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Audit firm, retain or rotation? (client and audit firm perspectives)

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Abstract: The purpose of this study is providing a framework for understanding the role of audit firm rotation in client expected value. And to explain the principles of client choice by auditor via specified models. We formalize this idea through stake-holder theory. Results show that the owners' expected outcome is increase in the level of reporting quality, all else held equal. Also client selection is a decrease in function with regard to the factors affecting it. Like the number of sub-branches, probability of good selection, probability of good perceived in a branch point, stages ahead and taking account of investigative intuition. We propose that retain-rotation audit firm vs. good or bad selection client relationship developed based on bid and ask process. Drawing on our analytical framework, we provide directions for further opportunities for research of client and audit firm.

Subjects: Economics, Finance, Business & Industry; Business, Management and Accounting; Auditing; Corporate Governance

Keywords: audit firm; client selection; model

JEL classification: C6; G2

1. Introduction

Over the past few years, the audit market has been subject to intense policy debates around the world, focusing in particular on the issue of concentration, choice, and liability. And it also considered the relationship between audit firm and the owner (Basioudis & Fifi, 2004; Gerakos & Syverson,

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PUBLIC INTEREST STATEMENT

In the current study, we suggest an explanation based on stakeholder theory. According to this theory, owners' expected outcome is increase in the level of reporting quality, all else held equal. We show that relationship between audit firm and client has developed based on bid and ask process. Also, we investigate the mutual relationship between audit firm and client in a mathematical model.

2012; Griffin & Lont, 2007). Based on economic theories, tendency of individuals and different groups to achieve a better position leads the property rights to the most valuable position; and thereby the produced scarce resources are adequately allocated. Thus, the production and supply of a particular good or service, or lack of it can be considered as a logical consequence of mechanisms that exist in the market and the value of the good or service reflects the views of consumers (Wallace, 1987). Fontaine, Ben Letaifa, and Herda (2013) indicate that owners are more likely to rotate audit firms when they understand that the audit firm mismanages the auditor–client relationship. Specifically, owners are more likely to rotate firms when they understand that their auditor is not available to them. Availability is aspect of audit service. That is previously unexplored elements of value-added audit services. Also they find evidence indicating that a close relationship with client management can help audit firms compensate for higher audit fees and extra billings by reducing their importance.

Audit service quality as opposed to audit quality plays a significant role in audit firm retention decisions (DeAngelo, 1981). From the owners' viewpoint, improvement of audit firm quality should lead to high stock value or expected value. Audit service quality leads to reporting quality and finally rising wealthy owners. Broadly speaking positive or negative signal from audit firm with regard to the audit firm quality and reporting quality could lead to retain or rotation. The length of auditor-other stakeholders' relationships constitutes a major issue in the auditor conflict of interest, because long relationships may cause auditor complacency about management decisions regarding the firm's reporting quality. Following this view, the mandatory rotation of external auditors has long been suggested to improve independence (Blandóna & Bosch, 2013). Independence is one of the factors that affect on audit firm quality. But in this research it is considered indirectly.

In this paper, we provide a framework for understanding the role of audit firm rotation in client expected value. We analyze the effect that reporting quality has on the contractual and monitoring relationship between the owners and the audit firm. We view the quality of information the firm discloses as a choice variable that affects the contracts between the owners and its audit firm. Through its impact on reporting quality, higher quality disclosure both provides benefits and imposes costs. The benefits reflect the fact that more accurate information about performance allows owners to make better decisions about their audit firm. The costs arise because audit firm has to be compensated for the increased risk to their careers implicit in higher disclosure levels, as well as for the incremental costs they incur trying to distort information in equilibrium. These costs and benefits complement existing explanations for transparency.

The objective for an audit is according to International Standards of Auditing (ISA) to enhance the degree of confidence of intended stakeholders in the financial reports. This is achieved by the expression of an opinion by the audit firm on whether the financial reports are prepared, in all material respects, in accordance with an applicable financial reporting framework. This opinion is on whether the financial reports give a true and fair view. It should be based on a reasonable assurance about whether the financial reports as a whole are free from material misstatement (Laitinen & Laitinen, 2014). Thus auditors are purposed to increase theoretical understanding of how audit quality is generated through the fundamental characteristics in a betrothal. Four main reasons of Fontaine et al. (2013) for rotation emerged from their interviews: audit fees, extra billings, business knowledge, and relationship issues.

In this research, we concentrate on audit fees as an effective factor in owner and audit firm contract. And we explore how an audit firm accepts or rejects working proposal from client. We formalize this idea through an extension of Hermalin and Weisbach (2007) and Laitinen and Laitinen (2014). The remainder of the paper is structured as follows: In the next section we review the model and literature. We then outline the research method. This is followed by the conclusion.

2. The model

The focus of our model is the relationship between the audit firm and the firm's owners. The owners seek to assess the audit quality based on the information available to them, and to replace it if the assessment is too low. The audit firm has career concerns, so it is concerned about information transmittal to the broader market. This concern provides it incentives to do what it can to influence the value and informational properties of the information to which the owners have access. Exogenous regulatory changes that affect disclosure quality thus affect both the information available to the owners, and the audit firm's response to the information. The model has the following timing and features.

Stage 1. The owners of a firm establish a level of reporting quality, q (its choice may be constrained by legal restrictions). The owners also hire an audit firm from a pool of ex ante identical would-be audit firms. Assume the owners make a take-it or leave-it offer to the audit firm. A given audit quality, α, is an independent random drawn from a normal distribution with mean 0 and known variance $1/\tau$ (τ is the precision of the distribution). Normalizing the mean of the audit quality distribution to zero is purely for convenience and is without loss of generality.

Stage 2. After the audit firm has been employed for some period, a public signal, s, pertaining to the audit quality is realized. The signal is distributed normally with a mean equal to α and a variance equal to $1/q$. Letting the precision, q, of the distribution be the same as the quality of reporting, q, is without loss of generality as we are free to normalize "reporting quality" using whatever metric we wish.

Stage 3. The owners decide, on the basis of the signal, whether to retain or rotation the audit firm.

Stage 4. Specifying good and bad client selection with regard to audit firms' perspective using tree model.

2.1. Audit firm preferences and audit quality

An audit quality is fixed throughout its career. We follow Wallace (1987) by assuming that the audit firm, like all other stakeholders, knows only the distribution of its quality. DeAngelo (1981) defines audit quality as the market-assessed joint probability that an auditor will discover a breach in the accounting system and report the breach, both of which are affected by auditor independence (Rezaee, Lo, & Suen, 2013). We assume that both the audit firm and potential employers learn about their quality from their actual performance and potential personnel can observe this past performance. In the sense that how do they increase the quality of financial reporting?

We assume that the audit firm's lifetime utility is

$$U(F_1) + U(F_2) \tag{1}$$

where F_1 is its fee as set in Stage 1 and F_2 is its fee as set in Stage 3. Note that, for convenience and without loss of generality, that we ignore temporary discounting. Also observe that we have ruled out deferred or contingent payments from the Stage 1 personnel to the audit firm at Stage 3. In our analysis, we assume the audit firm is risk averse (see Baldauf, Pummerer, & Steller, 2012). At some points in the analysis it is convenient to assume that the audit firm has the CARA utility function. We know that, CARA utility is a class of utility functions. Also it called exponential utility. Has the form, for some positive constant a; $u(c) = -(1/a)\, e^{-ac}$ "Under this specification the elasticity of marginal utility is equal to -ac, and the instantaneous elasticity of substitution is equal to $1/ac$." The coefficient of absolute risk aversion is a; thus the abbreviation CARA for Constant Absolute Risk Aversion.

$$U(F) = -1/\rho \exp(-\rho F) \tag{2}$$

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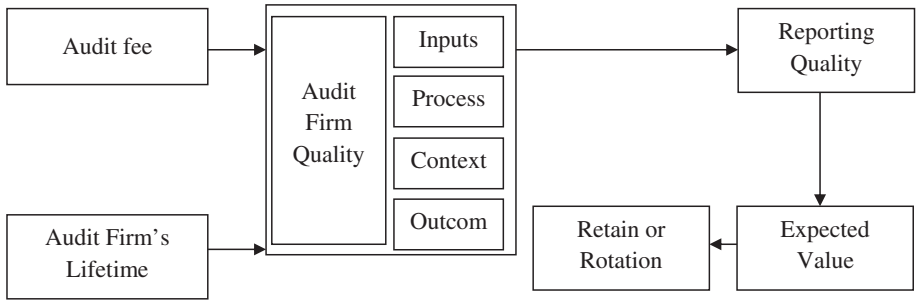

Figure 1. The reciprocal evaluation processes among audit firm quality, reporting quality and factors affecting them.

where ρ is the coefficient of absolute risk aversion. Note the CARA utility function satisfies the assumptions given above for the utility function. We can consider the case of a risk-neutral audit firm to be the limiting case as $\rho \downarrow 0$. The audit firm has a reservation utility, U_R. If, expected utilities' audit firms cannot be less than U_R; otherwise it will not accept the contract audit.

After the signal, *S*, is observed, the stakeholders (for example, owners) update their beliefs about the audit quality. The posterior distribution of audit quality is also normal.

$$\hat{\alpha} = \frac{qs}{q+\tau} \text{ and } \tau' = \tau + q \tag{3}$$

We assumed that the distribution of the signal *S* given the audit firm's true quality, α is normal with mean α and variance $1/q$; hence, the distribution of *s* given the prior estimate of the audit quality, 0 is normal with mean 0 and variance $1/q + 1/\tau$. Define

$$H = \frac{q\tau}{q+\tau} \tag{4}$$

To be the precision of *S* given the prior estimate of audit quality, 0.

2.2. The retain/rotation decision

The concept of audit firm rotation has been brought up several times by regulators for the purpose of improving auditing quality. Suppose that the outcomes realized by the firm if the audit firm was retained at Stage 3 is

$$R = \bar{r} + \alpha + \varepsilon - F_1 \tag{5}$$

where $\bar{r}$ is a known constant and ε is an ex ante unknown amount distributed normally with mean 0 and variance σ_ε^2. And *R* is decision return. Assume that the owners are risk neutral. The decision that they make at Stage 3 is whether to retain the audit firm, in which case their outcomes will be *R* as given by expression (5) or to fire the audit firm, in which case their outcomes will be

$$R = \bar{r} + \alpha_N + \varepsilon - F_1 - RC \tag{6}$$

where α_N is the quality of the new (replacement) audit firm. And *RC* its rotation cost. We assume that the firm cannot escape its fee obligation to the initial audit firm, hence the $-F_1$ term. The amount, *RC* which is assumed to be non-negative, reflects the costs associated with rotation the initial audit firm. Audit firm rotation increased the audit cost to clients (Kwon, Lim, & Simnet, 2010). These costs are assumed to represent the cost of disruption plus the compensation necessary to hire the new audit firm for the latter stages of the auditing process. Because the owners are risk neutral and the

unconditional expectation of an audit quality is zero, the owners make their decision to retain or fire the initial audit firm based on a comparison between what they expect to receive if they retain it,

$$\bar{r} + \hat{\alpha} - F_1 \tag{7}$$

And what they expect to receive if they rotate it,

$$\bar{r} - F_1 - RC \tag{8}$$

The former is less than the latter $\hat{\alpha} < -R$. Using expression (3), we can restate this rotation condition in terms of the signal as follows: owners rotate the initial audit firm if and only if

$$s < -\frac{(q+\tau)R}{q} \equiv S \tag{9}$$

Auditors in the capital market provide their services for a valuable function of lending their credibility over the financial reporting of public listed firms in an attempt to increase the expected value. The effect of audit firm rotation in firm value and financial performance is due to additional associate cost to reduce asymmetric information among owners, managers and other stakeholders. Since mandated audit firm rotation beginning in 2006, in Korea, Kwon et al. (2010) show a decrease in cost of debt and an increase in firm value for a firm with the mandatory audit firm rotation, which is consistent with the auditor entrenchment argument. Khatab (2013) shows that the audit rotation has significance effect of the firm value. In spite of many factors we propose the following model: Expected Value = *F* (audit firm quality, reporting quality). Laitinen and Laitinen (2014) discussed four dimensions of audit quality indicators; inputs, process, context, and outcomes. But we concentrated in outcomes. Given this option of change, the company's expected value prior to receiving a signal with precision q is

$$V = \bar{r} - F_1 + \int_{-\infty}^{\infty} \max\left\{-R, \frac{qs}{q+\tau}\right\} \sqrt{\frac{H}{2\pi}} e^{\frac{-Hs^2}{2}} ds \tag{10}$$

With regard to: $\left\{ \begin{array}{l} \text{If:Rotate } V = \bar{r} - F_1 - R \\ \text{If:Retain } V = \bar{r} - F_1 + \hat{\alpha} \end{array} \right\}$ then:

$$V = \bar{r} - F_1 + \text{Max}\{-R, +\bar{\alpha}\} \tag{11}$$

We calculate the mathematical expectation function:

$$E(V) = E(\bar{r} - F_1 + \max\{-R, \hat{\alpha}\})$$

$$V = E(\bar{r}) - E(F_1) + E(\max\{-R, \hat{\alpha}\})$$

$$V = \bar{r} - F_1 + \int_{-\infty}^{\infty} \max\{-R, \hat{\alpha}\} K(s) ds$$

Distribution of S is normal $\left(S \sim N\left(\alpha, \frac{1}{q}\right)\right)$. Because:

$$E(s) = \alpha$$

$$s = (s - \alpha) + \alpha$$

$$E(s) = E((s-\alpha)+\alpha) = E(s - E(s)) + E(\alpha) = E(s) - E(E(s)) + E(\alpha) = E(s) - E(s) + 0 = 0$$

$$\text{var}(s) = \text{var}(s-\alpha) + \text{var}(\alpha) = \text{var}(s) + \text{var}(\alpha) = \frac{1}{q} + \frac{1}{\tau} = \frac{q+\tau}{q\tau} = \frac{1}{H} \quad S \sim N\left(0, \frac{1}{H}\right)$$

Thus:

$$K(s)=\frac{1}{\sqrt{2\pi\sigma}}e^{\frac{-s^2}{2\sigma^2}},S\sim N\left(0,\frac{1}{H}\right)$$

$$K(s)=\frac{1}{\sqrt{2\pi\sigma}}e^{\frac{-s^2}{2\sigma^2}}=\frac{1}{\sqrt{2\pi}\frac{1}{\sqrt{H}}}e^{\frac{-s^2}{2/H}}=\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}$$

We rewrite the expected value:

$$V=\bar{r}-F_1+\int_{-\infty}^{\infty}\max\{-R,\hat{\alpha}\}\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds$$

$$V=\bar{r}-F_1+\int_{-\infty}^{s}\max\{-R,\hat{\alpha}\}\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds+\int_{s}^{\infty}\max\{-R,\hat{\alpha}\}\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds$$

$$V=\bar{r}-F_1+\int_{-\infty}^{s}-R\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds+\int_{s}^{\infty}\hat{\alpha}\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds=\bar{r}-F_1+\mathbf{I_1}+\mathbf{I_2}$$

$$\mathbf{I_1}=\int_{-\infty}^{s}-F\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds$$

$$\mathbf{I_2}=\int_{-\infty}^{s}\hat{\alpha}\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds$$

Relationships among H, $\hat{\alpha}$ and τ leads to:

$$\mathbf{I_2}=\int_{s}^{\infty}\frac{q}{q+\tau}s\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds=\int_{s}^{\infty}\frac{H}{\tau}s\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds=\frac{\sqrt{H}}{\tau}\int_{s}^{\infty}\frac{1}{\sqrt{2\pi}}HSe^{\frac{-Hs^2}{2}}ds$$

$$=\frac{-\sqrt{H}}{\tau}\int_{s}^{\infty}\frac{-1}{\sqrt{2\pi}}HSe^{\frac{-Hs^2}{2}}ds=\frac{-\sqrt{H}}{\tau}\left(\frac{1}{\sqrt{2\pi}}e^{\frac{-Hs^2}{2}}\right)=\frac{-\sqrt{H}}{\tau}\left(0-\frac{1}{\sqrt{2\pi}}e^{\frac{-Hs^2}{2}}\right)$$

Assuming that:

$$Z^2=Hs^2,\quad z=s\sqrt{H},\quad \frac{e^{-\frac{Hs^2}{2}}}{\sqrt{2\pi}}=\frac{e^{-\frac{z^2}{2}}}{\sqrt{2\pi}}=\emptyset(z)$$

$$\mathbf{I_2}=\frac{-\sqrt{H}}{\tau}\left(0-\frac{1}{\sqrt{2\pi}}e^{\frac{-Hs^2}{2}}\right)=\frac{-\sqrt{H}}{\tau}\left(-\emptyset(z)\right)=\frac{\sqrt{H}}{\tau}\emptyset(z)$$

$$\mathbf{I_1}=\int_{-\infty}^{s}-f\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds=-f\int_{-\infty}^{s}\sqrt{\frac{H}{2\pi}}e^{\frac{-Hs^2}{2}}ds$$

$$Z^2 = Hs^2, \quad z = s\sqrt{H}, \quad dz = \sqrt{H}\,\mathrm{ds} \longrightarrow \mathrm{ds} = \frac{dz}{\sqrt{H}}$$

$$\mathbf{I}_1 = -R\int_{-\infty}^{z=s\sqrt{H}} \frac{\sqrt{H}}{\sqrt{2\pi}} e^{\frac{-z^2}{2}} \frac{\mathrm{dz}}{\sqrt{H}} = -R\int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} e^{\frac{-z^2}{2}} \frac{\mathrm{dz}}{1} = -R\left(\int_{-\infty}^{z} \emptyset(z)dz\right)$$
$$= -R(\Phi(z) - \Phi(-\infty) = -R\big(\Phi(z) - 0\big) = -R\Phi(z)$$

$\Phi = \emptyset$
$\int \emptyset \mathrm{dz} = \Phi$

On the other hand:

$$Z = \sqrt{H}s, \quad H = \frac{q\tau}{q+\tau} \text{ and } \quad s < -\frac{(q+\tau)R}{q} \equiv S$$

$$Z = \sqrt{H}S = -\frac{R\tau}{H}\sqrt{H} \quad Z = \frac{-\tau R}{\sqrt{H}}$$

$$V = \bar{r} - F_1 + \mathbf{I}_1 + \mathbf{I}_2 = \bar{r} - F_1 - R\Phi\left(S\sqrt{H}\right) + \frac{\sqrt{H}}{\tau}\emptyset\left(S\sqrt{H}\right) \tag{12}$$

Based on what was shown:

LEMMA 1 *The owners' expected outcome (V) is increasing in the level of reporting quality, all else held equal.*

Proof It is sufficient to show that $\frac{\partial V}{\partial q}$ is positive. Observe

$$V = \bar{r} - F_1 + \frac{\sqrt{H}}{\tau}\emptyset(Z) - \Phi(Z)R, \quad Z = \frac{-\tau R}{\sqrt{H}}, \quad H = \frac{q\tau}{q+\tau}$$

$$\frac{\partial V}{\partial q} = \frac{\frac{\partial H}{\partial q}}{2\tau\sqrt{H}}\emptyset(Z) = \frac{1}{2\tau\sqrt{H}}\frac{\tau^2}{(q+\tau)^2}\emptyset(Z) > 0$$

If q is assumed to be constant, then $\sqrt{H}$ is fixed. Therefore,

$$\frac{\mathrm{dV}}{\mathrm{dZ}} = \frac{\mathrm{d}}{\mathrm{dZ}}\left(\frac{\sqrt{H}}{\tau}\emptyset(Z) - \Phi(Z)R\right) = \frac{d}{\mathrm{dZ}}\left(\frac{\sqrt{H}}{\tau}\emptyset(Z)\right) - \frac{\mathrm{d}}{\mathrm{dZ}}(\Phi(Z)R) \tag{13}$$

$$\frac{\mathrm{dV}}{\mathrm{dZ}} = \frac{\sqrt{H}}{\tau}\frac{\mathrm{d}}{\mathrm{dZ}}\big(\emptyset(Z)\big) - R\frac{\mathrm{d}}{\mathrm{dZ}}(\Phi(Z))** \tag{14}$$

On the other hand, we have:

$$\emptyset(Z) = e^{-z^2/2} \rightarrow \frac{\mathrm{d}\emptyset(Z)}{\mathrm{dZ}} = -Ze^{-z^2/2} = -Z\emptyset(Z)$$

$$\frac{\mathrm{d}}{\mathrm{dZ}}(\Phi(Z)) = \emptyset(Z)$$

Substituting values in (14):

$$\frac{dV}{dZ} = -\frac{\sqrt{H}}{\tau}\frac{-\tau R}{\sqrt{H}}\emptyset(Z) - R\emptyset(Z) = 0$$

The latter phrase means, in this case, *V* is constant. Broadly speaking, audit firm rotation is in direct contact with expected value via reporting quality. We illustrate in Figure 1 the reciprocal evaluation processes among audit firm quality, reporting quality, and factors affecting them.

3. Audit fee, auditing quality and retain or rotation

This study focuses on auditors as providers of financial and professional services. While such services traditionally have been associated with certain tasks, responsibilities, and professional conduct, they have been rather unassociated with marketing tasks. Audit fee is in conjunction with auditing marketing topic (Basioudis & Fifi, 2004; Broberg, Umans, & Gerlofstig, 2013; Mahdavi & Daryaei, 2015).

To study how auditors balance their inherent auditing responsibilities and conduct with the imposed marketing tasks, it is important to know what tasks are included in the auditing profession and what characterizes the marketing of professional services. In doing so we suppose owners and auditors and other stakeholders create balance. Because if not, based on what has already discussed the signal, rotation processes occurs. Issues like entering to new markets, improving research and development and reaching new technologies, economical savings, and globalization lead to owners look to stakeholders' contracts more closely (Broberg et al., 2013). Based on what was discussed, study on auditing as a financial and professional service and its relationship to marketing has emerged over the past decade, presumably as a response to changes in the business environment. We discuss the auditing marketing and its impact on contracts.

Relationship between audit firms and companies (the owner) has agreed the terms of a marketing concept that occurs in a time period. This agreement is an agreement in the form of contract and contract audits to be performed. The sale agreement describes the relationship between the interaction of suppliers and buyers and also suggests strategies to explain how such a phenomenon helps cooperation between suppliers and buyers. To create benefits for customers (or consumers') suppliers need to maintain their competitive advantage. The most competitive advantages are on price and quality of the product (or service). There are two ways for the seller (service provider) to create value for the buyer. An increase in profits by reducing costs for the buyer, the buyer reduces costs through increased buyer interest. Mental models for understanding the ways in which the research will be used in fact, these model subjects' perceptions of the causes, and events depict relevant results.

4. Client selection from the auditor's perspective

Based on the stakeholder theory is that as large companies have and its impact on society is so deep that the addition of shareholders, the greater part of the community and are responsive. This answer does not crystallize unless a balance between enforcement activities occur auditors (Mahdavi & Daryaei, 2015). Thus, retain-rotation audit firm vs. good or bad selection client without paying attention to the stakeholders contract is not possible.

The audit standards require the auditor to obtain reasonable assurance about whether the financial statements as a whole are according to accounting standards. This reasonable assurance is a high level of assurance. The probability that the auditor can comply with auditing standards, as well as receive desired fees is *P* (probability of good selection) and the probability that the auditor cannot comply with auditing standards, as well as do not receive desired fees is *Q* (probability of bad selection). Therefore, in this framework *P* and its complement $Q = 1 - P$ refer to the Client Selection (CS). Therefore, the principal idea of the model is to derive the probability *P* for the CS. In each CS stage (branch point of the tree), the auditor can discover d branch points (in the tree) at the distance of one

stage, d^2 branch points at the distance of two stages and, in general, d^k branch points at the distance of k stages. Taking account of investigative intuition v, the auditor is able to investigate CS in

$$D = d^1 + d^2 \ldots + d^v = \frac{d(d^v - 1)}{(d - 1)} \tag{13}$$

branch points. Each branch point of the tree is identical with respect to the number of sub-branches (d) and probability of good selection (p). Thus, the auditor is not faced by the problem of optimization being indifferent to what path to choose and continue. When the auditor proceeds and continues the CS, in the next stage (branch point) he or she is able to see d^v new branch points. Thus, after m periods, md^v new branch points will appear. Since the CS has resources to investigate for H stages ahead, the auditor can under this constraint continue (after the initial stage) for a maximum of $H - v$ stages to search for a good CS.

The probability that a branch point does not include a good selection is $1 - p$. However, the probability that a branch point includes a bad selection but the auditor perceives it as a good selection, is $p(1 - r)$. Let r be the probability of good perceives in a branch point. Thus, the probability that a branch point does not include bad selection or it does include a bad selection but the auditor is unable to perceive it is $q = 1 - p + p(1 - r) = 1 - rp$. Probability Q depends on q and the number of branch points investigated (N). When the CS starts, the auditor is first able to investigate D branch points. Then, the auditor under the budget constraint can proceed $H - v$ stages and investigate $(H - v)d^v$ new branch points and thus $N = D + (H - v)d^v$. For this random tree, Q is simply:

$$Q = q^N = (1 - rp)^{D+N-D} = (1 - rp)^{\frac{d(d^v-1)}{(d-1)} + (H-v)d^v} = 1 - P \tag{14}$$

If we define a binary random variable where the probability for the event (outcome) "Doing bad selection" is ($1 - rp$) and for the event "Doing good selection" respectively rp, it follows a binomial distribution, because the CS process is here consisted of a sequence of independent experiments. Thus, we can define the probability that the auditor can select k branch points including a good selection in the following way:

$$P(k, N, rp) = \frac{N!}{k!(N - k)!}(rp)^k(1 - rp)^{N-k} \tag{15}$$

LEMMA 2 *Q is a decreasing function with regard to the factors affecting it.*

Proof It is sufficient to show that the partial derivatives of Q with respect to p, r, d, H, and v. All these partial derivatives are negative.

Which equals (15) when $k = 0$. For this binomial distribution it holds that the expected number of branch points to be investigated before the first point including good selection, is simply $1/(rp)$ while the expected value of the total number of such branch points is Nrp. Equation (14) shows the probability Q that the auditor cannot select any branch point including a good selection. This measure is an indicator of inability of audit firm for a good selection of client. The partial derivatives of Q with respect to p, r, d, H, and v. All these partial derivatives are negative. For example:

$$\frac{\partial Q}{\partial p} = -r(d^v(H - v) + d(d^v - 1)/(d - 1))(1 - rp)^{d^v(H-v)+d(d^v-1)/(d-1)-1} < 0 \tag{16}$$

Therefore, Q is a decreasing function of the probability that a branch point includes a good selection p, the probability that a doing good selection r, the number of paths identified and able to follow d, the number of stages resourced H, and the range of vision v. This means that with decrease in of probability of bad factors as p, r, d, H, and v, we can control and decrease probability of bad selection.

5. Auditing marketing selection models

The marketing of Audit firms is a unique and highly specialized branch of financial services marketing. The practice of advertising, promoting, and selling financial products and services is in many ways far more complicated than the selling of consumer packaged commodity, automobiles, electronics, or other forms of goods or services. The environment in which financial services are marketed is becoming more competitive, making the task of marketing audit firms increasingly challenging and specialized. Audit firms marketers are challenged every day by the unique characteristics of the products they market. We follow Laeven, Levine, and Michalopoulos (2015) and Mahdavi and Daryaei (2015) in every period the economy produces a final good or service combining labor and a continuum of specialized intermediate goods or services according to the following production function:

$$Z_t = N^{1-\beta} \int_0^1 A_{i,t}^{1-\beta} X_{i,t}^{\beta} di, \beta \in (0,1)$$

where $X_{i,t}$ is the amount of intermediate good or service i in period t with technology level and auditor attitude of $X_{i,t}$. N is the labor supply. The final service Z is used for consumption, as an input into entrepreneurial and auditing marketing, and an input into the production of intermediate services. The production of the final good, which we define as the numerical, occurs under perfectly competitive conditions. Thus, the price of each intermediate good and service equals its marginal product:

$$P_{i,t} = \beta \left(\frac{A_{i,t}}{X_{i,t}} \right)^{1-\beta}$$

Pricing is one of the most important decisions in the marketing of financial services. Auditor's perspective, a client environment can have an impact on audit fees by affecting the required audit effort and the audit risk (Mahdavi & Daryaei, 2015, p. 6). The price can be considered as audit fee that was involved in expression (1) as desired fees for auditor that effect good or bad selection. Audit firms must consider not only the benefits and efficiencies of knowledge gained in the non-auditing consulting market but also the costs, in terms of competition, of providing both services.

6. Conclusion

In this paper we re-examine the retain-rotation problem, client perspective and the good or bad selection client, audit firm perspective. In contrast to the existing literature, we assume that these two issues must be examined together. With regard to pricing is one of the most important decisions in the marketing of financial services, we specify price in our model in format of audit fee. And we provide such analysis in this paper. Results show that the owners' expected outcome (V) is increase in in the level of reporting quality, all else held equal. Also client selection is a decreasing function with regard to the factors affecting it. Like the number of sub-branches (d), probability of good selection (p), probability of good perceives in a branch point (r), stages ahead (H) and taking account of investigative intuition (v). We propose that retain-rotation audit firm vs. good or bad selection client relationship developed in based on bid and ask process.

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