Auditor Liability and Client Acceptance Decisions*

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Abstract

The accounting profession has raised concerns that excessive liability exposure renders audit firms unwilling to provide audit services to risky clients, limiting the prospective clients' ability to raise external capital. In this paper we address this concern in a model where the auditor evaluates the riskiness of the client before accepting the client engagement. We consider a setting where a shift to stricter legal liability regimes not only increases the expected damage payments from the auditor to investors in case of audit failure but also increases litigation frictions such as attorneys' fees. The main finding is that the relationship between the strictness of the legal regime and the probability of client rejection is U-shaped. Our model therefore suggests that in environments with moderate legal liability regimes the client rejection rate is lower than in environments with relatively strong or relatively weak legal regimes. The analysis also generates empirical predictions relating the client's riskiness to equilibrium audit quality, rejection rates, and audit fees.

1 Introduction

The audit profession has long argued that excessively burdensome legal liability imposed on auditors hinders capital formation by increasing the likelihood that audit firms will reject potential clients, particularly high risk firms, leaving such firms with limited access to capital markets. For example, the International Federation of Accountants (1995, p. 7) states: "The legal liability climate in some countries is causing an increasing number of large firms to avoid high-risk audit clients and even entire industries ... Without audited financial statements ... start-up businesses may not be able to generate shareholder confidence. As a result, economic growth can be stymied." In a similar spirit, the Public Oversight Board (1993, p. 9,10) notes "...firms are reportedly refusing to undertake the audits of such (risky) companies... This poses a grave problem because it severely hampers the access of such companies to the credit and equity markets. This could significantly hamper the ability of small companies to grow, create jobs and develop imaginative products and services..."

The intuition behind these arguments is clear: all else equal, a greater legal liability makes audit firms unwilling to accept risky clients, reducing the prospective clients' ability to fund new projects. However, the question remains: does an increase in auditors' legal liability necessarily have an adverse impact on firms' ability to obtain capital *in equilibrium*? Auditors' legal liability for an audit failure represents a form of implicit insurance to outside investors, and an increase in this liability improves the terms at which a firm can raise capital from these investors. This benefit, in turn, can be used to compensate the auditor for the greater liability risk through a higher audit fee, which makes the potential client more valuable to the auditor and reduces the likelihood that the auditor will reject the client. Thus, the equilibrium implications of increased auditor liability are not as obvious as implied by the audit profession's arguments.

The purpose of our paper is to shed some light on the implications of the legal liability environment for the auditor's decision to accept or reject risky clients, the level of audit quality (given acceptance), and the level of the audit fee, in a setting where the auditor spends costly resources to evaluate the prospective client prior to making the acceptance decision.

In particular, we consider a setting in which an entrepreneur requires capital to undertake a new project and seeks that capital through outside investors. The entrepreneur can ask an auditor to provide information about the new investment opportunity.[1] Because the potential client is new to the auditor, the auditor knows rather little about the client initially and undertakes an evaluation prior to accepting the engagement. There are two potential types of clients: high-risk and low-risk. The effort devoted to the evaluation process determines the probability that the auditor discovers the client's type. We assume that the auditor rejects the client if he fails to discover the client-type or if he discovers that the client is a high-risk type, which implies that the entrepreneur is unable to raise capital to finance the project. This characterization is consistent with a new IPO setting in which the risk of a subsequent lawsuit is relatively high compared to audits of existing clients where the auditor's degree of familiarity with the client is high. Since the auditor rejects the client if uninformed about his type, the (good-type) client is more likely to be rejected and thus unable to obtain financing if the auditor invests little effort in the evaluation process. Our focus is therefore on the problem that the auditor may reject (good-type) clients too often from a social welfare perspective, consistent with the concerns raised by the audit profession. An important feature of our setting is that the audit fee offered by the entrepreneur plays an incentive role: the higher the fee, the greater is the value of becoming informed about the client's type (compared to

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[1] Equivalently, the auditor can be viewed as certifying the client's assertion about project quality.

staying uninformed and rejecting the client) and the higher is the auditor's effort devoted to the evaluation process.

If the auditor accepts the client, he proceeds with an audit which provides information about the new investment opportunity. The investors' decision whether or not to finance the project is based on the information provided by the auditor. Although the auditor effectively screens out high-risk client types, the auditor still faces litigation risk because the new project may fail after the auditor issues an unqualified opinion.

In order to investigate the effects of the litigation environment on the auditor's decision to accept or reject a prospective client, we consider three components of that environment: i) the strictness of the legal liability regime, which is interpreted as the probability that the auditor will be sued and found liable after an audit failure, consistent with Shleifer and Wolfenzon (2002), Newman, Patterson, and Smith (2005), and Choi, Kim, Liu, and Simunic (2006), ii) damage payments from the auditor to investors in case of a successful lawsuit against the auditor, and iii) other litigation costs incurred by the auditor such as criminal penalties, attorney fees, or reputation loss. These latter costs are not recovered by investors and are, for clarity, labeled "litigation frictions".[2] In our setting, stricter legal liability regimes lead to both larger expected damage payments to investors and larger expected litigation frictions.

We show that an increase in any of these litigation components results in an increase in both audit quality and the equilibrium audit fee. This relationship is consistent with empirical evidence by Choi, Kim, Liu, and Simunic (2006), Venkataraman, Weber, and Willenborg (2005), and Seetharaman, Gul, and Lynn (2002). However, when considering the auditor's equilibrium decision to reject or accept risky clients,

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[2]Radhakrishnan (1999) also separates audit litigation penalties into payments to investors and payments to lawyers (he calls the latter "recovery friction"). However, he does not consider the effects of these penalties on the auditor's client acceptance decision.

it is important to carefully distinguish between the three components of the liability environment. We first show that an increase in the potential damage payments to investors leads to a reduction (not to an increase) in the client rejection rate. A higher expected damage payment implies that the entrepreneur has to offer the auditor a larger audit fee. Otherwise, the audit engagement would become less attractive to the auditor which would lead to a lower evaluation effort and hence a higher rejection rate. However, the increase in the audit fee does not involve a real cost to the entrepreneur. If investors expect a larger damage award from the auditor in case of an audit failure, investors are willing to give the entrepreneur better financing conditions. The entrepreneur in turn can use these savings to compensate the auditor for the increased liability exposure. We call this the *triangle effect*. Hence, a change in the damage payment has no *direct* effects on the evaluation effort and the rejection rate.

What matters, however, is that a larger potential damage award induces the auditor to adopt an audit of higher quality (after accepting the client) which delivers more accurate information about the prospects of the investment opportunity. As a result, the project will be implemented less often when project prospects are poor. The anticipation of a better investment decision increases the value of the entrepreneur's investment opportunity in the initial stage. For this reason, the entrepreneur is more eager to attract the auditor and hence increases the audit fee by an amount that is larger than the increase in the auditor's expected damage payment. The auditor will therefore find the engagement more attractive, which induces higher evaluation effort and hence a lower rejection rate. However, for this result to hold it is crucial that the damage payments be fully recovered by the investors. If, on the other hand, the litigation friction increases, then the result is reversed, i.e., the client rejection rate increases. When the litigation friction is higher, the auditor will find the engagement

with the client less attractive and hence will have a weaker incentive to carefully evaluate the client, which leads to more rejections. Of course, the client can counteract this negative effect by offering a larger audit fee, but in this case a real cost is involved because the triangle effect does not hold. For this reason, the equilibrium rejection rate increases with the litigation friction.

Because a shift in the strength of the legal regime affects both the expected damage payments to investors as well as expected litigation frictions, a change in the legal regime involves two opposing effects. Depending on which effect is stronger, a change in the legal regime either increases or decreases the probability of client rejection. In particular, we show that the relationship between the strength of the legal liability regime and the client rejection rate is U-shaped. Our model therefore predicts that clients are less likely to be rejected in environments with moderate legal regimes compared to environments with relatively strong or relatively weak legal regimes.

Our model also provides predictions with respect to changes in the legal liability regime in the US triggered by the Sarbanes Oxley Act (SOX) of 2002. Assuming that the introduction of SOX increased the strength of the legal liability regime, our model points out potential costs and benefits associated with this change. The benefits are improved investment decisions due to higher levels of audit quality. The costs are increased litigation frictions which makes hiring the auditor and hence implementing the project more expensive. Depending on whether the benefits exceed the costs, the introduction of SOX can result in either a reduction or an increase in the client rejection rate.

The literature concerned with auditors' decisions to accept or reject potential clients is mainly survey and empirical research.[3] Most formal models of auditor-

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[3]See, e.g., Asare, Hackenbrack,and Knechel (1994), Huss and Jacobs (1991), Johnstone and Bedard (2003, 2004), and Johnstone (2000).

client interactions focus on the effects of the legal liability environment on the auditor's incentive to provide high quality audits.[4] In contrast, our paper focuses on the auditor's effort devoted to evaluating the prospective client and his decision to accept or reject the engagement. Such a choice is a key component of audit firms' overall risk management strategies.[5] For this reason, and in contrast to the existing auditing literature, the audit fee in our setting serves as an important incentive tool to motivate the auditor to spend effort on the evaluation task.

This paper is organized as follows. In section 2, we develop the model. In section 3 we derive the optimal audit effort, client evaluation effort, and audit fee. In section 4, the effects of changes in the auditor's legal environment are described. Section 5 considers the effects of variations in project risk. Section 6 concludes.

2 Model

Consider a setting with three parties: an entrepreneur, outside investors, and an auditor. All parties are risk neutral. The entrepreneur needs capital $I > 0$ to undertake a new project. In order to obtain the required capital, the entrepreneur sells $\beta \in [0, 1]$ proportion of the project's payoff to outside investors. If the project is financed, it generates cash flows of $x = X > I$ if it succeeds and $x = 0$ if it fails. If the entrepreneur is unable to obtain the required capital I from investors, the project is not undertaken and the entrepreneur receives zero payoff.

To focus on two types of activities engaged in by auditors, client evaluation versus

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[4]See, e.g., Dye (1993, 1995), Chan and Pae (1998), Chan and Wong (2002), Hillegeist (1999), Narayanan (1994), Schwartz (1997).

[5]For example, Arthur Andersen, et al. (1992, p 22) note: "Accountants are also practicing risk reduction. The six largest firms are attempting to reduce the threat of litigation by avoiding what are considered high-risk audit clients and even entire industries."

auditing, we assume that project success is dependent on both the type of the client and the underlying characteristics of the project. There are two types of entrepreneur, good and bad, $T \in \{G, B\}$. The *ex ante* probability of a good type is denoted by $p \in (0, 1)$. In case of a bad-type entrepreneur, the investment will fail with certainty, $x = 0$, regardless of the project's characteristics. We refer to $(1 - p)$ as *client risk*. In case of the good type, the outcome of the investment depends on the project's type, $N \in \{S, F\}$. For $N = F$ the investment will fail, $x = 0$, and for $N = S$, the investment will succeed, $x = X$, with certainty. The probability of success (project type S) is denoted by $\theta \in (0, 1)$. We refer to $(1 - \theta)$ as *project risk*. In the case of a good-type client, the investment has a positive net present value, $\theta X - I > 0$. The client-type T and project-type N are not known *ex ante* to any players, including the entrepreneur.[6] Without further information, investors are not willing to finance the project, i.e., $p\theta X - I < 0$.

The entrepreneur can hire an auditor to conduct an audit which provides additional information about the profitability of the project. The entrepreneur offers the auditor a noncontingent audit fee, denoted W, for audit services. The auditor is free to accept or reject the audit engagement. Before making this decision, the auditor devotes effort $e \in (0, 1)$ to evaluate the client's type T. We assume that effort e is the probability with which the auditor observes a perfect signal about the client's type. With probability $(1 - e)$ the auditor obtains no additional information. Put differently, after evaluating the client, the auditor either knows the client's type with certainty or has no better information than before the evaluation. The auditor's private cost of effort e is $c(e)$, with $c(e) = 0$, $c'(e) > 0$, $c''(e) > 0$.

We assume that the auditor always wishes to avoid accepting the bad-type client.

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[6]The assumption that the entrepreneur has no private information is common in the auditing literature; see for example Dye (1993, 1995), Schwartz (1997), Chan and Pae (1998), Chan and Wong (2002).

Such a client is associated with an excessive probability of project failure, making the engagement undesirable to the auditor due to significant litigation exposure. In addition, the auditor may suffer a (not modeled) reputation loss if discovered to be associated with a bad-type client. Thus, in our model, the client acceptance/rejection decision is an important tool that allows the auditor to control litigation risk. Further, we assume that litigation and reputational concerns related to the bad-type client are sufficiently large such that the auditor will not accept the client if the type is unknown. This assumption is important because it allows us to address the popular claim that high liability exposure hinders socially desirable capital formation in the sense that firms with valuable investment opportunities might be unable to obtain an audit and therefore be unable to raise capital. In contrast, if the auditor finds it beneficial to accept the client if the type is unknown, then good-type clients would never be rejected and the impairment of (socially desirable) capital formation would not be an issue.

If the auditor accepts the new client, the auditor proceeds to conduct an audit. Given our assumptions above, accepting the new client signals to investors that the client is a good type. For this reason, the sole aim of the audit is to provide additional information about the project-type N.[7] The auditor chooses audit effort a, which determines the quality of the audit. We assume that effort a represents the probability that the auditor reports the project-type as $\widehat{F}$, given that the true project-type is F. When the project-type is S the auditor reports $\widehat{S}$ with probability one.[8] Audit cost is denoted by $k(a)$, with $k(0) = 0$, $k'(a) > 0$, and $k''(a) > 0$.

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[7]Alternatively, the auditor may be viewed as obtaining information about the veracity of the client's assertions about the project-type. In such a setting, the client would always claim that the project-type is S and the auditor would provide either a qualified or unqualified opinion.

[8]A similar audit technology is assumed in Dye (1993, 1995), Schwartz (1997), Chan and Pae (1998), Hillegeist (1999), Radhakrishnan (1999), Chan and Wong (2002), and others.

Assume that investors behave competitively in the sense that they make zero profits. Given the assumption that $p\theta X - I < 0$, investors are unwilling to finance the project in the absence of an audit. Moreover, if the auditor accepts the audit engagement and reports $\widehat{F}$, investors will again not provide capital I, as it is clear that the project will fail. In these cases, the project is not undertaken, and the game ends. On the other hand, if the auditor accepts the engagement and issues a report $\widehat{S}$, investors are willing to finance the project in exchange for a fraction $\beta \leq 1$ of the project's final cash flows.

If the project is implemented and succeeds, the game ends. An audit failure occurs if the auditor issues a favorable report and the project fails. In this case the entrepreneur is bankrupt and unable to pay any damages to investors.[9] The investors' only recourse to recover their investment is to sue the auditor for an incorrect report, i.e., an audit failure. The auditor's expected litigation cost in case of an audit failure is given by $L = s(D + l)$, where D is the damage payment to investors and l is the litigation friction such as the cost of criminal penalties, attorney fees, or reputation loss. For example, consider the special case where the plaintiffs' attorneys operate on a contingent fee basis, as is common in the US. In this case, l is the portion of the damage payment that is retained by the plaintiffs' attorneys and D is the portion that is recovered by investors. We assume that l is smaller than D. The parameter $s \in [0, 1]$ represents the strictness of the legal liability regime and reflects the probability that the auditor is sued and found liable in case of an audit failure.

In most litigation environments, the auditor's maximum legal exposure to investors would be no greater than the original amount invested, and typically the damage payments to investors would be substantially less (i.e., in the case of a propor-

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[9]The assumption that the entrepreneur provides no insurance to investors is consistent with assumptions in Dye (1993, 1995), Chan and Pae (1998), Schwartz (1997), and others.

tionate liability regime). We therefore assume that the auditor's liability to investors, D, does not exceed I. This assumption rules out the possibilities that i) the auditor chooses an excessively high audit effort (i.e., selects an audit effort higher than the first best level) and ii) that investors prefer project failure over project success.

As will become clear later, the litigation friction ultimately reduces the value of the entrepreneur's investment opportunity. To ensure that the expected value of the investment opportunity is positive for a good type client (independent of audit quality) we assume that $\theta X - I - (1-\theta)sl > 0$.

Given our assumptions, the auditor will accept the client only after learning that he is a good type. For this reason the probability that the client engages the auditor is ep.[10] Hence, the auditor's expected payoff can be stated as

$$U^A = ep\left[W - (1-a)(1-\theta)L - k(a)\right] - c(e). \tag{1}$$

The auditor's reservation utility is normalized to zero. The entrepreneur's expected payoff is given by

$$U^E = ep\left[\theta(1-\beta)X - W\right]. \tag{2}$$

We also refer to U^E as the expected market value of the entrepreneur's firm. The investors' expected payoff is

$$U^I = ep\left[\theta\beta X + (1-\theta)(1-a)sD - I(\theta + (1-\theta)(1-a))\right]. \tag{3}$$

The investors' reservation utility is also normalized to zero. Investors are only willing to finance the project if the auditor performs an audit and issues a favorable report. The probability that the auditor issues a favorable report after accepting the client is given by $(\theta + (1-\theta)(1-a))$. If the project-type is S (which occurs with probability θ), the project is implemented and succeeds. In this case investors obtain βX and the

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entrepreneur receives $(1-\beta)X$. If the project-type is F and the auditor fails to report $\widehat{F}$ (which occurs with probability $(1-\theta)(1-a)$), then the project is implemented and fails. In this case, the entrepreneur is bankrupt, and the investors expect to obtain the damage award sD from the auditor.

The timeline of the model is as follows:

Stage 1: The entrepreneur requests an audit and offers the auditor the fee W.

Stage 2: The auditor devotes effort e to evaluate the client and decides whether or not to accept the engagement.

Stage 3: If the auditor declines the prospective client, the game ends. If he accepts the client, he conducts an audit and issues a report. In case of a favorable report $\widehat{S}$, investors finance the new project. In case of an unfavorable report $\widehat{F}$, the investors do not finance, and the game ends.

Stage 4: If the project is undertaken in stage 3, final cash flows x are realized. If the project succeeds, profits X are shared between the investors and the client based on the sharing rule β. If the project fails, investors sue the auditor in an attempt to recover damages.

3 Results

3.1 Benchmark: First best solution

As a benchmark, it is helpful to consider the first best solution where the auditor's efforts are observable and contractible. If effort levels are contractible, the entrepreneur can implement any effort level through a forcing contract, in which the auditor is compensated for his effort cost only if he exerts the contracted level of effort. The entrepreneur's goal is then to maximize his utility, keeping the utility of the auditor and the investors fixed at their reservation levels. Equating the auditor's and the in-

vestors' utility functions (1) and (3) with zero, solving for W and β, and substituting into (2) gives the entrepreneur's target function. The entrepreneur solves

$$\max_{e,a} ep\left[\theta(X - I) - (1 - \theta)(1 - a)(I + sl) - k(a)\right] - c(e).$$

The optimal levels, denoted a^f and e^f, satisfy

$$(1 - \theta)(I + sl) - k'(a) = 0$$

and

$$p\left[\theta(X - I) - (1 - \theta)(1 - a)(I + sl) - k(a)\right] - c'(e) = 0. \tag{4}$$

In order to ensure the auditor's participation, the entrepreneur needs to compensate the auditor for the litigation friction sl the auditor incurs in case of an audit failure. In contrast, the expected damage payment sD does not show up in the above problem. Similar to the litigation friction, the entrepreneur needs to compensate the auditor for the expected damage payments to investors. However, the audit fee increase does not involve a real cost to the entrepreneur. If investors can expect damage payments from the auditor in case of an audit failure, investors are willing to finance the project in exchange for a smaller fraction β of the project's cash flows. This situation is equivalent to a three person game where the players stand in a circle, each handing \$10 bills to the player on their left. Of course, changing the amount of money transferred does not make anybody better or worse off. We call this the *triangle effect.*

A higher quality audit a helps to improve the investment decision in stage 3 in the sense that the project is implemented less often if the project type is F. An improved investment decision is not only beneficial because it reduces the probability of wasting capital I for a type F project but also because it reduces the probability of audit failure and hence the expected litigation friction. The larger the capital outlay

I and the larger the litigation friction sl in case of audit failure, the larger is the optimal audit effort a^f.

To understand condition (4), note that the entrepreneur possesses a real option to invest in the new project in stage 1. The value of this real option for the good-type entrepreneur is captured by the term in square brackets in (4). If the auditor rejects the client, the entrepreneur loses the option to invest since there will be no financing. Hence, the higher the value of the real option, the more important is the evaluation effort undertaken by the auditor because higher effort reduces the probability of rejection. Note that the stage 1 value of the real option to invest in the project depends on the anticipated audit quality in stage 3. For $a < a^f$, an increase in audit quality improves the value of the investment opportunity and hence the optimal level of evaluation effort e.

3.2   Audit Quality

We begin the analysis by determining the auditor's optimal choice of audit quality a, given that he has accepted a good-type firm. To find the optimal effort a, the auditor solves

$$\max_a W - (1 - a)(1 - \theta)L - k(a).$$

The optimal choice of a, denoted a^*, satisfies

$$(1 - \theta)L - k'(a) = 0. \tag{5}$$

Clearly, the audit fee W has no impact on the quality of the audit a, because W does not depend on the outcome of the audit. However, if the expected litigation cost L increases, then the auditor will have a stronger incentive to carefully audit the client. Note that for $I = sD$ the auditor implements the first best audit quality, $a^* = a^f$. Since we assume that $D \leq I$, we rule out situations where the auditor

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overinvests in audit quality from a first best perspective (i.e., in our setting it holds that $a^* \leq a^f$).

Proposition 1 *If the expected litigation cost L increases, the auditor adopts an audit of higher quality, i.e., $\frac{da}{dL} > 0$.*

Thus, if any component of the auditor's litigation environment increases, we expect an increase in audit quality for those clients who are accepted by the auditor. This prediction is generally consistent with evidence in Venkataraman, Weber, and Willenborg (2005).

3.3 Client Evaluation

In stage 2, the auditor decides how much effort to put into the evaluation process. Assume that the audit fee offered by the entrepreneur is high enough to induce the auditor to accept a good-type client; that is $W - (1 - a^*)(1 - \theta)L - k(a^*) \geq 0$. If this condition is not satisfied, the auditor would not evaluate the client, but rather would remain uninformed and always reject the engagement. As will become clear later, this condition is satisfied in equilibrium.

The auditor's maximization problem is given by

$$\max_{e} ep\left(W - (1 - a^*)(1 - \theta)L - k(a^*)\right) - c(e),$$

where a^* satisfies (5). The first order condition for an optimal choice of e is

$$p\left(W - (1 - a^*)(1 - \theta)L - k(a^*)\right) - c'(e) = 0. \tag{6}$$

Holding the audit fee constant, consider how a change in the auditor's expected litigation cost L affects the optimal choice of effort e. There are two effects, an indirect effect and a direct effect. The indirect effect occurs because a higher liability L induces the auditor to choose a higher audit quality a. Because the level of a is

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chosen optimally in equilibrium, by the envelope theorem, this indirect effect is only second order and hence is negligible. The direct effect of an increase in L on e is negative; that is, a larger expected litigation cost weakens the auditor's incentive to diligently evaluate the potential client. The intuition for this result is as follows. If the auditor remains uninformed, he avoids the risk of legal liability by simply declining the engagement. But if he exerts effort to acquire information and learns the firm's type is good, the auditor will accept the client, exposing himself to the risk of legal liability. Thus, a higher evaluation effort increases the auditor's expected cost of litigation. For this reason, when litigation cost L increases, the auditor finds it less attractive to become informed, which weakens his incentive to work hard on the evaluation task. Put simply, a larger litigation exposure makes it relatively more attractive for the auditor to remain uninformed and reject the client.

Keeping the liability environment fixed, a higher audit fee W induces the auditor to put more effort in the evaluation process. When the audit fee W increases, the strategy to remain uninformed and reject the client becomes less attractive, which increases the value of obtaining information and hence the effort devoted to the evaluation task. For this reason the audit fee W plays an important incentive role in our setting.

The next proposition summarizes the results.

Proposition 2 *The auditor has a greater incentive to carefully evaluate the prospective client if the expected litigation cost declines (holding audit fee constant) and/or the audit fee increases, $\frac{de}{dL} < 0$, $\frac{de}{dW} > 0$.*

Since the auditor rejects the client if uninformed about his type, it follows that the probability of rejection is larger if the auditor chooses a lower evaluation effort. Let $R_G = p(1-e)$ denote the probability that a good type client is rejected and

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$R = (1-p) + p(1-e)$ the probability that the client is rejected independent of type. The next Corollary directly follows from Proposition 2.

Corollary 1 *The probability that the good type client is rejected R_G and the overall rejection rate R increase if the expected litigation cost increases and/or the audit fee W decreases, $\frac{dR_G}{dL} > 0$, $\frac{dR}{dL} > 0$, $\frac{dR_G}{dW} < 0$, $\frac{dR}{dW} < 0$.*

The finding that clients are more likely to be rejected if the litigation environment is tougher is consistent with arguments advanced by the audit profession. However, as we show in Section 3.5, this argument is incomplete because a shift in the expected litigation cost has an effect on the equilibrium audit fee offered by the entrepreneur.

3.4 Outside Investors

Investors are not willing to finance the project if the auditor refuses to perform the audit or if the auditor accepts the engagement but issues the report $\widehat{F}$. In these cases, the project is abandoned, and the game ends. Therefore, we focus on the case where the auditor accepts the audit engagement and reports $\widehat{S}$. The mere fact that the auditor has accepted the client signals to investors that the client is a good type. What remains unknown is the project-type. Given that the auditor has chosen audit quality a and reported $\widehat{S}$, the probability of project success is $P(S|\widehat{S}, a) = \frac{\theta}{\theta + (1-\theta)(1-a)}$ and the probability of failure is $P(F|\widehat{S}, a) = \frac{(1-a)(1-\theta)}{\theta + (1-\theta)(1-a)}$. Investors correctly conjecture that the auditor has chosen audit quality a, and hence expect to receive in stage 4

$$K(\beta) = P(S|\widehat{S}, a)\beta X + P(F|\widehat{S}, a)sD. \tag{7}$$

Since investors make zero profits in expectation (reservation utility is zero), β must satisfy

$$K(\beta) - I = 0. \tag{8}$$

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Substituting (7) into (8) and rearranging yields

$$\beta = \frac{I(\theta + (1-\theta)(1-a)) - (1-\theta)(1-a)sD}{\theta X}. \tag{9}$$

Clearly, the lower the fraction β the entrepreneur has to give up in order to finance the project, the better off is the entrepreneur. Keeping the audit effort a fixed, the level of β declines when the damage award to investors D increases. Intuitively, since investors can expect a larger payment from the auditor in case of project failure, investors are willing to finance the project in exchange for a smaller fraction β of the project's cash flows.

A change in the damage award D also has an impact on the audit quality a. There are two relevant effects associated with an increase in audit quality. First, a higher audit quality improves the investment decision in the sense that the project is implemented less often when the project-type is F. Second, a more diligent audit reduces the likelihood that investors obtain damage awards from the auditor after investing in the project. While the first effect reduces β, the second effect increases β. However, for $I > D$, the former effect dominates the latter, implying that investors demand a lower fraction β of final cash flows if audit effort increases.

Proposition 3 *The entrepreneur has to give up a smaller fraction β of final cash flows if the damage payment to investors, D, increases.*

3.5 Audit Fee

In stage 1, the entrepreneur chooses the audit fee W offered to the auditor. If the entrepreneur chooses a fee of $W < W^{\min} \equiv (1-a^*)(1-\theta)L + k(a^*)$, the auditor will immediately reject without investigating the client. However, it can be shown that due to our assumption $\theta X - I - (1-\theta)sl > 0$, the equilibrium audit fee will always exceed $W^{\min}$.

The firm solves the following problem

$$\max_{W} pe(\theta X(1 - \beta) - W), \tag{10}$$

subject to (5), (6), (9).

Lemma 1 *The optimal level of W satisfies*

$$-e + \frac{p\left[\theta X - W - I\left[a\theta + (1 - a)\right] + (1 - a)(1 - \theta)sD\right]}{c''(e)} = 0, \tag{11}$$

where e and a satisfy (6) and (5), respectively.

Proof: See the Appendix.

As shown in Section 3.3, an increase in W enhances the auditor's incentive to diligently evaluate the client before making the acceptance/rejection decision. When e increases, chances are higher that the auditor learns the client's type, which reduces the probability of rejection. The (good-type) entrepreneur is therefore better off if the auditor devotes more effort to the evaluation process.

When choosing the optimal level of W, the entrepreneur takes into consideration that a larger audit fee improves incentives for the evaluation task. The positive effect of a higher e on the entrepreneur's utility is captured by the term in square brackets in (11). This effect is traded off with the marginal cost of an increase in W.

Substituting (11) into (6) yields the equilibrium evaluation effort, denoted by e^*,

$$p\left[\theta X - I\left[a^*\theta + (1 - a^*)\right] - (1 - a)(1 - \theta)sl - k(a^*)\right] - ec''(e) - c'(e) = 0. \tag{12}$$

4 The Effects of the Liability Environment

In this section we are interested in the total effects of a change in the auditor's liability environment. In particular, we analyze how an increase in the strictness of the legal regime s, damage payments D, and litigation frictions l affect the equilibrium levels of

audit fee W, evaluation effort e, rejection rate R, and the utilities of the entrepreneur, U^E, and the auditor, U^A.

In order to simplify the exposition, it is helpful to consider specific cost functions for the auditor. We therefore assume for the remainder of the analysis that $k(a) = 0.5ka^2$ and $c(e) = 0.5ce^2$, where k and c are sufficiently large to ensure interior solutions.

4.1   Change in damage payment D

In this section we are interested in the total effects of a change in the damage payment D to investors. As described in Section 3.2, a larger potential damage payment D induces the auditor to choose a higher audit quality a. However, as a first step, it is helpful to consider a benchmark setting, where audit quality a remains fixed, i.e., does not change with D. Assuming a is fixed, if damages D increase, investors can expect higher payments in case of an audit failure. This auditor insurance is beneficial to the entrepreneur because it reduces the fraction β the entrepreneur needs to give up in order to obtain capital I from investors. On the other hand, an increase in the damage payment D renders the engagement with the client less attractive to the auditor, which reduces the auditor's incentive to devote effort in evaluating the client. This reduction in evaluation effort is detrimental to the entrepreneur because a lower effort e increases the likelihood of rejection. The entrepreneur counteracts this effect by increasing the audit fee by $(1 - a)(1 - \theta)sD$ (see (11)). By doing so, the entrepreneur restores the auditor's incentive to evaluate the client to its original level. In other words, in equilibrium, a change in the damage award D has no direct effect on the auditor's evaluation effort and the rejection rate. This result can also be verified by observing that the equilibrium effort level e^*, determined by (12), does not directly depend on D (recall that we are assuming here that a^* is not affected by

a change in D). Hence, there are no real effects associated with a change in D. This result is similar to the triangle effect outlined in the benchmark case.

However, a change in D does have real effects if one takes into consideration that an increase in D induces the auditor to conduct a more careful audit. Three effects are associated with an increase in the audit quality. First, a more careful audit is associated with a higher audit cost $k(a)$. The entrepreneur must therefore pay the auditor a higher audit fee in order to compensate him for the increased cost (otherwise the engagement becomes less attractive to the auditor such that he chooses a lower evaluation effort). Second, the increase in audit quality reduces the probability of an audit failure and hence reduces the litigation friction. A reduction in the litigation friction is beneficial to the entrepreneur because it reduces the cost of attracting the auditor. Finally, a higher audit quality results in an improved investment decision. That is, the provision of more accurate information reduces the probability that the project is implemented when the project-type is F. The anticipation of a higher audit quality therefore increases the stage 1 value of the entrepreneur's real option to invest in the project. For $D \leq I$, the benefits associated with an increase in audit effort outweigh the additional costs (the audit effort moves closer to the first best level a^f). Since the auditor now provides an audit of higher value, the entrepreneur is more eager to attract the auditor. To do this, the entrepreneur further increases the audit fee offered to the auditor, which strengthens the auditor's incentive to evaluate the client and hence reduces the probability of client rejection. This leads to the next proposition.

Proposition 4 *If the damage payment D increases, then*

i) the equilibrium audit fee W increases,

ii) the equilibrium evaluation effort e increases,

iii) the probability that the good type client gets rejected R_G and the overall rejection

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rate R decrease,

iv) the client-firm's expected market value U^E and the auditor's expected payoff from the engagement U^A increase.

Proof: See the Appendix.

The important point here is that auditors' willingness to provide audit services not only depends on the litigation environment but also on the audit fees that result from those audit engagements. Since an increase in the damages D makes the auditor more valuable to the entrepreneur, an increase in D results in an even greater increase in W which consequently leads to a reduction in the rejection rate. Larger potential damage payments to investors therefore have a positive impact on the client firm's market value.

4.2 Change in litigation friction l

We now consider the effects of a change in the litigation friction l. Clearly, a larger l induces the auditor to choose a higher audit effort, i.e., $\frac{da}{dl} > 0$. As explained in the previous section, an increase in audit quality is beneficial if the audit effort is below the first best level, i.e., if $sD < I$. However, there is also a negative effect associated with a larger litigation friction l that outweighs this positive effect. The expectation of a higher litigation friction l renders the engagement with the client less attractive to the auditor and hence lowers his incentive to put effort into the evaluation process. This reduction in evaluation effort in turn results in a higher likelihood of client rejection. The entrepreneur can counteract this effect by increasing the audit fee W, but this is costly. The important difference between a change in l and a change in D is that the triangle effect does not hold for the former. That is, the cost l is not recovered by investors and hence not passed on to the entrepreneur. Put simply, a larger level of l increases the cost of hiring the auditor and hence the cost of implementing the

project. This leads to the next proposition.

Proposition 5 *If the litigation friction l increases, then*

i) the equilibrium audit fee W increases,

ii) the equilibrium evaluation effort e decreases,

iii) the probability that the good type client gets rejected R_G and the overall rejection rate R increase,

iv) the client-firm's expected market value U^E and the auditor's expected payoff from the engagement U^A decrease.

Proof: See the Appendix.

One interpretation of litigation frictions is the auditor's cost of losing reputation in case of an audit failure. This expected cost may vary from client to client depending on the media coverage or more generally the visibility of the client-firm or the industry.[11] The higher the visibility and media coverage of the potential client, the higher is the auditor's concern for potential reputation loss. Hence, our model predicts that clients with higher media coverage and visibility pay their auditors a higher audit fee and are more likely to be rejected, but if accepted, these clients obtain a higher quality audit.

4.3   Change in legal regime s

It is now straightforward to see how a shift in the strictness of the legal regime s affects the equilibrium outcome. On the one hand, a higher s has beneficial effects because it increases the expected damage award the auditor has to pay investors. On the other hand, a larger s increases the expected litigation friction l that is not

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[11]For example, Johnstone and Bedard (2003) find that audit firms view publicly traded firms as relatively riskier than private firms, in part because of the scrutiny they receive.

recovered by investors. These two effects work in opposite directions. For relatively low levels of s the first effect dominates the second, and for relatively high levels of s the reverse is true. This leads to the next proposition.

Proposition 6 *Let $\widehat{s}$ denote the level of s that satisfies $[I - sD] \frac{da^*}{ds} - (1 - a^*)l = 0$.*

If investor protection becomes stronger (s increases), then

i) the equilibrium audit fee W increases,

ii) the equilibrium evaluation effort e increases for $s < \widehat{s}$ and decreases for $s > \widehat{s}$,

iii) the probability that the good type client gets rejected R_G and the overall rejection rate R decrease for $s < \widehat{s}$ and increase for $s > \widehat{s}$,

iv) the client-firm's expected market value U^E and the auditor's expected payoff from the engagement U^A increase for $s < \widehat{s}$ and decrease for $s > \widehat{s}$.

Proof: See the Appendix

A shift to stronger legal regimes has an unequivocally positive effect on audit quality and audit fees given that a client is accepted, consistent with evidence reported by Choi, Kim, Liu, and Simunic (2006), Venkataraman, Weber, and Willenborg (2005), and Seetharaman, Gul, and Lynn (2002). However, the effects of the legal regime on auditor acceptance rates is not as straightforward. Proposition 6 demonstrates a U-shaped relationship between the strictness of the legal regime and the probability of client rejection. Our model therefore suggests relatively fewer client rejections in environments where the legal regime is moderate compared to environments where the legal regime is relatively strong (i.e., $s > \widehat{s}$) or relatively weak (i.e., $s < \widehat{s}$). The intuition behind this result is as follow. If the legal regime is relatively weak, the induced audit quality is also relatively low, which results in suboptimal investment decisions. The anticipation of low audit quality therefore reduces the value of the entrepreneur's investment opportunity in the initial stage. As a consequence, the entrepreneur is not willing to offer a high audit fee, which induces a low evaluation

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effort and hence a high rejection rate.[12] On the other hand, if the legal regime is strong, the induced audit quality is also relatively high, which leads to improved investment decisions. However, the litigation friction, i.e., the liability cost that is not recovered by investors, is also relatively large, which makes it more expensive for the entrepreneur to attract the auditor. Due to this cost, the equilibrium rejection rate is larger in environments where the legal liability regime is strong.

Our model also generates predictions with respect to changes in the legal liability environment caused by the Sarbanes Oxley Act (SOX) of 2002. If SOX resulted in an increase in the strength of the US legal liability regime, s, our model indicates that there are benefits and costs associated with such a change. The benefits are improved investment decisions due to higher levels of audit quality. The costs are the increase in litigation frictions (and in audit cost) which makes hiring the auditor and hence implementing projects more expensive. Depending on whether the benefits exceed the costs (i.e., depending on whether $s < \widehat{s}$ or $s > \widehat{s}$), the introduction of SOX will either result in a reduction or an increase in the client rejection rate. To the best of our knowledge there are no empirical studies that investigate the impact of SOX on client rejections. If client rejection rates increased after the introduction of SOX, our model suggests that the costs associated with SOX exceed the benefits, at least for the relatively risky potential clients we consider.

A special case of our setting arises if plaintiffs' lawyers operate on a contingent fee basis, which is common practice in the US. In this case the auditor's expected legal liability cost can be characterized by $s(T\gamma + T(1 - \gamma))$, where T is the auditor's damage payment, γ is the fraction of T that is recovered by investors, and $(1 - \gamma)$ is the fraction that is retained by the plaintiffs' attorneys. Since a change in T in this

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[12]It is important to recall that our model only applies to potential clients who will be rejected if the auditor does not learn their type. If the legal regime is very weak, this set of potential clients may be small.

formulation is equivalent to a change in s, a change in the damage payment T has similar effects as a shift in the legal liability regime s.

5   The Role of Project Risk

In this section we analyze the equilibrium effects of a change in project risk (change in θ) on the levels of the audit fee, evaluation effort, client rejection rate, and the players' payoffs. Note that the auditor's expected litigation cost from an *ex ante* perspective is $(1-\theta)(1-a)s(D+l)$. Given this formulation, it is easy to see that an increase in project risk (i.e., an increase in $(1-\theta)$) has effects similar to an increase in the strictness of the legal regime s. That is, analogous to an increase in s, an increase in project risk has positive effects (since it induces higher audit quality) and negative effects (since it increases the litigation friction). In the following, we refer to these effects as "litigation risk" effects.

However, there is one important difference between a change in s and a change in project risk. An increase in project risk reduces the value of the entrepreneur's investment opportunity because the project will more likely fail. This loss in project value has important implications for the equilibrium outcome. To see this, recall that in our setting the audit fee serves as an incentive tool: the higher the fee offered by the entrepreneur, the higher is the auditor's incentive to evaluate the client (instead of rejecting him) and the higher is the probability of client acceptance. If the expected value of the project declines due to a higher likelihood of failure, the entrepreneur will find it less beneficial to provide the auditor with strong evaluation incentives and hence reduces the audit fee. Holding the litigation risk effect constant, the decline in project value therefore leads to a reduction in the equilibrium audit fee, the auditor's evaluation effort, and the payoffs for both the auditor and the entrepreneur. We refer to this effect as the "project value" effect. Note that the "project value" effect is

stronger if the outcome in case of project success, X, is larger.

Since a change in project risk is associated with both the litigation risk and the project value effects, it is difficult to provide general clear-cut empirical predictions. However, for industries that produce high profits in the event of project success, the project value effect dominates the litigation risk effect. Suppose for example that $X > 2I + sl$. In this case, the project has a positive expected value (for all $a \in (0,1)$) even when chances for success are only $\theta = 0.5$. This assumption seems to be consistent with risky industries where only a small fraction of new startups succeed, but the startups that do succeed are highly profitable. In this situation, the following results hold.

Proposition 7 *Suppose that $X \geq 2I + sl$. If project risk increases, i.e., $(1 - \theta)$ increases, then*

i) audit quality a increases,

ii) the equilibrium audit fee W decreases,

iii) the equilibrium evaluation effort e decreases,

iv) the probability that the good type client gets rejected R_G and the overall rejection rate R increase,

v) the client-firm's expected market value U^E and the auditor's expected payoff from the engagement U^A decrease.

Proof: See the Appendix.[13]

Our model predicts that firms that implement risky projects are more likely to be rejected by the auditor than firms that implement less risky projects. This result is consistent with survey and empirical evidence by Asare, Hackenbrack, and Knechel (1994) and Johnstone and Bedard (2003). In addition, given that a client is accepted,

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[13]The Appendix also provides the equilibrium effects of a change in θ for the case where X does not satisfy the condition $X \geq 2I + sl$.

the model suggests a positive link between project risk and audit quality, consistent with evidence in Bell, Landsman, and Shackelford (2001). Finally, our model suggests that firms with higher project risk pay their auditors lower, not higher, audit fees. This result seems to be at odds with the empirical evidence on the link between litigation risk and audit fees (e.g., Beatty (1993); for a summary see Simunic and Stein (1996)). However, it is important to point out that this result is driven by our modelling feature that the audit fee serves as an incentive tool to motivate evaluation effort. For this reason, the fee offered to the auditor not only depends on the expected litigation and audit cost (as usually argued) but also on the value of the entrepreneur's investment opportunity. The lower the expected value of the investment opportunity, the less eager is the entrepreneur to induce evaluation effort by offering a large audit fee. Our empirical predictions therefore only relate to firms or industries where the pre-engagement evaluation process of the auditor plays an important role.

6   Conclusion

There is substantial concern in the accounting and audit profession that excessive liability exposure adversely affects auditors' willingness to provide audit services to clients who are perceived as high-risk. If true, auditors' propensity to reject clients is a problem because it reduces prospective clients' ability to access external capital markets to fund innovative new projects. Our goal in this paper is to shed light on these concerns.

We find that audit quality and audit fees both increase with the auditor's expected litigation losses from audit failures. However, when considering the auditor's acceptance decision, we show that it is important to carefully identify the component of the litigation environment that is being investigated. We therefore decompose the liability environment into three components: i) the strictness of the legal regime, de-

fined as the probability that the auditor is sued and found liable in case of an audit failure, ii) potential damage payments from the auditor to investors and iii) other litigation costs incurred by the auditor, labeled litigation frictions, such as attorneys' fees or loss of reputation. We show that in equilibrium an increase in the potential damage payment actually leads to a reduction in the client rejection rate. This effect arises because the resulting higher audit quality increases the value of the entrepreneur's investment opportunity and hence makes him willing to increase the audit fee by an amount that is larger than the increase in the auditor's expected liability loss. However, for this result to hold it is crucial that damage payments be fully recovered by the investors. If, on the other hand, the litigation frictions increase, the result is reversed, i.e., the client rejection rates increase. Finally, since a shift in the strength of the legal regime affects both the expected damage payments to investors as well as litigation frictions, the relationship between the legal regime and rejection rates is non-monotonic. Specifically, we show that the relationship is U-shaped, which implies that for both weak and strong legal liability regimes, rejection rates are high compared to more moderate legal liability regimes.

The environment we consider is limited to settings where the proposed investment project is relatively risky, such that without further information, the project will not be funded. For this reason, the auditor's propensity is to reject the client if uncertain about the client-type. Our information structure is a simplification of more realistic settings in which the auditor can acquire some imperfect information about the prospective client. Despite these caveats, our model captures certain elements of auditor-client relationships that have attracted considerable attention in the professional and empirical literatures.

7 Appendix

Proof of Lemma 1.

Substitute (9) into the entrepreneur's utility function (2) and let λ_1 denote the Lagrangian multiplier associated with (6). The Lagrangian of the problem is then

$$\max_{W} LG = ep\left[\theta X - W - I\left[a\theta + (1-a)\right] + (1-a)(1-\theta)sD\right]$$
$$+ \lambda_1\left(p\left(W - (1-a)(1-\theta)L - k(a)\right) - c'(e)\right).$$

The necessary conditions for an optimal solution to (P) include

$$\frac{\partial LG}{\partial W} = -ep + \lambda_1 p = 0, \tag{13}$$

$$\frac{\partial LG}{\partial e} = p\left[\theta X - W - I\left[a\theta + (1-a)\right] + (1-a^*)(1-\theta)sD\right] - \lambda_1 c''(e) = 0. \tag{14}$$

Substituting (14) into (13) and rearranging yields (11).

Proof of Proposition 4.

From (5) it follows that
$$\frac{da}{dD} = \frac{(1-\theta)s}{k''(a)} > 0. \tag{15}$$

From (12) it follows that

$$\frac{de}{da} = \frac{p(1-\theta)(I-sD)}{2c''(e)}, \tag{16}$$

which is positive since we assumed that $I > D$.

Evaluation Effort and Rejection Rate: The first derivative of (12) with respect to D is
$$\frac{de}{dD} = \frac{p(1-\theta)(I-sD)}{2c''(e)}\frac{da}{dD} = \frac{de}{da}\frac{da}{dD}, \tag{17}$$
which is positive since $\frac{de}{da} > 0$ and $\frac{da}{dD} > 0$. From this it follows that $\frac{dR_G}{dD} < 0$ and $\frac{dR}{dD} < 0$.

Audit Fee: From (11) it follows that

$$W^* = -e^* \frac{c''(e^*)}{p} + \theta X - I\left[a^*\theta + (1 - a^*)\right] + (1 - a^*)(1 - \theta)sD. \qquad (18)$$

The first derivative with respect to D is

$$\frac{dW}{dD} = -\frac{de}{dD}\frac{c''(e)}{p} + [1 - \theta]\frac{da}{dD}(I - sD) + (1 - a)(1 - \theta)s.$$

Substituting (17) into above and rearranging gives

$$\frac{dW}{dD} = 0.5\left[1 - \theta\right](I - sD)\frac{da}{dD} + (1 - a)(1 - \theta)s,$$

which is positive since we assumed that $D \leq I$.

The Auditor's Utility: The auditor's *ex ante* utility is given by

$$U^A = ep\left[W - (1 - a)(1 - \theta)L - k(a)\right] - c(e). \qquad (19)$$

Substituting (6) into (19) gives

$$U^A = ec'(e) - c(e). \qquad (20)$$

The first derivative of (20) with respect to D is

$$\begin{aligned}
\frac{dU^A}{dD} &= \frac{de}{dD}c'(e) + ec''(e)\frac{de}{dD} - c'(e)\frac{de}{dD} \\
&= ec''(e)\frac{de}{dD},
\end{aligned}$$

which is positive since $\frac{de}{dD} > 0$.

The Entrepreneur's Utility: Substituting the investors' participation constraint (9) into the entrepreneur's utility function (2) gives

$$U^E = ep\left[\theta X - W - I\left[a\theta + (1 - a)\right] + (1 - a)(1 - \theta)sD\right].$$

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Substituting (18) into above and rearranging yields

$$U^E = e^2 c''(e). \tag{21}$$

The first derivative of (21) with respect to D is

$$\frac{dU^E}{dD} = 2e\frac{de}{dD}c''(e),$$

which is positive since $\frac{de}{dD} > 0$.

Proof of Proposition 5.

From (5) it follows that

$$\frac{da}{dl} = -\frac{(1-\theta)s}{-k''(a)} = \frac{(1-\theta)s}{k''(a)} > 0. \tag{22}$$

From (12) it follows that

$$\frac{de}{da} = \frac{p(1-\theta)\,(I-sD)}{2c''(e)} > 0. \tag{23}$$

Evaluation Effort and Rejection Rate: The first derivative of (12) with respect to l is

$$\frac{de}{dl} = p(1-\theta)\frac{(I-sD)\frac{da}{dl} - (1-a)s}{2c''(e)} = \frac{de}{da}\frac{da}{dl} - \frac{p(1-\theta)(1-a)s}{2c''(e)}. \tag{24}$$

Note that $a = \frac{(1-\theta)s(D+l)}{k}$ and $a^f = \frac{(1-\theta)(I+sl)}{k}$. Substituting $\frac{da}{dl} = \frac{(1-\theta)s}{k}$ into above yields:

$$\frac{de}{dl} = -\frac{p(1-\theta)}{2c''(e)}s\left[1 - a^f\right],$$

which is negative. For $\frac{de}{dl} < 0$, it follows that $\frac{dR_G}{dl} > 0$ and $\frac{dR}{dl} > 0$.

Audit Fee: The first derivative of (18) with respect to l is

$$\frac{dW}{dl} = -\frac{de}{dl}\frac{c''(e)}{p} + (1-\theta)\frac{da}{dl}\,(I-sD),$$

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which is positive since $\frac{de}{dl} < 0$, $\frac{da}{dl} > 0$, and we assumed that $I \geq D$.

The Auditor's Utility: The first derivative of (20) with respect to l is

$$
\begin{aligned}
\frac{dU^A}{dl} &= \frac{de}{dl}c'(e) + ec''(e)\frac{de}{dl} - c'(e)\frac{de}{dl} \\
&= ec''(e)\frac{de}{dl},
\end{aligned}
$$

which is negative since $\frac{de}{dl} < 0$.

The Entrepreneur's Utility: The first derivative of (21) with respect to l is

$$
\frac{dU^E}{dl} = 2e\frac{de}{dl}c''(e),
$$

which is negative since $\frac{de}{dl} < 0$.

Proof of Proposition 6

From (5) it follows that

$$
\frac{da}{ds} = -\frac{(1-\theta)(D+l)}{-k''(a)} = \frac{(1-\theta)(D+l)}{k''(a)} > 0.
$$

From (12) it follows that

$$
\frac{de}{da} = \frac{p(1-\theta)\,(I - sD)}{2c''(e)} > 0.
$$

Evaluation Effort and Rejection Rate: Using (12) we have

$$
\frac{de}{ds} = p\frac{(1-\theta)\,[I - sD]\,\frac{da}{ds}}{2c''(e)} - p\frac{(1-a)(1-\theta)l}{2c''(e)}. \tag{25}
$$

Note that the second derivative is

$$
\frac{d^2e}{ds^2} = -\frac{p}{2c''(e)}(1-\theta)\,[D - l]\,\frac{da}{ds},
$$

which is negative since we assumed that $D > l$. This implies that there exists a threshold $\widehat{s}$ that satisfies $[I - sD]\,\frac{da^*}{ds} - (1 - a^*)l = 0$ such that for $s < \widehat{s}$ it holds that

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$\frac{de}{ds} > 0$ and for $s > \hat{s}$ it holds that $\frac{de}{ds} < 0$. For $\frac{de}{ds} > 0$, we have $\frac{dR_G}{ds} < 0$, $\frac{dR_G}{ds} < 0$ and for $\frac{de}{ds} < 0$, we have $\frac{dR_G}{ds} > 0$, $\frac{dR_G}{ds} > 0$.

Audit Fee: The first derivative of (18) with respect to s is

$$\frac{dW}{ds} = -\frac{de}{ds}\frac{c''(e)}{p} + [1 - \theta]\frac{da}{ds}(I - sD) + (1 - a)(1 - \theta)D.$$

Substituting (25) into above and rearranging gives

$$\frac{dW}{ds} = 0.5(1 - a)(1 - \theta)l + 0.5[1 - \theta]\frac{da}{ds}(I - sD) + (1 - a)(1 - \theta)D,$$

which is positive since we assumed that $I \geq D$.

The Auditor's Utility: The first derivative of (20) with respect to s is

$$\begin{aligned}
\frac{dU^A}{ds} &= \frac{de}{ds}c'(e) + ec''(e)\frac{de}{ds} - c'(e)\frac{de}{ds} \\
&= ec''(e)\frac{de}{ds},
\end{aligned}$$

which is positive for $\frac{de}{ds} > 0$ and negative for $\frac{de}{ds} < 0$.

The Entrepreneur's Utility: The first derivative of (21) with respect to s is

$$\frac{dU^E}{ds} = 2e\frac{de}{ds}c''(e),$$

which is positive for $\frac{de}{ds} > 0$ and negative for $\frac{de}{ds} < 0$.

Proof of Proposition 7.

Evaluation Effort and Rejection Rate: From (12) it follows that

$$\frac{de}{d\theta} = p\frac{X - Ia^* + (1 - \theta)\frac{da}{d\theta}(I - sD) + (1 - a)sl}{2c''(e)}.$$

Substituting $a = \frac{(1-\theta)s(D+l)}{k}$ and $\frac{da}{d\theta} = -\frac{L}{k}$ into above and rearranging yields

$$\frac{de}{d\theta} = p\frac{X - 2Ia^* + asD + (1 - a)sl}{2c''(e)}, \tag{26}$$

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which is positive for $X - 2I - sl > 0$. For $\frac{de}{d\theta} > 0$, it follows that $\frac{dR_G}{d\theta} < 0$ and $\frac{dR}{d\theta} < 0$.

Audit Fee: From (18) it follows that

$$\frac{dW}{d\theta} = -\frac{de}{d\theta}\frac{c''(e)}{p} + X - Ia - (1-a)sD - I\left[\theta - 1\right]\frac{da}{d\theta} - (1-\theta)sD\frac{da}{d\theta}.$$

Substituting (26), $a = \frac{(1-\theta)s(D+l)}{k}$, and $\frac{da}{d\theta} = -\frac{L}{k}$ into above and rearranging yields

$$\frac{dW}{d\theta} = 0.5X - Ia - (1-a)sD - 0.5(1-a)sl + 0.5asD,$$

which is positive for $0.5X - I - 0.5sl > 0$ since we assumed that $D \leq I$.

The Auditor's Utility: The first derivative of (20) with respect to θ is

$$\begin{aligned}
\frac{dU^A}{d\theta} &= \frac{de}{d\theta}c'(e) + ec''(e)\frac{de}{d\theta} - c'(e)\frac{de}{d\theta} \\
&= ec''(e)\frac{de}{d\theta},
\end{aligned}$$

which is positive for $\frac{de}{d\theta} > 0$ and negative for $\frac{de}{d\theta} < 0$.

The Entrepreneur's Utility: The first derivative of (21) with respect to θ is

$$\frac{dU^E}{d\theta} = 2e\frac{de}{d\theta}c''(e),$$

which is positive for $\frac{de}{d\theta} > 0$ and negative for $\frac{de}{d\theta} < 0$.

This analysis leads to the next proposition, which is more general than the one provided in Section 5.

Proposition 8 *Let X^A and X^B denote the thresholds that satisfy*

$$X^A - Ia^* + (1-\theta)(I - sD)\frac{da^*}{d\theta} + (1-a^*)sl = 0, \; and$$

$$X^B - Ia^* + (1-\theta)(I - sD)\frac{da^*}{d\theta} + (1-a^*)sl - 2(1-a^*)(sD + sl) = 0,$$

respectively.

For $X > X^B$ ($X < X^B$), if project risk increases, i.e., θ declines, then

i) the equilibrium audit fee W decreases (increases),

For $X > X^A$ ($X < X^A$), if project risk increases, then

ii) the equilibrium evaluation effort e decreases (increases),

iii) the probability that the good type client gets rejected (and the overall rejection rate) increases (decreases),

iv) the entrepreneur and the auditor are both worse off (better off).

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