0.08***	-0.08***	0.13***	-0.13***	1.00	
DEC	0.06***	0.06***	0.03**	-0.10***	-0.10***	-0.03**	0.05***	0.06***	0.02*	-0.04*	1.00

Note: ***, **, * denotes significance at <.01, <.05 and <.10 levels, respectively for two-tailed test.

4. EMPIRICAL RESULTS

Table 3 depicts descriptive statistics on the variables used in the audit fees regression model. The U.S. manufacturing firms, on average, pay USD 2.86 million on audit fees while the mean total assets of the sample firms are USD 3.9 billion (not reported in Table 3). This shows that audit fees paid are approximately 0.1% of auditees' total assets. In terms of the efficiency score derived from DEA, the average value is 0.540, which means, on average the manufacturing firms are about semi-efficient from the benchmark firms.

Table 3: Descriptive statistics

	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
LNAFEE	6.078	0.609	5.695	6.109	6.478
EFF	0.540	0.139	0.464	0.543	0.599
LNTA	2.793	0.831	2.150	2.782	3.372
INVTA	0.151	0.102	0.079	0.131	0.201
RECTA	0.151	0.083	0.093	0.140	0.197
ROA	0.001	0.210	-0.014	0.044	0.087
LOSS	0.280	0.451	0	0	1.000
LEV	0.221	0.193	0.077	0.188	0.308
CRATIO	2.834	2.095	1.607	2.219	3.265
BIG4	0.790	0.406	1.000	1.000	1.000
DEC	0.590	0.492	0	1.000	1.000

The regression results are reported in Table 4. The overall model employed has a quite high level of explanatory power (adjusted $R^2 = 0.788$) and it is significant ($\rho < 0.001$); the results are consistent with prior audit fees model studies (Walker and Casterella, 2000; Charles *et al.,* 2010; Choi *et al.,* 2010).

Table 4: Regression analysis

Variable	Pred. Sign	Coefficient	p-value
Intercept	?	4.315***	0.000
EFF	–	-0.565***	0.000
LNTA	+	0.663***	0.000
INVTA	+	0.113***	0.005
RECTA	+	0.474***	0.000
ROA	–	-0.092***	0.000
LOSS	+	0.005	0.618
LEV	+	0.000	0.987
CRATIO	–	-0.013***	0.000
BIG4	+	0.159***	0.000
DEC	+	0.062***	0.000
Adj. R^2 =	0.788***		

Note: ***, **, * denotes significance at <.01, <.05 and <.10 levels, respectively for two-tailed test.

From Table 4, With regards to the testing variable, *EFF*, it is confirmed that firm efficiency could affect the determination of audit fees in a negative relation. The estimated coefficient for *EFF* is significantly and negatively related to *LNAFEE*, suggesting that the more efficient

an auditee is, the lower the audit fees could be. This is because the greater a firm efficiency is, the lower it is the level of risk exposure to the auditors.
All of the control variables are in the predicted directional relationship with *LNAFEE*. *LNTA*, *INVTA*, *RECTA*, *BIG4*, and *DEC* are all positively and significantly related to *LNAFEE*. All of the variables support the notion that the greater the extent of audit effort, the higher the audit fees (Low *et al.,* 1990). *LOSS* and *LEV* also have positive relationship with *LNAFEE*, yet insignificant. The insignificant result for *LOSS* is similar with that found by Walker and Casterella (2000), whereas Hay *et al.* (2006) document that the relationship between audit fees and leverage generally becomes less important after 1990. On the contrary, *ROA* and *CRATIO* both have significantly negative impacts on *LNAFEE*, since audit risk will increase should operating status of a firm worsen.

5. CONCLUSIONS

This study employs DEA to measure the firm efficiency that next serves as the audit fees driver variable in the audit fees model. We find that firm efficiency is significantly and negatively related to audit fees, suggesting that firm efficiency is one of the significant drivers of determination of audit fees. The more efficient an auditee is, the lower the audit fees could be.

This study contributes to the existing audit fees literature. Such an analysis leads to a better understanding on the effect of firm efficiency on determination of audit fees. Besides, using DEA that consolidates multiple input and output variables simultaneously to derive a single measure of financial performance better captures the determination of audit fees. The results assure that an efficient firm tends to have lower audit fees. The findings presented could draw the attention to take firm efficiency as an additional driver for audit pricing. Managers could thus improve their firm efficiency in order to get lower audit fees offered.

Finally, there are some limitations of this study. First, the sample size is limited to only the U.S. manufacturing firms. Besides, the sample is limited to large listed companies. As such, it is recommended that other industries should be studied to further improve the model validity in future research.

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