The Signaling Cost of Hiring a Large Auditor: Evidence from the Fee Differential between Large and Small Auditors*

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* The work described in this paper was funded by a research grant from the Research Grant Council of Hong Kong (Project #: PolyU 155039/17B).

Abstract

The market for financial auditing is highly concentrated. If large auditors audit with a greater accuracy, hiring a large auditor signals the firm's financial report quality to investors. This study considers the competition between large and small auditors and analytically shows that the fee differential between them consists of their audit cost difference and the signaling cost of hiring the former. The negative signal associated with a downward auditor switch is a switching cost. Large auditors therefore cannot compete with small auditors if the former perform no signaling function. The analytical model is empirically estimated to show the magnitude of the signaling cost embedded in a large auditor's audit and non-audit fees. Findings suggest that non-audit fees contain a larger signaling cost component than audit fees do. Moreover, auditees with higher financial report quality are willing to pay a higher signaling cost to signal their financial report quality.

Keywords: asymmetric information; signaling; financial audit market; price differential.

1. Introduction

Independent expert review of a product conveys information about the product's quality to buyers when they know less than the sellers about the true product quality. For instance, Reinstein and Snyder (2005) found that positive reviews written by influential movie critics can increase box office revenues for narrowly released movies. Similarly, some studies, such as Hadj Ali *et al.* (2008), Dubois and Nauges (2010), and Hilger *et al.* (2011), found that the pricing of *en primeur* wine and retail wine sales were associated with expert wine ratings.

A similar problem of asymmetric information occurs in financial markets because firms typically know more about the quality of their financial statements than investors. The quality of financial statements (i.e., financial report quality) represents how well the financial statements provide accurate and fair information on the underlying financial position and

performance of an entity.[1] A firm's financial report quality is uncertain to investors because such quality can be undermined by the firm's hidden earnings management and manipulation activities. Extensive research (e.g., Anderson *et al*., 2004; Hunton *et al*., 2006) shows how aggressive earnings management and manipulation, such as the opportunistic use of discretionary accruals to increase reported earnings, undermine the credibility of financial statements.[2]

In the financial audit market, external auditors of financial statements perform an expert review function similar to that performed by movie critics and wine experts because external auditors are responsible for providing reasonable assurance that the audited financial statements are free of material misstatements and comply with accounting standards. In that sense, an external audit is an independent expert review of a firm's financial statements to resolve the asymmetric information between the firm and investors regarding the firm's financial report quality. The financial audit market differs from the avenues of movie review and wine rating in that external auditors are hired by auditees to give expert opinions on the latter's financial report quality, and that external audit is mandated by law without legal substitute. An auditee's choice of auditor may, to a certain extent, reflect the auditee's financial characteristics such as its financial report quality.

This study is focused on the signaling function performed by large auditors in signaling an auditee's financial report quality to investors. Large auditors, the so-called 'big-N auditors', generally charge substantially higher audit fees than do small auditors, although all auditors presumably follow the same auditing standards and requirements.[3] Indeed, past studies have

[1] Refer to the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB).
[2] Other related studies include: Kamolsakulchai, 2015; Husnatarina and Nahartyo, 2012; Pratama, 2018; Katamba et al., 2017; Chang and Chou, 2016; Rahmawati et al., 2015; Denziana, 2015.
[3] Before 2002, the big-five auditors were Ernst & Young, Deloitte & Touche, Arthur Andersen, KPMG, and PricewaterhouseCoopers. Arthur Andersen collapsed in 2002 and sold most of its practices to the remaining big-four auditors.

found that large and small auditors differ in audit accuracy. Audit accuracy is the probability that a given auditor will discover a breach in an auditee's accounting system. According to DeAngelo (1981), this probability depends on the auditor's resources including technological capabilities, audit procedures and the extent of sampling.

Resources deployed on a given audit engagement are generally not directly observed by investors, so they cannot easily measure an auditor's audit accuracy and tend to perceive that large auditors achieve greater accuracy. A commonly cited reason is that large auditors have the resources and a great need to protect their reputation. Therefore, they devote more resources to each audit engagement than do small auditors (see, for example, DeAngelo, 1981; Dye, 1993). In fact, past studies have generally found that audit accuracy increases with auditor size (see, for example, Davidson and Neu, 1993; Lennox, 1999).

Findings from past research also suggest that a credible signal from hiring a large (big-N) auditor is valued by investors. For instance, Chaney and Philipich (2002) found that the market reacts with a stock price decline if the auditee announces a switch from a big-N to a non-big-N auditor because investors believe that the credibility of the auditee's financial statements will decline. Lin *et al.* (2009), Asthana *et al*. (2010), and Stunda (2012) reported similar findings. As financial report quality is valued by the market, auditees with high financial report quality are willing to pay higher costs to hire big-N auditors, who help to reveal more accurately the auditees' financial report quality to investors.

In contrast, for auditees with low financial report quality, hiring the more costly big-N auditors is not worthwhile because the audit results are unlikely to be favourable. Low-quality auditees may even switch to small and pliable auditors in an attempt to obtain more accounting flexibility (e.g., Hay and Davis, 2004). As such, the positive signal from hiring a big-N auditor

is credible to investors, who consider this signaling behaviour and effect when they evaluate a firm's financial report quality.

If auditees with high (low) financial report quality voluntarily select big-N (non-big-N) auditors, the big-N auditors would charge higher audit fees than the non-big-N auditors because the former not only devote more resources to each audit engagement but also convey a positive signal about the auditees' financial report quality. This signaling effect of hiring a large auditor has been documented by Carpenter and Strawser (1971) and Titman and Trueman (1986). However, no study has directly estimated the magnitude of this signaling effect as a part of the audit fee differential between large and small auditors.

This study considers the competition between big-N and non-big-N auditors and formulates the negative signal of a downward auditor switch from a big-N to a non-big-N auditor as a switching cost. This switching cost indicates the maximum signaling cost an auditee is willing to incur to hire a big-N auditor. In equilibrium, the fee differential between a big-N and a non-big-N auditor has two components: the difference in audit cost between the two types of auditor, which reflects their difference in audit accuracy, and the signaling cost of hiring the big-N auditor. This analytical formulation underpins an empirical framework for estimating the signaling cost as part of the fee differential between big-N and non-big-N auditors. Our empirical analysis considers not only audit fees but also non-audit fees because auditees are likely to take both into consideration when they make decisions on switching auditors. Our empirical findings show that auditees with higher financial report quality are willing to pay a higher signaling cost, and that non-audit fees embed a larger signaling cost component than audit fees do.

This study contributes to the literature in two ways. First, using detailed observations of auditor switches, this study is the first in the signaling literature to directly estimate the

signaling cost of hiring an external reviewer (i.e., auditor) for product quality (i.e., financial report quality). There have been limited empirical findings on the significance and magnitude of the signaling cost of hiring an external reviewer at the individual transaction level due to the lack of individual-level transaction data. Using data on audit fees and auditor switches at the individual auditee level, this study directly estimates the magnitude of each auditee's signaling cost associated with hiring a large auditor. Our findings reveal the presence of signaling costs associated with hiring an influential external reviewer of product quality, i.e., a large external auditor of financial report quality, in a real-world market. This study enhances understanding of the firm's (i.e., the auditee's) and the external reviewer's (i.e., the auditor's) strategic behavior in the presence of such signaling function as performed by the latter.

Second, this study adds insight into the ongoing debate on competition policies. The market for financial auditing is highly concentrated. In the UK, for instance, the big-four auditors earned 71% of all audit firm incomes in 2013 (Irvine, 2014). Similarly in the US, the big-four auditors handled 67% of all audit engagements in 2010 (Gerakos and Syverson, 2015). It has been argued that the big-N auditors' monopoly power in the financial audit market creates social losses. To restrain large auditors' market power, a regulation in the UK requires FTSE350 companies to put their statutory audit engagement out for tender every 10 years (Competition and Market Authority, 2014). A similar policy was proposed by the EU to cover all European public interest entities (Deloitte, 2014). Results from this study call on policy makers formulating competition policies to consider the signaling function performed by large auditors in the financial audit market, as this signaling function could improve resource allocation by alleviating the well-known problem of adverse selection arising from asymmetric information between firms and investors.

The rest of this article is organised as follows. Section 2 devises an analytical framework for the signaling cost associated with hiring a big-N auditor. Section 3 describes the data. Section 4 presents the empirical findings. Section 5 concludes the article.

2. Analytical Framework

Assume that auditors of the same size have the same cost structure and thus charge the same audit fee for providing the same audit service to the same auditee. Denote a big-N auditor as B and a non-big-N auditor as NB. Consider an auditee *i* who initially hires a B auditor and is considering a switch to another B or NB auditor in the current period.[4] The two succeeding auditors, B and NB, compete for auditee *i* by setting audit fees denoted by ρ_{Bi} and ρ_{NBi}, respectively, for their audit services to auditee *i*.

Apart from paying audit fees for audit services, auditees also pay their auditors with 'non-audit fees' for non-audit services such as financial consultancy. Therefore, auditees are likely to consider both audit and non-audit fees when making decisions on switching auditors. Frankel *et al*. (2002) documented that 96% of auditees purchase non-audit services and that non-audit fees comprise 70% of auditors' total fee revenues. According to Whisenant *et al.* (2003), audit and non-audit fees are determined simultaneously because they are related through a common set of fee determinants. If audit and non-audit fees are simultaneously determined by the same set of auditee characteristics, adding the latter to the former does not fundamentally change the analytical framework presented in this article. Therefore, the analysis of non-audit fees is left to the empirical part of this study.

[4] Without losing generality, one can alternatively assume that the auditee initially hires an NB auditor.

An auditee incurs a switching cost when it switches from one auditor to another. The gross cost of switching auditors has two components: the transaction cost (e.g., administrative and time costs) and the negative signal on financial report quality. Let $-m_i$ and $-s_i$ be the dollar values of these two components.[5] Assume that m_i is independent of the auditor type. Further assume that $s_i = 0$ for a lateral switch between two B auditors because it delivers neither a positive nor a negative signal about the auditee's financial report quality.[6] There is a negative signaling effect, $s_i > 0$, if the auditee switches downward from a B to an NB auditor.[7] As $-s_i$ indicates the negative signal from a downward auditor switch, s_i must equal the maximum signaling cost auditee *i* is willing to incur to avoid such a negative signal. In short, s_i is the signaling cost auditee *i* is willing to pay for a B auditor's signaling function.

Scenario 1: Voluntary switch

Auditee *i*'s decision on whether to switch auditors in period 2 depends on parameters ρ_{Bi}, ρ_{NBi}, m_i, and s_i. In our model, as auditors of the same size charge the same fee for the same service to the same auditee, an auditee who is initially hiring a B auditor will never switch to another B auditor if $m_i > 0$. The auditee will switch to an NB auditor if $\rho_{Bi} - \rho_{NBi} - s_i - m_i > 0$, and will stay with the original B auditor otherwise.

Scenario 2: Forced switch

[5] Our in-depth interview with accountants reveals that m_i is significant and mainly comprises the administrative and time costs of: the auditee's accounting department to educate the succeeding auditor on the firm's accounting systems such as the general ledger system, procurement system, payroll system, on-line payment gateway, and human resources; the senior executives such as the CFO to discuss with the succeeding auditor on the internal control system related to corporate governance and risk control; and the auditee's internal audit department to coordinate with the succeeding auditor on internal audit procedures. Moreover, there is no industry experience for an obvious relationship between m_i and auditor size.

[6] One can alternatively assume that the signal caused by a lateral switch is negative but less severe than that caused by a downward switch. Therefore, we normalise the value of *s* to zero for a lateral switch.

[7] $s < 0$ if one considers an alternative setting where the auditee initially hires an NB auditor. Such an alternative setting does not fundamentally change the analytical result of this study.

The voluntary switch scenario does not identify s_i from $s_i + m_i$. To solve this identification problem, we consider an alternative scenario in which auditee *i* is forced to switch auditors. A forced switch scenario in reality is usually caused by audit failures and regulatory violations. For instance, the collapses of Laventhol and Horwath in 1990 and Arthur Andersen in 2002 forced their clients to switch auditors. Moreover, nearly 15% of listed Chinese companies were forced to switch auditors in China after the unexpected suspension of eight Chinese audit firms' licenses by the regulator in 2001 (Chen *et al.*, 2009).

If auditee *i* is forced to switch auditors (i.e., staying with the original B auditor is no longer an option) and the transaction costs of switching (i.e., m_i) are by assumption independent of the succeeding auditor's type, the auditee will switch to an NB auditor if $\rho_{Bi} + m_i > \rho_{NBi} + s_i + m_i$, and will switch to a B auditor otherwise. Therefore, a forced switch scenario renders m_i to be irrelevant to decision making. Intuitively, m_i does not affect the decision whether to switch laterally or downward because m_i is the same in both cases. The auditee's decision on whether to switch to a B or an NB auditor is fully determined by ρ_{Bi}, ρ_{NBi}, and s_i.

Let $c_B(z_i)$ and $c_{NB}(z_i)$ be the cost functions of the succeeding B and NB auditors, respectively, where z_i is a vector of auditee *i*'s characteristics affecting the costs of auditing auditee *i*'s financial statements. It is a crucial assumption that $c_B(z_i) > c_{NB}(z_i)$ to reflect the difference in audit accuracy between the two types of auditor; that is, the B auditor devotes more effort and resources than the NB auditor to reviewing an auditee's financial statements. The B and NB auditors make the following profits from auditee *i*:

$$\pi_{Bi} = \rho_{Bi} - c_B(z_i) \text{ if } \rho_{Bi} - \rho_{NBi} - s_i < 0\ ,\ \pi_{Bi} = 0 \text{ otherwise.} \quad (1)$$

$$\pi_{NBi} = \rho_{NBi} - c_{NB}(z_i) \text{ if } \rho_{Bi} - \rho_{NBi} - s_i > 0\ ,\ \pi_{NBi} = 0 \text{ otherwise.} \quad (2)$$

π_{Bi} and π_{NBi} are assumed to be non-negative. In equilibrium, the setting of ρ_{Bi} and ρ_{NBi} should ensure that auditee *i* has no incentive to switch after it has selected an auditor. Using Shy's

(2002) undercut-proof property as the solution concept, the equilibrium pair of ρ_{Bi} and ρ_{NBi} should satisfy the following:

$$\rho_{Bi} - s_i - c_{\mathrm{NB}}(z_i) \leq 0 \text{ if the auditee has selected a B auditor.} \quad (3)$$

$$\rho_{NBi} + s_i - c_{\mathrm{B}}(z_i) \leq 0 \text{ if the auditee has selected a NB auditor.} \quad (4)$$

Equation (3) means that the B auditor sets the highest price ρ_{Bi} subject to the constraint that the NB auditor will not find undercutting ρ_{Bi} profitable. Similarly, Equation (4) means that the NB auditor sets the highest price ρ_{NBi} subject to the constraint that the B auditor will not find undercutting ρ_{NBi} profitable. In equilibrium, the two equations hold as equalities that give the following:

$$\rho_{Bi} - \rho_{NBi} = c_{\mathrm{NB}}(z_i) - c_{\mathrm{B}}(z_i) + 2s_i. \quad (5)$$

Equation (5) suggests that the fee differential between the B and NB auditors has two components: the difference between their audit costs and the signaling cost incurred in hiring the B auditor.

From Equation (5), the audit fee differential ($\rho_{Bi} - \rho_{NBi}$) between the B and NB auditors decreases with $c_{\mathrm{B}}(z_i)$ because a higher cost of the B auditor gives the NB auditor more room to charge a higher ρ_{NBi} without being undercut by the B auditor. For the same reason, $\rho_{Bi} - \rho_{NBi}$ increases with $c_{\mathrm{NB}}(z_i)$ because a higher cost of the NB auditor allows the B auditor to charge a higher ρ_{Bi} without being undercut by the NB auditor.

As $c_{\mathrm{NB}}(z_i) - c_{\mathrm{B}}(z_i) < 0$ by assumption, Equation (5) also implies that the B auditor cannot compete with the NB auditor for auditee *i* if the B auditor performs no signaling function (i.e., $s_i = 0$). Specifically, for the B auditor to be able to compete (i.e., $\rho_{Bi} \geq \rho_{NBi}$), the value of the B

auditor's signaling function to auditee i should be at least half of the audit cost difference between the two auditor types:

$$s_i \geq \frac{c_B(z_i) - c_{NB}(z_i)}{2}. \quad (6)$$

Equation (6) implies that the value of the B auditor's signaling function increases with the difference in audit accuracy between the B and NB auditors. The intuition is that the positive signal of hiring a B auditor is stronger and thus more valuable to the auditee if the B auditor's audit accuracy increases relative to that of the NB auditor.

If ρ_{Bi}, ρ_{NBi}, and z_i are observable, s_i can be estimated from Equation (5) for $i = 1, \ldots, N$ by the non-parametric method of data envelopment analysis (DEA) without specifying the functional forms of $c_{\mathrm{NB}}(.)$ and $c_{\mathrm{B}}(.)$.[8] Consider $\rho_{Bi} - \rho_{NBi}$ as the output and z_i as the input. The observation of auditee i's auditor switch lies below the output frontier and gives a positive value of s_i if $\rho_{Bi} - \rho_{NBi}$ is not maximised given z_i. Otherwise, $s_i = 0$ and thus the observation lies on the frontier if $\rho_{Bi} - \rho_{NBi}$ is maximised given z_i.

3. Data

The 2002 collapse of Arthur Andersen, one of the big-five auditors, provides a sample of forced auditor switches. The sample taken from *Audit Analytics* comprises downward switches of Arthur Andersen's former US clients to NB (i.e., non-big-four) auditors. The sample contains observations of audit and non-audit fees levied on each sample auditee by the initial B auditor (i.e., Arthur Andersen) and those by the succeeding NB auditor. The sample excludes auditees who laterally switched from the initial B auditor to another B auditor because such lateral

[8] Stochastic frontier analysis, an alternative approach, requires a specific functional form for the production/cost function.

switches provide no proxy for the succeeding NB auditor's fee to calculate the audit fee differential. The number of auditees in the sample is 97 after dropping those with missing observations and several extreme outliers.

Arthur Andersen's former clients switched auditors over the 2001–2002 period. Let t_i be the fiscal year in which auditee *i* switched from Arthur Andersen (i.e., the initial B auditor) to a succeeding NB auditor. ρ_{NBi} is the inflation-adjusted audit fee actually levied by the succeeding NB auditor in $t_i + 1$. Because the succeeding B auditor's audit fee is not observable for a downward auditor switch, ρ_{Bi} is proxied by the inflation-adjusted audit fee levied by the initial B auditor in $t_i - 1$ as auditors of the same type have the same cost structure and charge the same fee by assumption. ρ_{NBi} in $t_i + 1$ instead of t_i is used because the fee levied by the succeeding NB auditor in year t_i (i.e., the year when the auditor switch took place) may not cover the whole year of the audit service; ρ_{Bi} in $t_i - 1$ instead of t_i is used for the same reason.

As mentioned, audit and non-audit fees levied by auditors for audit and non-audit services to auditees are simultaneously determined by the same set of auditee characteristics. Moreover, auditees are likely to take both audit and non-audit fees into consideration when they make decisions on switching auditors. Therefore, in addition to the audit fees ρ_{Bi} and ρ_{NBi}, our empirical analysis also considers the total fees, ρ_{Bi}^{+} and ρ_{NBi}^{+}, as follows:

$$\rho_{Bi}^{+} = \rho_{Bi} + \psi_{Bi}, \tag{7.1}$$

and

$$\rho_{NBi}^{+} = \rho_{NBi} + \psi_{NBi}, \tag{7.2}$$

where ψ_{Bi} and ψ_{NBi} are the non-audit fees levied by the B and NB auditors for their non-audit services to auditee *i*, respectively.

Based on prior research on audit fee determinants, z_i in Equation (5) contains the following auditee characteristics:

- total assets (*ASST*) and
- inventory and accounts receivable as a percentage of total assets (*ACCR*).

These two variables represent the scale and complexity of the audit (Choi and Wong, 2007). Simunic and Stein (1996) and Francis *et al*. (1999) suggested that the audit effort required to produce a desired level of audit assurance increases with *ASST* and *ACCR*.

- Quick ratio (*QUIC*) measuring short-term liquidity.
- Dummy variable for net loss (*LOSS*).
- Dummy variable for equity deficit (*EQDF*).

Auditees suffering from a low short-term liquidity, a net loss, and/or a equity deficit have a higher probability of financial distress. [9] It is known that the auditor's litigation risk increases with the auditee's financial distress probability (St. Pierre, 1981; Choi and Wong, 2007). Auditors generally charge risky auditees a higher fee (Simunic, 1980; Simunic and Stein, 1996).

- SIC dummies are included to capture the possible industry effect.

The data on auditee characteristics were taken from Compustat and the Center for Research on Securities Prices.

Summary statistics for the major variables are provided in Table 1. As shown in the table, the mean audit fee differential between B and NB auditors is \$129,795 – \$118,623 = \$11,172, which is approximately 9.4% of an average NB auditor's audit fee levied on each auditee. The mean non-audit fee differential between B and NB auditors is \$105,391 – \$40,384 = \$65,007, which is substantially larger than the audit fee differential. The non-audit fee

[9] The quick ratio, also known as the 'acid-test ratio', is calculated as (current assets – inventories) / current liabilities.

collected by a B auditor from each auditee is on average 160% higher than that by an NB auditor. The next section empirically decomposes these fee differentials into two components, namely, the cost difference between the B and NB auditors and the signaling cost associated with hiring the B auditor.

** Insert Table 1 here **

4. Empirical Results

4.1. *Signaling cost*

The non-negative value of s_i embedded in the B auditor's audit fee for auditee *i* was estimated by applying the method of DEA on Equation (5) with $\rho_{Bi} - \rho_{NBi}$ as the output and z_i as the input. As such, s_i is the distance between the observed $\rho_{Bi} - \rho_{NBi}$ and the non-parametric output frontier. Our empirical analysis considers not only audit fees but also non-audit fees. Let $s_{\psi i}$ be the signaling cost embedded in the B auditor's total fee, which is calculated as the sum of audit and non-audit fees. $s_{\psi i}$ was estimated by replacing $\rho_{Bi} - \rho_{NBi}$ with $\rho_{Bi}^{+} - \rho_{NBi}^{+}$ in Equation (5), where ρ_{Bi}^{+} and ρ_{NBi}^{+} are defined in Equations (7.1) and (7.2).

Table 2 presents the summary statistics of the estimates of s_i and $s_{\psi i}$ for the 97 sample auditees. Panel 2.1 reports that the estimated s_i and $s_{\psi i}$ are zero for about one third of the sample auditees. In terms of DEA, s_i, $s_{\psi i} = 0$ if the observation of $\rho_{Bi} - \rho_{NBi}$ and z_i lies exactly on the output frontier. For this group of sample auditees, the observed fee differential between the B and NB auditors is fully explained by their difference in audit accuracy, and thus the B auditor performs no signaling function for the auditees' financial report quality.

Panel 2.2 of Table 2 reports summary statistics representing the entire sample of auditees with either zero or positive estimates of s_i and $s_{\psi i}$. As shown in this panel, the mean

estimated s_i is \$5,792 and $s_{\psi i}$ is \$19,362; these account for about 4.61% and 11.11% of the B auditor's audit fee and total fee, respectively.

Lastly, Panel 2.3 represents a subset of sample auditees with positive estimates of s_i and $s_{\psi i}$. For this group that accounts for about two third of the sample auditees, the mean estimated s_i and $s_{\psi i}$ are about 6.88% and 16.57% of the B auditor's audit fee and total fee, respectively. These positive estimates of s_i and $s_{\psi i}$ are analogical to the price premium paid for a higher Parker grade on top of the base price set on the basis of objective wine characteristics (Dubois and Nauges, 2010).

As both Panels 2.2 and 2.3 indicate, non-audit fees embed a larger signaling cost component than audit fees do. If one considers $s_{\psi i}$ as the total signaling cost of hiring a B auditor, our findings suggest that the B auditor collects approximately 70% of the total signaling cost from non-audit fees and the remaining 30% from audit fees. A plausible explanation is that the widespread pressure imposed by market forces on audit fees induces auditors to rely more on non-audit services for revenue growth (e.g., Singh, 2013; Ettredge *et al*., 2014). For instance, Beardsley *et al*. (2018) found that audit fee pressure has increased auditors' focus on non-audit services to subsidise the loss in profitability of audit services. This is consistent with our findings that auditors tend to plant a larger signaling cost component in non-audit fees than they do in audit fees.

** Insert Table 2 here **

4.2. *Signaling cost and financial report quality*

Past studies suggest that large auditors are effective in restraining auditees' opportunistic reporting of discretionary accruals that undermines financial report quality (Becker *et al*., 1998; Francis and Krishnan, 1999; Krishnan, 2003). As a firm's financial report quality is uncertain to and valued by investors (e.g., Chaney and Philipich, 2002), the higher the financial report

quality of the auditee, the higher the signaling cost the auditee is willing to pay for signaling its financial report quality to investors. By contrast, auditees with low financial report quality are unwilling to pay a high signaling cost of hiring a large auditor because the audit results are unlikely to be favourable. These auditees may even switch to a small and pliable auditor in an attempt to obtain more flexibility for further earnings management (Francis and Krishnan, 1999; Hay and Davis, 2004). Therefore, the signaling cost an auditee is willing to pay for hiring a large auditor is expected to be inversely related to the auditee's financial report quality.

This section empirically investigates whether the signaling cost of hiring a B auditor increases with the auditee's financial report quality. An auditee's financial report quality is proxied by its earnings quality prior to switching auditors. Earnings quality is the extent to which the auditee's reported earnings are free from aggressive earnings management like opportunistic use of discretionary accruals to increase reported earnings. Earnings quality therefore declines with aggressive earnings management.

Past research typically measures the degree of a firm's earnings management by abnormal accruals (*ABA*), predictability of cash flow (*PCF*), the Jones model (*JM*), the modified Jones model (*MJM*), the performance-matched accrual measure based on the Jones model (*PJM*), and the performance-matched accrual measure based on the modified Jones model (*PMJM*) (see, for example, Dechow *et al*., 2010). In this study, an integrated measure for degree of earnings management, denoted by $Q_i(t)$, is calculated as the first principal component of the absolute values of *ABA*, *PCF*, *JM*, *MJM*, *PJM*, and *PMJM* for auditee *i* in year *t*. Note that $Q_i(t)$ is an inverse measure of earnings quality and thus financial report quality.

Using the same notation from the last two sections, s_i and $s_{\psi i}$ are the signaling costs embedded in the B auditor's audit fee and total fee, respectively, when auditee *i* switches

auditors in year t_i. As s_i is a censored variable, the following dichotomous probit regression is estimated to examine the relationship between s_i and $Q_i(t_i\text{-}1)$:

$$S_i = \alpha + \beta\, Q_i(t_i\text{-}1), \text{ where} \tag{8}$$

$$S_i = \begin{cases} 0 & \text{if } s_i = 0 \\ 1 & \text{if } s_i > 0 \end{cases}.$$

To take non-audit fees into consideration, an alternative specification of Equation (8) is also estimated with s_i replaced by $s_{\psi i}$ and with S_i replaced by $S_{\psi i}$ as the dependent variable. Note that Equation (8) indirectly controls for auditee characteristics (z_i) through the estimation of s_i and $s_{\psi i}$ in Equation (5).

The first column of Table 3 reports the probit regression results. The estimated coefficient of $Q_i(t_i\text{-}1)$ is significantly negative for both specifications using S_i and $S_{\psi i}$ as the dependent variables, implying that an auditee's likelihood of incurring a positive signaling cost increases with its financial report quality.[10]

** Insert Table 3 here **

To check whether the signaling cost increases with auditee *i*'s financial report quality, Equation (8) is re-estimated by an ordered probit regression with S_i replaced by $\tilde{S}_i$ as the dependent variable, where

$$\tilde{S}_i = \begin{cases} 0 & \text{if } s_i = 0 \\ 1 & \text{if } \tilde{s} > s_i > 0 \\ 2 & \text{if } s_i > \tilde{s} \end{cases} \tag{9}$$

and $\tilde{s}$ is the median of s_i, $\forall s_i \neq 0$. In an alternative specification to include non-audit fees, $\tilde{S}_{\psi i}$ instead of $\tilde{S}_i$ is used as the dependent variable by replacing s_i with $s_{\psi i}$ in Equation (9). The

[10] The reported chi-square statistic = $2(L1 - L0)$, where L0 and L1 are the full model log-likelihoods. It is known that the pseudo *R*-square = $1 - L1/L0$ should not be interpreted in the same way as the OLS-based *R*-square because the former is not calculated to minimise variance.

significantly negative coefficient of $Q_i(t_i\text{-}1)$, as reported in the middle column of Table 3, suggests that auditees with higher financial report quality are more likely to pay a higher signaling cost.

To check the robustness of our findings, the last column of Table 3 reports the results of a left-censored tobit regression of s_i and $s_{\psi i}$ on $Q_i(t_i\text{-}1)$. Consistent with the results from the probit and ordered probit regressions, the coefficient on $Q_i(t_i\text{-}1)$ from the tobit regression is statistically significant at the 5% level when $s_{\psi i}$ is used as the dependent variable. However, when s_i replaces $s_{\psi i}$ as the dependent variable, the coefficient on $Q_i(t_i\text{-}1)$ becomes marginally insignificant at the 5% level (or significant only at the 10% level). This finding is indeed consistent with those from Table 1, suggesting that large auditors embed a more significant proportion of the total signaling cost in non-audit fees than in audit fees. Taken together, findings from this section confirm that auditees with higher financial report quality tend to pay a higher signaling cost of hiring a large auditor to signal their financial report quality.

5. Conclusions

Independent expert review of a product conveys information about the product's quality to the buyers when the seller knows more than the buyers about the true product quality. External auditors in the financial audit market perform a similar expert review function to resolve asymmetric information regarding a firm's financial report quality. While a firm's hidden earnings management and manipulation activities make its financial report quality uncertain to investors, the external auditor hired by the firm provides reasonable assurance that the audited financial statements are free of material misstatements and comply with accounting standards.

Large auditors generally charge substantially higher audit fees than do small auditors. Investors cannot directly observe an auditor's audit accuracy and tend to associate large

auditors with greater accuracy. As financial report quality is valued by the market, auditees with high financial report quality are willing to pay higher costs to employ large auditors, who will more accurately reveal the auditees' financial report quality to investors. However, paying the higher costs to employ large auditors is not worthwhile for auditees with low financial report quality because the audit results are unlikely to be favourable. Therefore, large auditors charge much higher audit fees than small auditors because the former not only devote more resources to each audit engagement but also convey a positive signal about the auditees' financial report quality.

This study considers the competition between large and small auditors and formulates the negative signal of a downward auditor switch from a large to a small auditor as a switching cost. The switching cost is essentially the maximum signaling cost an auditee is willing to pay to avoid the negative signal from a downward auditor switch. In equilibrium, the fee differential between a large and a small auditor has two components: the difference in audit cost between the two types of auditor, which reflects their difference in audit accuracy, and the signaling cost of hiring the large auditor.

Using data on audit fees and auditor switches at the individual auditee level, this study directly estimates the magnitude of each sample auditee's signaling cost associated with hiring a large auditor. Our empirical findings suggest that for auditees incurring a positive signaling cost, the mean signaling cost is approximately 6.88% and 16.57% of a large auditor's audit fee and total fee, respectively, where the total fee is the audit fee plus non-audit fee. Our findings also show that when facing market pressure on audit fees, large auditors tend to embed a larger signaling cost component in non-audit fees than they do in audit fees. Specifically, a large auditor collects approximately 70% of the total signaling cost from non-audit fees and the remaining 30% from audit fees. Moreover, auditees with higher financial report quality are willing to pay a higher signaling cost to signal their financial report quality to investors.

Our findings reveal the presence of signaling costs as well as the signaling function performed by influential external reviewers of financial statements, i.e., large auditors, in a real-world market. It has been argued that large auditors' monopoly power in the financial audit market creates social losses. However, the signaling function performed by large auditors may help alleviate the well-known problem of adverse selection arising from asymmetric information between firms and investors. This study's findings thus call on policy makers formulating competition policies to consider large auditors' signaling function in the financial audit market.

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Table 1: Summary statistics

	Before auditor switch (auditor type: B)		After auditor switch (auditor type: NB)	
	Mean	Std. dev.	Mean	Std. dev.
Audit fee (s_i)	129795	85374	118623	92162
Non-audit fee ($s_{\psi i}$)	105391	154943	40384	59381
ASST	96.778	211.064	77.590	228.513
ACCR	0.170	0.159	0.178	0.178
QUIC	2.084	3.358	1.588	2.070
LOSS	0.651	0.478	0.650	0.479
EQDF	0.110	0.314	0.210	0.409

Notes: *ASST*, *ACCR*, *QUIC*, *LOSS*, and *EQDF* are total assets, accounts receivable to total assets, quick ratio, loss dummy, and equity deficit dummy, respectively.

Table 2: Estimates of signaling cost

Signaling cost		s_i	$s_{\psi i}$
Panel 2.1 Number of auditees with s_i, $s_{\psi i} = 0$ (% of the total)		33 (34%)	32 (33%)
Panel 2.2 Auditees with s_i, $s_{\psi i} \geq 0$	Mean s_i and $s_{\psi i}$	$5,792	$19,362
	Mean ratio of s_i to ρ_B.	4.61%	-
	Mean ratio of $s_{\psi i}$ to ρ_B^+.	-	11.11%
Panel 2.3 Auditees with s_i, $s_{\psi i} > 0$	Mean s_i and $s_{\psi i}$	$8,645	$28,894
	Mean ratio of s_i to ρ_B.	6.88%	-
	Mean ratio of $s_{\psi i}$ to ρ_B^+.	-	16.57%

Notes: ρ_{Bi} and ρ_{NBi} are the audit fees levied by the B and NB auditors, respectively, on auditee i. ρ_{Bi}^+ and ρ_{NBi}^+ are the total fees (= audit fees plus non-audit fees) levied by the B and NB auditors, respectively. s_i and $s_{\psi i}$ are the signaling costs embedded in $\rho_{Bi} - \rho_{NBi}$ and $\rho_{Bi}^+ - \rho_{NBi}^+$, respectively.

Table 3: Signaling cost and financial report quality

	Probit regression		Ordered probit regression		Tobit regression (left-censored)	
Independent variable	Dependent variable = S_i	Dependent variable = $S_{\psi i}$	Dependent variable = $\tilde{S}_i$	Dependent variable = $\tilde{S}_{\psi i}$	Dependent variable = s_i	Dependent variable = $s_{\psi i}$
$Q_i(t_i-1)$	–0.4301* (0.038)	–0.5925* (0.2515)	–0.3812* (0.1896)	–0.4507* (0.2123)	–6577.213† (3545.229)	–16559.28* (8365.443)
Constant	0.6363** (0.1692)	0.7440** (0.1815)	-	-	4050.311 (2542.76)	18017.05** (5622.825)
Thresholds	-	-	–0.6094, 0.2676	–0.6693, 0.2114	-	-
LR chi-square	5.00* *p*-value = 0.0253	7.73** *p*-value = 0.0054	4.60* *p*-value = 0.0319	5.59* *p*-value = 0.0181	3.97* *p*-value = 0.0464	4.91* *p*-value = 0.0267

Notes: Values in parentheses are standard errors. * indicates significance at the 5% level. ** indicates significance at the 1% level. † indicates significance at the 10% level.