FIRM VALUE, AUDIT QUALITY, AND SOCIAL WELFARE IN THE PRESENCE OF COSTLY LITIGATION AGAINST AUDITORS

by

Suil Pae

B.B.A., Seoul National University, 1987

M.B.A., Seoul National University, 1989

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

THE FACULTY OF COMMERCE AND BUSINESS ADMINISTRATION

We accept this thesis as conforming

to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

July 1996

In presenting this thesis in partial fulfilment of the requirements for an advanced degree at the University of British Columbia, I agree that the Library shall make it freely available for reference and study. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by the head of my department or by his or her representatives. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Faculty
Department of Commerce

The University of British Columbia
Vancouver, Canada

Date July 22/96

ABSTRACT

This dissertation has two objectives. The first is to provide a framework for understanding strategic interactions between an auditor and investors in a competitive rational expectations economy. The second is to provide a welfare analysis of auditor litigation in a costly legal environment. We present a model which captures the following aspects: (i) investors in a competitive capital market form rational expectations about their future litigation opportunities against auditors; (ii) auditors compete for potential clients, and they strategically consider the threat of litigation; (iii) the audited firm's production decision depends on audit quality; and (iv) trial is a costly process, and litigants have settlement opportunities. The market price of the firm and audit quality are endogenized.

The welfare analysis provides a rationale why society maintains a legal system which provides an incentive for the investors to recover their *ex post* financial loss from the auditor through a costly legal process, even if they can price-protect themselves *ex ante* with or without such a mechanism. We interpret the court system as a decentralized disciplinary mechanism for the auditor moral hazard problem, which enables the potential auditee to use an auditor as a commitment device.

We examine the economic consequences of legal policies which potentially influence the size of legal costs. When audit failure is clearly defined, an increase in the auditor's legal costs decreases social welfare. An increase in the investors' legal costs has a more complex impact on the actions of economic agents upon which the social costs and benefits of an audit crucially depend. We also study the economic impact of a change from an American to a British rule of allocating legal costs, which was recently proposed by the accounting profession in the U.S. In contrast to the practitioners' common belief, we demonstrate that the British rule might increase the frequency of lawsuit. Therefore, regulators must be very careful in evaluating the accountants' proposal of the British rule, and it should not replace the American rule unless a careful analysis indicates that the net benefit of audits under the British rule is larger than that under the American rule.

TABLE OF CONTENTS

ACKNOWLEDGEMENT

I am most grateful to my research supervisor, Jerry Feltham, whose influence as a mentor goes far beyond his professional guidance and continuing support during my entire Ph.D. program. I also wish to thank the members of my dissertation committee, Sunil Dutta, Dan Simunic, and Guofu Tan for their excellent suggestions and comments. I also have benefitted from helpful comments of Steve Huddart, Jack Hughes, Bill Scott, Reed Smith, Brett Trueman, and the seminar participants at UBC, UC-Berkeley, UC-Davis, UC-Riverside, Duke University, Hong Kong University of Science and Technology, University of Oregon, and University of Waterloo. All faculty members and Ph.D. students in the accounting division of the Faculty of Commerce provided me constant support and encouragement. My thanks also go to Derek Chan, who brought the auditor's legal liability issue to my attention and provided helpful suggestions. My wife, Kyujin Cho, deserves very special thanks for her patience and understanding throughout my Ph.D. program.

Financial support from the Killam Pre-Doctoral Fellowship, University Graduate Fellowship, Meilicke Memorial Graduate Fellowship, and MacPhee Graduate Fellowship is gratefully acknowledged.

CHAPTER 1:

INTRODUCTION

1.1 Motivation of Study

A substantial increase in litigation involving public accountants in recent years, in terms of the number of lawsuits filed and alleged damage claimed,[1] has generated numerous discussions in the accounting profession and legal community, as well as by academics.[2] In particular, recent debates on the auditor's legal liability illustrate that the users (e.g., external investors, banks,

---

[1] Mednick [1987] states "more suits have been filed against auditors in the past 15 years than in the entire previous history of the profession. The number of lawsuits reported to the special investigations committee of the American Institute of CPAs SEC practice section has increased in each of the last six years. The largest accounting firms collectively have paid more than $250 million in settlements of mostly audit-related lawsuits since 1980 (p.119)." According to Mednick and Peck [1993], the Big Six auditing firms spent $404 million (7.7% of their accounting and auditing revenue) on litigation-related expenditures in 1990, $477 million (9%) in 1991, and $598 million (10.9%) in 1992, which is nearly, on average, $100 million per firm in 1992 alone. He also reports that currently pending claims against the Big Six auditing firms of more than $30 billion represent more than twenty times the combined partners' capital in all six firms. O'Malley [1993] documents that the claims against other than the Big Six auditors rose by two-thirds between 1987 and 1991. As for an impact of the auditor litigation on clients, Weinback [1993] states that "... of more than 1500 small CPA firms in California specializing in small business, the portion of doing audit work declined by 15% to 53% in past 2 years. As a result, many small businesses are having a difficult time finding an auditor in order to attract capital (p. 363)."

[2] Various views/studies on auditor litigation can be found in the special issues of *Journal of Economics, Management, and Strategy* (Vol. 2, No. 3, 1993) and *Journal of Accounting Research* (Vol. 32, Supplement, 1994).

employees, government, etc.) of audited financial statements (F/S hereafter) *expect* auditors to provide *insurance* against financial losses caused by poorly audited F/S. Auditors argue that this is a misunderstanding of the nature of audited information, since an audit can provide only reasonable assurance given the imperfection of audit technology and business risk.[3] Nonetheless, the audited F/S users have the idea that an auditor, like a manufacturer, should be subject to product liability in the sense that the auditor is legally liable for the financial damage caused by material misstatements in the audited F/S.[4] Given that it is the F/S users' perception that determines their litigation behavior, it is unlikely that litigation against auditors will diminish unless the auditors succeed in changing the F/S users' current perception of the role of the auditor.[5]

Given the current perception of the role of an audit, the auditor has a *dual* role in external investors' valuation of firm.[6] The first is to provide an audited report which reduces investors' uncertainty about the firm's current and future performance. The second is to provide insurance in that when the audited firm is in financial distress, the investors may use the legal system to potentially

---

[3] In particular, the profession recognizes, in *Statements on Auditing Standards* (SAS) no. 53, that frauds and intentional misrepresentations are more difficult to detect than misstatements due to errors. Moreover, an audited firm may have a going-concern problem due to business risk, which is uncontrollable by the auditor. However, in SAS no. 59, the auditor is required to evaluate and discuss explicitly whether there is substantial doubt about the firm's viability as a going-concern for a reasonable period of time.

[4] The New Jersey Supreme Court first argued that the auditor should supply such insurance in *Rosenblum* v. *Alder* Slip Op. A-39/85 (N.J. June 9, 1983).

[5] Practitioners recognize that this so-called "expectation gap" is so widely spread that they need to devote substantial resources to increase public understanding of an audit's nature and its inherent limitations. See Epstein and Geiger [1994]. Some practitioners, e.g., Aldersley [1994], expect a change in the nature of auditing into a financial statement insurance business. Palmrose [1987] states that the current professional standards maintaining non-responsibility of the auditor to detect management fraud, due to the inherent limitations of audit process, do not serve to prevent auditor litigation and the auditor's payments in case of management fraud.

[6] Although the following discussion equally applies to the other classes of financial statement users, we focus on the external investors in the thesis.

recover at least some of their losses. However, it must be pointed out that the "insurance" provided by the auditor (via enforcement of the court system) differs from the insurance in an usual sense.[7] That is, there are several important features that distinguish the auditor's insurance from the usual insurance policies provided by insurance companies. First, there is no explicit contractual relation between the external investors (insurees) and the auditor (insurer). More specifically, the external investors do not pay an insurance premium to the auditor. The insurance premium is effectively paid in the form of an audit fee by the party who hires the auditor, i.e., current shareholders.[8] Second, the accident rate (i.e., the probability that financial losses are incurred due to misstatements in F/S) does not depend upon the investors' care (as in auto insurance) or some investor characteristic unknown to the auditor (as in life insurance).[9] Instead, it is determined by the costly audit effort provided by the auditor, and the firm characteristics (which may be influenced by management's actions). Third, an audit fee includes not only the auditor's expected loss from litigation, but also the compensation for the auditor's costly effort to reduce the litigation risk.[10]

Fourth, even when the investors suffer financial losses (e.g., an audited firm goes bankrupt),

---

[7] As will be discussed in a moment, "insurance" is not an appropriate word in the auditor litigation context. Perhaps, a potential *ex post* transfer might be a more appropriate term. We, however, use the term "insurance" as it is commonly used in the literature and practice.

[8] Therefore, it is the audited firm to which the effect of the auditor's insurance role ultimately belongs. This will be clear in chapter 2 where we discuss the equilibrium welfare of the audited firm.

[9] In the former case, the insuree's moral hazard problem arises, and Holmstrom [1979] shows the optimality of a deductible in the insurance policy in such a setting. On the other hand, the latter case is well-known as an adverse selection problem in the insurance literature, e.g., Rothschild and Stiglitz [1976].

[10] For example, Simunic and Stein [1995] report that the threat of litigation induces auditors to exert more effort (i.e., provide a high quality audit service) rather than simply charge a high risk premium for litigation risk. Pratt and Stice [1994] document that audit fees reflect both the amount of audit evidence collected and an additional premium to cover litigation risk. Beatty [1993] also documents a positive relation between auditor's exposure to legal liability and audit fee in initial public offerings markets.

they are not entitled to recover their financial damage from the auditor unless they initiate litigation to assess whether there was audit failure.[11] Moreover, in case of litigation, there are substantial legal costs to be borne by the investors and auditors, which might be dead-weight losses to the litigants if there is no audit failure. Finally, it is the insurees (investors) who influence the size of their potential financial loss (damage). This is because the size of financial loss is related to the market price at which the audited firm is traded, and that market price is effectively determined by the external investors. In addition, the audited firm's production decision may depend on the market price. These distinctive features suggest that the role of auditor as an insurer is quite different from that of pure insurance companies.[12] As pointed out by Francis [1994], the insurance hypothesis is not descriptive of why the auditors are sued or not sued. An immediate question is why society maintains a court system that motivates the investors to litigate against auditors for their potential *ex post* recovery of financial losses, and what are the costs and benefits of such a mechanism.

Under current practice, the audit fee is not contingent upon subsequent observable events (including the auditor's opinion, the audited firm's stock price, etc.). Given a non-contingent audit fee, an auditor moral hazard problem arises because the auditor's costly effort is not observable by the other parties.[13] Potential litigation against auditors by the audited F/S users, however, can

---

[11] By audit failure, we mean that the auditor fails to detect/report material misstatements in the financial statements.

[12] In addition, the insurance provided by the auditor does not have a risk diversification role. This follows from the fact that any idiosyncratic risk associated with firm's cash flow can be *more efficiently* diversified via capital markets (i.e., by holding a well-diversified portfolio) or through usual insurance contracts. That is, both institutional arrangements involve significantly less transaction costs compared to those of legal process. On the same vein, systematic risk associated with a specific firm's cash flow is by definition uninsurable, and it does not make sense to insure the investors from such systematic risk through the costly legal process.

[13] A moral hazard problem arises in any situation where an economic agent cannot precommit to take a costly action. In the extreme, if there is no mechanism that motivates auditors to exert effort, no audit effort will be provided, and hence, an audit has no value.

mitigate the auditor moral hazard problem. With minimal audit effort, the auditor is unlikely to detect intentional and/or unintentional misstatements, if any, in F/S. In the presence of the opportunity to litigate, if external investors suffer financial losses due to poorly audited F/S, then they may use the court system to recover at least some of their damages, alleging that the auditor failed to provide due professional care. Since litigation imposes financial and reputational costs on the auditor (whether the auditor is liable or not), the litigation risk/threat provides an incentive for the auditor to exert effort in auditing even if the audit fee is non-contingent and the costly audit effort is not observable. Therefore, the legal liability in the auditing context can be better understood as a decentralized disciplinary mechanism for the auditor's incentive problem, rather than an insurance or protection mechanism for the investors. Recent studies by Carcello and Palmrose [1994], Pratt and Stice [1994], among others, provide empirical support for the above statements.[14] A consequence of increased auditor effort is the enhanced credibility of audited F/S, which helps the economic agents make improved resource allocation decisions.

The objective of this thesis is to examine the auditor's legal liability issue in a costly litigation framework from a social welfare perspective.[15] As Kinney [1993] states, the greatest beneficiary of

---

[14] Carcello and Palmrose [1994] report that public accountants are included as defendants in the majority (74%) of financial reporting/disclosure lawsuits when the audited firm is bankrupt. Pratt and Stice [1994] document that the overall financial condition of a client is the primary consideration in the audit planning and the audit fee. They report that poorer financial conditions are associated with higher litigation risk, more audit evidence, and higher audit fees. See also Kothari, Lys, Clifford, and Watts [1988] and Lys and Watts [1994].

[15] Simunic and Stein [1995] document that audit firms make client-specific audit fee adjustments for litigation risk, and the increase in audit fees in aggregate across clients appears to be adequate to compensate for audit firms' actual litigation-related expenditures (about 10% of accounting and auditing revenue). They conclude that audits are *not* systematically mispriced at least until the early 1990's. This evidence suggests that the audit market is competitive, and audits are priced so that the auditors earn a normal profit *ex ante*. That is, in a competitive equilibrium, auditors pass the audit costs and expected litigation loss to the client in the audit fee. On the other hand, the external investors in a rational expectations equilibrium are *ex ante* price-protected. Since we assume competitive audit and financial markets in our model, the auditee's welfare is the same as social

the legal system would/should be the society as a whole.[16] To the best of our knowledge, there have been no published studies in the accounting literature which address the auditor's legal liability issue from the social welfare perspective with explicit recognition of the costly legal system. To address the social welfare issue in auditor litigation, at least two conditions are necessary. First, one must ensure that the economic setting is such that the audit has a *real* impact on the resource allocation decision, so that the aggregate welfare is potentially increased by the use of audit technology. If there is no efficiency loss induced by the market mechanism, audits have no impact on the social welfare since the aggregate welfare would be the same with or without audits.[17]

Second, even if the audits potentially improve the audited firm's investment and/or production decisions, we cannot make a complete welfare statement unless the potential social welfare improvement is carefully compared with the social costs. In other words, when the costly court system is used as a mechanism to motivate the auditor to provide costly effort, the audit and legal costs have to be subtracted from the gross value of an audit. Also notice that the legal costs have an important implication for social welfare. For example, a legal system, in which the investors' legal costs are too small relative to the auditor's legal costs, would induce the investors to pursue the *ex post* recovery of their financial loss too aggressively. This might result in excessively large audit costs

---

welfare in our study. Therefore, we use the auditee's welfare and social welfare interchangeably throughout the thesis.

However, it must be noted that our welfare analysis is in a partial equilibrium setting. To provide a welfare analysis in a general equilibrium setting, we need to specify the investment opportunity set of the economy and the auditors' and investors' utility functions for consumption, which goes beyond the scope of our study. See fn. 20 in chapter 5 for a further discussion.

[16] Kinney [1993] further states "An especially promising area is the modeling of legal liability systems at the society level, that is, models of what would happen if a given system applies were to be applied across an economy of many preparers and users with alternative investments. Models can also be developed to show the effects of liability rules on the cost of capital, aggregate investment, and the efficiency of capital allocation. (p. 360)"

[17] In effect, the audit and legal costs are dead-weight losses in such a setting.

and legal expenditures, which dominate the social benefit of the audit. Hence, in order to examine the welfare implications of a regulatory policy which potentially influences the legal costs, we need to clearly understand how the economic agents respond to such a change in their legal costs, and how those responses affect the social costs and benefits of an audit.

1.2 Literature Review

There is an extensive body of studies in the law and economics literature on litigation in non-auditing contexts. There are essentially two issues upon which these studies focus: litigation/settlement and its implications on substantive behavior, i.e., the primary action of one party which potentially causes harm to other parties (e.g., care of engineering contractors for the safety of buildings).[18] Specifically, they study the incentive to litigate/settle when one party's action does damage to the other, and how that incentive changes when the court decision rule is changed. In some studies, a two-stage game is considered to examine the change in the incentive for care in the first stage induced by a change in the legal environment: such a change in the court system has a direct impact on the second stage behavior (i.e., litigation and settlement), which will induce a change in the substantive behavior. However, as we will discuss shortly, such analyses in the law and economics literature do not seem to directly apply to the auditor litigation context, mostly due to the lack of potential plaintiffs' rational response before they suffer *ex post* loss in these studies. Experimental studies in the accounting literature (see Dopuch and King [1992] and Dupuch, King and Schatzberg [1994] for example) provide evidence that market agents adjust their economic strategies

[18] See Shavell [1982], P'ng [1983 and 1987], Bebchuk [1984], Reinganum and Wilde [1986], Nalebuff [1987], Katz [1987], Plott [1987], Polinsky and Rubinfeld [1988 and 1996], Polinsky and Che [1991], Shapiro [1991], Spier [1992 and 1994], Beckner and Katz [1995], Farmer and Pecorino [1995], among others.

to price-protect themselves in response to a change in the legal environment. This in particular implies that for any given legal system in place, the investors (potential plaintiffs) and the auditor (potential defendant) rationally anticipate the consequence of subsequent litigation opportunity in their pricing of the firm and the audit service. In addition, as we mentioned earlier, the investors effectively determine the size of their potential loss in the auditor litigation context while the damage amount in the law and economics studies is exogenously specified or at best a (stochastically) decreasing function of the potential defendant's *ex ante* care.

In what follows, we briefly review some of existing studies in the accounting literature which address the auditor litigation issue. In particular, we focus our discussion on the two necessary conditions mentioned in the previous section. Balachandran and Nagarajan [1987] (BN) study the incentive effect of alternative legal liability rules on the auditor's effort. Their model is essentially a game between the auditor and the court, where the focus is on the change in the audit effort induced by a change in the court's decision rule.[19] As BN admit in their conclusion, their study cannot make welfare inferences since their analysis is done in a partial equilibrium framework. For example, the audit market is absent in the model. In addition, their model formally rules out the F/S users. As an implicit justification, BN assume that litigation is costless and thus the unmodeled plaintiffs prefer to file lawsuits and go trial.[20] As a consequence of the absence of F/S users in their model, BN need to make an exogenous damage assessment when the auditor is liable. As discussed earlier, if we explicitly introduce the F/S users (who must be the key players in the auditor litigation), the damage assessment has to be linked with F/S users' economic decisions based on the audited F/S. When the

[19] They consider two legal systems. The first one is termed a strict liability rule under which the auditor is held liable whenever there is a loss. The second one is a negligence rule, and it holds the auditor for losses whenever the auditor fails to provide a prescribed due care standard.

[20] They also do not distinguish between filing a suit and going to trial.

existing legal system is replaced by an alternative legal system, the auditor's decision will change (as studied by BN), which changes the informational content of the audited F/S. This in turn will change the F/S users' economic decisions, which again changes the potential damage assessment.[21]

Nelson, Rosen, and White [1988] (NRW) study an interesting feature of the interaction between the audit effort and managerial discretion on the effectiveness of the internal control system in the auditor's legal liability context.[22] As in BN, NRW rule out the F/S users, i.e., the potential users of the legal system. Another important limitation of their study is that there is no *ex ante* demand for an audit. In other words, the auditor in their model has no welfare-enhancing role, and hence, the efficient solution is no audit in such a setting.[23]

A similar caveat applies to recent studies in the accounting literature. For example, Melumad and Thoman [1990a] study the economic consequences of auditor litigation in an adverse selection setting. All projects are undertaken in their study, since all projects have a net positive expected return regardless of the types of the auditees. Along the same vein, the firm's production decision has been made before an auditor is hired in the studies by Narayanan [1994], Schwartz [1994], and Smith and Tidrick [1995]. This implies that the auditor has no real impact on the firm's future cash flow. Instead, the auditor's role in the above studies is essentially to provide a prediction of the firm's

---

[21] This change in the damage amount will in turn change the auditor's effort decision, and this process will continue until an equilibrium state is reached.

[22] A crucial assumption in their study (their comparative static analysis in particular) is that the manager's accounting effort and audit quality are *strategic substitutes*. That is, manager's additional internal control effort lowers the marginal product of audit effort. Also notice that they assume that the auditor's and manager's effort levels are observable *ex post*, which makes the negligence liability rule implementable in their study. We believe that the negligence liability rule is very difficult to apply in the auditor litigation, not only because the audit effort is unverifiable but also because a complete specification of due care standards is extremely costly in the auditing context.

[23] As Demski [1988] states, we might need to worry about studying auditing in a model in which the efficient solution is not to audit.

future profitability. Although their examination of the change in the audit effort in response to a change in the legal environment is interesting, the audit and legal costs are dead-weight losses from a social welfare perspective, and hence, the social welfare would be higher if there were no auditors in their settings.[24] In sum, all the studies mentioned above have no welfare-enhancing role of the auditor, which is the first necessary condition to address the welfare implication of auditor litigation.

In contrast to above studies, Shibano [1991], Gode [1993], Dye [1995], Schwartz [1995], Chan [1995] have settings in which the auditor's costly effort affects the audited firm's production decision, and hence, potentially improves the social welfare. In Shibano [1991], a potential under-investment problem (abandonment of a positive expected return project) arises due to asymmetric information.[25] The auditor's effort affects the high type's decision to undertake the project, which increases the social welfare. The role of the auditor in Dye [1995], Schwartz [1995], and Chan [1995] is to prevent the investment by a low type firm which has a negative expected return project. Gode [1993] discusses other possible welfare-enhancing roles of the auditor, e.g., risk sharing and trade-facilitation, although he does not provide formal analyses.

However, Shibano [1991] and Gode [1993] do not explicitly consider the costly litigation process, even though the court system is implicitly embedded in their models as an incentive mechanism for the auditor. On the other hand, Dye [1995] and Schwartz [1995] implicitly assume a *costless* legal system. That is, the investors' expected recovery from the litigation is the same as the auditor's expected litigation loss in Schwartz [1995]. Similarly, in Dye [1995], the auditor's

---

[24] In other words, even though the audited report affects the amount of transfer from one party to the other party, society as a whole (or equivalently, the party who potentially hires an auditor) would be *ex ante* better off if the potential auditee could precommit not to hire an auditor. Similar arguments can be found in Feltham [1990].

[25] There are two possible types (high and low), and both have positive expected return projects. The dilution effect may induce the high type to give up undertaking the project when the information rent earned by the low type is sufficiently high.

effective liability (the unconditional expected assessment of the auditor's legal liability) is an exact *ex ante* transfer from the auditor to the investors so that there is no dead-weight loss associated with litigation.[26] In a credit market setting, Chan [1995] assumes that the lenders bear no legal costs, and hence, a lawsuit is filed against the auditor whenever the audited firm goes bankrupt.[27] In addition, these studies do not consider the litigants' settlement opportunities. In summary, although these studies have a value-creating auditor in their models, they do not provide a complete answer to the social welfare issue in a costly legal environment.

It is now clear that the two necessary conditions to address the social welfare implications of auditor litigation are not satisfied by the existing studies in the accounting literature because the costs and benefits of auditing and using the costly court system as an incentive mechanism are not taken into account in an appropriate manner. In a sense, the existing studies provide only a partial picture of auditor litigation. It is our belief that for a better understanding of auditor litigation, we need to consider the economic behavior of the auditors, potential auditees, F/S users, and court's decision rule simultaneously. To achieve this objective, we use a simple game theoretic analysis and employ the Nash equilibrium concept in competitive audit and financial markets. We believe that an examination of auditor litigation in such a broad setting is the first step toward a better understanding of the welfare implications of auditor's legal liability, which may be helpful to policy/law makers as they ponder the proposed changes in the institutional framework of audit service.

---

[26] In Dye [1995], the social surplus, the sum of firm's incremental welfare and the aggregate expected profits of the auditors, reflects the information value of audit only, without the costs of the legal system. Similarly, once we introduce the competition among the auditors for clients, the *ex ante* social welfare in Schwartz [1995] includes no legal costs even though the investors sue the auditor with probability one.

[27] The social welfare in Chan [1995] does not include the welfare of the lenders' lawyer who receives a fraction of total recovery.

1.3 Overview of Thesis

To address the social welfare implications of the auditor's legal liability in a costly litigation environment, we explicitly consider the auditor's welfare-enhancing role and the social costs of auditing and the court system in a competitive rational expectations economy. In particular, we present a model in which (i) the external investors form rational expectations about future litigation opportunities when they trade in a competitive capital market; (ii) the auditors compete for potential clients; (iii) the auditor strategically chooses the audit quality taking the litigation threat into account;[28] (iv) the audited firm's investment/production decision is non-trivially affected by the audit quality; and (v) litigation is a costly process and litigants can settle before going to trial.

To be more specific, the basic model in chapter 2 has the following ingredients. An entrepreneur, who wants to sell his firm to the competitive financial market, chooses to hire an auditor. The entrepreneur obtains private information about the expected future cash flow that will result from future investment by the new owners (that information is termed the firm's or entrepreneur's type). The firm's type is communicated to the financial market via an audited report. The audit technology is imperfect in the sense that there is a strictly positive probability that material misstatements in the report are not detected by the auditor. The auditor's costly effort can reduce this probability. When an audited report is issued, the firm is traded to investors at a market-determined price. The cash flow is realized at the end of the period. Investors can file a lawsuit against the auditor if they suffer financial losses, and if they believe that there are material misstatements in the audited report. If a lawsuit is filed, then the court determines whether material misstatements in the audited report are undetected by the auditor, which is termed audit failure. The auditor is liable for

[28] The precise meaning of audit quality is given in chapter 2. Roughly speaking, the higher the audit quality, the less likely that material misstatements are in the audited financial statements. A higher quality audit is more costly to provide than a lower quality audit.

the investors' financial losses if the court determines there has been audit failure, and in the basic model the court accurately assesses whether this has occurred.[29] Litigation is a costly process in that it imposes substantial legal costs on the litigants to determine audit failure. Initially, the American rule of allocating legal costs is considered. That is, litigants bear their own legal costs, irrespective of the court's decision of audit failure.

Notice that in this setting investors rationally anticipate the possibility of a lawsuit against the auditor in their pricing of the firm, as well as fully recognizing the informational role of the audited report generated by an imperfect audit technology. Consequently, the equilibrium value of the firm consists of two parts, one for the expected future cash flow from the audited firm (referred to as the information value of audit) and the other for the investors' net expected payoff from litigation (referred to as the insurance value of audit). We analyze how the auditor optimally determines the audit quality given his strategic consideration of litigation risk, which is assumed to be the sole mechanism to discipline the auditor's moral hazard problem. The market price of the firm, which is a part of the investor's potential financial losses, and the audit quality emerge endogenously.[30]

---

[29] Two points should be made clear. First, note that auditor in my study is never responsible for the business risk of the client. This is because the auditor is never held liable for high type firm's business failure. That is, since the auditor attests to the firm's type, but not to the future success of project, the auditor is not held liable if the trial reveals the auditor's attestation is consistent with the firm's true type. Second, the liability rule in chapters 2 and 3 is the strict liability rule in that the auditor is held liable irrespective of the amount of audit effort whenever the inconsistency between the auditor's attestation and the firm's true type is revealed in the trial. In chapter 4, we consider an alternative liability rule, termed vague negligence regime, under which the probability of auditor being liable for a low type firm's outcome depends on the audit quality.

[30] Although not directly comparable with our model, Titman and Trueman [1986] and Datar, Feltham, and Hughes [1991] examine the audit quality in IPO settings. In their models, the auditor is not an active player in that the audit quality is exogenously given, and the investors do not consider the litigation opportunity even if the audit technology is imperfect. In the finance literature, Hughes and Thakor [1992] discuss the impact of litigation risk on the underwriters' pricing decision. Some features that distinguish our study from theirs include: (i) the fee structure is flat for the auditor, while the underwriter's revenue is assumed to be a fraction of price of the firm marketed; (ii) the auditor does not know the firm's true type when he chooses an audit quality, while the underwriter

This endogeneity distinguishes our model from the recent studies in the accounting literature mentioned in the previous section.[31] In their analysis of the auditor's legal liability, they assume an exogenous damage assessment as in most studies in the law and economics literature. An exogenous damage assessment is not an appropriate assumption in our context given the investors' rational anticipation of the litigation opportunity in their pricing decision as discussed above.[32] Under the American rule of legal costs allocation, we establish that the market price and audit quality are strategic complements in the sense that the higher the market price, the higher audit quality, and *vice versa*. This is driven by the fact that (i) as the audit quality increases, the increase in the information value of audit dominates the decrease in the insurance value of audit, and (ii) as the market price increases, the auditor's expected litigation loss increases, which induces the auditor to provide a higher audit quality. This strategic complementarity allows us to generate intuitive comparative static predictions.

We then provide a welfare analysis, which suggests a rationale why the entrepreneur hires an imperfect auditor. In particular, we interpret the entrepreneur's hiring of the auditor as the entrepreneur's *ex ante* commitment to discipline his *ex post* incentive to misreport the firm's

---

is assumed to observe the firm's true type before determining the selling price; and (iii) the investors in our study have uncertainty about audit failure when filing a lawsuit against the auditor, whereas a lawsuit against the underwriter is always successful when it is pursued in their study. In a non-litigation framework, Chemmanur and Fulghieri [1994] study an investment bank's reputation acquisition where the investment bank's information production technology is similar to ours.

[31] Gode [1993] and Chan [1995] are exceptions.

[32] With an exogenous damage assumption, the studies in the law and economics literature state that the legal liability has two objectives, deterrence and fair compensation (see Shapiro [1991] and Cooter [1991], for example). With an endogenous damage, as pointed out by Gode [1993], any *ex post* compensation for the investors' financial losses is "fair," if investors are rational and voluntarily participate in trading, and the compensation rule is common knowledge *ex ante*.

profitability.[33] If there were no litigation against the auditor, the entrepreneur's commitment would not be credible due to the auditor's moral hazard problem. Hence, we view the court system, through which the investors may recover at least some of their financial losses, as a decentralized incentive mechanism that enhances the credibility of the entrepreneur's commitment by disciplining the auditor's moral hazard problem.

Given that the trial process is costly, filing a lawsuit does not imply that the case goes to trial. Even though the majority of lawsuits related to financial reporting include a public accountant as a defendant, Palmrose [1991a] finds that the trial rate, i.e., the percentage of total cases tried to verdict, is small (about 10%). Therefore, even though external investors believe that auditors play an insurance role in that they seek to recover their losses from the auditor (who is typically the only solvent or deep-pocketed defendant in the litigation involving financially troubled firms), only a small proportion of cases go to trial, as is typical in most malpractice lawsuits.[34]

Chapter 3 extends the basic model of chapter 2 to a setting in which a pretrial settlement is allowed, and examines how the settlement opportunity affects the investors' valuation of the firm and the auditor's quality choice decision in the setting where the damage is endogenously determined. To address strategic aspects of the pretrial settlement process, we introduce further structure to our basic model. Our model of pretrial negotiation is in the spirit of P'ng [1987] in the sense that the defendant

---

[33] By *ex ante* (*ex post*) we mean before (after) the true type of firm is privately revealed to the entrepreneur.

[34] This rate is higher than the rate of trial of civil securities litigation, which is less than 5%, as reported in Alexander [1991]. Viscusi [1991] reports that the trial rate in the product liability litigation is 4%. Palmrose [1991a] documents that auditors appear to be the only defendant at trial in 67% of trial cases. With regard to the trial resolution, she also reports that the auditor's success rate is about 50%, which is significantly less than that of a defendant in malpractice trials in other settings. Over 70% of auditor payments are less than $10 million in 1991 dollars. Practitioners argue that, under the current American rule of allocating legal costs, where litigants pay their own legal costs regardless of the court decision, investors may bring lawsuits solely for the purpose of coercing settlements. For example, see O'Malley [1993].

(auditor) has private information about his success in trial. In such a setting, the pretrial settlement game between the auditor and investors is a stylized model of bargaining under incomplete information. The informed defendant (auditor) moves first by making a settlement offer. The uninformed plaintiffs (investors) accept or reject the offer. If the settlement offer is rejected, then the case goes to trial, and the litigants incur legal costs.[35] In this setting, the auditor makes a strategic settlement offer since the investors' decision to bring the case to trial crucially depends upon the information transmitted by the settlement offer.

We characterize the equilibrium settlement offers made by the privately informed auditor, the investors' acceptance decision given a settlement offer, and the trial rate. We then characterize the equilibrium value of the firm and audit quality in the presence of pretrial negotiation. As one might expect, the opportunity of pretrial negotiation reduces the trial rate, so that the expected legal costs are decreased. Somewhat surprisingly, the equilibrium price of the firm and audit quality are not affected by the auditor's legal costs. In addition, it is shown that the pretrial settlement decreases the equilibrium value of the firm and audit quality in the sense that both are lower than those without pretrial negotiation. We then examine the impact of changes in the legal costs on the entrepreneur's (social) welfare. We establish that the entrepreneur's welfare decreases in the auditor's legal costs. This is driven by the fact that the auditor's legal costs do not affect the equilibrium value of the firm and audit quality, while an increase in the auditor's legal costs increases the expected aggregate legal costs borne by the entrepreneur *ex ante*. Consequently, in our setting, a social policy that leads to an increase in the auditor's legal costs merely decreases the entrepreneur's welfare. On the other

[35] As long as it is common knowledge that the auditor has private information in the pretrial settlement game, the sequence of moves in the pretrial negotiation does not matter in our analysis. See chapter 3 for a detailed discussion.

hand, the impact of a policy which increases the investors' legal costs is very complex.[36] We identify conditions under which regulatory actions or institutional arrangements which increase the investors' legal costs can lead to an increase or a decrease in the entrepreneur's welfare.

An important assumption maintained in chapters 2 and 3 is that the court can determine auditor failure without error through the costly trial process. This is implied by our assumption that the firm's true type, to which the auditor attests, is publicly verified at the expense of legal costs at trial. In reality, even after substantial legal expenditures, it might be the case that the firm's true type is extremely difficult to verify, and hence, the audit failure is not well-defined. This setting might be termed "vague liability regime." Chapter 4 addresses the auditor's legal liability issue in the vague liability regime, focusing on the changes in the economic incentives induced by the vagueness of auditor's legal liability. We identify a set of conditions under which the main results in chapters 2 and 3 remain qualitatively unchanged,[37] except that the auditor's legal costs has an impact on the auditor's audit quality choice, and hence, on the market price indirectly. This implies that the changes in the legal costs have a more complex impact on the trial rate through the equilibrium audit quality and market price.

In chapters 2, 3 and 4, our analysis assumes that the litigants (the auditor and external

---

[36] As will be shown in chapter 3, the endogeneity of the damage amount has a welfare implication because an increase in the investors' legal costs reduces the trial rate via a decrease in the market price. On the other hand, an exogenous damage assessment implies that an increase in the investors' legal costs has no impact on the trial rate since the trial rate is independent of the market price.

[37] For this, we need regularity conditions under which the market price increases as the audit quality increases. The conditions are effectively to ensure that an increase in the audit quality has a first-order effect on the informational value of audit rather than on the insurance value. Otherwise, the market price might decrease in the audit quality since the decrease in the litigation payoff might dominates the increase in the informational value. In such a case, we have some unintuitive comparative static results: For example, (i) as the auditor's legal costs increase, the market price decreases although the audit quality increases; and (ii) as the audit becomes more costly to perform, the market price increases although the audit quality decrease.

investors) pay their own legal costs, irrespective of the court's decision, i.e., the American rule of allocating legal costs. In response to the litigation crisis, the Big Six auditors issued a Statement of Position in 1992, proposing extensive reforms of federal and state liability laws affecting public accountants. Their proposal includes replacing the American rule of allocating the legal costs by the British rule, under which the losing party is required to pay the winning party's legal costs as well as his own.

Recently, Smith and Tidrick [1995] provide an analysis of this issue. Focusing on the audit quality induced by alternative allocation rules for legal costs, they find that the audit quality under the British rule is the higher than that under the American rule when the (marginal) cost of the audit is sufficiently high. However, whether the audit quality *per se* is an appropriate yardstick to assess the legal costs allocation rules is questionable. If the role of an independent auditor is to provide F/S users with a verification of the auditee's information so as to improve their resource allocation decisions, the evaluation of a legal costs allocation rule must be based upon its impact on the efficiency under the proposed rule, but not on the audit quality. In other words, there are no grounds to believe that a high quality audit is more desirable to the society than a low quality audit unless social welfare globally increases in the audit quality.[38]

Chapter 5 examines the economic consequences of the British rule of allocating legal costs.

---

[38] Feltham [1990] states, "...welfare issues should be the forefront of our analysis when we explore alternative institutional arrangements (p. 59)." Gigler [1994] makes a similar point, "...regulators may view the auditor effort as a means to an end, rather than an end in itself (p. 63)." Gode [1993] also observes that the appropriate measure for evaluating a liability regime is neither deterrence nor fair compensation, but should be the social welfare. Taken together, the comparison of the equilibrium audit quality is meaningful only if that comparison allows us to examine the social welfare consequence of an alternative legal environment. However, since the auditor in Smith and Tidrick [1995] has no welfare-enhancing role (the audited firm's future cash flow is generated by a stochastic process over which the auditor has no control), the social welfare would higher if their were no auditor at the very beginning. That is, the audit and legal costs are merely dead-weight losses in their model.

We provide an alternative interpretation of the British rule that it is effectively the same as the American rule, under which (i) the size of the investors' legal costs is the sum of litigants legal costs; (ii) the size of the auditor's legal costs is zero; and (iii) the damage assessment is increased by the sum of investors' and auditor's legal costs. Therefore, the adoption of the British rule will induce changes in the investors' litigation/settlement and pricing strategy, and auditor's settlement and audit quality decision rule, which result in a different equilibrium audit quality and market price. Interestingly, we find that the information value and the insurance value of an audit exactly offset each other in the investors' competitive pricing rule. This in turn implies that the audit quality has no indirect impact on the equilibrium market price in the comparative static analysis.

The social welfare induced by the British rule in the extended model is compared with that induced by the American rule. We establish that the trial rate under the British rule is higher than under the American rule, and hence, the expected aggregate legal costs are larger under the British rule than under the American rule.[39] Consequently, a change to the British rule increases social welfare only if the audit quality induced by the British rule is such that the welfare improvement, net of audit costs, more than offsets the increased legal expenditure of the society. Otherwise, the British rule decreases social welfare in our setting.

Chapter 6 summarizes the thesis and provides concluding remarks. Although we consider

---

[39] This contrasts to the argument/belief by the proponents of the British rule that it will lead to less expenditures on litigation. Given the continued debates about the rules for allocating legal costs, it is important to recognize that there is no reason to believe that the adoption of the British rule would improve efficiency. In fact, the theoretical support of the British rule in the non-auditing context is also mixed (or very weak at best). See Shavell [1982], Bebchuk [1984], Katz [1987], Plott [1987], P'ng [1987], and Beckner and Katz [1995], among others. Notice that, as pointed by Katz [1987], there are already a number of important federal statutes, as well as many state statutes in the U.S., which provide indemnification of successful plaintiffs, which have an incentive effect similar to that of the British rule. Snyder and Hughes [1990] provide empirical evidence that, in Florida, the medical malpractice defendants' legal expenses per case increased by more than 100% after Florida malpractice reform.

auditor litigation in a broad setting in which all key players are considered, our study is of course not without limitations. In particular, as in all analytical research, we make numerous simplifying assumptions, which are in a sense inevitable to capture essential features of auditor litigation in a tractable manner. Some assumptions provide simplicity without materially impacting on our main results. Others might limit the applicability of our conclusions. We discuss some important assumptions and potential future research opportunities. The appendix provides all proofs.

Before we proceed to the main chapters, it is worthwhile to make brief comments on the welfare-enhancing role of audits in general. There are variety of settings in which audits play a welfare-enhancing role. For example, as will be clear in the next chapter, the audit in our study potentially improves social welfare by reducing the probability of wasteful investment by a low type firm which has a negative net expected return project as in Dye [1995] and Schwartz [1995]. As an another example, an audit might make it possible to undertake a positive net expected return project, which would not be financed from external financial markets without an audit, as in Shibano [1991].[40] An important presumption in such settings is that there is no way to credibly reveal the potential auditee's type to the F/S users other than the audited report. The audited report in such settings has value as useful information since the auditor can detect misrepresentation of the firm's type by exerting costly audit effort. However, due to the imperfection of the audit technology, there always exists a positive equilibrium probability that the audited report is not correct, which generates the litigation threat as an essential disciplinary mechanism for the auditor's moral hazard problem.

On the other hand, there are many cases in which the firm can reveal its type credibly, although such credible revelation is usually costly. That is, when there are signalling and/or screening

[40] Note that this case can also arise in our setting if we assume that the firm cannot be traded in the competitive financial market without an audit, which would result in a foregone positive expected return by a high type firm.

devices, the equilibrium can be fully separating in the sense that the firm's type is fully revealed by use of such signalling and/or screening devices. Notice that audits have a potential welfare-enhancing role in this setting if they can reduce signalling/screening costs. The key issue here is that the audit technology must be discriminatory across the potential types of auditees so that the audited F/S users can rule out some types given an audited report. Otherwise, audits have no value in a fully separating equilibrium, which follows from a general property that only the support of distribution matters in a separating equilibrium allocation.[41]

The spirit of our study is to study the essential role of auditor litigation as an indirect incentive device and its welfare implications. Restricting the study to the setting in which firms have limited ability to fully separate themselves allows us to achieve our objectives more easily.

---

[41] For example, Feltham and Hughes [1988] and Datar, Feltham and Hughes [1991] examine the value of audit in a signalling framework in which a risk averse entrepreneur shares risk with risk neutral investors. The role of an audited report in this setting is a preliminary signalling device in the sense that private information of the risk averse entrepreneur is partially revealed by the audited report although not entirely. This reduces the amount of risk that the risk averse entrepreneur needs to bear to separate himself from worse types (i.e., entrepreneurs who have a lower expected return projects than the entrepreneur in question). They establish that an imperfect audit is valuable in a separating equilibrium only if the audit technology is discriminatory in that the audited report changes the support of the posterior beliefs held by investors. In a credit market setting, Pae [1995] establishes that imperfect audits can improve the allocational efficiency by reducing the contractual distortion induced by asymmetric information. In particular, he considers a setting in which the lenders use collateral as a screening device, which results in a non-trivial welfare loss since substantial transaction costs are involved in the liquidation of collateral. In such setting, audits have a potential welfare-enhancing role in that the amount of collateral can be reduced when a discriminatory auditor is hired. The value of the audit increases in audit quality. The more likely the project is to be highly profitable, the more valuable is the audit to the borrower.

However, it has to be noted that the auditor in the above-mentioned studies has no incentive problem, i.e., he is an automaton, and hence, incentive mechanisms are suppressed in the analysis. We believe that introduction of the auditors' moral hazard problem would not materially change the audit's essential welfare-enhancing role in a setting where a separating equilibrium prevails (i.e., the reduction of signalling/screening costs), although a formal introduction of an incentive mechanism into their studies is likely to add substantial complexity to the analysis.

CHAPTER 2:

THE BASIC MODEL

This chapter develops a simple model to address the interactions between the auditor and the investors in a competitive rational expectations economy in which the auditor has a welfare-enhancing role. A costly court system is formally introduced as an indirect mechanism to discipline the auditor moral hazard problem. Section 2.1 explains the audit technology and the liability rule in place. The investors' pricing and litigation strategies in a competitive financial market are analyzed in section 2.2. The auditor's problem of minimizing his total costs, the sum of audit costs and expected litigation losses, is solved in section 2.3. Section 2.4 characterizes the equilibrium of the basic model, and the comparative static results are reported in section 2.5. Finally, we provide social welfare implications of the auditor's legal liability in a costly litigation environment in section 2.6.

2.1 The Model

Consider a setting in which a risk neutral entrepreneur wants to sell his firm to risk neutral investors for some life cycle or liquidity reason. To generate future cash flow, an up-front investment of I dollars has to be made by the new owners. The future expected cash flow depends on the state

of nature, which determines the firm's type.[1] There are two types of firms, and *a priori* the entrepreneur and external investors share a homogeneous belief that the probability of a low type firm (denoted by t = L) is $\phi \in (0,1)$. For the high type firm (t = H), the project succeeds with probability $p \in (0,1)$, and fails with probability (1 - p). When successful, the project yields cash flow $R > I$. If the project fails, the cash flow is assumed to be zero. For simplicity, the project fails with probability one for the low type firm. We assume $pR > I$ so that investment by a high type firm is a positive expected net present value project.[2]

We initially assume that the entrepreneur hires an independent auditor who is paid a non-contingent audit fee, F.[3] There is more than one auditor, and auditors compete for a client in a Bertrand fashion. Hence, the audit market is perfectly competitive. We assume that the firm's true type is privately revealed to the entrepreneur after an auditor is hired. The entrepreneur reports a type to the auditor, and the auditor attests to the entrepreneur's report. The auditor is a risk neutral expected payoff maximizer.

The audit technology, which is assumed to be identical across auditors, is characterized by

---

[1] One can think of the type of firm as the current financial status and the future prospects of the firm as a going-concern.

[2] Note that we have monotone likelihood ratio property (MLRP) here since $Pr[0 \mid H] / Pr[0 \mid L] (= 1 - p) < Pr[R \mid H] / Pr[R \mid L] (= p / 0 = \infty)$, which further implies the future cash flow of the high type firm is first-order stochastic dominant over that of the low type firm. The choice of zero success probability of the low type firm and zero cash flow in case of project failure for both types are for analytic simplicity in that as long as the net expected return of the high (low) type firm's project is positive (negative), there is no material qualitative change in our subsequent analysis.

[3] Alternatively, we take as given that firms traded in financial markets are required to submit an audited report. In section 2.6 we discuss the implication of a non-mandatory audit choice. By a non-contingent audit fee, we mean that the audit fee is not contingent upon any subsequent observable event. We, however, do not mean the flat fee structure is the optimal form of audit contract in this setting. We take the convention that a contingent audit contract is precluded. See Melumad and Thoman [1990b] for a discussion of the optimal audit contract in a setting similar to ours.

the conditional probability of the audited report $r \in \{\ell,h\}$ given the firm's true type and audit quality. The audited report $r = \ell$ (h) is interpreted as an attestation by the auditor that the entrepreneur's type is L (H). We measure audit quality by the probability that the audited report is consistent with the firm's type. In particular, we assume that

$$\Pr[h \mid H,q] = 1 \text{ and } \Pr[\ell \mid L,q] = q, \tag{2.1}$$

where $q \in [0,1]$ is referred to as the audit quality.[4] The auditor's personal cost to perform an audit of quality q is denoted by a continuously differentiable function C(q) where $C(0) = 0$, $C'(0) = 0$, $C'(q) > 0$, and $C''(q) > 0$ for all $q \in (0,1]$. The auditor determines the audit quality without knowing the true type of his client. The audit quality q is not observable by anyone other than the auditor.[5, 6]

---

[4] We simplify the analysis by assuming that there is no type I error (i.e., $r = \ell$ given the firm's true type H). This formulation is consistent with empirical evidence (e.g., St. Pierre and Anderson [1984]) that auditor litigation is mostly related to overstatements of profitability but not understatements. Analytically, there is no qualitative change in our analysis as long as $\Pr[h \mid H,q]$ is sufficiently high, not necessarily one, so that the firm is traded when the audited report h is issued.

[5] Notice that the F/S contains many accrual items which require professional judgement for future events. For example, the recognition of bad debt expenses and revenue in long-term construction contracts requires careful evaluation of debtors' credibility as well as economic conditions affecting the industry in which the firm is operating. Recall that the privately informed entrepreneur wants to sell his firm. In order to make his firm look profitable in the future, if we view the net income as the firm's type, the low type firm has an incentive to understate expenses and overstate revenues.

The audit process is such that given the entrepreneur's report on a type (e.g., net income), the auditor exerts costly effort to collect evidence (e.g., visiting warehouse for inventory account and obtaining confirmation letters from banks and debtors) to verify the entrepreneur's report. Based upon the evidence, the auditor decides whether the report by the entrepreneur is acceptable or not. If the evidence contradicts the entrepreneur's report, the auditor may withdraw from the engagement or must issue a qualified or adverse opinion. As will be shown shortly, the firm cannot be sold if the audited report is "low." Hence, if the auditor refuses to give an unqualified opinion on the F/S, the entrepreneur's rational response is to cease to sell his firm. In reality, there are many or continuum of firm types, and the firm and auditor negotiate the final audited report. Alternatively, the entrepreneur might decide to stay private. In our binary type setting in which the low type firm has no value, no audited report is perceived the same as "low" by the investors. Also, to simplify the analysis, we suppress a negotiation process (Antle and Nalebuff [1991]) by assuming that the auditor always reports his findings in the audit process. As one might expect, our analysis of auditor's legal

The investors price the entrepreneur's firm based on the audited report, ℓ or h. We assume that the financial market is perfectly competitive, and that the riskless interest rate is zero without loss of generality. An investment of \$I is made if the firm is traded. At the end of the period, the cash flow from the investment, R or zero, is realized, and the firm is liquidated. After observing the realized cash flow, the investors can file a lawsuit against the auditor. If no lawsuit is filed, the game is over. If investors file a lawsuit, the case goes to trial, which is a costly process in that the legal cost of the investors and auditor are denoted by LC_I and LC_A, respectively.[7] The litigants pay their own legal costs irrespective of the court decision, i.e., the American rule of allocating legal costs. The firm's true type is revealed in the court after the costly trial. We assume that the auditor is liable for the investors' financial losses in the case of audit failure, which is said to have occurred if the

---

liability can be easily extended to a more-than-two-type setting, since the essential role of the legal system as a disciplinary mechanism does not change.

[6] Note that there would be no change in the following analysis if we assume that the firm's true type is *unknown* to the entrepreneur. This is because the entrepreneur would report "high" even if he is not aware of the true type, and the auditor is aware of such an incentive. The reason for assuming that the true type is known to the entrepreneur before his reporting to the auditor is that we view the audited report as an attestation service to financial markets. That is, we assume that the audited report can at best provide information about what the entrepreneur knows, but cannot provide additional information. This view is along the line of Datar, Feltham, and Hughes [1991] while other studies, like Titman and Trueman [1986] and Dye [1995], view that the audited report provides new information. Since it is the investors' beliefs based upon an audited report that matter for trading and investment decision, our analysis is consistent with both views.

[7] In the basic model, we assume away pretrial negotiation. Pretrial settlement is considered in chapter 3. Since our model is in a single-period setting, the auditor's reputational concern does not enter directly into the model. Auditor's legal costs, however, can capture the reputational effect indirectly. Also notice that to simplify the analysis we parameterize the legal costs as fixed constants. That is, we suppress the contracting process between the investors and lawyers. In reality, the investors pay a contingent fee to the lawyer, i.e., some fraction of total recovery. This fraction is determined by negotiation between the investors and lawyer. In equilibrium, this fraction will be such that the lawyer's fee revenue just compensates him for the legal costs of the lawyer if the lawyers' market is competitive. As such, the lawyer's legal costs are effectively paid by the investors.

audit report is h (ℓ) while the firm's true type is L (H).[8] The structure of the game is common knowledge.[9]

Time Line

Stage 1: The entrepreneur hires an auditor at a competitively determined non-

[8] The court's assessment of investors' financial damage due to audit failure will be defined in the next section. Notice that we implicitly assume that it is impossible to penalize misreporting by the entrepreneur. Although in reality the auditee and auditor are usually held jointly liable for misstated financial disclosure, we take an extreme position to highlight the limited liability of the auditee and the unlimited liability (deep-pocket) of the auditor.

[9] In this thesis, we assume away two other types of auditor moral hazard problem. Firstly, the auditor might have an incentive collude with his client and compromise independence as a third party. To address this type of auditor moral hazard problem, we need a richer model that captures at least (i) the auditor earns (quasi) rents from his client, and (ii) the relationship between the auditor and client potentially lasts more than one period so that the client might threaten to replace the auditor credibly. In such a case, the auditor would trade off the potential litigation risk with on-going relation with his client. Since we will study the auditor's legal liability issue in a single-period model in which the audit market is competitive, our study rules out this type of auditor moral hazard problem, which might be an important consideration in reality.

Secondly, note that the audit technology given by (2.1) states that once the audit quality is chosen, the auditor has no further discretion over his final report. That is, it rules out the possibility that auditor reports $r = \ell$ with his audit quality choice being $q = 0$ since, according to (2.1), $r = h$ is for sure once $q = 0$ is selected. This assumption is commonly adopted in the auditor litigation literature (e.g., Dye [1993 and 1995], Narayanan [1994], Gode [1993]). Suppose that we relax the audit technology assumption given by (2.1) so that the auditor can make the reporting and the quality decisions separately. In such a setting, one might argue that the auditor can avoid legal liability by reporting ℓ without providing any effort given a non-contingent audit contract. However, such a reporting strategy does not imply no litigation threat in our setting. In particular, there might be a lawsuit initiated by the high type client, since the project success reveals the firm's true type is high (which implies that the auditor did not provide any effort). A similar argument can be found in Dye [1993]. This additional auditor moral hazard problem and the corresponding litigation threat of the auditee complicate the analysis without adding further insights to the role of auditor litigation, and hence, they are exogenously assumed away by (2.1). Another potential reason for the unlikeliness of such reporting behavior is the auditor's reputational consideration in a multi-period setting. The revelation of zero audit quality (i.e., no audit effort) would impose such a severe reputational penalty on the auditor that he will not be able to earn a normal profit in the future, which prevents the auditor from using such a reporting strategy. In our one-period setting, we need to impose an exogenous assumption, (2.1), to simplify the analysis.

Also notice that the auditor is held liable for the investors' financial damage regardless of the actual audit quality whenever the audited report is misstated. In chapter 4, we will discuss the setting in which the firm's true type is not revealed in the court and, hence, the audit failure is not well-defined.

contingent audit fee F.

Stage 2: The firm's true type, t = L or H, is randomly drawn and revealed to the entrepreneur. The entrepreneur reports a type to the auditor.

Stage 3: The auditor chooses an audit quality q to verify the entrepreneur's report at the audit cost C(q). The audited report, r = ℓ or h, is issued to the competitive financial market.

Stage 4: The market price given the audited report r, V_r, is determined. An investment of $I is made if the firm is traded.

Stage 5: The cash flow, R or zero, is realized. The investors (i.e., the new owner of the firm) can file a lawsuit against the auditor. If no suit is filed, the game is over.

Stage 6: If a lawsuit is filed, the case goes to trial. The litigants pay their own legal costs irrespective of the court's decision. The firm's true type is revealed in the court. The auditor pays the financial damage of the new owners of the firm in the case of audit failure.

2.2 Value of the Firm

Recall that audit effort is unobservable by parties other than the auditor. Initially, let $q^e > 0$ be the investors' audit quality conjecture.[10] Suppose that the audited report is ℓ. The posterior belief given ℓ is such that the investors perceive that the entrepreneur's type is low for sure, i.e., $\Pr[L \mid \ell, q^e] = 1$. This is because of the audit technology $\Pr[\ell \mid H,q] = 0$ for all q. Therefore, the firm is priced at zero, $V_\ell = 0$, and hence, there is no trading and no investment of I dollars. On the

[10] We will characterize an equilibrium in which the conjecture is self-fulfilling.

other hand, when the audited report is h, the investors' posterior belief that the firm is a low type is given by

$$\phi_h^c \equiv \phi_h(q^c) \equiv \Pr[L \mid h,q^c] = \Pr[L]\cdot\Pr[h \mid L,q^c] \,/\, \Pr[h \mid q^c]$$

$$= \frac{\phi(1-q^c)}{\phi(1-q^c)+(1-\phi)} \in (0,\phi). \tag{2.2}$$

This is because

$\Pr[h \mid H,q] = 1$ for all q, $\Pr[L] = \phi$, and

$\Pr[h \mid q] = \Pr[L]\cdot\Pr[h \mid L,q] + \Pr[H]\cdot\Pr[h \mid H,q] = \phi(1 - q) + (1 - \phi)$.

Note that $\phi_h^c \to 0$ as $q^c \to 1$ and $\phi_h^c \to \phi$ as $q^c \to 0$.

Given the posterior belief, ϕ_h^c, the investors' gross expected future cash flow, net of the investment but not the legal costs, is represented by

$$G(q^c) \equiv (1 - \phi_h^c)pR + [\phi_h^c + (1 - \phi_h^c)(1 - p)]\cdot\Pi^c - I, \tag{2.3}$$

where Π^c is the investors' net expected payoff from their litigation decision, which is made when the project fails given r = h. Notice that the gross expected future cash flow consists of two components. The first one is the expected future cash flow from the investment when the project is successful. When the project fails, the investor may file a lawsuit against the auditor to recover their damage if they believe that the audited report h is mistakenly issued for a low type firm. This explains the second component.[11] Hence, given r = h, the rational investors' anticipation of the possibility of litigation will be reflected in their pricing of the entrepreneur's firm. To characterize the investors' expected future cash flow we must characterize Π^c, which requires an examination of the litigation

[11] Note that the investors are unsure of audit failure at the time of filing a lawsuit (i.e., in case of project failure) since the high type firm's project fails with a positive probability. When the cash flow from the investment is R, the firm's true type is high. Hence, there is no audit failure, and there is no litigation.

game.

Suppose that the firm was traded at a positive price, V_h. Upon observing the failure of the project, the investors update their beliefs of the firm's true type. The posterior belief that the firm is a low type (or equivalently, that the audit failure has occurred) is given by

$$\phi_{hf}^{c} \equiv \phi_{hf}(q^c) \equiv \Pr[L \mid h,f,q^c] = \frac{\phi_h^c}{\phi_h^c+(1-\phi_h^c)(1-p)} = \frac{\phi(1-q^c)}{\phi(1-q^c)+(1-\phi)(1-p)}. \tag{2.4}$$

Recall that the auditor is liable for the investors' financial loss caused by audit failure. If the audited report had been $r = \ell$, the investors would not have bought the firm at the price of V_h, and the investment I would not have been made. Therefore, the investors' total investment of $(V_h + I)$ is due to the audited report h which is erroneously issued for a low type firm, and that amount is assumed to be the financial damage awarded to the investors in the case of audit failure.[12]

The investors' suing strategy, σ^*: $\mathbb{R}_+ \times [0,1] \to [0,1]$, is a mapping from the price at which the firm is traded, $V_h \in \mathbb{R}_+$, and the conjecture of audit quality, $q^c \in [0,1]$, to the probability of filing a lawsuit against the auditor, i.e., $\sigma = \sigma^*(V_h,q^c) \in [0,1]$.[13] Observe that if the investors file a lawsuit, their expected payoff, $\Pi^c(\sigma = 1,V_h,q^c)$, is given by

$$\Pi^c(\sigma = 1,V_h,q^c) = \phi_{hf}^{c}(V_h + I) - LC_l. \tag{2.5}$$

The next lemma follows immediately.

---

[12] To sharply focus on the relation between the market price and damage, we assume away any punitive damage, although the analysis can be easily extended to such a case.

[13] Filing a lawsuit is equivalent to going to trial in this chapter since settlement is precluded in the basic model.

Lemma 2.1: There exists a cutoff value, $V^+(q^e) = LC_I / \phi_{hf}^e - I$, such that the investors' suing strategy is characterized as follows.

$$\begin{aligned} \sigma^*(V_h,q^e) &= 1 && \text{if } V_h > V^+(q^e); \\ \sigma^*(V_h,q^e) &\in [0,1] && \text{if } V_h = V^+(q^e); \text{ and} \\ \sigma^*(V_h,q^e) &= 0 && \text{if } V_h < V^+(q^e). \end{aligned} \tag{2.6}$$

The investors' conjecture of audit quality, q^e, and their financial loss (which is the post-investment value of the firm), $V_h + I$, jointly determine the investors' expected payoff in the litigation game. In particular, given the conjecture of audit quality, the investors will seek to recover their financial loss if the loss is sufficiently large, even though they are unsure of audit failure. Similarly, given the amount of their financial loss, the investors will sue the auditor if the conjectured audit quality is sufficiently low. This follows from the fact that the cutoff value, $V^+(q^e)$, is increasing in the audit quality conjectured, q^e.[14] When the market price V_h is equal to the cutoff value, the investors randomize their suing decision, and they are indifferent between suing and not suing the auditor.

As discussed earlier, the market price of the firm consists of two parts. The first part is for the return from the investment of I dollars, and the second part is the expected payoff from litigation. We take the investors' conjecture of audit quality as given, and characterize the equilibrium price of the firm as a function of audit quality. In the next section, we endogenize the audit quality by solving the auditor's quality choice problem.

---

[14] Lemma 2.1 is quite descriptive of litigation involving the auditor as a defendant under the current U.S. legal system. Lys and Watts [1994] and Carcello and Palmrose [1994] report that auditor litigation is more frequent for larger client firms. Palmrose [1988] provides evidence that the Big Eight auditors, who are perceived as high quality auditors, have a significantly lower litigation rate than that of non-Big Eight auditors during 1960-1985.

From lemma 2.1, we have

$$\Pi^c(\sigma^*(V_h,q^c),V_h,q^c) = \max\{0, \phi_{hf}^c(V_h + I) - LC_I\}.$$

The firm value in a competitive financial market given the audited report h must be equal to the gross expected future cash flow, so that the investors' net expected payoff is zero. Hence, substituting $\Pi^c(\sigma^*(V_h,q^c),V_h,q^c)$ into (2.3), we must have the following:

$$V_h = (1 - \phi_h^c)pR + [\phi_h^c + (1 - \phi_h^c)(1 - p)]\cdot\max\{0, \phi_{hf}^c(V_h + I) - LC_I\} - I. \quad (2.7)$$

The next proposition establishes a unique market price for each audit quality conjectured, when the following condition (C2.1) holds:

$$pR > [1 / (1 - \phi) + (1 - p) / \phi]LC_I. \quad (C2.1)$$

Condition (C2.1) is satisfied if the fraction of low and/or high type is not extreme and the expected return of the project in the successful state, pR, is large relative to the investors' legal costs, LC_I.

Proposition 2.1: Under the condition (C2.1), there exists a cutoff audit quality $q^o \in (0,1)$ such that when the audited report is h, the market value of the firm is given by

$$V_h^*(q^c) = \begin{cases} (pR-I) - \left[(1-p) + \dfrac{\phi(1-q^c)}{1-\phi}\right] LC_I & \text{for } q^c < q^o, \\ \dfrac{1-\phi}{\phi(1-q^c)+(1-\phi)}pR - I & \text{for } q^c \geq q^o. \end{cases}$$

$V_h^*(q^c)$ is continuous on [0,1], and increasing in q^c.

It is crucial to note that the pricing rule in proposition 2.1 incorporates the investors' suing strategy which has to be consistent with each market price for a given conjectured audit quality in the competitive financial market. The cutoff value, q^o, is the conjectured audit quality below (above)

which the investors (do not) file a lawsuit.[15] The competitive market price $V_h^*(q^c)$ for $q^c < q^o$ represents the market price at which the investors buy the firm and they file a lawsuit against the auditor if the firm subsequently goes bankrupt. One can verify that the market price has a positive insurance component. That is,

$$\begin{aligned}
&[\phi_h^c + (1 - \phi_h^c)(1 - p)]\cdot\Pi^c(\sigma^*(V_h^*(q^c),q^c)=1,V_h^*,q^c) \\
&= [\phi_h^c + (1 - \phi_h^c)(1 - p)]\{\phi_{hf}^c[V_h^*(q^c) + I] - LC_I\} \qquad (2.8) \\
&> 0,
\end{aligned}$$

where the inequality follows from (C2.1).[16] Notice that the market price increases in $q^c < q^o$. This implies that the increase in the information value more than offsets the decrease in the insurance value as q^c increases to q^o. For the conjectured audit quality equal to or higher than q^o, the investors have rational expectations that the expected payoff in the litigation game is zero. In other words, they do not count on the recovery from the litigation against the auditor. Since the insurance value is zero, the market price consists of the information value only. Finally, $V_h^*(q^c)$ belongs to a compact set $[\underline{V}, \bar{V}] \subset \mathbb{R}_+$ where

$$\begin{aligned}
\underline{V} &= (pR - I) - [(1 - p) + \phi / (1 - \phi)]LC_I, \\
\bar{V} &= pR - I.
\end{aligned}$$

The lower bound, $\underline{V}$, is the market price when the conjectured audit quality is zero, and the upper bound, $\bar{V}$, is the market price when the audited report provides perfect information, i.e., the firm's

---

[15] In other words, $V^+(q^c) < (=,>)\ V_h^*(q^c)$ at $q^c < (=,>)\ q^o$. As such, $\sigma = \sigma^*(V_h^*(q^c),q^c) = 1$ for $q^c < q^o$, and $\sigma = \sigma^*(V_h^*(q^c),q^c) = 0$ for $q^c > q^o$. For $q^c = q^o$, σ is an arbitrary real number in [0,1].

[16] See the proof in the appendix.

true type is high given the audited report h.[17]

2.3 Auditor's Problem

When the auditor selects his audit quality, he anticipates all the consequences of performing an audit of quality q. First, the audit quality affects the probability of the audited report $r \in \{\ell,h\}$. Second, if the audited report is h, the firm will be traded at some positive price, V_h, and the investors will undertake the project. The market price reflects not only the informational role of the audited report but also the investors' rational expectations of the litigation opportunity in case of the firm's subsequent bankruptcy. The market price *per se* is of no direct interest to the auditor, but it is important to the auditor's quality decision in our setting since it is a part of the damage assessment in a lawsuit, and hence, determines the auditor's expected litigation loss.

Let $V_h^c \in \mathbb{R}_+$ and $\sigma^c \in [0,1]$ be the auditor's conjectures of market price and lawsuit probability, respectively. The auditor, as an economic agent, maximizes his expected payoff which is the audit fee minus the total expected cost of the audit. Since the audit fee is sunk at the time when the auditor chooses his audit quality, it has no impact on that choice. The auditor's problem is therefore to choose an audit quality which minimizes the total expected cost of the audit, i.e., the sum of the audit cost and expected litigation loss. Notice that if the market price is V_h^c, and if a lawsuit is filed when the project fails, he faces an expected loss of $\Omega(q,V_h^c) \equiv \phi_{hf}(q)(V_h^c + I) + LC_A$. Therefore, the auditor's best response, $q = q^*(V_h^c,\sigma^c)$, is a mapping $q^*: \mathbb{R}_+ \times [0,1] \to [0,1]$ such that

$$q \in \underset{q'}{\operatorname{argmin}}\ TC(q',V_h^c,\sigma^c) = C(q') + [\phi(1 - q') + (1 - \phi)(1 - p)]\sigma^c\Omega(q',V_h^c).$$

---

[17] The lower bound can be rewritten as $\underline{V} = \{\phi pR - [(1 - p) + \phi / (1 - \phi)]LC_I\} + W_0$, where $W_0 \equiv (1 - \phi)pR - I$, which is the price of the firm in a no audit setting. By (C2.1), the terms in the braces have a positive value. We assume that $W_0 > 0$ to ensure that $\underline{V}$ is positive. Otherwise, define the lower bound by zero, and there is no qualitative change in the following analysis.

Lemma 2.2: The auditor's response function is characterized as follows.

(i) $q = q^*(V_h^c, \sigma^c) = 0$ for all $V_h^c \in \mathbb{R}_+$ if $\sigma^c = 0$;

(ii) For $\sigma^c \in (0,1]$, assuming an interior solution,[18] $q = q^*(V_h^c, \sigma^c)$ is given by

$$C'(q) = \phi\sigma^c(V_h^c + I + LC_A). \tag{2.9}$$

$q^*(V_h^c, \sigma^c)$ is increasing in V_h^c and σ^c.

Since litigation is assumed to be the only way to discipline the auditor's moral hazard problem, the audit quality is at its minimum when there is no lawsuit against the auditor. For a positive probability of a lawsuit, the auditor trades off the marginal cost and benefit in his audit quality decision. As the market price and/or lawsuit probability increases, the marginal benefit of audit quality increases, which induces the auditor to provide a higher quality audit.

2.4 Equilibrium Market Price and Audit Quality

We are now ready to characterize the equilibrium of the whole game in the basic model. The equilibrium is $\{q^*, V_h^*, \sigma^*\}$, where q^* is the audit quality, V_h^* is the market price given the audited report $r = h$, and σ^* the probability of a lawsuit against the auditor when $r = h$ and the audited firm is bankrupt.[19]

The formal structure of our equilibrium is a Nash equilibrium constrained by the capital market competitive equilibrium condition. Specifically, the game has the following characteristics. First, even if the auditor chooses the audit quality and the investors subsequently determine their

[18] Given our assumption $C'(0) = 0$, which ensures $q > 0$ for any positive assessment of lawsuit probability, the sufficient and necessary condition for an interior solution is a sufficiently large value of $C'(1)$.

[19] We already know that the market price given $r = \ell$ is zero.

pricing strategy, unobservability of audit quality implies that the audit quality and market price must be determined simultaneously. That is, the auditor chooses the audit quality based upon his conjecture of the market price and lawsuit probability while the investors price the firm based upon their conjecture of the audit quality. These conjectures must be self-fulfilling in equilibrium. That is, the auditor's beliefs about the market price, the investors' lawsuit probability, and the investors' beliefs about the audit quality are concentrated at the equilibrium market price, audit quality, and lawsuit probability with probability one. Second, the market price must be determined competitively in that the investors' expected payoff is zero in equilibrium.

Third, the game has a sequential aspect in that the investors move twice; first in the pricing stage and the second in the litigation stage. This requires that the investors' pricing and suing strategy must be consistent for a given audit quality. As one can see in lemma 2.1, once the equilibrium market price and audit quality are determined, the investors' equilibrium lawsuit probability, $\sigma^* = \sigma^*(V_h = V_h^*, q^e = q^*)$, follows immediately. This is driven by the competitive nature of our game such that V_h^* and σ^* must yield a zero expected payoff to the investors in equilibrium. This in effect allows us to express the market price as a function of the conjectured audit quality only, suppressing $\sigma = \sigma^*(V_h, q^e)$, in proposition 2.1.[20]

---

[20] To see this more clearly, let $U_i(q,\sigma,V_h)$ be the expected payoff to the investors (i = I) and the auditor (i = A). Let $V_h = \mu(\sigma,q)$ be the equilibrium market price given the audited report h, suing probability σ, and the audit quality q. The strategy profile, (q^*,σ^*,V_h^*), is a Nash equilibrium if, and only if,

$$q^* \in \underset{q}{\text{argmax}}\ U_A(q,\sigma^*,V_h^*) \text{ for all } q \in [0,1], \qquad \text{(F.1)}$$

$$\sigma^* \in \underset{q}{\text{argmax}}\ U_I(q^*,\sigma,V_h^*) \text{ for all } \sigma \in [0,1], \qquad \text{(F.2)}$$

and

$$V_h^* = \mu(\sigma^*,q^*). \qquad \text{(F.3)}$$

Substituting $V_h = \mu(\sigma,q)$ into $U_i(q,\sigma,V_h)$ for i = I and A, one can find the equilibrium by solving for (q^*,σ^*). On the other hand, to focus on the market price, we effectively formulated the model in an alternative way such that the investors' suing strategy is consistent with each market price given a conjectured audit quality. That is, we substitute the best response function $\sigma^*(V_h,q^e)$ derived from

To ensure the existence of a pure-strategy Nash equilibrium, we assume that

$$q^*(V_h^c = V^o, \sigma^c = 1) = C'^{-1}(\phi(V^o + I + LC_A)) \leq q^o, \qquad \text{(C2.2)}$$

where $V^o \equiv V_h^*(q^o)$, and $V_h^*(\cdot)$ is given by proposition 2.1. In other words, the audit quality chosen by the auditor, when he conjectures that the market price is V^o and the probability of lawsuit is one, is less than the audit quality conjecture that would induce the investors to randomize their suing strategy.[21]

(F.2) into (F.3). Solving $V_h = \mu(\sigma^*(V_h,q^c),q^c)$ for V_h, we have $V_h = V_h^*(q^c)$ as the investors' pricing rule consistent with their suing strategy, which is characterized by proposition 2.1. In this formulation, the equilibrium market price and audit quality are determined by the intersection of $q = q^*(V_h^c,\sigma^c)$ and $V_h = V_h^*(q^c)$. One can easily see that we get the same equilibrium in either way. Also note that, in section 2.6, the equilibrium condition of the audit market becomes another constraint: $U_A(q^*,\sigma^*,V_h^*) = 0$ (i.e., $F = TC(q^*,\sigma^*,V_h^*)$), since identical auditors competitively bid for a potential client.

[21] There exists a mixed-strategy Nash equilibrium when condition (C2.2) is not satisfied. One can check that it is uniquely given by $(V_h^*,q^*,\sigma^*) = (V^o,q^o,\sigma^o)$, where $\sigma^o < 1$ is characterized by (2.9) in which (V^o,q^o) given in proposition 2.1 replaces (V_h^c,q^c). This equilibrium, however, is not asymptotically stable in the following sense.

> **Definition 2.1:** A Nash equilibrium is *asymptotically stable* if there exists an open neighborhood of the equilibrium such that any strategy profile in that neighborhood converges to that equilibrium. A Nash equilibrium is *globally stable* if it is asymptotically stable for any open neighborhood of the equilibrium.

Roughly speaking, the asymptotic stability requires that starting from a strategy of a player sufficiently close to a proposed equilibrium, the *tâtonnemant process* converges to the proposed equilibrium. For a detailed discussion, refer to Fudenberg and Tirole [1991, pp. 23-29]. It follows immediately that (V^o,q^o,σ^o) is not asymptotically stable. Also notice that (C2.2) does not guarantee a *unique* pure-strategy equilibrium. In effect, one can check that if the number of equilibria is finite, an odd number of equilibria exist under (C2.2). If the equilibrium is not unique, i.e. the number of equilibria is at least three, there always exists an equilibrium which is not asymptotically stable. This is troublesome in the comparative static analysis, since the prediction of a new equilibrium induced by a small perturbation of parameters crucially depends upon the equilibrium originally selected. To avoid the multiplicity of equilibria, we later impose a condition stronger than (C2.2), under which a unique and globally stable equilibrium exists.

Proposition 2.2: Assume (C2.1) and (C2.2). Then, a Nash equilibrium, $\{q^*, V_h^*, \sigma^*\}$, is characterized by

$$V_h^* \equiv V_h^*(q^*) = (pR-I) - \left[(1-p) + \frac{\phi(1-q^*)}{1-\phi}\right] LC_I \leq V^o, \tag{2.10}$$

$$C'(q^*) = \phi(V_h^* + I + LC_A), \tag{2.11}$$

where $q^* \leq q^o$ with $\sigma^* = 1$.

In equilibrium, the conjectures are self-fulfilling. The firm, for which the audited report h is issued, is traded at the price of V_h^*, and the investors (new owners) undertake the project. When the project fails, the investors implement their suing strategy specified in lemma 2.1, which is sequentially rational given that the firm is traded at V_h^* and the investors' equilibrium belief about the audit quality is concentrated on q^* with probability one. The auditor correctly anticipates the equilibrium market price and the investors' lawsuit probability in his audit quality choice.

2.5 Comparative Statics

We now examine how the equilibrium (pre-investment) market value of the firm, V_h^*, and the equilibrium audit quality, q^*, change in response to the changes in the exogenous parameters. To ensure a unique interior pure-strategy equilibrium, we assume that (C2.2) holds with strict inequality (i.e., the equilibrium audit quality is strictly less than q^o, and hence, the market price of the firm is strictly less than V^o). For simplicity, the audit cost function is given by $C(q) = kq^2/2$, in which case, (C2.2) is equivalent to assuming

$$k > \phi(V^o + I + LC_A) / q^o.^{22} \qquad \text{(C2.2')}$$

Proposition 2.3: Assume (C2.1) and (C2.2'). Then we have the following relations:

(i) As the expected return of the project increases (i.e., as p or R increases), the equilibrium market price and audit quality increase;

(ii) As the initial investment, I, increases, the equilibrium market price decreases and the audit quality does not change;

(iii) As the investors' legal cost, LC_I, increases, the equilibrium market price and audit quality decrease;

(iv) As the auditor's legal cost, LC_A, increases, the equilibrium market price and audit quality increase;

(v) As the audit technology becomes more costly (i.e., as k increases), the equilibrium market price and audit quality decrease;

(vi) An increase in the prior belief that the firm is a low type, ϕ, has an ambiguous impact on the equilibrium market price and audit quality.

---

[22] Notice that (C2.2') is stronger than (C2.2), but far stronger than what we need. The quadratic cost function, $kq^2/2$, is assumed since it allows an easy parametric representation of a change in the marginal cost of audit (i.e., a change in k). For an arbitrary increasing and convex cost function C(q), sufficient conditions for a unique interior pure-strategy equilibrium (i.e., $q = q^*(V_h^c,\sigma^c)$ and $V_h = V_h^*(q^c)$ intersect only once in $(0,q^o) \times (\underline{V},V^o)$), are that (i) the slope of $q^*(V_h^c,\sigma^c = 1)$ is greater than that of $V_h^*(q^c)$ at an intersection point (q^*, V_h^*); and (ii) the slope of $q^*(V_h^c,\sigma^c = 1)$ is non-decreasing in $V_h^c \in (V_h^*,V^o)$. Suppressing σ^c in $q^*(\cdot)$, recall that we have $q^{*\prime}(V_h^c) = \phi / C''(q^*(V_h^c))$ and $V_h^{*\prime}(q^c) = \phi LC_I / (1 - \phi)$ for all $q^c \le q^o$. Therefore, the condition (i) is equivalent to $C''(q^*) / \phi > \phi LC_I / (1 - \phi)$. Totally differentiating $q^{*\prime}(V_h^c) = \phi / C''(q^*(V_h^c))$ with respect to V_h^c, we get $q^{*\prime\prime}(V_h^c) = - C'''(q^*)(q^{*\prime})^2 / C''(q^*)$. Hence, condition (ii) holds if $C'''(q) \ge 0$. If $C(q) = kq^2/2$, we have $C''(q) = k$ and $C'''(q) = 0$. Hence, these conditions reduce to

$$k / \phi > \phi LC_I / (1 - \phi). \qquad \text{(F.4)}$$

Lemma A.1 in the proof of proposition 2.3 (see appendix) shows that (C2.2') implies (F.4).

As usual in comparative statics in a gaming situation, a change in a parameter has a direct and an indirect impact on the equilibrium behavior of the players. Notice that the market price increases as the conjectured audit quality increases, and the audit quality increases as the conjectured market price increases. In other words, the market price and the audit quality are strategic complements. Thus, we expect the indirect effect to be positive.

An increase in p or R increases the market price directly. An increase in the market price induces an increase in the audit quality, and this reinforces the increase in the market price. Holding the audit quality constant, an increase in I decreases the market price by the same amount (see (2.10)). Hence, there is no change in the post-investment market value of the firm, $V_p^* \equiv V_h^* + I$, for which the auditor is liable in case of audit failure. Hence, there is no chance in the equilibrium audit quality, and therefore, there is no effect of the audit quality on the equilibrium market price.

An increase in the investors' legal cost, LC_I, directly decreases the market price, which indirectly induces a decrease in the audit quality. The opposite holds for an increase in the auditor's legal cost. An increase in LC_A directly induces the auditor to choose a higher quality audit, which indirectly increases the market price. An increase in k has no direct impact on the market price. It induces the auditor to decrease the audit quality, which indirectly decreases the market price. An increase in ϕ has two opposing effects on the market price and the audit quality. It directly increases the audit quality, and decreases the market price. The decrease in the market price indirectly induces the auditor to decrease the audit quality. The net effect is ambiguous. If the direct effect dominates the indirect effect, the audit quality (market price) increases (decreases), and *vice versa*.

2.6 Welfare Analysis in the Basic Model

The purpose of this section is to provide an analysis of entrepreneur's welfare in the costly litigation framework. Rational expectations by the investors and auditor imply that they are both price-protected. This, in conjunction with competition in the financial and audit markets, implies that the investors' expected payoff and the auditor's expected profit are driven down to zero in equilibrium. Hence, the entrepreneur's welfare is the same as the social welfare in our model. Since the entrepreneur hires an auditor *prior* to knowing the firm's true type, the appropriate measure of welfare, W, is the entrepreneur's *ex ante* expected payoff.

Notice that in a no audit setting, if the entrepreneur were able to commit to report his type truthfully, his *ex ante* expected payoff would be $(1 - \phi)(pR - I)$ since there will be no investment by a low type firm. However, such commitment is not credible. This is because, once the true type is *privately* revealed to the entrepreneur and if the true type is low, he has an *ex post* incentive to misreport in order to sell his firm at the average price, $(1 - \phi)pR - I$. The lack of a credible commitment mechanism results in an *ex ante* welfare loss by ϕI. In an audit setting, an independent auditor will report ℓ with a probability q^* for the low type, and hence, the wasteful investment by the low type firm can be prevented with the probability q^*. Consequently, the entrepreneur's *ex ante* welfare with an independent auditor is increased by $\phi q^* I$. Of course, such an increase is not free of charge. Given his legal liability, the auditor will include his expected litigation loss, as well as audit costs, in the audit fee. We formalize the above argument in what follows.

Since the firm is traded only when the audited report is h, we have

$$W = \Pr[h \mid q^*] \cdot V_h^* - F^*. \tag{2.12}$$

F^* is the competitive equilibrium audit fee. Consequently, it must be

$$F^* = TC(q^*, V_h^*, \sigma^*)$$

$$= C(q^*) + [\phi(1 - q^*) + (1 - \phi)(1 - p)]\sigma^*\{\phi_{hf}(q^*)[V_h^* + I] - LC_I\}, \quad (2.13)$$

where (q^*, V_h^*, σ^*) is given by proposition 2.2. Using proposition 2.2 and rearranging terms, we get

$$W = W_0 + \phi q^* I - C(q^*) - [\phi(1 - q^*) + (1 - \phi)(1 - p)]\cdot(LC_I + LC_A), \quad (2.14)$$

where $W_0 \equiv (1 - \phi)pR - I$ is the entrepreneur's welfare (i.e., the market price of the firm) in a no audit setting. It follows that the *incremental* value of an audit is

$$W - W_0 = \phi q^* I - C(q^*) - [\phi(1 - q^*) + (1 - \phi)(1 - p)]\cdot(LC_I + LC_A),$$

and hence, the entrepreneur is *ex ante* better off by hiring an auditor if and only if $W > W_0$. An audit of quality q^* saves wasteful investment by a low type firm, $\phi q^* I$, while he bears the audit costs, $C(q^*)$, and the expected legal costs given by the third term. Notice that the improvement of the investment decision imposes the investors' and auditor's expected legal costs, as well as the audit costs, on the entrepreneur *ex ante*. This results from the fact that the investors are price-protected and the audit fee includes the expected litigation loss of the auditor. Competitive financial and audit markets force all the cost and benefit to belong to the entrepreneur *ex ante*.

Throughout the analysis, we assumed that the entrepreneur hires an auditor. Alternatively, our analysis can be viewed as a case in which an audit is mandatory. The welfare analysis in this section, however, illustrates that the regulator does not need to require that firms hire an auditor. This is because the owner of the firm (entrepreneur in the model) would *voluntarily* hire an auditor as long as the incremental value of an audit is positive. As we discussed earlier, the welfare loss arises from the lack of credible commitment mechanism in a no audit setting. Hence, we can interpret the entrepreneur's hiring of an auditor as the entrepreneur's *ex ante* commitment to discipline his potential *ex post* incentive to misreport the firm's true type (profitability).[23] Notice that, in a non-

[23] That is, once the type is privately known, the low type entrepreneur has an incentive to misreport the true type whereas the high type entrepreneur has no such incentive. The potential existence of low type and the privacy of information about types essentially impose an *ex post* negative externality on the high type in the form of information cost.

mandatory audit framework, the threat of litigation is essential for the entrepreneur to hire an auditor. Without the auditor's legal liability, the audit does not benefit the entrepreneur due to the auditor's moral hazard problem. That is, the entrepreneur's commitment is not credible. Therefore, we view the *ex post* litigation or the court system as an indirect incentive mechanism that enhances the credibility of entrepreneur's commitment by disciplining the auditor's moral hazard problem in a decentralized way.[24]

[24] A question arising in the non-mandatory audit setting is what if the entrepreneur hires the auditor *after* the firm type is privately revealed. Our analysis can be viewed as a setting in which the high type cannot credibly reveal or signal the firm's type through his auditor hiring decision. To see this, suppose that only the high type hires an auditor at an audit fee F. The auditor then chooses $q = 0$, and the market price is $pR - I > 0$. The high type hires an auditor if, and only if, the high type's payoff, $U_H = (pR - I) - F$, is greater than $W_0 = (1 - \phi)pR - I$, i.e., $\phi pR > F$. Note that hiring an auditor is a signal in this setting, while the audited report does not play an important role. Since $q = 0$ and there is no litigation, F must be sufficiently small. This case, however, cannot be sustained as an equilibrium since the low type has an incentive to mimic the high type (i.e., hire an auditor), which results a low type payoff greater than zero, i.e., $U_L = U_H > 0$. The key is that the entrepreneur in our setting can be better off by hiring the auditor before knowing his type but not after. Finally, recall that our analysis can be viewed as a setting in which the firm type is unknown to the entrepreneur, and the auditor provides new/additional information. In such a case, of course, the above discussion is unnecessary.

CHAPTER 3:

THE EXTENDED MODEL

In chapter 2, we assumed away the possibility of pretrial settlement by exogenously assuming that the lawsuit is tried whenever filed. As reported by Palmrose [1991], most litigation against auditors is settled before going to trial.[1] The litigants have incentives to resolve the dispute to avoid incurring substantial legal costs. In this chapter, we extend the basic model to a setting in which litigants (the investors and auditor) negotiate to settle before the costly trial. In section 3.1, we characterize a settlement equilibrium, and examine how the pretrial settlement opportunity affects the investors' competitive pricing and the auditor's quality decision. Section 3.2 provides a welfare analysis. In particular, we study the welfare implications of a change in the investors' and the auditor's legal costs.

3.1 Pretrial Negotiation

The economic setting in this chapter is the same as in the basic model, except that filing a lawsuit does not necessarily imply going to trial. Instead, it gives an opportunity to the investors to negotiate with the auditor before going to trial. For simplicity, we assume that the legal costs are

[1] For example, Palmrose [1991a] reports that the trial rate in the auditor litigation is about 10% of filed lawsuits.

imposed on the litigants only in the case of trial, and there are no costs associated with filing a lawsuit and the pretrial settlement process. An immediate consequence of this assumption is that the investors' expected payoff from filing a lawsuit cannot be negative, since they can always drop the case before going to trial without incurring legal costs. Hence, to simplify the analysis, we assume that the investors file a lawsuit against the auditor whenever the firm, for which the audited report h is issued, subsequently goes bankrupt. We also assume that the litigant chooses to settle if going to trial does not strictly improve his expected welfare.

In addition to the above simplifying assumptions, we introduce asymmetric information between the defendant and plaintiffs, which allows us to address the strategic aspects of the pretrial settlement. In particular, we assume that when a lawsuit is filed but before the case goes to trial, the auditor (defendant) receives a signal that perfectly reveals the firm's true type.[2, 3] In such a setting,

---

[2] Another setting of asymmetric information considered in the literature assumes the plaintiffs (investors) have private information. Studies in the law and economics literature adopting such a scenario include Reinganum and Wilde [1986], Polinsky and Rubinfeld [1988], Shavell [1989], Polinsky and Che [1991], and Spier [1994], in which the plaintiff's private information is about the amount of damage or the likelihood of prevailing at trial. We rule out this scenario for two reasons. First, the damage amount (the market price V_h plus investment I) is publicly known at the beginning of litigation game. Second, notice that the prevailing probability in our setting depends upon the firm's true type. When the incentives of litigants to obtain such information are endogenized, the auditor's cost of acquiring information about audit failure (or equivalently, the firm's true type) is likely to be significantly smaller than that of investors, given that the auditor has already collected substantial audit evidence in the process of auditing and the auditor usually follows the audited firm and its industry closely after auditing. Given these two reasons, it is more reasonable to assume that in the pretrial settlement, the auditor has private information about the probability of prevailing at trial rather than to assume that the investors have private information about the damage assessment or the probability of prevailing at trial. To capture the above aspect in a simple way, we assume that when the lawsuit is filed, the auditor obtains at no cost a signal which is perfectly correlated with the firm's true type.

[3] Given the firm's true type is publicly revealed in the court, our assumption of private revelation of the firm's type to the auditor implies that the auditor has perfect private pretrial information about audit failure. However, it should be noted that as the following analysis illustrates, the signal does not need to be perfect. Our results remain qualitatively unchanged as long as the auditor's expected payoff from litigation depends on the private signal, since an auditor whose litigation loss will be large has an incentive to mimic the settlement strategy of an auditor who

the pretrial settlement game between the auditor and investors is a stylized model of bargaining under asymmetric information. In particular, the informed auditor makes a strategic settlement decision since his decision transmits private information about the audit failure, and hence, the investors' expected payoffs from trial. The uninformed investors anticipate the auditor's strategic incentive, and hence, their settlement decision also reflects strategic considerations.

Having private information, the auditor knows whether the project failure is because of the business risk of a high type firm (recall that there is a positive probability, 1 - p, that the high type firm's project fails), or because the firm is in fact a low type (audit failure). There is no audit failure in the former case, while the auditor is liable for the damage in the latter case. The investors know that the auditor has private information. We consider the following sequence of moves by the auditor and investors after a lawsuit if filed. The audited firm's true type is privately revealed to the auditor, and the auditor proposes a take-it-or-leave-it settlement offer, $S \geq 0$, to the investors.[4] Given the settlement offer S, the investors decide whether to accept or reject it. If the investors accept S, they drop the case whereas the case goes to trial if they reject S. The trial reveals the firm's true type after imposing legal costs LC_I and LC_A on the investors and the auditor, respectively, and the auditor is liable in the case of audit failure.[5] The next proposition characterizes equilibria for the pretrial

---

expects a small litigation loss. Also note that in reality the firm's true type may not be revealed in the court even after spending substantial amount on litigation. In such cases, the auditor's legal liability (or court decision) may be based on a "vague" liability rule (see Schwartz [1994]). In such settings, the revelation of the firm's true type to the auditor in the pretrial negotiation does not provide perfect private information to the auditor, since the court's decision is still vague. See chapter 4 for an analysis of such settings.

[4] $S = 0$ is interpreted as no settlement offer.

[5] It should be noted that the sequence of moves in the pretrial game does not matter in that there is no change in our subsequent analyses under the following alternative sequence of moves. The (uninformed) investors move first by making a settlement offer. Given the settlement amount, the (informed) auditor decides whether to accept or reject it. If the settlement offer is rejected, the investors decide whether or not to bring their case to trial. The robustness of our results to the

settlement game with asymmetric auditor information.[6]

Proposition 3.1: Suppose that a lawsuit is filed against the auditor.

(o) If $\phi_{hf}^{c}(V_h + I) - LC_I \leq 0$, then the following is an equilibrium in the pretrial negotiation.

- Both the liable and non-liable auditors make no settlement offer.
- Given no settlement offer, the investors drop the case with probability one.
- The investors would accept any strictly positive offer with probability one.

(i) If $0 < \phi_{hf}^{c}(V_h + I) - LC_I \leq LC_A$, then the following is an equilibrium in the pretrial negotiation.

- Both the liable and non-liable auditors make a settlement offer $S_1 = \phi_{hf}^{c}(V_h + I) - LC_I$.
- The investors accept the offer S_1 with probability one.
- For offers strictly less than S_1, the investors would bring the case to trial with probability one.

(ii) If $LC_A < \phi_{hf}^{c}(V_h + I) - LC_I$, then the following is an equilibrium in the pretrial negotiation.

---

sequence of moves follows from the fact that effectively the same information is transmitted by the auditor's acceptance or rejection decision. We restrict our analysis to the former sequence for simplicity. The characterization of the settlement equilibrium under the latter sequence of moves is presented in appendix 3A.

[6] The equilibria stated in proposition 3.1 are sequential equilibria in the sense of Kreps and Wilson [1982]. Roughly speaking, an equilibrium is a sequential equilibrium if (i) at any information set, the strategy of a player is rational for the remainder of the game given the player's beliefs (sequential rationality), and (ii) for any information set reached with positive probability, the players' beliefs are updated using Bayes' rule (consistency). The investors' beliefs at each information set are stated in the proof. Appendix 3B shows that the equilibria pass the Intuitive Criterion test suggested by Cho and Kreps [1987].

- The non-liable auditor makes no settlement offer with probability one.
- The liable auditor makes a settlement offer $S_2 = (V_h + I) - LC_I$ with probability $\delta = \frac{\phi^c_{hf}(V_h+I)-LC_I}{\phi^c_{hf}(V_h+I-LC_I)} < 1$, and no offer with probability $1 - \delta$.
- The investors accept an offer of S_2 or greater with probability one.
- Given no settlement offer, the investors drop the case with probability $a = \frac{LC_A+LC_I}{V_h+I+LC_A} < 1$, and bring the case to trial with probability $1 - a$.
- For any positive settlement offer strictly less than S_2, the investors bring the case to trial with probability one.[7]

When a lawsuit is filed, the litigants play a game of incomplete information where the informed auditor moves first by making a settlement offer. Upon observing the settlement offer, the uninformed investors update their beliefs regarding the auditor's type, and decide whether to accept the offer. Suppose that the investors believe that both the liable and non-liable auditors would make the same settlement offer. Given that offer, the investors' expected payoff from trial is $\phi_{hf}{}^c(V_h + I) - LC_I$ since the investors' belief that the auditor is liable is the same as $\phi_{hf}{}^c$. In other words, the investors infer nothing about the auditor's type (i.e., audit failure) from the settlement offer. Depending on whether $\phi_{hf}{}^c(V_h + I) - LC_I$ is negative, or positive but less or greater than the auditor's

[7] Proposition 3.1 is similar to proposition 1 in P'ng [1987]. Our model, however, differs from P'ng [1987] in that: (i) the potential plaintiffs (investors) competitively determine the market price (part of their potential financial losses) in the pre-litigation stage in anticipation of litigation and pretrial negotiation; and (ii) the probability of a litigation game (i.e., the probability of bankruptcy of the firm for which the audited report h is issued) depends on not only the potential dependant's effort (audit quality) but also the stochastic structure of firm's future cash flow from investment.

legal costs LC_A, three types of equilibria are possible in the pretrial negotiation.

In case (o), given no settlement offer from both types, no case is tried since bringing the case to trial would yield a non-positive expected payoff, $\phi_{hf}^{c}(V_h + I) - LC_I$, to the investors. Given that there will be no trial, no auditor makes a positive settlement offer, and hence, no one has an incentive to deviate from the stated strategies.

In case (i), given that both the liable and non-liable auditors offer $S_1 = \phi_{hf}^{c}(V_h + I) - LC_I > 0$, the investors have no incentive to go to trial.[8] Given that S_1 is accepted and any offer strictly less than S_1 is rejected, no auditor would deviate from the settlement offer S_1 since the loss from the trial is $LC_A \geq S_1$ for the non-liable auditor and $V_h + I + LC_A > S_1$ for the liable auditor, respectively.[9]

In case (ii), notice that the non-liable auditor plays more aggressively since his legal cost is less than the investors' expected payoff when the settlement offer transmits no information. In equilibrium, the non-liable type auditor makes no settlement offer, while the liable auditor makes a positive settlement offer, S_2, with a positive probability, δ. Notice that the liable auditor still attempts to take advantage of the investors' uncertainty about audit failure in that he offers no settlement with a positive probability, $1 - \delta$. Since the positive settlement offer, S_2, reveals that the auditor is liable, it is accepted by the investors. Given no settlement offer, the investors update their assessment of the probability that the auditor is liable. If they do not bring the case to trial with a positive probability, the liable auditor will mimic the non-liable auditor with probability one. To make the litigation threat credible, the investors bring the case to trial with a positive probability, $1 - a$, given no settlement

---

[8] The investors' expected payoff from trial is the same as S_1, and hence, the investors choose to settle since they are not strictly better off by going to trial.

[9] Any offer made by the non-liable auditor less than S_1 will be mimicked by the liable auditor, which leads the investors to credibly threaten to bring the case to court. Consequently, the non-liable auditor cannot reduce the settlement amount.

offer. That trial probability is such that the liable auditor is indifferent between making the settlement offer S_2 and no offer. Since there is a positive probability of trial, the non-liable auditor suffers an expected loss.[10]

We now turn to investors' pricing decision in the competitive financial market. If the auditor reports h, then the investors set the price taking into consideration their future litigation opportunities. Notice that filing a lawsuit is trivial in the extended model, since investors can always drop the case without incurring legal costs. In other words, they file a suit whenever the project fails. As in chapter 2, let q^e be the conjectured audit quality. The investors' conjectured future expected cash flow, if they pay V_h for the firm, is

$$G(q^e) \equiv (1 - \phi_h^e)pR + [\phi_h^e + (1 - \phi_h^e)(1 - p)]\cdot\Pi^e(V_h,q^e) - I, \qquad (3.1)$$

where $\Pi^e(V_h,q^e)$ is the investors' net expected payoff from litigation if the market price is V_h and the audit quality is q^e. Notice that given V_h and q^e, the investors determine which case in the settlement game will prevail by computing $\phi_{hf}^e(V_h + I) - LC_I$. In case (o), it is obvious that $\Pi^e(V_h,q^e) = 0$. In both cases (i) and (ii), the investors' net expected payoff is given by $\phi_{hf}^e(V_h + I) - LC_I$.[11] Hence, given a market price V_h and the audit quality conjecture q^e, the investors' conjectured expected payoff when the firm goes bankrupt (in which event, a lawsuit is always filed and the pretrial settlement game is played) can be represented as

---

[10] In both case (i) and (ii), the non-liable auditor bears costs induced by the information asymmetry between the auditor and the investors. That is, if the non-liable auditor could credibly reveal his type to the investors, he would be better off in the litigation game.

[11] Case (i) is obvious since both auditors offer $\phi_{hf}^e(V_h + I) - LC_I$. In case (ii), the investors' net expected payoff from litigation is given by

$\Pi^e(V_h,q^e) = \phi_{hf}^e[\delta(V_h + I - LC_I) + (1 - \delta)(1 - a)(V_h + I - LC_I)] + (1 - \phi_{hf}^e)(1 - a)(-LC_I)$.
Substituting δ and a into the above expression yields $\phi_{hf}^e(V_h + I) - LC_I$.

$$\Pi^c(V_h,q^c) = \max\{0,\ \phi_{hf}^c(V_h + I) - LC_I\}.^{12} \tag{3.2}$$

Substituting (3.2) into (3.1), and imposing the competitive market condition, $G(q^c) = V_h$, it follows that the competitive market pricing function given a conjectured audit quality in the extended model is the same as that in the basic model. That is, given a conjectured audit quality, the competitive market value of the firm for which the audited report h is issued in the extended model is the same as that given by proposition 2.1.[13]

Now consider the auditor's problem. Recall that the auditor chooses an audit quality before the firm is traded. As in the basic model, the auditor makes conjecture about the firm's market value.[14] Let V_h^c be the market price conjectured by the auditor. As the investors conjecture their expected payoff from litigation in their pricing stage, the auditor conjectures his expected loss from litigation in his quality choice stage. That is, if the auditor decides to provide an audit quality q given his conjecture of the market price V_h^c, he can compute $\phi_{hf}(V_h^c + I) - LC_I$, which tells his expected loss from litigation/settlement, $\Omega(q,V_h^c)$.[15] Therefore, the audit quality chosen by the auditor given his conjecture V_h^c, $q = q^*(V_h^c)$, is such that

$$q \in \underset{q'}{\text{argmin}}\ TC(q',V_h^c) = C(q') + [\phi(1 - q') + (1 - \phi)(1 - p)]\Omega(q',V_h^c) \tag{3.3}$$

---

[12] That is, if $\phi_{hf}^c(V_h + I) - LC_I \leq 0$, case (o) prevails and the expected payoff is zero, and if $\phi_{hf}^c(V_h + I) - LC_I > 0$, either case (i) or (ii) prevails and the expected payoff is $\phi_{hf}^c(V_h + I) - LC_I$.

[13] Note that in the basic model, the market price $V_h^*(q^c)$ incorporates the investors' probability of filing a lawsuit against the auditor (which is one for $q^c < q^o$ and zero for $q^c > q^o$). On the other hand, in the extended model, the probability of filing a lawsuit equals one for all q^c, and $V_h^*(q^c)$ incorporates the investors' anticipation that case (i) or (ii) will prevail as pretrial settlement for $q^c < q^o$, and case (o) for $q^c \geq q^o$.

[14] Recall that when the firm for which the audited report h is issued goes bankrupt, the investors' probability of filing a lawsuit is one in the extended model. As such, the auditor makes a conjecture of the market price only.

[15] In other words, the auditor conjectures that if $\phi_{hf}(V_h^c + I) - LC_I \leq 0$, case (o) prevails and if $\phi_{hf}(V_h^c + I) - LC_I > 0$, either case (i) or (ii) prevails.

where $\Omega(q,V_h^c)$ is the auditor's expected loss which occurs in the case of the firm's bankruptcy. Using proposition 3.1, we have

$$\Omega(q,V_h^c)=\begin{cases}\Omega_o(q,V_h^c)=0 & \text{in case (o)},\\ \Omega_1(q,V_h^c)=\phi_{hf}(V_h^c+I)-LC_I & \text{in case (i)},\\ \Omega_2(q,V_h^c)=\phi_{hf}(V_h^c+I-LC_I)+(1-\phi_{hf})[(V_h^c+I-LC_I)/(V_h^c+I+LC_A)]LC_A & \text{in case (ii)}.\end{cases}$$

Proposition 3.2: Assume (C2.1) and (C2.2).

(a) In the extended model, the firm's equilibrium market price and the equilibrium audit quality are independent of the auditor's legal costs, and are characterized by (2.10) and

$$C'(q^*) = \phi(V_h^* + I - LC_I), \tag{3.4}$$

where $q^* < q^o$.[16]

(b) The equilibrium market price and audit quality in the extended model are lower than those in the basic model if the equilibrium in the basic model is unique.[17]

Condition (C2.1) rules out the case (o) of pretrial settlement in equilibrium, and (C2.2) sustains a Nash equilibrium in which the investors file a lawsuit whenever the firm goes bankrupt,

---

[16] q^o is the same as that given in the proof of proposition 2.1.

[17] Recall that (C2.2) does not guarantee a unique equilibrium market price and audit quality. When multiple equilibria exist in the basic model, we cannot compare the equilibrium market prices and audit qualities in the basic and extended models. Therefore, we assume the uniqueness of equilibrium in the basic model, which is essentially equivalent to assuming that the auditor's best response function intersects the market pricing function only once. The proof in the appendix shows that the uniqueness of equilibrium in the basic model implies a unique equilibrium in the extended model.

as assumed. In case (i), it follows from (3.3) and $\Omega_1(\cdot)$ that the auditor's legal costs do not affect the auditor's quality choice. Substituting $\Omega_2(\cdot)$ into (3.3), it follows that in case (ii), the auditor's legal costs affect the auditor's expected payoff only when the audited firm is a high type and the project fails, which is not controllable by the auditor *ex ante*. Hence, the auditor's legal costs have no impact on the audit quality choice in case (ii). Equation (3.4) characterizes the audit quality in both cases (i) and (ii). Since the investors' pricing rule does not change, we have the same characterization for the market price for a conjectured audit quality. In equilibrium, the conjectures are self-fulfilling, and the pretrial settlement given by proposition 3.1 is sequentially rational given the equilibrium market price and audit quality. If $\phi_{hf}(q^*)(V_h^* + I) - LC_I \leq LC_A$, case (i) prevails as an equilibrium in the pretrial settlement game. Otherwise, case (ii) prevails.

Result (b) is driven by the fact that the auditor chooses a lower audit quality for a given conjecture of the market price and lawsuit probability (which is one in the extended model) than he does in the case of no pretrial settlement. In equilibrium, a lower audit quality is correctly anticipated by the rational investors, resulting in a lower firm value.

The comparative statics in the extended model are the same as proposition 2.3 in the basic model except that (vi) is replaced by: An increase in the auditor's legal costs has no impact on the equilibrium market price and audit quality.[18] This observation plays an important role in the welfare analysis given in the next section.

3.2 Welfare Analysis in the Extended Model

The purpose of this section is to provide an analysis of the entrepreneur's welfare when

[18] Notice that an increase in the investors' legal costs now has both direct and indirect effects on the equilibrium market price and audit quality.

pretrial negotiation is permitted. As in the basic model, the rational expectations and competition in the financial and audit markets imply that the investors' expected payoff and the auditor's expected profit are driven down to zero. The entrepreneur's welfare is

$$W = \Pr[h \mid q^*]V_h^* - TC(q^*, V_h^*).$$

If case (i) in proposition 3.1 prevails as an equilibrium, W can be expressed as

$$W = W_0 + \phi q^* I - C(q^*),$$

where $W_0 \equiv (1 - \phi)pR - I$ is the entrepreneur's welfare (i.e., the market price of the firm) in a non-audit setting. The incremental value of an audit is $\phi q^* I - C(q^*)$, and hence, the entrepreneur is *ex ante* better off by hiring an independent auditor (or in a mandatory audit setting) than he is in the non-audit setting if, and only if, $W > W_0$. An audit of quality q^* saves wasteful investment by a low type firm, $\phi q^* I$, while it costs $C(q^*)$. Since there is no trial in case (i), no litigation costs are imposed on the entrepreneur *ex ante*. In spite of no trial, the court system plays the key disciplinary role in inducing the auditor to provide an audit of quality $q^* > 0$, which would be unattainable without the litigation threat.

On the other hand, in case (ii), the entrepreneur bears positive expected legal costs as well as audit costs since there is a strictly positive probability of trial. In particular,

$$W = W_0 + \phi q^* I - C(q^*) - (1 - \phi)(1 - p)\left[\frac{V_h^* + I}{V_h^* + I + LC_A}\right](LC_I + LC_A), \tag{3.5}$$

where the fourth term represents the *ex ante* aggregate expected legal costs. Again, the entrepreneur is better off with an audit if, and only if, $W > W_0$. Notice that the *ex ante* trial rate in the extended model is $(1 - \phi)(1 - p)$ times $(V_h^* + I) / (V_h^* + I + LC_A)$ (the ratio between the damage assessment

and liable auditor's trial loss). Hence it is strictly less than that in the basic model.[19] Consequently, as one might expect, the pretrial settlement opportunity saves on the expected legal costs.

Proposition 3.3: Assume (C2.1) and (C2.2′).

(a) The entrepreneur's welfare is nonincreasing in the auditor's legal costs.

(b) An increase in the investors' legal costs can increase or decrease the entrepreneur's welfare.

The intuition underlying result (a) is that the equilibrium audit quality and market price are independent of the auditor's legal costs in the extended model as established in proposition 3.2. It is obvious that an increase in the auditor's legal costs has no impact on the entrepreneur's welfare in case (i). When case (ii) prevails as an equilibrium, the impact is only on the expected legal costs. The increase in the legal costs dominates the decrease in the *ex ante* probability of trial, which results in an increase in the expected legal costs. Hence, a social policy that leads to an increase in the auditor's legal costs decreases the entrepreneur's welfare in our setting.

The impact of an increase in the investors' legal costs is ambiguous in general. In case (i), an increase in the legal costs has no direct impact on the entrepreneur's welfare since no case goes to trial. However, there are two indirect effects. An increase in LC_I results in a lower audit quality, and hence, the audit cost decreases. A lower audit quality, however, leads to a decrease in the saving on the investment by a low type firm. The net effect is an increase (a decrease) in the entrepreneur's welfare if the former (latter) dominates the latter (former). In case (ii), there are two other effects related to the expected legal costs. The first is a direct increase in the legal costs. The second is a

[19] The *ex ante* trial rate in the basic model is $\phi(1 - q^*) + (1 - \phi)(1 - p)$, where q^* is the equilibrium audit quality in the basic model.

decrease in the trial probability through a decrease in the market price.[20] In sum, lower audit costs (via a lower audit quality) and a lower trial probability (via a lower market price) improves the welfare, while the direct increase in the legal costs and the indirect increase in the investment by the low type firm (via a lower audit quality) work in the opposite direction, resulting in an ambiguous impact on the entrepreneur's *ex ante* expected payoff.[21]

As in the basic model we can interpret the auditor as the entrepreneur's commitment device to discipline his *ex post* incentive to misrepresent the firm's profitability. Along the line of that interpretation, we can restate proposition 3.3 as follows: An increase in the auditor's legal costs diminishes the power of the entrepreneur's commitment, while the effect of an increase in the investors' legal costs can be positive or negative. Intuitively, large auditor legal costs imply that the auditor is a very costly commitment device from the entrepreneur's view point. When the investors' legal costs are too small, the investors pursue the recovery of their financial loss too aggressively, which in turn induces the auditor to provide an excessively high quality audit. On the other hand, if the investors' legal costs are too large, then the litigation threat is not sufficient to motivate the auditor to provide a higher quality audit.

Note that the entrepreneur's welfare given by (3.5) can be rewritten as

---

[20] Recall that the market price decreases as LC_I increases.

[21] It is interesting to compare our result to that of Shibano [1991]. He establishes that there exists a level of auditor's liability which maximizes the investment gain of the society. He capture the auditor's liability level as an exogenous penalty imposed on the auditor in case of a type II error. He states that a component of penalty associated with the type II error is a potential loss of reputation, which is captured as LC_A in our model. Our analysis shows that a change in LC_A has no impact on the audit effort/quality, if the pretrial negotiation in which the auditor has private information is allowed. Hence, contrary to Shibano [1991], a change in such a penalty does not affect the aggregate investment gain in our setting, but merely decreases the social welfare via an increase in the expected legal costs. Instead, it is the external investors' legal costs that affect the investment gains (the savings on wasteful investment in our model) and, hence, the social welfare.

$$W = W_0 + \Psi(q^*) - (1 - \phi)(1 - p)[\frac{V_h^* + I}{V_h^* + I + LC_A}](LC_I + LC_A), \quad (3.6)$$

where $\Psi(q) \equiv \phi qI - C(q)$ is net benefit of an audit of quality q, i.e., the saving on the wasteful investment less the audit costs. Recall that we understand the court system as an indirect incentive mechanism for mitigating the auditor moral hazard problem. If there is no moral hazard problem (i.e., audit effort is observable and contractible), then the regulator would not allow the external investors to recover their *ex post* financial losses through a costly court system.[22]

On the other hand, under the moral hazard setting (i.e., when the audit effort is unobservable or non-contractible), only the minimum audit effort is provided unless there is a disciplinary mechanism to motivate the auditor to exert costly effort. Using the court system as an incentive mechanism in the second-best setting is justifiable only if the net benefit of audit, $\Psi(q^*)$, more than offsets the aggregate expected legal costs, i.e., the third term in (3.6). Otherwise, there is no economic reason to protect the rational investors from their *ex post* financial losses through costly litigation given that they can always price-protect themselves.[23]

The predictions given by proposition 3.3 suggest that care must be taken when assessing the social consequences of regulatory policies and/or institutional arrangements which potentially influence the auditor's and investors' legal costs.[24] In particular, since entrepreneur's welfare is

---

[22] In such a setting, the entrepreneur would implement an audit quality q^F, characterized by $C'(q^F) = \phi I$ (i.e., $q^F \in \underset{q'}{\text{argmax}}\ \Psi(q')$). The audit fee in that case would be $C(q^F)$.

[23] Of course, our discussion is based on a fundamental assumption that the all the players in the game are rational, and fully anticipate all the consequences of their economic decisions. Our analysis might be inappropriate if applied to a setting in which the regulator has an objective to protect unsophisticated investors.

[24] Note that the legal costs in our model includes both visible (e.g., legal fees) and invisible (e.g., reputation) costs imposed on the litigants in the process of reaching the court's final decision

decreasing in the auditor's legal costs in our extended model, it follows immediately that regulatory policies which potentially increase the auditor's legal costs are not desirable from a welfare perspective. On the other hand, the impact of the investors' legal costs on the social welfare is more difficult to evaluate since such a change in the legal environment affects an audit's net benefit, $\Psi(q)$, as well as the aggregate expected legal costs. If the regulator can influence the investors' legal costs in a continuous way, the socially optimal investors' legal costs would be such that they equate the marginal benefit of an audit and the marginal expected legal costs.[25] Formally, assuming that there exists an interior solution denoted by LC_I^R, the investors' legal costs must satisfy

---

at trial, i.e., to produce evidence to prove whether the audited report is correct or not. Legislation or regulatory actions which shift the burden of proof to the investors (auditors) can increase the investors' (auditor's) legal costs. Another example, especially for the investors' legal costs, is legislation which makes it easier or more difficult to take class action suits to court. For example, class action suits are common in the U.S. while they are often not allowed in Canada. Palmrose [1991b] reports that there exists a spectrum for the auditor litigation disclosure, from private information to wide-spread public information sources (like *WSJ*). That is, no source systematically captures and reports all auditor litigation information to market participants. She finds that only about 20 percent of auditor litigation cases have been disclosed in wide-spread public information sources. Given this finding, a regulatory action which affects the availability of auditor litigation information would influence the auditor's reputation costs, which is a part of the auditor's legal costs in our model.

[25] Social optimality must be interpreted in a restricted sense in that we characterize the court system by the magnitude of the legal costs under the American rule of allocating legal costs. There are many (perhaps infinitely many) other ways to characterize the court system. For example, the plaintiff may be awarded a multiple of their financial damage in case of prevailing at trial, or the losing party may be required pay a positive penalty in addition to his own legal costs. Our early assumptions that the award amount is the same as the damage amount, and that there is no punitive penalty for the losing party (especially for the auditor) rule out such considerations. In chapter 5, we consider an alternative legal system, the British rule of allocating legal costs, in which the losing party pays the winning party's legal costs as well as his own. This is effectively a relaxation of the second assumption, since in a sense the British rule has the effect of imposing a punitive penalty on the losing party by the amount of winning party's legal costs. The truly optimal legal system should be the one derived in a setting in which all potential ways of characterizing the court system are considered simultaneously. Derivation of such a court system is beyond the scope of this thesis. Instead, we mainly focus on the impact of legal costs on the investors' pricing and litigation/negotiation strategies and the auditor's quality choice and negotiation incentives.

$$[\phi I - C'(q^R)](dq^*/dLC_I)$$

$$= (1 - \phi)(1 - p)[\frac{dV_h^*}{dLC_I} \cdot \frac{LC_A}{(V_h^R+I+LC_A)^2}(LC_A+LC_I^R)+\frac{V_h^R+I}{V_h^R+I+LC_A}], \quad (3.7)$$

where q^R and V_h^R are the equilibrium audit quality and market price induced by LC_A and LC_I^R.[26]

The key point is that the regulator has to consider the impact of the investors' legal costs on the equilibrium market price and audit quality, upon which the equilibrium expected aggregate legal costs, the audit costs, and the saving on the wasteful investment by the low type depend. The left-hand side in (3.7) is the change in the net benefit of the audit, $\Psi(q)$, and the right-hand side is the change in the expected social legal costs. An increase in the investors' legal costs decreases the audit quality, which induces more investment deadweight losses but reduces audit costs. Such a change in the net benefit of the audit has to be balanced with a change in the aggregate expected legal costs. An increase in LC_I directly increases the legal costs, while it indirectly decreases the expected legal costs via a decrease in the trial rate, which is induced by a decrease in the market price. In sum, the above discussion implies that a regulatory policy which potentially increases the investors' legal costs would improve the social welfare if the left-hand side of (3.7) is less than the right-hand side, and *vice versa*.

The welfare analysis in this section illustrates the complexity of the effect of a regulatory decision. As in any economic policy, the consequences of a change in legal policy in the auditor litigation context must be carefully evaluated. Such a change can induce changes in the litigants' actions in the legal process, which in turn influences the auditor's quality and audit pricing decision and investors' pricing decision.

---

[26] That is, $LC_I^R \in \underset{LC_I}{\text{argmax}}\ W(\cdot)$, where $W(\cdot)$ is given by (3.6). dq^*/dLC_I and dV_h^*/dLC_I are stated in the proof of proposition 3.3.

APPENDIX 3A:

ANALYSIS OF THE SETTLEMENT GAME WHEN THE INVESTORS MOVE FIRST

The following proposition characterizes the equilibrium of the pretrial game when the investors move first by making a settlement offer. Given the settlement amount, the auditor decides whether to accept or reject it. If the settlement offer is rejected, the investors decide whether or not to bring their case to trial.

Proposition 3A: Suppose that a lawsuit is filed against the auditor.

(o) If $\phi_{hf}^{c}(V_h + I) - LC_I \leq 0$, then the following is an equilibrium in the pretrial settlement game.

- The investors arbitrarily choose a positive offer S_o or no offer
- The liable and non-liable auditors reject any positive settlement offer, S_o, with probability one.
- If the settlement offer S_o is rejected, the investors drop the case with probability one.

(i) If $0 < \phi_{hf}^{c}(V_h + I) - LC_I \leq LC_A$, then the following is an equilibrium in the pretrial settlement game.

- The investors make a settlement offer $S_1 = \phi_{hf}^c(V_h + I) - LC_I$.
- The liable and non-liable auditors accept offers less than or equal to S_1 with probability one, and reject any offer strictly greater than S_1.

(ii) If $LC_A < \phi_{hf}^c(V_h + I) - LC_I$, then the following is an equilibrium in the pretrial settlement game.

- The investors make a settlement offer $S_2 = V_h + I - LC_I$.
- The non-liable auditor rejects the offer S_2 with probability one.
- The liable auditors rejects the offer S_2 with probability

$$r_L = \frac{(1-\phi_{hf}^c)LC_I}{\phi_{hf}^c(V_h+I-LC_I)} < 1.$$

- If S_2 is rejected, the investors bring the case to trial with probability

$$t = \frac{V_h+I-LC_I}{V_h+I+LC_A} < 1.$$

- The liable and non-liable auditors reject any offer strictly greater than S_2 with probability one.

The proof proceeds effectively the same as the proof of proposition 3.1, and hence it is omitted. The key point is that the auditor's acceptance or rejection of the settlement offer made by the investors transmits effectively the same information about audit failure as in the case where the

auditor makes a settlement offer to the investors.[27] In contrast to the latter case, the liable auditor's strategic rejection of the settlement offer plays an important role here. One can verify that the investors' and auditor's equilibrium expected payoff in the pretrial game in which the investors make a settlement offer are exactly the same as those given in the analysis in section 3.2. Therefore, there is no change in our analysis of the capital market equilibrium, the audit quality choice, the entrepreneur's welfare, and the socially optimal legal costs.

[27] In an analysis of pretrial settlement game with an exogenous damage assessment, Smith and Tidrick [1995] assume the same sequence of moves as that assumed here. But they ignore the strategic transmission of information by assuming that the plaintiffs bring the case to trial whenever the settlement offer is rejected by the defendant.

APPENDIX 3B:

STABILITY OF EQUILIBRIA

This appendix shows that the equilibria in proposition 3.1 pass the Intuitive Criterion (IC) stability test proposed by Cho and Kreps [1987]. Notice that the pretrial negotiation is effectively a signalling game in which the privately informed auditor sends a message (the settlement offer) and the uninformed investors are receivers. Let $T \equiv \{\tau \mid \tau = NL,L\}$ be the set of types of the auditor, $\Theta \equiv \{\theta \mid \theta = \text{accept, reject}\}$ be the set of investors' strategies given a settlement offer, and let Ω_τ be the equilibrium expected litigation loss of the type-τ auditor. In our setting, (IC) requires the following.

Definition 3B.1: For an off-equilibrium message S', let

$$T^*(S') \equiv \{\tau \in T \mid \Omega_\tau < \min_{\theta \in \Theta^*(T,S')} \Omega_\tau(S',\theta)\},$$

where $\Theta^*(T,S')$ is the set of the investors' best responses given an off-equilibrium message S' with possible beliefs whose support is T. If for any off-equilibrium message S', there exists a type $\tau \in T - T^*(S')$ such that $\Omega_\tau > \max_{\theta \in \Theta^*(T-T^*(S'),S')} \Omega_\tau(S',\theta)$, then the equilibrium fails to pass the Intuitive Criterion.

The types in the set $T^*(S')$ strictly prefer not to send an off-equilibrium message S', since they are strictly better off by staying on the equilibrium path, even for the most favorable best response of the investors on an off-equilibrium path reached by S'. Therefore, given S', the investors must assign positive probabilities on $T - T^*(S')$ only. Then (IC) checks whether there exists a type τ in $T - T^*(S')$ whose expected litigation loss even for the investors' worst response (from the auditor's perspective) is strictly less than the equilibrium expected litigation loss. If there is such a type, then the proposed strategy profile cannot be an equilibrium, since such type a in $T - T^*(S')$ will deviate.

Consider case (o), and let $S' > 0$ be a settlement offer. Since $\Omega_\tau = 0$ for all $\tau \in T$ and $\min_{\theta \in \Theta^*(T,S')} \Omega_\tau(S',\theta) > 0 = \Omega_\tau$ for all $\tau \in T$, we have $T^*(S') = T$. Consequently, $T - T^*(S') = \varnothing$, and hence, (IC) is trivially satisfied.

In case (i), recall that we have $\Omega_{NL} = \Omega_L = \phi_{hf}^c(V_h + I) - LC_I \equiv \Omega_0 \leq LC_A$. Hence, we have $\min_{\theta \in \Theta^*(T,S')} \Omega_\tau(S',\theta) = S' < \Omega_0$ for all $\tau \in T$ and for any $S' \in = [0,\Omega_0)$. Then $T^*(S') = \varnothing$, and hence, $T - T^*(S') = T$. But $\max_{\theta \in \Theta^*(T,S')} \Omega_{NL}(S',\theta) = LC_A \geq \Omega_{NL}$, and $\max_{\theta \in \Theta^*(T,S')} \Omega_L(S',\theta) = V_h + I + LC_A > \Omega_L$. Hence, the equilibrium stated in the text passes (IC). Consider $S' > \phi_{hf}^c(V_h + I) - LC_I$. It is obvious that $\min_{\theta \in \Theta^*(T,S')} \Omega_\tau(S',\theta) > \Omega_0$ for all $\tau \in T$, and hence, we have $T^*(S') = T$. Hence, $T - T^*(S') = \varnothing$, and (IC) is trivially satisfied.

In case (ii), we have $\Omega_L = V_h + I - LC_I$, and $\Omega_{NL} = [(V_h + I - LC_I) / (V_h + I + LC_A)] \cdot LC_A \leq LC_A$. Consider an off-equilibrium settlement offer $S' \in (0, V_h + I - LC_I) = (0,\Omega_L)$. Since $\min_{\theta \in \Theta^*(T,S')} \Omega_L(S',\theta) = S' < \Omega_L$, we have $L \notin T^*(S')$. Firstly, suppose that $S' \geq LC_A$. Then $\min_{\theta \in \Theta^*(T,S')}$

$\Omega_{NL}(S',\theta) = LC_A > \Omega_{NL}$, which implies that $NL \in T^*(S')$, and hence, $T - T^*(S') = \{L\}$. But $\max_{\theta \in \Theta^*(T-T^*(S'),S')} \Omega_L(S',\theta) = V_h + I + LC_A > \Omega_L$. Therefore, the suggested equilibrium passes (IC).

Secondly, suppose that $S' < LC_A$. If $NL \in T^*(S')$, we have $T - T^*(S') = \{L\}$. Following the same reasoning as for $S' \geq LC_A$ case, the equilibrium passes (IC). If $NL \notin T^*(S')$, then $T^*(S') = \varnothing$, which implies $T - T^*(S') = T$. (IC) is satisfied since $\max_{\theta \in \Theta^*(T,S')} \Omega_{NL}(S',\theta) = LC_A > \Omega_{NL}$ and $\max_{\theta \in \Theta^*(T,S')} \Omega_L(S',\theta) = V_h + I + LC_A > \Omega_L$. Finally, for an off-equilibrium settlement offer $S' > V_h + I - LC_I$, (IC) is trivial since $T^*(S') = T$ (recall $\min_{\theta \in \Theta^*(T,S')} \Omega_{NL}(S',\theta) = LC_A > \Omega_{NL}$ and $\min_{\theta \in \Theta^*(T,S')} \Omega_L(S',\theta) > \Omega_L$), which implies $T - T^*(S') = \varnothing$.

CHAPTER 4:

VAGUE LIABILITY REGIME

This chapter considers a setting in which the firm's true type is not publicly revealed in the court even after costly trial. Recall that it is common knowledge that the high type firm has a strictly positive probability of project failure, and that the auditor's attestation is about the firm's type but not about the success of project, i.e., the audited report h does not guarantee the project's success. Consequently, non-revelation of the firm's type implies that we cannot determine whether the audited report is consistent with the firm's true type. Put differently, audit failure is not well-defined. Following Schwartz [1994], we refer to this setting as a vague liability regime (VLR hereafter), whereas the setting in which the firm's true type is publicly verified at trial is referred to as a clear liability regime (CLR hereafter). Given a liability regime, the investors evaluate their expected payoff from litigation under the regime in place, and it will be reflected in their pricing decision. Similarly, the auditor evaluates his expected litigation loss under the prevailing liability regime, and hence, it will be incorporated in his audit quality decision.

Whatever liability regime prevails, the court decides whether the auditor is liable or not, once a lawsuit is tried. Accordingly, we make the following assumption regarding the auditor's legal liability (court's decision rule) under VLR. First, we assume that the auditor is not held liable if the firm's true type is high (although the type is not publicly verifiable in the court). That is, the auditor

always successfully defends himself at trial given that the audit report h was issued for a high type firm. Second, for a low type firm, we assume that the court decision is represented by a decreasing and weakly convex function $N(q) \equiv Pr[Neg \mid L,q]$, which denotes the probability that the court decides the auditor is negligent (hence liable). The reason for this assumption is as follows. If there is a well-defined set of negligence standards, say $q_s \in [0,1]$, the court compares the actual audit quality (note that the actual audit quality q^* is self-fulfilled in equilibrium among the rational players) with q_s. There are at least two aspects which obscure this scenario. The first one is that q_s is very unlikely to be well-specified.[1] The second one is that the court may not be fully rational. In sum, the vagueness of negligence standards and the court's potential error create uncertainty about the court's decision, and hence, litigants' payoffs.[2]

The following two sections examine the basic and extended models under VLR, and

---

[1] Although Generally Accepted Auditing Standards (GAAS) might be such a set of standards, they allow various interpretations (even among accountants, not to mention non-accountants). In effect, it would be extremely costly to have a complete set of negligence standards in the auditing context for all possible contingencies. In addition, the court decision is often made by a jury whose members are not familiar with the technical details of the audit process. Palmrose [1991a] reports that during the past decades few judge trials occurred in her sample of 800 lawsuits, and the auditor success rate is higher on judge trials compared to jury trials. As such, the auditors don't feel that they are free of legal liability even though they follow all the procedures required in GAAS.

[2] Note that we have $Pr[Neg \mid L,q] \equiv N(q) = 1$ for all q in our analysis of CLR in chapters 2 and 3. Note that we maintain the assumption of $Pr[Neg \mid H,q] = 0$ under VLR as under CLR. This is to simplify the analysis of VLR without material changes in a qualitative sense. More generally, one might consider a specification such that $Pr[Neg \mid L,q] \equiv N_L(q)$ and $Pr[Neg \mid H,q] = N_H(q)$ (i.e., there is a strictly positive probability that the auditor who issued $r = h$ to high type firm is held liable). It can be easily checked that this alternative formulation does not change the analysis of this chapter qualitatively as long as: (i) $N_L(q)$ and $N_H(q)$ are decreasing and convex in q; (ii) $N_H(q)$ is sufficiently small, and $N_L(q)$ is sufficiently larger than $N_H(q)$ for all q, which implies the expected litigation loss of the auditor who audited the low type firm is first-order stochastic dominant over that of the auditor who audited the high type firm; and (iii) $N_o(q) \equiv \phi_{hf}(q)N_L(q) + [1 - \phi_{hf}(q)]N_H(q)$, where $\phi_{hf}(q) = \phi_h(q) / [\phi_h(q) + (1 - \phi_h(q))(1 - p)]$, is decreasing (implied by (i) and (ii)) and concave in q. However, in this case, the auditor is potentially responsible for the business risk as well as audit failure. This is because even if the firm's true type is high and the audited report is h, there is a positive probability of being held liable by the court in the case of the firm's bankruptcy.

demonstrate that under some regularity conditions, our analysis in chapters 2 and 3 does not change in a qualitative sense.[3]

4.1 The Basic Model

When the investors competitively bid for a firm for which the audited report h is issued, they conjecture the audit quality and their expected payoff from litigation. Recall that in the basic model, filing a lawsuit is equivalent to going to trial, which incurs legal costs LC_I to the investors. Hence, if the firm price is V_h and q^c is the conjectured audit quality, the investors' conjectured expected payoff from filing a lawsuit is $\phi_{hf}{}^c N^c(V_h + I) - LC_I$. They will file a lawsuit (i.e., go to trial) if, and only if, $\phi_{hf}{}^c N^c(V_h + I) - LC_I > 0$. Consequently, the introduction of vagueness in auditor liability (due to uncertainty in the court decision) into the basic model induces a change in the investors' conjecture of their net expected payoff from litigation such that

$$\Pi^c(\sigma^*(V_h,q^c),V_h,q^c) = \max \{0, \phi_{hf}{}^c N^c(V_h + I) - LC_I\}, \tag{4.1}$$

where $N^c \equiv N(q^c)$, $\phi_{hf}{}^c \equiv \phi_{hf}(q^c)$, and $\sigma^*(\cdot)$ is the investors' suing strategy.[4] An immediate consequence of VLR is that the cutoff value for the market price, $LC_I / \phi_{hf}{}^c N^c - I$, above which the investors file a lawsuit against the auditor, is larger than that under CLR for the same conjectured audit quality since $N^c \leq 1$. Similarly to proposition 2.1, the next proposition establishes the investors' zero-profit pricing rule, which is consistent with their suing strategy for a conjectured audit quality q^c. We assume that

$$pR > [1 / (1 - \phi) + (1 - p) / \phi][LC_I / N(0)], \tag{C4.1}$$

and

---

[3] We maintain our assumption of the American rule of allocating legal costs.

[4] A formal development of $\sigma^*(\cdot)$ can be done in a manner similar to lemma 2.1.

$\phi_h(q^c)N(q^c)$ is concave in q^c. (C4.2)

These conditions ensure a unique cutoff audit quality q^o under VLR, as (C2.1) does under CLR considered in chapter 2.[5]

Proposition 4.1: Assume (C4.1) and (C4.2). There exists a cutoff audit quality $q^o \in (0,1)$ such that when the audited report is h, the competitive market value of the firm under VLR is given by

$$V_h^*(q^c) = \begin{cases} \dfrac{1-\phi_h(q^c)}{1-\phi_h(q^c)N(q^c)}\left[pR-\left[(1-p)+\dfrac{\phi(1-q^c)}{1-\phi}\right]LC_I\right]-I & \text{for } q^c < q^o, \\ \dfrac{1-\phi}{\phi(1-q^c)+(1-\phi)}pR-I & \text{for } q^c \geq q^o. \end{cases} \quad (4.2)$$

As in the analysis of CLR, the market price function incorporates the investors' suing strategy in that when the project fails, they file a lawsuit against the auditor if the conjectured audit quality q^c is less than the cutoff quality q^o, and they do not if $q^c > q^o$. In other words, the investors' pricing and litigation strategy is consistent in that $\sigma^*(V_h^*(q^c),q^c) = 1$ for all $V_h < V^o \equiv V_h^*(q^o)$. One can verify that the market price for a given conjecture $q^c < q^o$ has a positive insurance component. An immediate consequence is:

[5] It is easy to see that (C4.1) corresponds to (C2.1), since it reduces to (C2.1) if $N(q^c) = 1$, which is the case under CLR. Also note that under CLR we don't need a condition corresponding to (C4.2) since $\phi_h(q^c)N(q^c) = \phi_h(q^c)$ is concave. Note that (C4.2) is a sufficient, not necessary, condition to ensure a unique cutoff point between zero and one. As shown in the proof, it merely rules out the possibility that monotonically decreasing functions intersect each other multiple times.

Corollary 4.1: The cutoff value q^o under VLR is strictly lower than that under CLR. The market price for a conjectured audit quality $q^c \in [0,q^o]$ is strictly lower than that under CLR for the same conjectured audit quality.

Recall that the auditor, who issued the audited report r = h for a low type firm, is held liable with probability N(q) < 1 under VLR, while he is held liable with probability one under CLR. Hence, the cutoff audit quality under VLR, below which the investors file a lawsuit, is strictly less than that under CLR. In other words, the vague liability regime in our setting decreases the investors' expected payoff from the litigation game, which reduces the "insurance" component of the market price.

Note that the price function under VLR, $V_h^*(q^c)$ given by (4.2), is not necessarily monotonically increasing in $q^c \in [0,q^o]$. This contrasts with the price function under CLR. This arises because when $N(q^c)$ decreases sufficiently fast as q^c increases, it might be the case that the decrease in the litigation payoff dominates the increase in the information value, which results in $V_h^{*\prime}(q^c) < 0$ for some $q^c \in [0,q^o]$. The next corollary identifies a sufficient, not necessary, condition to endure that the price function $V_h^*(q^c)$ in proposition 4.1 increases in q^c.

Corollary 4.2: The market price function is monotonically increasing in the conjectured audit quality if

$$\frac{-N'(q^o)}{1-N(q^o)} \leq \frac{1}{1-q^c} \quad \text{for } q^c \in [0,q^o].^6 \tag{4.3}$$

[6] An expression similar to (4.3) can be found in Schwartz [1995]. She refers to the left-hand (right-hand) side as the insurance (quality) effect. It should be noted, however, that the legal system is costless in her model, which allows her to exogenously assume that financial statement users sue the auditor always, and fully recover their *ex post* losses. In the presence of costly litigation as in our model, the investors do not recover their losses fully. The investors' nontrivial legal costs in part explain why (4.3) is only a sufficient condition for the monotonicity of the market price in audit

Throughout the subsequent analysis, we assume (4.3). As will be shown in a moment, the reason for assuming the monotonicity of price function is to ensure that the market price and audit quality are strategic complements. This strategic complementarity allows us to provide intuitive comparative statics under VLR as under CLR.

Now consider the auditor's problem. In his audit quality choice stage, the auditor conjectures the firm's market price V_h^c and investors' lawsuit probability σ^c. Under VLR, the auditor's expected loss in the case of litigation (i.e., $\sigma^c = 1$) is given by

$$\Omega(q,V_h^c) = \phi_{hf}(q)N(q)(V_h^c + I) + LC_A.$$

Hence, we have the following characterization of audit quality for the conjectured market price and lawsuit probability.

Proposition 4.2: Given his conjecture of the market price V_h^c and lawsuit probability σ^c, the auditor's quality choice, $q = q^*(V_h^c,\sigma^c)$, is characterized by

$$C'(q) = \phi\sigma^c\{(V_h^c + I)[N(q) - N'(q)(1 - q)] + LC_A\}. \qquad (4.4)$$

$q^*(V_h^c,\sigma^c)$ is increasing in V_h^c and σ^c.[7]

Corollary 4.3: Assume (4.3). The auditor provides a lower audit quality under VLR than he does under CLR for the same conjectured market price V_h^c and lawsuit probability σ^c.

As one can see from (4.4) and (2.9), the only difference in the auditor's incentive in choosing

---

quality whereas in her model, a condition similar to (4.3) is necessary and sufficient for the investment amount to increase in audit quality.

[7] We implicitly assume $\sigma^c > 0$. As in the lemma 2.2, we have $q^*(V_h^c,\sigma^c = 0) = 0$ for all $V_h^c \in \mathbb{R}_+$.

the audit quality between CLR and VLR is that the auditor under VLR takes into account the impact of q on his expected litigation loss through N(q). One can easily check that (4.4) reduces to (2.9) if $N(q) = 1$ for all q. There are essentially two effects induced by VLR on the auditor's quality choice. The first effect is a decrease in the auditor's litigation loss since $N(q) \leq 1$.[8] The decrease in the expected damage assessment reduces the marginal benefit of avoiding audit failure, which induces the auditor to provide lower audit quality than he does under CLR. In contrast, the second effect is that VLR motivates the auditor to provide a higher quality since $N'(q) < 0$. That is, the auditor has an incentive to reduce the expected litigation loss by increasing audit quality. The net effect is captured by the expression $N(q) - N'(q)(1 - q)$.

The corollary immediately follows from (4.3) (or equivalently, $N(q) - N'(q)(1 - q) \leq 1$), which implies that the auditor's marginal benefit of audit quality (the right-hand side of (4.4)), is less than that under CLR (the right-hand side of (2.9)). Put alternatively, the auditor's litigation loss does not decrease via N(q) fast enough to motivate the auditor to provide a higher audit quality under VLR than under CLR.

We now characterize the equilibrium of the basic model under VLR. To ensure a pure strategy equilibrium under VLR, we assume

$$C'^{-1}(\phi(V^o + I + LC_A)) \leq q^o. \qquad \text{(C4.3)}$$

Proposition 4.3: Assume (C4.1), (C4.2), (C4.3) and (4.3). The equilibrium market price, audit quality, and lawsuit probability under VLR are given by

$$V_h^* = V_h^*(q^*) = \frac{1-\phi_h(q^*)}{1-\phi_h(q^*)N(q^*)}\left[pR - \left[(1-p)+\frac{\phi(1-q^c)}{1-\phi}\right]LC_I\right] - I$$

[8] That is, the litigation loss in case of issuing the audited report h to the low type firm is $N(q)(V_h^c + I) + LC_A$ under VLR while it is $V_h^c + I + LC_A$ under CLR.

$$C'(q^*) = \phi\{(V_h^* + I)[N(q^*) - N'(q^*)(1 - q^*)] + LC_A\},$$

where $q^* < q^o$, and $\sigma^* = 1$.[9] The equilibrium market price and audit quality under the VLR are lower than those under CLR.

Comparing propositions 4.3 and 2.2, the characterization of equilibrium under VLR is essentially the same as that under CLR, except that the vagueness of the audit liability is taken into account in the investors' pricing and litigation decision, and the auditor's quality decision. Recall that there is a positive probability under the VLR that the auditor who issued the audited report r = h for the low type firm is not held liable. This implies that the value of the firm to the investors under VLR is lower than under CLR, due to the decreased expected litigation payoff from litigation (or, so to speak, the reduced insurance component of market price) as established by corollary 4.1. On the other hand, the auditor provides a lower quality audit since the net effect of VLR decreases the marginal benefit of audit quality as established by corollary 4.3. One can check that the comparative statics are qualitatively the same as those given in proposition 2.4, since the market price and audit quality are strategic complements, as established by corollary 4.2 and proposition 4.2.[10]

---

[9] Under (C4.3), we have that $q^*(V_h^c = V^o, \sigma^c = 1) \leq q^o$, where $q^*(\cdot)$ is characterized by (4.4), and q^o and $V^o \equiv V_h^*(q^o)$ are given by proposition 4.1. This follows $N(q) - N'(q)(1 - q) < 1$ given by (4.3). Otherwise, the equilibrium market price and audit quality are given by V^o and q^o, in which the investors randomize their litigation decision as they do under the CLR when (C2.2) is not satisfied.

[10] Notice that strategic complementarity ensured by a monotonic price function (corollary 4.2) is essential here. If we do not have (4.3), the price function might have a negative slope at the equilibrium point. In such a case, the comparative static analysis may yield results that are not intuitive. For example, it might be the case that the equilibrium market price decreases as the auditor's legal costs increase. This is driven by the fact that the increase in the auditor's legal costs induces an increase in the equilibrium audit quality, which in turn results in a decrease the insurance component of market price larger than an increase in the information value (via a higher audit quality). Along the same line of reasoning, the market price may increases as the audit is more costly to perform since the increase in the investors' litigation payoff more than compensates for the decrease in the information value of the audit. Given that the primary role of the auditor is as an

4.2 The Extended Model and Welfare Analysis

Whether the pretrial negotiation is under CLR or VLR, it allows the litigants to save on the costly legal expenditures. As under CLR, we assume that when the firm for which the audited report h is issued subsequently goes bankrupt, the investors file a lawsuit against the auditor with probability one in the extended model (recall that the litigants bear their legal costs only at trial, and the investors can always drop their case after filing a lawsuit but before going to trial). We maintain the assumption in the previous chapter that the firm's type is privately known to the auditor before going to trial. We refer to the auditor who receives a signal that the firm's type is low (high) as the low (high) type auditor.[11] Notice that the private revelation of the firm's type to the auditor under VLR raises effectively the same strategic incentives in the pretrial game as under CLR. This follows from the fact that the low type auditor has a larger expected litigation loss than the high type auditor.[12] The following proposition corresponds to proposition 3.1.

Proposition 4.4: Suppose that a lawsuit is filed against the auditor.

(o) If $\phi_{hf}{}^{c}N^{c}(V_h + I) - LC_I \leq 0$, then the following is an equilibrium in the pretrial settlement game.

(imperfect) information producer rather than as a potential *ex post* transferrer (or insurer), we believe that the change in the audit quality has a first-order effect on the market price through the information value, and the insurance value has a second-order effect on the market price.

[11] We referred to the auditor as a liable or non-liable auditor in chapter 2 since the auditor who issued the audited report h for a low (high) type firm is held liable (not liable) with probability one. On the other hand, under VLR, there is a positive probability that the auditor who issued the audited report h for a low type firm is not held liable in the court. As such, we use high/low rather than liable/non-liable to refer to the auditor's type.

[12] It is easy to see that our specification that the high type auditor is not held liable with probability one is not restrictive in the sense that our subsequent analysis does not change qualitatively as long as the high type's winning probability is sufficiently higher than that of the low type. See footnote 2 in this chapter.

- Both the low and high type auditors make no settlement offer.
- Given no settlement offer, the investors drop the case with probability one.
- The investors would accept any strictly positive offer with probability one.

(i) If $0 < \phi_{hf}^{c}N^{c}(V_h + I) - LC_I \leq LC_A$, then the following is an equilibrium in the pretrial settlement game.

- Both the low and high type auditors make a settlement offer $S_1 = \phi_{hf}^{c}N^{c}(V_h + I) - LC_I$.
- The investors accept the offer S_1 with probability one.
- For offers less than S_1, the investors would bring the case to court with probability one.

(ii) If $LC_A < \phi_{hf}^{c}N^{c}(V_h + I) - LC_I$, then the following is an equilibrium in the pretrial settlement game.

- The high type auditor makes no settlement offer with probability one.
- The low type auditor makes a settlement offer, $S_2 = N^{c}(V_h + I) - LC_I$ with probability $\delta = \dfrac{\phi_{hf}^{c}N^{c}(V_h+I)-LC_I}{\phi_{hf}^{c}[N^{c}(V_h+I)-LC_I]} < 1$, and no offer with probability 1-δ.
- Given S_2, the investors accept with probability one.
- Given no settlement offer, the investors drop the case (i.e., accept no settlement offer) with probability $a = \dfrac{LC_A+LC_I}{N^{c}(V_h+I)+LC_A} < 1$, and bring the case to trial with probability 1 - a.
- For any positive amount of settlement offer less than S_2, the investors bring

the case to court with probability one.

The economic reasoning is exactly the same as that underlying proposition 3.1. As in CLR, the low type auditor takes advantage of information asymmetry in that he tries to bluff the investors by mimicking the high type auditor, and the information transmitted by the settlement offers plays an important role in the investors' trial decision. In particular, in case (ii), the investors anticipate the low type auditor's incentive, and their trial decision is such that the low type auditor is indifferent between fully revealing his type and mimicking the high type auditor. In both cases (i) and (ii), the high type auditor bears the cost of asymmetric information in that he would be better off *ex post* if he were able to credibly reveal his type to the investors.

We now turn to the investors' pricing stage, and as in CLR, their anticipation of the litigation opportunity will be incorporated in the market price of the firm. One can check that if the market price is V_h and the conjectured audit quality is q^c, the investors' expected payoff from litigation is

$$\Pi^c(V_h,q^c) = \max\{0,\phi_{hf}{}^cN^c(V_h + I) - LC_l\},$$

which is the same as (4.1).[13] Hence, we have the same competitive market price for a conjectured audit quality, $V_h^*(q^c)$, as that without pretrial negotiation, and therefore it is given by proposition 4.1.

On the other hand, the auditor conjectures the market price when determining the audit quality, and anticipates his expected loss from litigation which occurs if he issues the audited report h for a firm and the firm subsequently fails.[14] It is easy to verify that the auditor's audit quality decision for his conjectured market price, $q^*(V_h^c)$, is characterized by

---

[13] Recall that the lawsuit probability is one when the firm goes bankrupt, which explains why we express the investors' expected payoff from litigation as $\Pi^c(V_h,q^c)$ in the extended model while it is expressed as $\Pi^c(\sigma^*(V_h,q^c),V_h,q^c)$ in (4.1) in the basic model.

[14] Recall that in the extended model, the auditor conjectures the market price only.

$$C'(q) = \phi\{(V_h^c + I)[N(q) - N'(q)(1 - q)] - LC_I\}$$

for case (i), and

$$C'(q) = \phi\{(V_h^c + I)[N(q) - N'(q)(1 - q)] - LC_I\}$$

$$- (1 - \phi)(1 - p)\frac{N'(q)(V_h^c+I)}{[N(q)(V_h^c+I)+LC_A]^2}LC_A(LC_I + LC_A)$$

for case (ii).[15]

Notice that a distinguishing feature of VLR from CLR is that, in case (ii), the auditor's legal costs have an impact on the audit quality, and hence, on the market price indirectly. This is driven by the fact that the auditor's expected loss from the litigation game is

$$\Omega(q,V_h^c) = \phi_{hf}(q)[N(q)(V_h^c+I) - LC_I] + [1 - \phi_{hf}(q)]\frac{N(q)(V_h^c+I)-LC_I}{N(q)(V_h^c+I)+LC_A}LC_A,$$[16]

in case (ii). Hence, The auditor's problem is to solve

$$\min_q TC = C(q) + [\phi(1 - q) + (1 - \phi)(1 - p)]\Omega(q,V_h^c).$$

$$= C(q) + \phi(1 - q)[N(q)(V_h^c + I) - LC_I] + (1 - \phi)(1 - p)\frac{N(q)(V_h^c+I)-LC_I}{N(q)(V_h^c+I)+LC_A}LC_A,$$

---

[15] In case (o), $q^*(V_h^c) = 0$ for all $V_h^c \in \mathbb{R}_+$. This case, however, is ruled out in equilibrium by (C4.1).

[16] Recall that in case (ii) the investors bring the case to trial with a strictly positive probability, $1 - a = \frac{N(q^*)(V_h^*+I)-LC_I}{N(q^*)(V_h^*+I)+LC_A}$, in equilibrium when no settlement offer is made. Otherwise, the low type auditor would mimic the high type auditor with probability one. The positive trial rate $1 - a$ makes the low type auditor indifferent between mimicking and not.

where the third term is the auditor's expected litigation loss when the audited firm is a high type. Recall that the auditor's legal costs under CLR has no impact on the audit quality choice since the auditor's expected litigation loss when the audited firm is a high type does not include the choice variable, q. Put differently, LC_A is additively separable from q in the auditor's objective function under CLR. On the other hand, under VLR, it is multiplicatively separable from q, and hence, it has an impact on the audit quality. It can be shown that the higher the auditor's legal costs, the higher the audit quality ($dq^*/dLC_A > 0$).

We now consider the regulator's problem under VLR. Assuming that case (ii) prevails as an equilibrium, it follows that the social welfare is given by

$$W^* = W_0 + \phi q^* I - C(q^*) - (1 - \phi)(1 - p)\frac{N(q^*)(V_h^* + I)}{N(q^*)(V_h^* + I) + LC_A}(LC_I + LC_A), \qquad (4.5)$$

where the fourth term represents the *ex ante* expected legal costs.[17] Proposition 3.3 under CLR states that legal policies which potentially induce an increase in the auditor's legal costs are not desirable from a welfare viewpoint. In contrast, such a statement is no longer valid under VLR. Recall that the audit quality is affected by the auditor's legal costs under VLR. Hence, the auditor's legal costs have an indirect effect on the market price via the audit quality. This in turn implies that the auditor's legal costs have a more complex impact on the expected legal costs since the trial rate, $(1 - \phi)(1 - p)\frac{N(q^*)(V_h^* + I)}{N(q^*)(V_h^* + I) + LC_A}$, depends on q^* and V_h^*, both of which interact each other.

---

[17] Notice that the equilibrium trial rate is $(1 - \phi)(1 - p)$ times $\frac{N(q^*)(V_h^* + I)}{N(q^*)(V_h^* + I) + LC_A}$, which is the ratio between the equilibrium damage assessment and the low type auditor's equilibrium loss from trial as is the expression in CLR.

Consider an increase in the auditor's legal costs. It directly decreases the trial rate. On the other hand, it increases the audit quality and market price, which has in turn two opposing indirect effects on the trial rate. The trial rate increases via an increase in the market price. However, the decrease of N(q), which is induced by an increase in the audit quality, decreases the trial rate.[18] In addition to these impacts on the trial rate, there is a direct increase in the legal costs when the auditor's legal costs increase. Moreover, an increase in the audit quality decreases (increases) the investment deadweight losses (audit costs). The net effect of an increase in the auditor's legal costs can be negative or positive depending on which effect is dominant. A similar analysis can be done for an increase in the investors' legal costs.[19]

[18] Recall that $N'(q) < 0$, and $N(V_h + I) / [N(V_h + I) + LC_A]$ is increasing in N and V_h.

[19] There would be a decrease in the audit quality and market price, which changes the trial rate, the investment deadweight losses, and the audit costs.

CHAPTER 5:

BRITISH RULE OF LEGAL COSTS ALLOCATION

Our analyses in the previous chapters assume that the litigants (the auditor and investors) pay their own legal costs irrespective of the court's decision, i.e., the American rule of allocating legal costs. Recently, accountants in the U.S. propose an alternative rule of allocating legal costs under which the losing parties at trial are required to pay the prevailing parties' legal costs, i.e., the British rule of allocating legal costs.[1] The objective of this chapter is to identify the basic economic incentives of the investors and auditor induced by the British rule, and examine its welfare consequences.

Clearly, such a change in the legal costs allocation rule will induce changes in the investors' litigation and settlement decision, which in turn change their pricing strategy. Similarly, the auditor's

[1] Another proposal is to replace the joint and several liability rule by the proportionate liability rule. The proportionate liability rule can be captured in our study by introducing an apportioning rule, $\alpha \in [0,1]$, so that the auditor is liable only for a portion of the entire damage amount, i.e., $\alpha(V_h + I)$. The implications are (i) the investors' expected litigation payoff is decreased, and (ii) the auditor's expected litigation loss is decreased. It follows that the investors pay less for the firm under the proportionate liability rule than under joint and several liability rule, and the auditor has a less incentive to provide a high audit quality. However, if the apportioning rule is a decreasing function of audit quality, the auditor might provide a higher audit quality to reduce his portion of liability. See Narayanan [1994] for a detailed discussion of the proportionate liability rule.

settlement strategy will change, which will be reflected in his audit quality decision rule. Consequently, the adoption of the British rule would result in a different equilibrium audit quality, market price, audit fee, and hence, trial frequency. In particular, such changes in the equilibrium variables imply that, as one might expect from our previous analysis, there will be changes in the three major determinants of the value of an audit (or equivalently, social welfare) in our setting: the saving on the wasteful investment, the audit costs, and the expected legal costs.

Section 5.1 characterizes an equilibrium of the basic model in which filing a lawsuit is equivalent to going to trial. In section 5.2, we introduce the information asymmetry between the auditor and investors, and the litigants are allowed to settle before going to trial, i.e., the extended model. We compare the social welfare under the American and British rules in section 5.3.

In the analysis of auditor litigation under the British rule, we make the following assumptions in both the basic and extended models. First, the firm's true type is publicly revealed at trial at the expense of legal costs. That is, we assume that CLR prevails.[2] Second, we assume that the investors' and auditor's legal costs are of the same magnitudes as those are under the American rule.[3] Third, the court's assessment of investors' financial damage in case of audit failure remains unchanged, i.e., it is the market price plus the investment of I.

5.1 The Basic Model

As in the analysis under the American rule, we begin with the litigation game so as to derive

[2] The effects of vague liability regime (VLR) can be analyzed in a manner similar to that in chapter 4. In particular, it can be shown that there is no qualitative change in our welfare analysis.

[3] As long as the legal costs are exogenously given in our model, the second assumption is not unreasonable. Litigation studies in which the litigants' legal expenses are endogenized include Plott [1987] and Katz [1987].

the investors' price function in the competitive market. Suppose that the firm, for which the audited report h is issued, is traded at a positive market price V_{hB},[4] and its project subsequently fails. When the investors sue the auditor under the British rule, they receive $(V_{hB} + I)$ from the auditor without paying their legal costs if the auditor is held liable. On the other hand, they bear the entire legal costs, $LC_I + LC_A$, if the auditor is not liable. As in lemma 2.1, the investors will sue the auditor if, and only if, the market price, V_{hB}, and the conjectured audit quality, q^c, are such that

$$\Pi_B^c(\sigma = 1, V_{hB}, q^c) = \phi_{hf}^c(V_{hB} + I) - (1 - \phi_{hf}^c)LC_T > 0,$$

where $LC_T \equiv LC_I + LC_A$ is the sum of investors' and auditor's legal costs, i.e., the total legal costs of litigants.

To see an essential feature of the British rule, notice that the right-hand side of the above expression can be written as:

$$\phi_{hf}^c(V_{hB} + I + LC_T) - LC_T > 0.$$

It is immediate to see that the investors evaluate their expected litigation payoff under the British rule *as if* the American rule prevails in a setting in which the damage amount is $(V_{hB} + I + LC_T)$ and their legal cost is LC_T. In other words, the British rule is effectively the same as the American rule under which the damage assessment is increased by the total legal costs, and the investors' legal costs are increased by the auditor's legal costs for a given market price and conjectured audit quality.[5, 6]

---

[4] The subscript "B" denotes variables under the British rule of allocating legal costs. Later, we use the subscript "A" to denote the variables under the American rule of allocating legal costs to distinguish those variables (note that the subscript "A" in LC_A denotes the auditor's legal costs as before).

[5] Recall that under the American rule, the damage assessment is the market price plus the investment of I, and the size of the investors' legal cost is LC_I. See the expression (2.5) in chapter 2.

[6] Proponents of the British rule generally argue that such an increase in the legal costs would reduce the investors' incentive to litigate, thereby decreasing the legal expenditure of the society as a whole. However, to the extent that an increase in the damage assessment would motivate the

It follows that the investor's expected payoff from litigation given their conjectured audit quality and a market price is

$$\Pi_B^c(\sigma^*(V_{hB},q^c),V_{hB},q^c)) = \max \{0, \phi_{hf}^c(V_{hB} + I) - (1 - \phi_{hf}^c)LC_T\}.$$

Following the same reasoning as that in chapter 2, the competitive price function that is consistent with the investors' litigation strategy is given by the next proposition. We assume that

$$pR > [(1 - p) / \phi]LC_T. \qquad (C5.1)$$

Condition (C5.1) ensures a unique cutoff point $q_B^\circ \in [0,1]$, below (above) which the investors decide to go (not to go) to trial, as (C2.1) does in chapter 2.[7]

Proposition 5.1: Assume (C5.1). There exists a cutoff audit quality $q_B^\circ \in (0,1)$, such that when the audited report is h, the competitive market value of the firm under the British rule is given by

$$V_{hB}^*(q^c) = \begin{cases} \underline{V}_B \equiv pR - I - (1-p)LC_T & \text{for } q^c < q_B^\circ, \\ \dfrac{1-\phi}{\phi(1-q^c)+(1-\phi)}pR - I & \text{for } q^c \geq q_B^\circ. \end{cases}$$

$V_{hB}^*(q^c)$ is continuous on [0,1], and nondecreasing in q^c.[8]

---

investors to litigate, which has been apparently ignored by those proponents, we do not know the net effect of the British rule on the investors' incentive. A similar point can be found in Katz [1987].

[7] Note that (C5.1) is not inconsistent with (C2.1) in chapter 2. In effect, as will be established by proposition 5.4, if $[(1 - p) / \phi]LC_T \geq [1 / (1 - \phi) + (1 - p) / \phi]LC_I$ (or equivalently, $[LC_A / LC_I] \geq [\phi / (1 - \phi)(1 - p)]$), the equilibrium market price under the British rule is higher than that under the American rule. On the other hand, if $[(1 - p) / \phi]LC_T < [1 / (1 - \phi) + (1 - p) / \phi]LC_I$, the equilibrium market price under the British rule can be higher or lower than that under the American rule. A detailed discussion will be given by proposition 5.4.

[8] Note that $V_{hB}^*(q^c)$ for $q^c \in [0,q_B^\circ]$ can be rewritten as $\underline{V}_B = W_0 + [\phi pR - (1 - p)LC_T]$. The terms in the brackets have a positive value by (C5.1), and hence, $V_{hB}^*(q^c) > 0$ since we have $W_0 > 0$. Also note that $\underline{V}_B = V_B^\circ \equiv V_{hB}^*(q_B^\circ)$.

An interesting point is that the market price below the cutoff audit quality is *independent* of the conjectured audit quality. This is driven by the fact that the insurance value and information value exactly offset each other under the British rule. In other words, as the conjectured audit quality increases up to q_B°, the insurance value decreases at a rate equal to the rate at which the information value increases. Under the American rule, the increase in the information value dominates the decrease in the insurance value, which results in the strictly increasing price function $V_{hA}^*(q^c)$ given in proposition 2.1, even below the cutoff audit quality q_A°. Under the British rule, the fact that the investors pay the auditor's legal costs as well as their own if the auditor is not liable, causes the investors' expected payoff from the litigation to decrease faster than it does under the American rule, and results in the competitive market price function which is constant for all $q^c \in [0, q_B^\circ]$.

We now consider the auditor's problem. When a lawsuit is filed, the auditor's expected loss given his conjecture of the market price is

$$\Omega_B(q, V_h^c) \equiv \phi_{hf}(q)(V_h^c + I + LC_T). \tag{5.2}$$

This is because he bears no costs when the firm's type is high, but he must pay the investors' financial damage plus the entire legal costs if the firm's type is low. Comparing (5.2) with the auditor's litigation loss under the American rule, $\phi_{hf}(q)(V_h^c + I) + LC_A$, one can see that the British rule is effectively the same as the American rule under which the auditor's litigation payoff changes as follows: The damage assessment is the sum of market price, investment of I, and total legal costs, whereas there are no legal costs at trial.

The auditor's problem is to choose an audit quality q_B such that

$$q_B \in \underset{q}{\operatorname{argmin}}\ TC_B(q, V_h^c, \sigma^c) = C(q) + [\phi(1 - q) + (1 - \phi)(1 - p)]\sigma^c \Omega_B(q, V_h^c),$$

where $\Omega_B(q, V_h^c)$ is given by (5.2).

Lemma 5.1: The auditor's response function, q_B^*: $\mathbb{R}_+ \times [0,1] \rightarrow [0,1]$, is characterized as follows.

(i) $q_B = q_B^*(V_h^c,\sigma^c) = 0$ for all $V_h^c \in \mathbb{R}_+$ if $\sigma^c = 0$;

(ii) For $\sigma^c \in (0,1]$, assuming an interior solution, $q_B = q_B^*(V_h^c,\sigma^c)$ is given by

$$C'(q_B) = \phi\sigma^c(V_h^c + I + LC_T). \tag{5.3}$$

$q_B^*(V_h^c,\sigma^c)$ is increasing in V_h^c and σ^c.

Comparing lemmas 5.1 and 2.2, it follows immediately that $q_B^*(V_h^c,\sigma^c) \geq q_A^*(V_h^c,\sigma^c)$ for all (V_h^c,σ^c), where equality holds for $\sigma^c = 0$. That is, the auditor provides a higher audit quality under the British rule than he does under the American rule for the same conjectured market price and lawsuit probability. This follows from the fact that the marginal benefit of providing a higher audit quality is larger under the British rule than that under the American rule. That is, under the British rule the auditor's loss is $(V_h^c + I + LC_T)$ if he is held liable, while he pays nothing otherwise. The increased (decreased) loss in the case of (no) audit failure under the British rule provides a stronger *ex ante* incentive for the auditor to avoid audit failure than under the American rule.

We are now ready to characterize the equilibrium of the basic model under the British rule.

Proposition 5.2: Assume that

$$q_B^*(V_h^c = V_B^\circ, \sigma^c = 1) = C'^{-1}(\phi(V_B^\circ + I + LC_T)) \leq q_B^\circ, \tag{C5.2}$$

where $V_B^\circ \equiv V_{hB}^*(q_B^\circ)$. Then a Nash equilibrium, $\{q_B^*, V_{hB}^*, \sigma_B^*\}$, is characterized by

$$V_{hB}^* = pR - I - (1 - p)LC_T, \tag{5.4}$$

$$C'(q_B^*) = \phi(V_{hB}^* + I + LC_T) = \phi p(R + LC_T), \tag{5.5}$$

where $q_B^* \leq q_B^\circ$ with $\sigma_B^* = 1$.

Condition (C5.2) rules out an equilibrium in which the investors randomize their litigation strategy, i.e., $\sigma_B^* \in (0,1)$.[9] It is worthwhile to discuss two points. Given that the investors sue the auditor with probability one in equilibrium, and given that their *effective* legal costs are LC_T,[10] the equilibrium market price directly depends on the investors' as well as the auditor's legal costs. The dependence is only through the sum of both parties' legal costs, which is induced by the very nature of British rule. Secondly, the audit quality also directly depends upon the investors' as well as auditor's legal costs. This follows from the fact that even though the auditor's *effective* legal costs are zero, the *effective* damage assessment includes LC_T. Again, the dependence is only through the sum of both parties' legal costs.

The next proposition summarizes the comparative static results for the equilibrium market price and audit quality under the British rule.

Proposition 5.3:

(i) As the investors' and/or auditor's legal costs increases, the equilibrium market price decreases, and the audit quality increases.[11]

---

[9] Condition (C5.2) corresponds to (C2.2) in chapter 2. When (C5.2) does not hold, the unique equilibrium is given by $(V_B^\circ, q_B^\circ, \sigma_B^\circ)$, where $\sigma_B^\circ < 1$ is determined by (5.3). As we discussed in chapter 2, that equilibrium is not asymptotically stable. Also note that the kinked-point (q_B°, V_B°) under the British rule differs from (q_A°, V_A°) under the American rule in general. Proposition 5.4 identifies a sufficient condition under which $q_B^\circ \geq q_A^\circ$, and hence, $V_B^\circ \geq V_A^\circ$.

[10] By the effective legal costs, we mean the legal costs perceived by the litigants under the British rule. That is, they are LC_T for the investors and zero for the auditor. Similarly, the effective damage assessment is the sum of the market price, investment I, and total legal costs for both the investors and auditor.

[11] From the discussion above, we can see that the distinction between the auditor's and investors' legal costs is immaterial here. What matters in the investors' and auditor's best responses is the total legal costs. However, the relative size of legal costs is crucial when we compare the

(ii) As the audit technology becomes more costly, the equilibrium audit quality decreases while the equilibrium market price does not change.

(iii) As the prior belief that the firm is a low type increases, the equilibrium audit quality increases while the equilibrium market price does not change.

(iv) For all the other parameters (i.e., p, R, and I), the equilibrium market price and audit quality change in the same directions as they do under the American rule.

The results are mainly driven by the fact that there is no indirect effect of the audit quality on the market price.[12] An increase in the investors' and/or auditor's legal costs directly decreases the market price, and increases the audit quality. Although the audit quality is decreased indirectly by the decrease in the market price, the increase in legal costs has a dominant direct effect on the audit quality, which results in a net increase in the audit quality. As auditing becomes more costly, a lower audit quality is provided. Since there is no indirect effect of the audit quality on the market price, the equilibrium market price does not change.

In contrast to the ambiguous effect of the change in the prior belief, ϕ, under the American rule, an increase in ϕ under the British rule induces an increase in the audit quality, while the market price does not change. The absence of a direct effect of ϕ on the market price contrasts with the decrease in the market price under the American rule. Under the American rule, such a decrease in the market price induces a decrease in the audit quality indirectly, which in turn decreases the market price further. On the other hand, the positive linkage between the audit quality and market price (strategic complementarity) implies that a direct increase in the quality audit induced by an increase

---

market prices and audit qualities under the American and British rules as will be shown by the next proposition.

[12] However, note that the market price has a positive impact on the audit quality.

in ϕ leads to an indirect increase in the market price, resulting in an ambiguous net effect under the American rule. The lack of an indirect effect of the audit quality on the market price under the British rule removes such a counter-balancing effect.

Note that in general we cannot compare the equilibrium market prices and audit qualities under the British and American rules, although we know that the auditor under the British rule has a stronger *ex ante* incentive to provide a higher audit quality than he has under the American rule. This is because auditor's best response and investors' competitive pricing rule jointly determine the equilibrium, and the market price function under the British rule can be over, below, or passing through the market price function under the American rule. The next proposition identifies conditions under which we can compare the equilibrium market price and audit quality under British and American rules.

Proposition 5.4:

(i) If $\frac{LC_A}{LC_I} \geq \frac{\phi}{(1-\phi)(1-p)}$, then $V_{hB}^* \leq V_{hA}^*$.

(ii) If $\frac{LC_A}{LC_I} \leq \frac{\phi(1-q_A^\circ)}{(1-\phi)(1-p)}$, then $V_{hB}^* \geq V_{hA}^*$ and $q_B^* \geq q_A^*$, where q_A° is the cutoff audit quality under the American rule.

Notice that the ratio between the auditor's and investors' legal costs, LC_A/LC_I, plays the key role in comparing the equilibrium variables. When it is larger than $\phi/[(1 - \phi)(1 - p)]$, the proof shows that $V_{hB}^*(q^\circ) \leq V_{hA}^*(q^\circ)$ for all q°. That is, the competitive market price function under the British

rule lies below that under the American rule. Intuitively, when the auditor's legal costs are relatively larger than the investors', the firm has a less value to the investors given that they might have to pay the auditor's large legal costs as well as their own. Put differently, the British rule is not attractive to the investors compared to the American rule in such a case, since under the British rule the amount that the investors potentially shift to the auditor (i.e., their legal costs) is small relative to the amount that is potentially shifted from the auditor (i.e., the auditor's legal costs).[13]

On the other hand, when the ratio is smaller than $\phi(1 - q_A^\circ)/[(1 - \phi)(1 - p)]$, we have $q_B^\circ \geq q_A^\circ$ (or equivalently $V_B^\circ \geq V_A^\circ$), and hence, $V_{hB}^*(q^c) \geq V_{hA}^*(q^c)$ for all q^c. This, in conjunction with $q_B^*(V_h^c,\sigma^c) \geq q_A^*(V_h^c,\sigma^c)$ for all (V_h^c,σ^c), establishes that the equilibrium market price and audit quality under the British rule are higher than those under the American rule.

When the ratio is intermediate (i.e., LC_A/LC_I is between $\phi(1 - q_A^\circ)/[(1 - \phi)(1 - p)]$ and $\phi/[(1 - \phi)(1 - p)]$), the market price function under the British rule can be lower or higher than that under the American rule.[14] In this case, although we have $q_B^\circ \leq q_A^\circ$, we cannot compare the equilibrium market price and audit quality under the British and American rule in general.

5.2 The Extended Model.

The costly litigation process motivates the litigants to settle their dispute before going to trial under both the American and British rules. As in chapter 3, we introduce the assumption that the auditor has private information about audit failure before going to trial, and examine the impact of

---

[13] Notice that the audit qualities are not comparable in this case since the audit quality under the British rule can be higher or lower than that under the American rule.

[14] That is, $V_B^\circ = \underline{V}_B \in (\underline{V}_A, V_A^\circ)$ where $\underline{V}_A$ is the lower bound of the market price under the American rule. In such a case, it is easy to see that there exist q_1^c and q_2^c in $[0,q_B^\circ]$ such that $V_{hB}^*(q_1^c) > V_{hA}^*(q_1^c)$ but $V_{hB}^*(q_2^c) < V_{hA}^*(q_2^c)$.

the British rule on the litigants' strategic considerations in the pretrial negotiation game.[15] Also we maintain our assumption that the investors file a lawsuit against the auditor when the firm for which the audited report h is issued goes bankrupt.

As under the American rule, the key issues are the liable auditor's incentive to mimic the non-liable auditor's settlement strategy, and the information transmitted by the settlement offer. Recall that under the American rule, the non-liable auditor is worse off in litigation due to the information asymmetry since he bears his legal costs irrespective of the court's decision when the case goes to trial. However, the non-liable auditor pays no legal costs under the British rule. This obviously induces the non-liable auditor to play more aggressively in the pretrial negotiation in that no settlement offer is a dominant strategy in all circumstances.[16] On the other hand, the investors bear no legal costs when the auditor is liable, and the liable auditor has to pay the total legal costs as well as the investors' financial losses. The following proposition characterizes the equilibria for the pretrial settlement game under the British rule.

Proposition 5.5: Suppose that a lawsuit is filed against the auditor.

(i) If $\phi_{hf}^{c}(V_{hB} + I) - (1 - \phi_{hf}^{c})LC_T \leq 0$, then the following is an equilibrium in the pretrial negotiation.

- Both the liable and non-liable auditors make no settlement offer.
- Given no settlement offer, the investors drop the case with probability one.
- The investors would accept any strictly positive offer with probability one.

(ii) If $0 < \phi_{hf}^{c}(V_{hB} + I) - (1 - \phi_{hf}^{c})LC_T$, then the following is an equilibrium in the

---

[15] We assume the same sequence of moves here as under the American rule.

[16] Recall that under the American rule the non-liable auditor makes a positive settlement offer in case (i) of proposition 3.1 to avoid his legal costs incurred if the investors take the case to trial.

pretrial negotiation.

- The non-liable auditor makes no settlement offer with probability one.
- The liable auditor makes a settlement offer $S_2 = V_{hB} + I$ with probability

$$\delta_B = \frac{\phi_{hf}^c(V_{hB}+I)-(1-\phi_{hf}^c)LC_T}{\phi_{hf}^c(V_{hB}+I)} < 1,$$ and no offer with probability 1 - δ_B.

- The investors accept S_2 with probability one.
- Given no settlement offer, the investors drop the case with probability

$$a_B = \frac{LC_T}{V_{hB}+I+LC_T} < 1,$$ and bring the case to trial with probability 1 - a_B.

- For any positive settlement offer strictly less than S_2, the investors would bring the case to trial with probability one.

Recall that under the American rule we have three cases (proposition 3.1), and the cutoff values are zero and the non-liable auditor's legal costs, LC_A. The equilibrium settlement strategies of the auditor and investors depend on whether the investors' expected payoff from trial when no information is transmitted by the settlement offer, $\phi_{hf}^c(V_{hA} + I) - LC_I$, is negative or positive but greater or less than LC_A. On the other hand, under the British rule, the investors' expected payoff from trial when no information is transmitted by the settlement offer is $\phi_{hf}^c(V_{hB} + I) - (1 - \phi_{hf}^c)LC_T$, and the non-liable auditor's legal cost is zero. Hence, there are two cases here. The economic insights are similar to those under the American rule. In particular, for a given market price, the British rule increases the settlement offer that makes the liable auditor indifferent between revealing his type and

making no offer, as established in case (ii).[17] As mentioned earlier, in contrast to the American rule, the British rule does not make the non-liable auditor worse off in litigation due to asymmetric information.

To characterize the equilibrium of the whole model, we need to return to the investors' pricing stage given their conjecture of audit quality, and the auditor's quality choice stage given his conjecture of market price. The analysis proceeds essentially the same manner as in chapter 3. It can be easily verified that as in the American rule, the investors' expected payoff from litigation with the opportunity for pretrial negotiation is the same as that in the basic model, i.e., max $\{0, \phi_{hf}^{c}(V_{hB} + I) - (1 - \phi_{hf}^{c})LC_T\}$. Hence, we have the same competitive market price function in the extended model as in the basic model. On the other hand, the auditor's expected litigation loss is zero in case (i), and $\phi_{hf}(q)(V_{hB}^{c} + I)$ in case (ii). The equilibrium market price and audit quality under the British rule are characterized as follows.

Proposition 5.6: Assume (C5.1) and (C5.2). In the extended model, the equilibrium market price and audit quality under the British rule are characterized by

$$V_{hB}^{*} = pR - I - (1 - p)LC_T, \tag{5.6}$$

$$C'(q_B^{*}) = \phi(V_{hB}^{*} + I) = \phi[pR - (1 - p)LC_T].^{18} \tag{5.7}$$

Corollary 5.1: In the extended model, as the investors' and/or auditor's legal costs increase,

---

[17] That is, the investors, who bear no legal costs if the auditor is liable, request the total damage assessment (market price plus their post-trading investment of $I) under the British rule as a settlement, whereas they accept the total damage assessment minus their legal costs to settle under the American rule.

[18] Note that when the firm's project fails, the investors always file a lawsuit against the auditor who attested that the firm's type is high.

the equilibrium market price and the audit quality decrease.

Since the pretrial settlement opportunity decreases the auditor's litigation loss from $\phi_{hf}(q)(V_{hB}^c + I + LC_T)$ to $\phi_{hf}(q)(V_{hB}^c + I)$, we have a lower equilibrium audit quality in the extended model than in the basic model. On the other hand, the market price is the same as that in the basic model due to the fact that the market price is independent of the audit quality below the cutoff quality. The corollary follows from the fact that as one can see from the first equality in (5.7), the total legal costs have no direct impact on the auditor's quality choice. However, an increase in the legal costs decreases the market price, which indirectly decreases the audit quality as the second equality of (5.7) shows. This contrasts with the comparative static result in the basic model ((i) in proposition 5.3), where the audit quality increases as the legal costs increase.[19]

5.3 Welfare Analysis

Given that the rule of allocating legal costs is a social policy, we naturally examine the social welfare consequence of the British rule. The characterization and comparison of the equilibrium audit qualities and market prices under the American and British rules given in the previous sections help us to make a welfare comparison. *A priori*, as one might expect, an unanimous or unconditional welfare statement is difficult to make in a setting like ours. This is because the British rule results in equilibrium audit quality, market price, and audit fee which are different from those under the American rule, and those changes in the equilibrium variables affects social welfare in different ways. For example, a higher audit quality implies larger savings on the wasteful investment but also implies

[19] That is, the legal costs' direct positive effect on the audit quality dominates the indirect negative effect via the market price.

larger audit costs. Consequently, we at best expect to characterize conditions under which the social welfare under the British rule is higher (or lower) than that under the American rule.[20]

The social welfare in the extended model under the British rule is given by

$$W_B = \Pr[h \mid q_B^*] \cdot V_{hB}^* - TC_B^*, \tag{5.8}$$

where

$$TC_B^* = TC_B(q_B^*, V_{hB}^*, \sigma^*) = C(q_B^*) + [\phi(1 - q_B^*) + (1 - \phi)(1 - p)]\phi_{hf}(q_B^*)(V_{hB}^* + I) \tag{5.9}$$

is the equilibrium audit fee under the British rule. Substituting (5.9) into (5.8), and rearranging terms, we get

$$W_B = W_0 + \phi q_B^* I - C(q_B^*) - (1 - \phi)(1 - p)(LC_I + LC_A). \tag{5.10}$$

We compare (5.10) with the social welfare under the American rule. From chapter 3, we have

$$W_{A1} = W_0 + \phi q_{A1}^* I - C(q_{A1}^*), \tag{5.11}$$

if no case goes to trial, and

$$W_{A2} = W_0 + \phi q_{A2}^* I - C(q_{A2}^*) - (1 - \phi)(1 - p)\frac{V_{hA}^* + I}{V_{hA}^* + I + LC_A}(LC_I + LC_A), \tag{5.12}$$

---

[20] It has to be pointed out that our welfare analysis is in a partial, not a general, equilibrium framework since we focus on a single firm. A change in the legal system will affect the investment decisions of the other firms in the economy as well as that of the firm in our model, which results in a change in the aggregate production of the economy. In the general equilibrium setting, since the auditor and investors are consumers as well, and since the change in the legal environment induces a change in the aggregate production of the economy, their consumption plan will change accordingly. To capture those economy-wide changes, we need to explicitly introduce the investment opportunity set of the whole economy as well as the auditors' and investors' utility functions for consumption, which is beyond the scope of this thesis. Finally, recall that all the welfare consequences are passed to the entrepreneur in our partial equilibrium analysis. On the other hand, in the general equilibrium setting, the distributional effect induced by the change in the legal system might differ across the entrepreneurs, auditors and investors although the aggregate welfare consequence effect might be in the same direction as the partial equilibrium analysis predicts.

if there is a strict positive probability of trial.[21]

Proposition 5.7: The expected total legal costs under the British rule are larger than under the American rule. The social welfare is increased by the adoption of the British rule only if

$$\phi q_B^* I - C(q_B^*) > \phi q_{Aj}^* I - C(q_{Aj}^*) \text{ for } j = 1,2. \tag{5.13}$$

When case (i) under the American rule prevails, no case is tried, and hence, the first part of proposition follows trivially. Given that the total expected legal costs under the British rule are larger than under the American rule, it is impossible for the social welfare under the British rule to be higher than that under American rule if (5.13) does not hold. Notice that (5.13) requires that the change in the wasteful investment, $\phi I(q_B^* - q_{A1}^*)$, be greater than the change in the audit costs, $C(q_B^*) - C(q_{A1}^*)$.[22]

Suppose that case (ii) under the American rule prevails. Notice that the trial rate under the British rule, $(1 - \phi)(1 - p)$, is higher than under the American rule, $(1 - \phi)(1 - p)(V_{hA}^* + I)/(V_{hA}^* + I + LC_A)$. This result contradicts the argument by the proponents for the British rule that the social legal costs would be smaller if the British rule replaces the American rule. Also note that this result is somewhat counter-intuitive given that the auditor under the British rule has a stronger *ex ante*

[21] The subscripts "A1" and "A2" to q in (5.11) and (5.12) denote the equilibrium audit quality when case (i) and (ii) prevails under the American rule, respectively.

[22] There are two possibilities. The first case is that the audit quality under the British rule increases, and the corresponding saving on the wasteful investment is more than compensating for the increase in the audit costs. The second case is that the audit quality under the British rule is lower than that under the American rule, but the decrease in the audit costs more than offsets the decrease in the wasteful investment.

incentive to provide a higher audit quality than under the American rule.[23]

There are essentially two reasons for this result. First, notice that equilibrium audit quality is determined not only by the auditor's response function but also by the investors' competitive pricing function. Given that the investors' reaction changes when the British rule is in place,[24] the fact that auditor has a stronger *ex ante* incentive does not necessarily imply a higher equilibrium audit quality.

Second, notice that there is no component of $\phi(1 - q^*)$ in the expressions of the trial rates under both rules. Instead, they are given by $(1 - \phi)(1 - p)$ times the ratio between the *effective* damage assessment and the liable auditor's litigation loss in case of trial. Recall that the effective damage assessment under the British rule is $(V_{hB}^* + I + LC_T)$, which is the same as the liable auditor's trial loss, and hence, they cancel out. On the other hand, they are $(V_{hA}^* + I)$ and $(V_{hA}^* + I + LC_A)$ under the American rule. Notice that in a sense the larger amount at stake under the British rule induces the liable auditor to have a stronger incentive to make no settlement in the litigation stage. Anticipating such an incentive, the investors need to reject the no settlement offer (i.e., take the case to trial) more frequently to make the litigation threat credible.[25] The pretrial settlement equilibria under both rules are such that the liable auditor is indifferent between settling by revealing his type and going to trial by making no settlement offer (i.e., mimicking the non-liable auditor's strategy). Hence, the audit fee includes the entire amount of auditor's litigation loss when the firm

---

[23] That is, in the extended model, the auditor's best response under the British rule is characterized by $C'(q_B) = \phi(V_h^c + I)$ while it is given by $C'(q_A) = \phi(V_h^c + I - LC_I)$ under the American rule. The convexity of C(q) then implies $q_B^*(V_h^c) \geq q_A^*(V_h^c)$ for all $V_h^c \in \mathbb{R}_+$.

[24] As demonstrated by proposition 5.4, a key factor is the ratio between the auditor's and investors' legal costs.

[25] One can check that the trial strategy given no settlement offer under the British rule, $1 - a_B(V_h)$, is larger than that under the American rule for a given market price.

is a low type, and it is passed onto the entrepreneur. Similarly, the market price includes the investors' litigation payoff when the firm is a low type, and it is paid to the entrepreneur. Consequently, the auditor's loss and investors' gain from the litigation when the firm is a low type cancel out in the calculation of entrepreneur's (social) welfare, which explains the absence of $\phi(1 - q^*)$ in the expression in the trial rates. Only the probability that the audited firm is a high type and its project fails, $(1 - \phi)(1 - p)$, appears in the trial rate. This probability is then multiplied by the ratio of effective damage assessment and the liable auditor's trial loss, which sustains the pretrial settlement equilibrium discussed above.[26, 27]

Given that the society bears larger expected legal costs under the British rule, the social welfare under the British rule can not be higher than that under the American rule unless the equilibrium audit quality is such that the net benefit of the audit under the British rule is greater that under the American rule, i.e., $\phi q_B^* I - C(q_B^*) > \phi q_{A2}^* I - C(q_{A2}^*)$.

In this chapter, we have examined the impact of the legal fee shifting rule on the investors' pricing, litigation, settlement strategies, and the auditor's quality choice, settlement strategy, and pricing of audit services in a competitive rational expectations model. Clearly, a change in the legal system is a social policy, and hence, we need to take a social welfare perspective in evaluating such a change. In an evaluation of the accountants' proposal of the British rule, Smith and Tidrick [1995]

---

[26] Considering the litigation game only, Shavell [1982] and Bebchuk [1984] obtain a similar result that trial is more frequent under the British rule. Similarly, given that a lawsuit is initiated, Katz [1987] and Plott [1987], who endogenize the litigants' legal expenditure upon which the litigants prevailing probabilities depend, find that the amount of legal fees per lawsuit rises when the British rule is adopted. Katz [1987] points out that the result of Reinganum and Wilde [1986] also implies less frequency of settlement when uncertainty over the winning probability is introduced into their model.

[27] One has to be careful in interpreting our result here. It does not imply that the legal costs of a society where the British rule is in place are larger than the legal costs of other society where the American rule prevails in place. We are comparing the social legal costs of a society which changes its rule of allocating legal costs from the American to British rule, *ceteris paribus*.

focus on its impact on the audit quality. Although the audit quality is an interesting equilibrium variable to examine, we propose that social welfare be the yardstick to evaluate the overall implication of a change in the legal system in the costly auditing and legal environment. Any change in the legal system requires a careful examination of its impact on economic agents' incentives, since the social costs and benefits crucially depend upon the equilibrium interactions of parties whose welfare is affected by such a change in the legal environment.[28]

[28] In our competitive rational expectations economy, the investors and the auditor price-protect themselves whatever legal system is in place. Hence, they are indifferent to any legal system in equilibrium. If the markets are not competitive, a change in the legal system will have a distributional consequences. Even in that case, the analysis must be based on the social efficiency, since the regulator might implement a Pareto-improving redistribution policy once the total surplus is increased.

CHAPTER 6:

CONCLUDING REMARKS

6.1 Summary of Thesis

Our study has two objectives. The first is to provide a framework for understanding strategic interactions between an auditor and investors in a competitive rational expectations economy. That is, we explicitly consider the investors' anticipation of the opportunity for litigation in their pricing stage, and the auditor's anticipation of the threat of litigation in his audit quality choice stage. The second objective is to provide a welfare analysis of auditor litigation in a costly legal environment. In particular, we examine the economic consequences of legal policies which potentially influence the size of legal costs. We also study the economic impact of a change from an American to a British rule of allocating legal costs, which was recently proposed by the accounting profession in the U.S.

The investors' current perception that auditors provide insurance is not convincing given that we have well-functioning capital and insurance markets. Instead, our study stresses that the auditor's legal liability is better understood as a part of the social system in which the court system is used to discipline the auditor moral hazard problem. Therefore, we argue that the efficiency of the court system in the auditing context should be evaluated as an incentive mechanism rather than as a protection or insurance mechanism.

To achieve these two objectives, we present a model which captures the following aspects of

the system: investors' rational expectations in a competitive capital market, auditor's strategic consideration of the threat of litigation, competition among auditors for potential clients, audited firm's production decision which non-trivially depends on audit quality, and costly trial and pretrial settlement opportunities between the litigants. In sum, our model represents a social system in which the actions of potential auditees, auditors, and the investors influence the productive use of the economy's resources.

Although several recent studies (see Balachandran and Nagarajan [1987], Nelson, Rosen, and White [1988], Melumad and Thoman [1990a], Narayanan [1994], Schwartz [1994 and 1995], Smith and Tidrick [1995], Shibano [1991], Gode [1993], Chan [1995], and Dye [1995]) in the accounting literature address the auditor's legal liability issue, they do not provide a broad picture of audit litigation issue in that most studies focus on only a part on the system. More importantly, the welfare implication of costly litigation has not been explored. In some studies, audits do not have a welfare-enhancing role, whereas in others the social costs of using the court system are not explicitly considered (although litigation is assumed as an explicit or implicit mechanism to discipline the auditor moral hazard problem). Also we note that the studies in the law and economics literature do not directly apply to the auditor litigation context, since the potential plaintiffs' rational response before they suffer *ex post* loss is absent in those studies.

Chapter 2 provides a conceptual framework in which the price of a firm in a competitive financial market impounds the investors' rational expectations about their opportunity for litigation against the auditor, and illustrates how an audit can improve social welfare in a costly legal environment. In particular, our welfare analysis provides a rationale why society maintains a legal system which provides an incentive for the investors to recover their *ex post* financial loss from the auditor through a costly legal process, even if they can price-protect themselves *ex ante* with or without such a mechanism. We interpret the court system as a disciplinary mechanism for the auditor

moral hazard problem, which enables the potential auditee to use an auditor as a commitment device.

Chapter 3 considers a more realistic setting in which the litigants can settle without going to trial. To enrich the model, we introduce the information asymmetry between the auditor and investors. In such a setting, the settlement offer plays the role of a signalling device for the auditor's private information about his probability of prevailing at trial. It is shown that as one might expect, the expected aggregate legal costs are reduced by the settlement opportunity. We emphasize the role of legal costs in that they affect the equilibrium audit quality and market price upon which the social welfare crucially depends. A regulator needs to carefully evaluate the economic consequences of a legal policy and/or an institutional arrangement which has a potential impact on the auditor and/or investors' legal costs. Such a change in the legal costs influences the actions of economic agents upon which the social costs and benefits of an audit crucially depend.

In chapter 4, we consider a setting in which the audit failure is not clearly defined, termed vague liability regime. We identify a set of conditions under which our analyses in chapters 2 and 3 remain qualitatively unchanged. The extended model in this chapter might be most descriptive of the current legal environment of auditor litigation in the U.S. The analysis in this chapter illustrates that a regulatory policy, which potentially influences the legal costs, has a more complex impact on the social welfare compared to the setting in which the audit failure is clearly defined.

Our analyses in chapters 2, 3, and 4 assume that the litigants bear their own legal costs irrespective of the court decision, i.e., the American rule of allocating legal costs. In chapter 5, we consider the Big Six auditors' recent proposal for the adoption of the British rule of allocating legal costs. Under the British rule, the loser pays the winner's legal costs, as well as his own. Such a change in the rule of allocating legal costs clearly has economic implications in that it essentially imposes a penalty on the loser by the amount of winner's legal costs and subsidizes the legal costs for the winner. In contrast to the practitioners' common belief, the British rule might increase the

frequency of lawsuit as demonstrated by our analysis in chapter 5. Also, given that the investors rationally anticipate the consequences of a change in the legal environment, and that the investors' and the auditor's responses jointly determine the equilibrium audit quality, there is no reason to believe that a higher audit quality would be induced under the British rule than under the American rule. Therefore, regulators must be very careful in evaluating the accountants' proposal of the British rule, and it should not replace the American rule unless a careful analysis indicates that the net benefit of audits under the British rule is larger than that under the American rule.

6.2 Discussion of Assumptions and Future Research

The extreme viewpoint that the court system is the sole device for disciplining the auditor's moral hazard problem allows us to highlight several points in a single-period model, but our study makes numerous assumptions. The following discusses some of the important assumptions and future research opportunities.

First, recall that we implicitly assume that the auditors have unlimited wealth (so that all of the investors' losses are recoverable *ex post*). Dye [1995] formally recognizes the auditor's limited wealth, and studies the effects of incorporation of audit firms on the evolution of audit industry when auditors differ in their wealth. Introducing auditor's limited liability into our model would complicate the analysis, but we conjecture that there would be no qualitative change if the wealth of the auditor is known as in Dye [1995]. The auditor's limited wealth essentially restricts the investors' opportunity to recover their financial losses through litigation *ex post*, resulting in a lower equilibrium firm value and a lower audit quality.[1] The investors and auditor are price-protected in equilibrium, and hence,

[1] Dye [1995] formally shows that the equilibrium audit quality for an auditor given his initial wealth weakly declines by the introduction of limited liability.

the auditor's limited liability will only affect the entrepreneur's welfare. The impact on the entrepreneur's welfare depends on the benefit and cost of the audit. In our setting, a lower quality audit induced by the limited liability decreases the social benefit, but it also decreases the social cost of the audit.

If the auditor's wealth is unknown, the pretrial negotiation game becomes much more complex since the auditor has private information about his wealth and audit failure, both of which are relevant to the investors' trial decision. In such a case, the liable and/or rich auditor's strategic settlement offer plays an important role in the analysis of pretrial settlement game. We speculate that our qualitative results still remain the same in such a setting, except that the Nash equilibrium is replaced by the Bayesian-Nash equilibrium.[2] It might be interesting to examine the characteristics of the equilibrium of the audit market and pretrial settlement game, since the auditors have countervailing incentives in such a setting. This arises because the auditor has an incentive to overstate his wealth (i.e., to state that he is able to provide full insurance to the investors) in his pricing stage to get a client at a higher audit fee, while he has a counter-balancing incentive to understate his wealth in the litigation stage. Even if the audit contract might be such that the auditor's wealth is fully revealed to the auditee, it is not revealed to the external investors since the audit fee (contract) is not publicly observable. We leave the analysis of the capital market equilibrium, the audit quality choice, and the pretrial negotiation game in such a setting for future research.

Another crucial assumption is that all players in our game are risk neutral. In the following, we discuss the potential implications of investor and auditor risk aversion. Suppose that the investors are risk averse. If the risk averse investors hold a fully diversified portfolio, and if there is no systematic risk arising from the firm's future cash flow, then the risk averse investors price the firm

[2] Note that the auditor has a two-dimensional type space in the litigation and settlement stage in this setting since the investors have uncertainty about the audit failure and the auditor's wealth.

as if they were risk neutral. Therefore, there is no change in our analysis. On the other hand, if the aggregate cash flow of economy in each state (the success and failure of the project) varies with the firm's cash flow from the investment, then the investors need to be compensated for the non-diversifiable risk. Since the investors are price-protected, it is the entrepreneur who *ex ante* pays the risk premium to the investors for the economy-wide risk arising from the firm's investment. We conjecture that the specification of the investors' preference would not qualitatively change the main conclusions of our analyses in chapters 2 to 4 except for the above-mentioned point.

The auditor's risk neutrality is equivalent to assuming that the pool of audit clients is large enough for the auditor to diversify the litigation risk. Given the investors' expectation about the auditor's insurance function, the auditor's risk preference is an important consideration. Suppose that the pool of clients is not large enough for the auditor to diversify the litigation risk. This is likely to be the case for a small auditing firm. In such a case, the entrepreneur has to compensate a risk averse auditor for non-diversifiable litigation risk, and the audit fee consists of three parts: the audit costs, the expected litigation loss for a specific client, and the risk premium for the auditor's non-diversified litigation risk arising from his pool of clients.[3]

The size of the non-diversifiable litigation risk is an interesting empirical question. If the litigation risk premium is large, the question is whether the court system is a cost-effective social mechanism for disciplining the auditor's moral hazard problem. Suppose that the regulator removes the investors' litigation opportunities, which reduces our model to a no auditor setting. The investors

[3] Note that the impact of the auditor risk aversion on the entrepreneur's welfare is an open question. On one hand, the auditor must be compensated for the litigation risk for a given probability of litigation. On the other hand, the auditor has an incentive to reduce the litigation risk (recall that the probability of litigation is a decreasing function of the audit quality *ceteris paribus*). Therefore, a risk averse auditor might provide a higher audit quality (which is also anticipated by rational investors) than a risk neutral auditor so that a lower equilibrium litigation probability and a larger reduction in the investment deadweight losses dominate the risk premium and an increase in the audit costs.

are always price-protected with or without the auditor. Consequently, the economic consequences of a no audit policy on the social welfare in our setting are the loss of the saving on the investment by a low type firm, and the saving on the audit costs, the expected legal costs, and the risk premium for non-diversifiable litigation risk. The key point is that society does not utilize the auditor's expertise to improve the real investment decision. Hence, if the social benefit more than offsets the social cost including the risk premium for non-diversifiable litigation risk, then auditing and using the court system as an indirect incentive device is a cost-effective social mechanism.

Auditors differ in their ability to diversify litigation risk. For example, the pool of clients of big auditing firms (e.g., Big Six) is larger than that of small auditing firms.[4] An implication is that the entrepreneur does not have to pay as large a risk premium if he hires a big auditing firm instead of a small auditing firm. The reduced risk premium, however, does not imply that the audit fee of a big auditing firm is lower than that of a small auditing firm. This is because (i) the big auditing firms might have higher reputation costs, and (ii) the audit fee includes the auditor's expected litigation loss, which is an increasing function of the auditee's market price and investment amount. From our analysis, a potential explanation for the empirical observation that large firms choose big auditing firms is as follows: (i) a big auditing firms does not require as large a risk premium; and (ii) the larger the auditee's size, the higher the endogenized audit quality, and the benefit from the improved investment decision (which increases in the audit quality and the amount of investment) more than offsets the cost of a higher quality audit and the higher reputation costs.

The risk aversion of the auditor and investors is likely to have a compounding effect on our analysis of the British rule of legal cost allocation in chapter 5. Risk averse litigants have stronger

[4] Also note that the number of auditors (partners) who share risk is larger in big auditing firms than in small auditing firms.

incentives to settle since the trial under the British rule imposes greater uncertainty in their payoffs due to the large stakes. *A priori*, the impact of risk aversion on the settlement process, and its consequential impact on the investors' pricing decision and the auditor's quality choice are difficult to predict. Accordingly, the welfare implication of the British rule in a rational expectations economy when the litigants are risk averse is less clear.[5] We are not aware of any study in the accounting or law and economics literature which formally introduces risk aversion into the analysis of British rule, and we leave the analysis of such a setting for future work.

The entrepreneur's risk neutrality assumption is crucial to have a semi-pooling equilibrium in our model.[6] If the entrepreneur is risk averse, the high type might be able to signal his type to the financial market by holding a large fraction of the firm, which is costly for the low type to mimic. In such a case, as we discussed in chapter one, a fully separating equilibrium is sustained without audits, and the welfare-enhancing role of an audit is quite different from that considered in our study. That is, the audit report must be discriminatory to have a potential value, and the role of an audit is to save on signalling costs.[7] The role of the court system in a separating equilibrium still would be to motivate the self-interested auditor to provide costly effort so that the audited report is

---

[5] Although the entrepreneur must compensate the investors and auditor for their risk in the form of a lower market price and a higher audit fee *ceteris paribus*, the trial rate might decrease substantially.

[6] The assumption that the entrepreneur sells the whole firm is innocuous as long as the entrepreneur is risk neutral. This follows from the fact that the low type can mimic the high type's retained ownership whatever it is.

[7] The binary type space in our model raises some technical problems, since it can be shown that the audit technology assumed in our study cannot be a discriminatory one unless the audit is perfect. In other words, we need a richer type space (i.e., more than two types) for an audit to have a potential welfare-enhancing role in such a setting.

discriminatory.[8]

The exogenous legal costs seem restrictive. However, as long as the lawyer's market is competitive, it allows us to simplify the analysis by suppressing the contracting process between the litigants and lawyers. That is, the lawyer's fee compensates the lawyer for his/her costs so that he/she earns an *ex ante* normal profit in equilibrium. When the liability rule is vague as in chapter 4, it seems more likely that the lawyer's effort increases the prevailing probability.[9] Although formal consideration of a legal fee contract in such a setting would add complexity to the analysis, we conjecture that there would be no qualitative change in our conclusions.[10]

In addition to the assumptions discussed earlier, other important aspects of auditor litigation are abstracted away from our analysis. For example, the audit market might be imperfect, preventing the competitive bidding process. Auditors might differ in their audit costs as well as their wealth. In a multi-period world, the auditor might play much more aggressively in settlement to deter future lawsuits than in a single-period world.[11] Auditors provide not only the audit (attestation) service but also management advisory service (MAS), and a change in the legal environment might induce a change in the profitability of audit service relative to MAS. Similarly, legal liability might have a

---

[8] Notice in such a case that it is the auditee who potentially sues the auditor since the external investors are aware of the firm's type, which is fully revealed by the equilibrium contract, at the time of their trading.

[9] See Katz [1987] and Plott [1987] for example.

[10] For example, given a contingent contract (say, a fraction of total recovery is paid to the investors' lawyer), the lawyer's effort is a function of the terms of contract which maximizes his/her own expected payoff, and the competition among the lawyers will drive the expected payoff down to his/her reservation expected payoff. Then the investors' and auditor's problems are essentially the same as before, except that their litigation payoffs are replaced by their payoff in the subgame with lawyers and their lawyers play the litigation and settlement game on behalf of them.

[11] That is, the auditor is likely to be a long-lived (repeated) player in the litigation, whereas the litigation is a one-shot game for the investors. A similar point can be found in Alexander [1991].

substantial impact on the auditor's (potential client's) investment on the development of audit technology (internal accounting system). Some practitioners (e.g., O'Malley [1993] and Weinback [1993]) argue that threat of litigation drives auditors away from audits for environmentally sensitive and high-tech industries, which might be detrimental to the society as a whole. These issues are undoubtedly fruitful topics for future research.

By and large, our study is aimed at a better understanding of auditor litigation from a welfare perspective in a classical competitive rational expectations economy. We stressed the notion of price protection by the auditors and investors in the financial and audit markets. Given the above discussion, it is clear that the analysis in this thesis is far from exhaustive. Nonetheless, we believe that our model provides a foundation for studying many unaddressed but important issues in the continuing policy debates regarding auditor's legal liability.

REFERENCES

Aldersley, S.J. [1994]. The Acme Financial Statement Insurance Co., Inc.: A Case Study. Auditing Symposium XII: Proceedings of 1994 Deloitte & Touche/University of Kansas Symposium on Auditing Problems, Edited by R.P. Srivastava, School of Business, University of Kansas, Lawrence, Kansas, 73-91.

Alexander, J.C. [1991]. Do the Merit Matter? A Study of Settlements in Security Class Actions. *Stanford Law Review*, February, 479-598.

Antle, R. and B. Nalebuff [1991]. Conservatism and Auditor-Client Negotiation. *Journal of Accounting Research*, Vol. 29 (Supplement): 31-54.

Arthur Andersen & Co., et al. [1992]. *The Liability Crisis in the United States, Impact on the Accounting Profession - A Statement of Position.*

Balachandran, B. and N. Nagarajan [1987]. Imperfect Information, Insurance, and Auditors' Legal Liability. *Contemporary Accounting Research*, Vol. 3, No. 2, 281-301.

Beatty, R.P. [1993]. The Economic Determinants of Auditor Compensation in the Initial Public Offerings Market. *Journal of Accounting Research*, Vol. 31, No. 2, 294-302.

Bebchuk, L.A. [1984]. Litigation and Settlement under Imperfect Information. *RAND Journal of Economics*, Vol. 15, NO. 3, Autumn, 404-415.

Beckner III, C.F. and A. Katz [1995]. The Incentive Effects of Litigation Fee Shifting When Legal Standards are Uncertain. *International Review of Law and Economics*, Vol. 15, 205-224.

Carcello, J.V. and Z-V. Palmrose [1994]. Auditor Litigation and Modified Reporting on Bankrupt Clients. *Journal of Accounting Research*, Vol. 32, Supplement, 1-30.

Chan, D. [1995]. How Expanding Auditor's Scope of Third-Party Liability for Negligence Can Reduce Audit Quality and Capital Investment. Working Paper, University of British Columbia.

Chemmanur, T.J. and P. Fulghieri [1994]. Investment Bank Reputation, Information Production,and Financial Intermediation. *Journal of Finance*, Vol. XLIX, 57-79.

Cho, I. and D. Kreps [1987]. Signaling Games and Stable Equilibria. *Quarterly Journal of Economics*, Vol. 102, 179-221.

Cooter, R.D. [1991]. Economic Theories of Legal Liability. *Journal of Economic Perspectives*, Vol. 5, No. 3, Summer, 11-30.

Datar, S.M., G.A. Feltham, and J.S. Hughes [1991]. The Role of Audits and Audit Quality in Valuing New Issues. *Journal of Accounting and Economics*, Vol. 14, 3-49.

Demski, J. [1988] Discussion of Legal Liabilities and the Market for Auditing Services. *Journal of Accounting, Auditing, and Finance*, Vol. 3, No. 3, Summer, 297-300.

Dopuch, N. and R. King [1992]. Negligence Versus Strict Liability Regimes in Auditing: An Experimental Investigation. *Accounting Review*, Vol. 67, No. 1, January, 97-120.

Dopuch, N., R. King, and J. Schatzberg [1994]. An Experimental Investigation of Alternative Damage-Sharing Liability Regimes with an Auditing Perspective. *Journal of Accounting Research*, Vol. 32, Supplement, 103-130.

Dye, R.A. [1995]. Incorporation and the Audit Market. *Journal of Accounting and Economics*, Vol. 19, 75-114.

Dye, R.A. [1993]. Auditing Standards, Legal Liability, and Auditor Wealth. *Journal of Political Economy*, Vol. 101, No. 5, 887-914.

Epstein, M.J. and M.A. Geiger [1994]. Investor Views of Audit Assurance: Recent Evidence of The Expectation Gap. *Journal of Accountancy*, January, 60-66.

Farmer, A. and P. Pecorino [1995]. Can Fee Shifting Reduce the Incidence of Trial?: Pretrial Bargaining in the Face of a Rule 68 Offer. Working Paper, University of Tennessee.

Feltham, G.A. and J.S. Hughes [1988]. Communication of Private Information in Capital Markets, Contingent Contracts, and Verified Reports. *Economic Analysis of Information and Contracts*, G.A. Feltham, A.H. Amerce, and W.T. Ziemba (eds.), Boston, Kluwer Academic Publishers, 271-317.

Feltham, G.A. [1990]. Discussion of An Equilibrium Analysis of Optimal Audit Contracts. *Contemporary Accounting Research*, Vol. 7, 56-60.

Feltham, G.A. [1995]. *Analysis of Information in Organizations and Markets*, Unpublished Lecture Notes, University of British Columbia.

Francis, J. [1994]. Discussion of Lawsuit against Auditors. *Journal of Accounting Research*, Vol. 32, Supplement, 95-102.

Fudenberg, D. and J. Tirole [1991]. *Game Theory*, MIT Press, Cambridge, MA.

Gigler, F. [1994]. Discussion of An Analysis of Auditor Liability Rules. *Journal of Accounting Research*, Vol. 32, Supplement, 61-64.

Gode, D.K. [1993]. An Analysis of Auditors' Legal Liability. Working Paper, Carnegie Mellon University.

Holmstrom, B. [1979]. Moral Hazard and Observability. *Bell Journal of Economics*, Vol. 10, No. 1, 74-91.

Hughes, P.J. and A.V. Thakor [1992]. Litigation Risk, Intermediation, and the Underpricing of Initial Public Offerings. *Review of Financial Studies*, Vol. 5, 709-742.

Lys, T. and R.L. Watts [1994]. Lawsuits against Auditors. *Journal of Accounting Research*, Vol. 32,Supplement, 65-93.

Katz, A. [1987]. Measuring the Demand for Litigation: Is the English Rule Really Cheaper? *Journal of Law, Economics, and Organization*, Vol. 3, No.2, Fall, 143-175.

Kinney, W.R. [1993]. Auditor's Liability: Opportunities for Research. *Journal of Economics, Management, and Strategy*, Vol. 2, No. 3, Fall, 349-360.

Kothari, S.P., T. Lys, W.S. Clifford, and R.L. Watts [1988]. Auditor Liability and Information Disclosure. *Journal of Accounting, Auditing and Finance*, Vol.3, Fall, 307-339.

Kreps, D.M. and R. Wilson [1982]. Sequential Equilibria. *Econometrica*, Vol. 54, 1003-1037.

Mednick, R. [1987]. Accountants' Liability: Coping with the Stampede to the Courtroom. *Journal of Accountancy*, September, 118-122.

Mednick, R. and J. Peck [1993]. *Proportionality: A Much-Needed Solution to the Accountant's Legal Liability Crisis*. Arthur Andersen & Co. Reprinted in *Accountants' Liability: The Need for Fairness*, J.T. Behrendt, R. Clegg, and R.L. Weigel (eds.), Washington D.C., National Legal Center for the Public Interest.

Melumad, N. and L. Thoman [1990a]. On Auditors and the Courts in an Adverse Selection Setting. *Journal of Accounting Research*, Vol. 28, 77-120.

Melumad, N. and L. Thoman [1990b]. An Equilibrium Analysis of Optimal Audit Contract. *Contemporary Accounting Research*, Vol. 7, 22-55.

Nalebuff, B. [1987]. Credible Pretrial Negotiation. *RAND Journal of Economics*, Vol. 18, No. 2, 198-210.

Narayanan, V.G. [1994]. An Analysis of Auditor Liability Rules. *Journal of Accounting Research*, Vol. 32, Supplement, 39-59.

Nelson, J., J. Rosen, and L. White [1988]. Legal Liabilities and the Market for Auditing Services. *Journal of Accounting, Auditing, and Finance*, Vol. 3, No. 3, Summer, 255-285.

O'Malley, S.F. [1993]. Legal Liability is Having a Chilling Effect on the Auditor's Role. *Accounting Horizons*, June, 82-87.

Pae, S. [1995]. The *Ex Ante* Value of Audit and Audit Quality in Credit Markets, Working Paper, University of British Columbia.

Palmrose, Z-V. [1991a]. Trial of Legal Disputes Involving Independent Auditors: Some Empirical Evidence. *Journal of Accounting Research*, Vol. 29, Supplement, 149-185.

Palmrose, Z-V. [1991b]. An Analysis of Auditor Litigation Disclosure. *Auditing, A Journal of Practice and Theory*, Vol. 10, Supplement, 54-71.

Palmrose, Z-V. [1988]. An Analysis of Auditor Litigation and Audit Service Quality. *The Accounting Review*, Vol. LXIII, No. 1, January, 55-73.

Palmrose, Z-V. [1987]. Litigation and Independent Auditors: The Role of Business Failures and Management Fraud. *Auditing: A Journal of Practice and Theory*, Vol. 6, No. 2, 90-103.

Plott, C.R. [1987]. Legal Fees: A Comparison of the American and British Rules. *Journal of Law, Economics, and Organization*, Vol. 3, No. 2, Fall, 185-192.

P'ng, I.P.L. [1983]. Strategic Behavior in Suit, Settlement, and Trial. *Bell Journal of Economics*, Vol. 14, 539-550.

P'ng, I.P.L. [1987]. Litigation, Liability, and Incentives for Care. *Journal of Public Economics*, Vol. 34, 61-85.

Polinsky A.M. and Y.K. Che [1991]. Decoupling Liability: Optimal incentives for care and litigation. *RAND Journal of Economics*, Vol. 22, No. 4, Winter, 562-570.

Polinsky A.M. and D.L. Rubinfeld [1988]. The Welfare Implications of Costly Litigation for the Level of Care. *Journal of Legal Studies*, Vol. XVII, 151-164.

Polinsky A.M. and D.L. Rubinfeld [1996]. Optimal Awards and Penalties When the Probability of Prevailing Varies Among Plaintiffs. forth coming in *RAND Journal of Economics*.

Pratt, J. and J.D. Stice [1994]. The Effect of Client Characteristics on Auditor Litigation Risk Judgments, Required Audit Evidence, and Recommended Audit Fees. *Accounting Review*, Vol. 69, No. 4., October, 639-656.

Reinganum, J.F. and L.L. Wilde [1986]. Settlement, Litigation, and the Allocation of Litigation Costs. *RAND Journal of Economics*, Vol. 17, No. 4, Winter, 557-566.

Rothschild, M. and J. Stiglitz [1976]. Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information. *Quarterly Journal of Economics*, Vol. 90, No. 4, 629-649.

Schwartz, R. [1994]. On Auditor's Legal Liability, Vague Due Care, and a New Perspective on Auditing Standards. Working Paper, Washington University.

Schwartz, R. [1995]. Auditor's Legal Liability - A Broader Perspective, Is a High Quality Audit Sufficient To Guarantee an Efficient Investment?, Working Paper, Washington University.

Shapiro, C. [1991]. Symposium on the Economics of Liability. *Journal of Economic Perspectives*, Vol. 5, No. 3, Summer, 3-10.

Shavell [1982]. Suit, Settlement, and Trial: A Theoretical Analysis of Alternative Methods for the Allocation of Legal costs, *Journal of Legal Studies*, Vol. 11, 55-82.

Shibano, T. [1991]. Regulation of Public Accountants and Efficient Capital Investment. Working Paper, University of California at Berkeley.

Simunic, D.A. and M.T. Stein [1995]. The Impact of Litigation Risk on Audit Pricing: A Review of the Economics and the Evidence. Working Paper, University of British Columbia.

Smith, J.R. and D.E. Tidrick [1995]. The Effect of Alternative Judicial Systems and Litigation Costs on Auditing. Working Paper, University of Texas at Austin.

Snyder, E. and J. Hughes [1990]. The English Rule for Allocating Legal Costs: Evidence Confronts Theory. *Journal of Law, Economics, and Organization*, Vol. 6, 345-380.

Spier, K.E. [1994]. Pretrial Bargaining and the Design of Fee-Shifting Rules. *RAND Journal of Economics*, Vol. 25, No. 2, 197-214.

Spier, K.E. [1992]. The Dynamics of Pretrial Negotiation. *Review of Economic Studies*, Vol. 59, 93-108.

St. Pierre K. and J. Anderson [1984]. An Analysis of the Factors Associated with Lawsuits against Public Accountants. *Accounting Review*, Vol. 59, 242-263.

Titman, S. and B. Trueman [1986]. Information Quality and the Valuation of New Issues. *Journal of Accounting and Economics*, Vol. 8, 159-172.

Viscusi, W.K. [1991]. Product and Occupational Liability. *Journal of Economic Perspectives*, Vol. 5, No. 3, Summer, 71-91.

Weinback, L.A. [1993]. The Liability Crisis: Its Impact on Clients, *Journal of Economics, Management, and Strategy*, Vol. 2, No. 3, Fall, 361-366.

APPENDIX: PROOFS

Proof of Lemma 2.1:

The proof follows directly from the fact that $\Pi^c(\sigma = 1, V_h, q^c) = \phi_{hf}^c(V_h + I) - LC_I$ is increasing in V_h and the investors' expected payoff from suing the auditor is positive, zero, or negative if, and only if, Π^c is positive, zero, or negative. Solving $\Pi^c(\sigma = 1, V_h, q^c) = 0$ for V_h, we get the cutoff value $V^+(q^c) = LC_I / \phi_{hf}(q^c) - I$. **Q.E.D.**

Proof of Proposition 2.1:

Suppose $\Pi^c = 0$. Then $V_h = (1 - \phi_h^c)pR - I$. To be consistent with the suing strategy, we must have $\phi_{hf}^c(V_h + I) \leq LC_I$. That is,

$$\phi_{hf}^c(1 - \phi_h^c)pR \leq LC_I.$$

Substituting (2.2) and (2.4) for ϕ_h^c and ϕ_{hf}^c, and rearranging terms yields

$$\frac{\phi(1-q^c)}{\phi(1-q^c)+(1-\phi)}pR \leq \left[(1-p)+\frac{\phi(1-q^c)}{1-\phi}\right]LC_I. \qquad (A.1)$$

On the other hand, suppose $\Pi^c = \phi_{hf}^c(V_h + I) - LC_I > 0$. Then

$$V_h = (1 - \phi_h^c)pR + [\phi_h^c + (1 - \phi_h^c)(1 - p)]\cdot[\phi_{hf}^c(V_h + I) - LC_I] - I.$$

Substituting (2.2) and (2.4) for ϕ_h^c and ϕ_{hf}^c, and solving for V_h yields

$$V_h = (pR-I)-\left[(1-p)+\frac{\phi(1-q^c)}{1-\phi}\right]LC_I.$$

This market price induces a lawsuit if, and only if,

$$\phi_{hf}{}^c(V_h + I) = \phi_{hf}{}^c\cdot\left[pR-\left[(1-p)+\frac{\phi(1-q^c)}{1-\phi}\right]LC_I\right] > LC_I,$$

or, after substituting (2.4) for $\phi_{hf}{}^c$ and rearranging terms,

$$\frac{\phi(1-q^c)}{\phi(1-q^c)+(1-\phi)}pR > \left[(1-p)+\frac{\phi(1-q^c)}{1-\phi}\right]LC_I. \qquad (A.2)$$

Let the LHS and the RHS of (A.2) be $\Phi(q^c)$ and $\Gamma(q^c)$. Observe that Φ is decreasing and concave in q^c, and Γ is linearly decreasing in q^c. $\Phi(1) = 0$ and $\Gamma(1) = (1\text{-}p)LC_I > 0$. We also have $\Phi(0) > \Gamma(0)$ if (C2.1) holds. Furthermore, (C2.1) implies that there exists a unique value $q^o \in (0,1)$ defined by $\Phi(q^o) = \Gamma(q^o)$, i.e.,

$$\frac{\phi(1-q^o)}{\phi(1-q^o)+(1-\phi)}pR = \left[(1-p)+\frac{\phi(1-q^o)}{1-\phi}\right]LC_I,$$

such that $\Phi(q^c) < \Gamma(q^c)$ for $q^c > q^o$, and $\Phi(q^c) > \Gamma(q^c)$ for $q^c < q^o$. Therefore, $\Pi^c > 0$ is consistent with the conjectured audit quality $q^c < q^o$, and $\Pi^c = 0$ is consistent with the conjectured audit quality $q^c \geq q^o$. Continuity and monotonicity of $V_h{}^*(q^c)$ follow immediately. **Q.E.D.**

Proof of Lemma 2.2:

The auditor's objective function simplifies to

$$TC(q:V_h{}^c,\sigma^c) = C(q) + \sigma^c[\phi(1 - q)(V_h{}^c + I + LC_A) + (1 - \phi)(1 - p)LC_A].$$

If $\sigma^c = 0$, the auditor provides the minimum quality audit, $q = 0$, for any conjectured value of V_h^c. For $\sigma^c > 0$ the auditor's best response is characterized by the first-order condition, which is given by (2.9). Totally differentiating the first-order condition with respect to V_h^c and σ^c, we have the second part of (ii) by the convexity of C(q). **Q.E.D.**

Proof of Proposition 2.2:

Suppose that (C2.2) holds with strict inequality. Then the equilibrium pair of audit quality and market price, (q^*,V_h^*), is the intersection point of the auditor's best response function and the equilibrium pricing rule, which are characterized by (2.10) and (2.11). Since $V_h^* < V^o$, we have $\sigma^* = 1$. If (C2.2) holds with equality, the only sustainable equilibrium pair of audit quality and market price is (q^o,V^o), and the equilibrium suing probability σ^* is given by

$$\sigma^* = C'(q^o) / \phi(V^o + I + LC_A).$$

Suppose $\sigma^* < 1$. This implies that

$$C'(q^o) < \phi(V^o + I + LC_A).$$

Recall that we have $C'(q^*(V^o,\sigma^c=1)) = \phi(V^o + I + LC_A)$. By the convexity of C(q), this implies that $q^o < q^*(V^o,\sigma^c=1)$, which contradicts (C2.2). **Q.E.D.**

Proof of Proposition 2.3:

Let

$$X(V_h^*,q^*:\alpha) = V_h^* - (pR-I) + \left[(1-p) + \frac{\phi(1-q^*)}{1-\phi}\right] LC_I,$$

$$Y(V_h^*,q^*:\alpha) = kq^* - \phi(V_h^* + I + LC_A),$$

where $\alpha \equiv (p,R,I,LC_I,LC_A,k,\phi)$ is the vector of parameters. In equilibrium, we have $X(\cdot) = 0$ and

$Y(\cdot) = 0$. Let $H = \begin{bmatrix} X_{V_h} & X_q \\ Y_{V_h} & Y_q \end{bmatrix} = \begin{bmatrix} 1 & -\frac{\phi}{1-\phi}LC_I \\ -\phi & k \end{bmatrix}$, where subscripts denote the partial derivatives. We first establish the following lemma.

Lemma A.1: (C2′) $\Rightarrow k / \phi > \phi LC_I / (1 - \phi)$.

Proof of Lemma A.1: Notice that (C2.2′) implies $k / \phi > (V^\circ + I) / q^\circ$. By definition of V°, we have

$$V^\circ + I = \frac{1-\phi}{\phi(1-q^\circ)+(1-\phi)}pR$$

$$= pR - \left[(1-p)+\frac{\phi(1-q^\circ)}{1-\phi}\right]LC_I \text{ (by definition of } q^\circ)$$

$$> \left[\frac{1}{1-\phi}+\frac{1-p}{\phi}-(1-p)-\frac{\phi(1-q^\circ)}{1-\phi}\right]LC_I \text{ (by (C2.1))}$$

$$> \phi q^\circ LC_I / (1 - \phi).$$

Therefore, we have $(V^\circ + I) / q^\circ > \phi LC_I / (1 - \phi)$, which implies $k / \phi > \phi LC_I / (1 - \phi)$.

Q.E.D.

By the lemma A.1, we have $|H| = k - \phi^2 LC_I / (1 - \phi) > 0$. Using the implicit function theorem, we have

$$\frac{dV_h^*}{dp} = \frac{1}{|H|}k(R+LC_I) > 0; \qquad \frac{dq^*}{dp} = \frac{1}{|H|}\phi(R+LC_I) > 0;$$

$$\frac{dV_h^*}{dR} = \frac{1}{|H|}kp > 0; \qquad \frac{dq^*}{dR} = \frac{1}{|H|}\phi p > 0;$$

$$\frac{dV_h^*}{dI} = -1; \qquad \frac{dq^*}{dI} = 0;$$

$$\frac{dV_h^*}{dLC_I} = \frac{-1}{|H|}k[(1-p)+\frac{\phi}{1-\phi}(1-q^*)] < 0;$$

$$\frac{dq^*}{dLC_I} = \frac{-1}{|H|}\phi[(1-p)+\frac{\phi}{1-\phi}(1-q^*)] < 0;$$

$$\frac{dV_h^*}{dLC_A} = \frac{1}{|H|}\frac{\phi^2}{1-\phi}LC_I > 0; \qquad \frac{dq^*}{dLC_A} = \frac{\phi}{|H|} > 0;$$

$$\frac{dV_h^*}{dk} = \frac{-1}{|H|}\frac{\phi}{1-\phi}q^*LC_I < 0; \qquad \frac{dq^*}{dk} = \frac{-1}{|H|}q^* < 0;$$

$$\frac{dV_h^*}{d\phi} = \frac{k}{|H|}\frac{LC_I}{(1-\phi)^2}[q^*(2-\phi)-1];$$

$$\frac{dq^*}{d\phi} = \frac{1}{|H|}\{[LC_I\frac{\phi}{(1-\phi)^2}+\frac{k}{\phi}]q^* - \frac{\phi}{(1-\phi)^2}LC_I\}. \qquad \textbf{Q.E.D.}$$

Proof of Proposition 3.1:

Suppose that a lawsuit is filed. The following verifies that the strategy profile stated in proposition 3.1 is an equilibrium.

(o) Given no settlement offer by both types of the auditors with probability one, the investors's expected payoff from trial is $\phi_{hf}^{c}(V_h + I) - LC_I \leq 0$. Hence, it is sequentially rational for the investors not to go to trial. Given no trial, no auditors have an incentive to make a positive settlement offer. The investors' strategy for a positive settlement offer is sequentially rational with an off-equilibrium belief, $\mu_o \equiv$ Pr[liable auditor $|$ a positive settlement offer] $= \phi_{hf}^{c}$.

(i) Assume $0 < \phi_{hf}^{c}(V_h + I) - LC_I \leq LC_A$. According to the proposed strategy of the investors, a deviation from the stated strategy costs $V_h + I + LC_A$ to the liable auditor, and LC_A to the non-liable auditor. Since both types of the auditors have the expected loss of $S_1 = \phi_{hf}^{c}(V_h + I) - LC_I \leq LC_A < V_h + I + LC_A$, neither type of the auditor has an incentive to offer $S < S_1$. Consider the investors given the settlement offer $S_1 = \phi_{hf}^{c}(V_h + I) - LC_I$. Given that both types of the auditors offer S_1 with probability one, the investors' belief that the auditor is liable is ϕ_{hf}^{c}. Hence, the investors have no incentive to change their strategy. The investors' strategy given a settlement offer $S' < S_1$, is sequentially rational by an off-equilibrium belief $\mu_1 \equiv$ Pr[liable auditor $|$ $S' < S_1$] $=$ 1.

(ii) Assume $\phi_{hf}^{c}(V_h + I) - LC_I > LC_A$. The non-liable auditor will never make a settlement offer greater than LC_A. and hence, he will not offer $S > LC_A$.

The liable auditor can either offer S_2 and reveal his type,[1] or make no offer in an attempt to disguise himself as a non-liable auditor. Let a be the investors' acceptance probability given no settlement offer, and let δ be the probability that the liable auditor offers $V_h + I - LC_I$. To determine

[1] The liable auditor would never offer more than $V_h + I - LC_I$, if he is to reveal his type and settle before trial.

a, notice that the liable auditor randomizes, only if

$$V_h + I - LC_I = (1 - a)(V_h + I + LC_A).$$

This implies that

$$a = (LC_I + LC_A) / (V_h + I + LC_A). \quad (A.3)$$

Now consider the investors' responses to the settlement offers. The settlement offer $S_2 = V_h + I - LC_I$ reveals that the auditor is liable, and hence, the investors have no incentive to reject. Given no settlement offer, the investors' belief that the auditor is liable, denoted by ρ^c, is

$$\rho^c = \phi_{hf}^c(1 - \delta) / [\phi_{hf}^c(1 - \delta) + (1 - \phi_{hf}^c)]. \quad (A.4)$$

The investors randomize, only if

$$0 = \rho^c(V_h + I - LC_I) + (1 - \rho^c)(-LC_I). \quad (A.5)$$

Equation (A.4) and (A.5) together imply that

$$\delta = [\phi_{hf}^c(V_h + I) - LC_I] / [\phi_{hf}^c(V_h + I - LC_I)]. \quad (A.6)$$

Next, it is straightforward to see that the liable auditor's expected loss is $V_h + I - LC_I < V_h + I + LC_A$, while the expected loss of the non-liable auditor, Ω_{NL}, is

$$\Omega_{NL} = (1 - a)LC_A = LC_A[V_h + I - LC_I] / (V_h + I + LC_A) < LC_A.$$

Hence, neither type of the auditor has an incentive to deviate from the stated strategies. Finally, the investors' strategy for settlement offer $S' \in (0,S_2)$ is sequentially rational by an off-equilibrium belief $\mu_2 \equiv \Pr[\text{liable auditor} \mid S' \in (0,S_2)] = 1$. **Q.E.D.**

Proof of Proposition 3.2:

The conjectures of the auditor and investors must be self-fulfilling in equilibrium. That is, the auditor's conjecture of the market price and the investors' conjecture of the audit quality must be correct, and the litigants' pretrial negotiation strategy has to be consistent with the auditor's quality

choice and the investors' pricing decision. Finally, the investors' net expected payoff must be zero. We first establish the following lemma.

Lemma A.2: Under the condition (C2.1), case (o) can not be sustained as an equilibrium.

Proof of Lemma A.2: Suppose that case (o) is the equilibrium of the pretrial game. In such a case, the auditor chooses the minimum audit quality, i.e., $q^*(V_h^c) = 0$. For the auditor's conjecture of market price to be consistent with his pretrial negotiation strategy, we need $\phi_{hf}(0)(V_h^c + I) - LC_I \leq 0$. That is, V_h^c must be such that $(V_h^c + I) \leq LC_I / \phi_{hf}(0) = [1 + (1 - \phi)(1 - p) / \phi]LC_I \equiv V_1$. This, however, cannot be consistent with the equilibrium market price. In equilibrium, the investors' conjecture of audit quality and the auditor's conjecture of market price must be self-fulfilling. In other words, we must have $V_h^c = V_h^*(0)$ so that the conjectures of the auditor and investors are simultaneously self-fulfilled. Using $V_h^*(0) + I = \underline{V} + I = pR - [(1 - p) + \phi / (1 - \phi)]LC_I$, one can check that $V_h^*(0) + I \leq V_1$ contradicts (C2.1). **Q.E.D.**

Now suppose that the auditor conjectures either case (i) or (ii) as an equilibrium of the pretrial game. Rearranging the objective function of the auditor in case (i) and (ii), it is easy to see that the auditor's optimal choice of audit quality, $q = q^*(V_h^c)$, is characterized by

$$C'(q) = \phi(V_h^c + I - LC_I), \tag{A.7}$$

in both cases (i) and (ii). Given that the investors' competitive pricing function, $V_h^*(q^c)$, is the same as that in proposition 2.1, we have the same characterization of q^o, and hence, V^o. The convexity of C(q) and (C2.2) imply that $q^*(V_h^c) < q^o$ for all $V_h^c < V^o$. Also, note that by construction of the competitive market pricing function, $V_h^*(q^c) < V^o$ for all $q^c < q^o$. Imposing the equilibrium condition (i.e., $q^c = q^*$ and $V_h^c = V_h^*$), we have the characterization given by (2.10) and (3.4). Since $q^*(V_h^c)$

$< q^o$ for all $V_h^c < V^o$ and $V_h^*(q^c) < V^o$ for all $q^c < q^o$, we have $q^* = q^*(V_h^*) < q^o$ and $V_h^* = V_h^*(q^*) < V^o$. It remains to be shown that the equilibrium market price and audit quality are such that $\phi_{hf}(q^*)(V_h^* + I) - LC_I > 0$. But we know that $\phi_{hf}(q^c)[V_h^*(q^c) + I] - LC_I > 0$ for all $q^c < q^o$. Since $q^* < q^o$ and $V_h^* = V_h^*(q^*)$, the result follows. From the (2.10) and (3.4), it is obvious that q^* and V_h^* are independent of LC_A. This completes the proof of part (a).

For part (b), recall that the equilibrium is an intersection of the competitive market pricing function, $V_h^*(q^c)$, and the auditor's best response function. In both the basic and extended models, we have the same characterization of $V_h^*(q^c)$, which is increasing in q^c. Consider the auditor's best response functions. We compare the auditor's best response function in the extended model (characterized by (A.7)), $q_2^*(V_h^c)$, with that in the basic model. Since (C2.2) ensures $\sigma^* = 1$ in the basic model (proposition 2.2), it suffices to consider the auditor's best response function in the basic model characterized by (2.9) evaluated at $\sigma^c = 1$, i.e., $q_1^*(V_h^c)$ characterized by $C'(q) = \phi(V_h^c + I + LC_A)$. To facilitate the comparison, it is useful to express the inverse of auditor's best response function as $\psi_j^*(q)$ for $j = 1,2$ where $\psi_j^*(\cdot) \equiv q_j^{*-1}(\cdot)$. By the convexity of C(q), we have (i) both $\psi_1^*(q)$ and $\psi_2^*(q)$ are increasing in q, and (ii) $\psi_1^*(q) < \psi_2^*(q)$ for all q. Let (q_j^*, V_{hj}^*) be the equilibrium pair in the basic ($j = 1$) and extended ($j = 2$) model. If the equilibrium in the basic model is unique, it must be true that in (q,V_h) space, (iii) the slope of $\psi_1^*(q)$ evaluated at q_1^* is greater than the slope of $V_h^*(q)$ evaluated at q_1^*, and (iv) $\psi_1^*(q) < V_h^*(q)$ for all $q < q_1^*$ and $\psi_1^*(q) > V_h^*(q)$ for all $q > q_1^*$.[2] The properties (i)-(iv), in conjunction with the fact that $V_h^*(q)$ is increasing in q, then imply that the intersection of $\psi_2^*(q)$ and $V_h^*(q)$ in (q,V_h) space (i.e., the equilibrium in the

[2] Of course, $\psi_1^*(q) = V_h^*(q)$ at $q = q_1^*$. If (iii) does not hold, it is easy to see that (C2.2) is violated, and (iv) follows from the uniqueness assumption.

extended model) must occur at some value $q^+ < q_1^*$.[3] Set $q^+ = q_2^*$. Since $V_{h2}^* = V_h^*(q_2^*)$, part (b) follows from the fact that $V_h^*(q)$ is increasing in q, i.e., $V_h^*(q_2^*) < V_h^*(q^1)$. **Q.E.D.**

Proof of Proposition 3.3: Let the social welfare in cases (i) and (ii) be W_1 and W_2, respectively.

(a) Differentiating W_1 and W_2 with respect to LC_A, we have

$$dW_1 / dLC_A = 0.$$

$$dW_2 / dLC_A = - (1 - \phi)(1 - p)(V_h^* + I)(V_h^* + I - LC_I) / (V_h^* + I + LC_A)^2 < 0,$$

since $V_h^* + I - LC_I > 0$.

(b) Differentiating W_1 and W_2 with respect to LC_I, we get

$$dW_1 / dLC_I = (\phi I - kq^*)(dq^* / dLC_I),$$

$$dW_2 / dLC_I = (\phi I - kq^*)(dq^* / dLC_I)$$

$$- (1 - \phi)(1 - p)\left[\frac{dV_h^*}{dLC_I} \cdot \frac{LC_A}{(V_h^* + I + LC_A)^2}(LC_A + LC_I) + \frac{V_h^* + I}{V_h^* + I + LC_A}\right],$$

where

$$\frac{dV_h^*}{dLC_I} = \frac{-1}{|H|}\left(k\left[(1-p) + \frac{\phi}{1-\phi}(1-q^*)\right] + \frac{\phi^2}{1-\phi}LC_I\right) < 0, \tag{A.8}$$

$$\frac{dq^*}{dLC_I} = \frac{-\phi}{|H|}\left[(2-p) + \frac{\phi}{1-\phi}(1-q^*)\right] < 0, \tag{A.9}$$

---

[3] Suppose that the intersection occurs at some value $q' > q_1^*$. Then we have $\psi_2^*(q') = V_h^*(q') < \psi_1^*(q')$ where the inequality follows from (iv). Hence, $\psi_1^*(q') > \psi_2^*(q')$. But this is a contradiction to (ii).

and $|H| = k - \phi^2 LC_I / (1 - \phi) > 0$. Given the quadratic audit cost function $C(q) = kq^2/2$, we obtain closed form expressions of the market price and audit quality. In particular,

$$q^* = \phi[pR - [(2 - p) + \phi/(1 - \phi)]LC_I] / [k - LC_I\phi/(1 - \phi)]. \quad (A.10)$$

Hence, $dW_1/dLC_I > 0$ if, and only if, $\phi I < kq^*$. That is,

$$I < k[pR - [(2 - p) + \phi/(1 - \phi)]LC_I] / [k - LC_I\phi/(1 - \phi)]. \quad (A.11)$$

To show the indeterminacy of dW_2/dLC_I, consider a setting in which LC_A is sufficiently large. Let $LC_A \to \infty$. Applying L'Hopital's lemma to dW_2/dLC_I, and using the fact that q^*, dq^*/dLC_I and dV_h^*/dLC_I are independent of LC_A, we have $dW_2/dLC_I = (\phi I - kq^*)(dq^*/dLC_I) - (1 - \phi)(1 - p)(dV_h^*/dLC_I)$. Since $dq^*/dLC_I < 0$ and $dV_h^*/dLC_I < 0$, we have $dW_2/dLC_I > 0$ if (A.11) holds.[4] On the other hand, consider a setting in which LC_A is sufficiently small. Let $LC_A \to 0$. Then, using the fact that q^*, dq^*/dLC_I and dV_h^*/dLC_I are independent of LC_A, we have $dW_2/dLC_I = (\phi I - kq^*)(dq^*/dLC_I) - (1 - \phi)(1 - p)$. Hence, if (A.11) does not hold, we have $dW_2/dLC_I < 0$ since $dq^*/dLC_I < 0$. **Q.E.D.**

Proof of Proposition 4.1:

Suppose $\Pi^e = \phi_{hf}^e N^e(V_h + I) - LC_I > 0$. Then

$$V_h = (1 - \phi_h^e)pR + [\phi_h^e + (1 - \phi_h^e)(1 - p)]\cdot[\phi_{hf}^e N^e(V_h + I) - LC_I] - I.$$

Substituting (2.4) for ϕ_{hf}^e, and solving for V_h yields

$$V_h = \frac{1-\phi_h(q^e)}{1-\phi_h(q^e)N(q^e)}\left[pR - \left[(1-p)+\frac{\phi(1-q^e)}{1-\phi}\right]LC_I\right] - I. \quad (A.12)$$

This market price induces a lawsuit (i.e., $\Pi^e > 0$) if, and only if,

---

[4] Note that (A.11) holds if LC_I is sufficiently small (i.e., (A.11) reduces to $I < pR$).

$$V_h + I > LC_I/(\phi_{hf}{}^c N^c). \tag{A.13}$$

Substituting (A.12) into (A.13), and rearranging terms (using (2.2) and (2.4)), we have

$$\phi_h{}^c N^c pR > \left[(1-p) + \frac{\phi(1-q^c)}{1-\phi}\right] LC_I. \tag{A.14}$$

Let the LHS and RHS of (A.14) be $\Phi_v(q^c)$ and $\Gamma_v(q^c)$, respectively. Note that $\Gamma_v(q^c)$ is the same as $\Gamma(q^c)$ in the proof of proposition 2.1. Since $N^c \equiv N(q^c)$ and $\phi_h{}^c \equiv \phi_h(q^c)$ are decreasing in q^c, $\Phi_v(q^c)$ is decreasing in q^c. $\Phi_v(1) = 0$ and $\Gamma_v(1) = (1 - p)LC_I > 0$. We also have $\Phi(0) > \Gamma(0)$ if (C4.1) holds. Since Γ_v is linearly decreasing in q^c, and (C4.2) ensures that Φ_v is concave, there exists a unique value $q^o \in (0,1)$ defined by $\Phi_v(q^o) = \Gamma_v(q^o)$, i.e., q^o satisfies

$$\frac{\phi(1-q^o)}{\phi(1-q^o)+(1-\phi)(1-p)} pR = \left[1 + \frac{\phi(1-q^o)}{1-\phi}\right] \frac{LC_I}{N(q^o)}. \tag{A.15}$$

By definition of q^o, it follows that $\Phi_v(q^c) < \Gamma_v(q^c)$ for $q^c > q^o$, and $\Phi_v(q^c) > \Gamma_v(q^c)$ for $q^c < q^o$.

Suppose $\Pi^c = 0$. Then $V_h = (1 - \phi_h{}^c)pR - I$. To be consistent with the investors' suing strategy, we must have $\phi_{hf}{}^c N^c(V_h + I) \leq LC_I$. That is,

$$(1 - \phi_h{}^c)pR \leq LC_I/\phi_{hf}{}^c N^c,$$

or after rearranging terms, we have

$$\phi_h{}^c N^c pR \leq \left[(1-p) + \frac{\phi(1-q^c)}{1-\phi}\right] LC_I, \tag{A.16}$$

which is the opposite of (A.14). The rest of proof proceeds exactly in the same manner as the proof of proposition 2.1, and hence, the details are not repeated here. **Q.E.D.**

Proof of Corollary 4.1:

Comparing (A.15) with the characterization of the cutoff audit quality under CLR given in the proof of proposition 2.1, the first result follows since $N(q^c) \in (0,1)$ for all $q^c \in (0,1)$. Comparing $V_h^*(q^c)$ characterized by (4.2) with the market price given by proposition 2.1, we obtain the second result by the fact $[1 - \phi_h(q^c)] / [1 - \phi_h(q^c)N(q^c)] < 1$. **Q.E.D.**

Proof of Corollary 4.2:

From (4.2), it is obvious that $V_h^*(q^c)$ increase in q^c for $q^c \in [q^o,1]$. Differentiating $V_h^*(q^c)$ with respect to q^c on $[0,q^o]$,[5] it follows that $V_h^{*\prime}(q^c) > 0$ if

$$\frac{d}{dq^c}\left[\frac{1-\phi_h(q^c)}{1-\phi_h(q^c)N(q^c)}\right] \geq 0,$$

Differentiating and rearranging terms establishes the result. **Q.E.D.**

Proof of Proposition 4.2:

The auditor's problem is to solve

$$\min_{q'} TC(q',V_h^c,\sigma^c),$$

where

$$TC(q,V_h^c,\sigma^c) = C(q) + [\phi(1 - q) + (1 - \phi)(1 - p)]\sigma^c\Omega(q,V_h^c)$$

$$= C(q) + \sigma^c\{\phi(1 - q)[N(q)(V_h^c + I) + LC_A] + (1 - \phi)(1 - p)LC_A\}.$$

For $\sigma^c > 0$, the first-order condition is

[5] Since is $V_h^*(q^c)$ not differentiable at q^o, we mean the left-hand derivative of $V_h^*(q^c)$ at q^o.

$$C'(q) - \phi\sigma^c\{(V_h^c + I)[N(q) - N'(q)(1 - q)] + LC_A\} = 0, \qquad (A.17)$$

which is (4.4) in the text. The second-order condition is satisfied since C(q) is increasing and convex in q, while N(q) is decreasing and convex in q. Rewrite the first-order condition as $\varphi(q,V_h^c,\sigma^c) = 0$ where $\varphi(\cdot)$ is the LHS of (A.17). By the implicit function theorem and the second-order condition ($\partial\varphi(\cdot)/\partial q > 0$), we have

$\partial q/\partial V_h^c =$ (in sign) $\partial\varphi/\partial V_h^c$, and

$\partial q/\partial\sigma^c =$ (in sign) $\partial\varphi/\partial\sigma^c$.

Partially differentiating $\varphi(\cdot)$ with respect to V_h^c and σ^c establishes the monotonicity result. **Q.E.D.**

Proof of Corollary 4.3: By (4.3), we have $[N(q) - N'(q)(1 - q)] \leq 1$. Comparing (4.4) and (2.9) establishes the result. **Q.E.D.**

Proof of Proposition 4.3:

The proof for the first part is essentially the same as that for proposition 2.3. We only note that the LHS of (C4.3) is the audit quality that would be chosen by the auditor given his conjecture $V_h^c = V^o$ and $\sigma^c = 1$, if he were liable for the amount of $V^o + I$. Recall that under VLR, the auditor's marginal benefit is $\phi\{[N(q) - N'(q)(1 - q)](V^o + I) + LC_A\} < \phi[(V^o + I) + LC_A]$, where the inequality follows from (4.3). (C4.3) ensures that the audit quality that would be chosen by the auditor given his conjectures $V_h^c = V^o$ and $\sigma^c = 1$ is strictly less that q^o, and hence, (C4.3) is sufficient to sustain $\sigma^* = 1$ in equilibrium.

Comparing (4.4) with (2.9), we can see that a lower audit quality is provided under VLR than under CLR for the same conjectured market price and lawsuit probability because of (4.3). This observation and corollaries 4.1 and 4.2 establish the second part. **Q.E.D.**

Proof of Proposition 4.4:

Similar to the proof of the proposition 3.1. **Q.E.D.**

Proof of Proposition 5.1:

The market price in the competitive financial market must be such that

$$V_{hB} = (1 - \phi_h^c)pR + [\phi_h^c + (1 - \phi_h^c)(1 - p)] \cdot \max \{0, \phi_{hf}^c(V_{hB} + I) - (1 - \phi_{hf}^c)LC_T\}.$$

The next steps are to establish the consistency requirement in the investors' strategies in pricing and litigation stage, and to show the existence of a cutoff audit quality, q_B°, characterized by

$$\frac{\phi(1-q_B^\circ)}{\phi(1-q_B^\circ)+(1-\phi)}pR = (1-p)LC_T.$$

Since those steps proceed effectively in the same way as the proof of proposition 2.1, we omit the details here. **Q.E.D.**

Proof of Lemma 5.1:

Similar to the proof of lemma 2.2. **Q.E.D.**

Proof of Proposition 5.2:

The proof proceeds effectively the same as the proof of proposition 2.1. The second equality in (5.5) follows from V_{hB}^* given by (5.4). **Q.E.D.**

Proof of Proposition 5.3:

The result follows immediately from proposition 5.2. **Q.E.D.**

Proof of Proposition 5.4:

(i) Suppose $\frac{LC_A}{LC_I} \geq \frac{\phi}{(1-\phi)(1-p)}$. Then, it follows that $V_{hB}^*(q^c) \leq V_{hA}^*(q^c)$ for all q^c since

$\underline{V}_B$ (the lower bound of $V_{hB}^*(q^c)$) is less than $\underline{V}_A$ (the lower bound of $V_{hA}^*(q^c)$). This, in conjunction with $q_B^*(V_h^c,\sigma^c) \geq q_A^*(V_h^c,\sigma^c)$ (which is implied by lemma 5.1), establishes the result.

(ii) Suppose $\frac{LC_A}{LC_I} \leq \frac{\phi(1-q_A^o)}{(1-\phi)(1-p)}$. One can verify that $q_B^o \geq q_A^o$ (or equivalently, $\underline{V}_B = V_B^o \geq V_A^o$) under this condition.[6] Therefore, we have $V_{hB}^*(q^c) \geq V_{hA}^*(q^c)$ for all q^c. Again, the result follows since $q_B^*(V_h^c,\sigma^c) \geq q_A^*(V_h^c,\sigma^c)$. **Q.E.D.**

Proof of Proposition 5.5:

Similar to the proof of proposition 3.1. **Q.E.D.**

Proof of Proposition 5.6:

The proof is analogous to the proof of proposition 3.2. In particular, one can show that if case (i) in proposition 5.5 prevails in equilibrium, we have a contradiction to (C5.1), as lemma A.2 rules out the case (o) in equilibrium. If case (ii) prevails in equilibrium, the auditor's best response function, $q_B = q_B^*(V_h^c)$, is characterized by

$$C'(q_B) = \phi(V_h^c + I).$$

After imposing the equilibrium condition, $q^c = q_B^*$ and $V_h^*(q^c) = V_h^*$, it remains to check whether

---

[6] Recall that $V_B^o \equiv V_{hB}^*(q_B^o) = \underline{V}_B$ and $V_A^o \equiv V_{hA}^*(q_A^o) > \underline{V}_A$.

the strategy profile in the settlement game is consistent with the equilibrium pair (V_{hB}^*, q_B^*), i.e., we need to establish $\phi_{hf}(q_B^*)(V_{hB}^* + I) - (1 - \phi_{hf}(q_B^*))LC_T > 0$. Since all the above steps proceed in the exactly same manner as in the proof of proposition 3.2, we omit the details here. **Q.E.D.**

Proof of Corollary 5.1:

Differentiating (5.6) with respect to LC_T establishes that the equilibrium market price is increasing in the legal costs. Upon using the convexity of C(q), we establish that the equilibrium audit quality is decreasing in the legal costs by totally differentiating (5.7), $C'(q_B^*) = \phi[pR - (1 - p)LC_T]$, with respect to LC_T. **Q.E.D.**

Proof of Proposition 5.7:

Given that the trial rate under the American rule is either zero or $(1 - \phi)(1 - p)(V_{hA}^* + I)/(V_{hA}^* + I + LC_A)$, and the trial rate under the British rule is $(1 - \phi)(1 - p)$, the first result is obvious. Since the expected legal costs under the British rule are higher than those under the American rule, if $\phi q_B^* I - C(q_B^*) \leq \phi q_A^* I - C(q_A^*)$, it is impossible to have $W_B > W_{Aj}$ for j = 1,2. **Q.E.D.**