The Economics of Auditing Standards

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Abstract

Auditing standards provide the objectives to be achieved in an audit and methods to be used by auditors. Standards differ across countries and vary over time. This thesis explores variations in auditing standards, focusing on the questions of how players with different economic incentives influence (or set) auditing standards and how those choices vary with different legal liability regimes.

The thesis analyzes the process of setting auditing standards by considering two of the standards' properties: toughness (stringency) and vagueness (imprecision). I present a contracting model between an auditor and prospective investors. The properties of auditing standards are incorporated into the model because they affect the auditor's expected liability to investors and thereby affect the level of effort the auditor chooses to exert.

The model predicts that auditors and investors each weakly prefer precise auditing standards if they can choose both the toughness and precision of the standards. Given precise auditing standards, investors are likely to choose tougher standards than the auditors' professional organization. If the toughness is fixed at a non-optimal level, however, the auditors and investors will prefer vaguer auditing standards whether the toughness is too high or too low. These predictions are supported by empirical evidence.

When the legal regime becomes stronger, the standard setters (auditors or investors) initially prefer tougher auditing standards, but when the regime is stronger than a negligence-based liability regime with auditing standards defining due care, they prefer less tough auditing standards. Furthermore, if the toughness is fixed at an optimal level, the players have stronger incentives to choose precise standards as the legal regime becomes stronger.

This thesis adds to the literature by investigating the standard setters' economic incentives in influencing (in this thesis, *choosing*) the properties of auditing standards. By understanding the economic impact of different standards, regulators, investors, and auditors are more able to anticipate the implications of a change in standards. This research is timely given the recent transfer of authority over auditing standards for public companies from the AICPA to the PCAOB in the U.S., and the world-wide trend of improving the clarity of auditing standards.

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Dedication

For my husband Gerhard Trippen, my parents, sister, and relatives. They have offered me unconditional love and support.

Chapter 1

Introduction

Prior to 2002, the American Institute of Certified Public Accountants (AICPA) set Generally Accepted Auditing Standards (GAAS) as the standards for audits conducted for both public and private companies in the United States (U.S.). The AICPA is the national professional organization for Certified Public Accountants (CPAs), so this meant that the auditing profession was able to set its own auditing standards.[1] The Sarbanes-Oxley Act of 2002 (SOX), however, created the Public Company Accounting Oversight Board (PCAOB) to oversee the auditors of public companies, and authorized the PCAOB to establish auditing and related professional practice standards for publicly held companies. The Oversight Board members are selected by the U.S. Securities and Exchange Commission (SEC). An article in BusinessWeek proposed that the PCAOB should be established to take over audit standards and write tougher rules that protect the public investors, not CPAs.[2] Commissioner Paul S. Atkins claimed that, "It was created because of deep failings in the U.S. accounting profession's ability to regulate itself."[3]

Auditing standard boards around the world have been trying to improve the clarity of auditing standards. On October 31, 2005, the International Auditing and Assurance Standards Board (IAASB) of the International Federation of Accountants (IFAC) announced that it intends to improve the clarity of its International Standards on Auditing (ISAs). In January 2006, the Canadian Auditing and Assurance Standards Board proposed changes to several sections of the Canadian Institute of Chartered Accountants (CICA) Handbook to improve the clarity of the auditing standards. On March 20,

[1]The AICPA's mission is to provide CPAs with the resources, information and leadership that enable them to provide valuable services in the highest professional manner to benefit the public as well as employers and clients. Although it monitors individual auditors' performance, it serves as the national representative of CPAs before governments, regulatory bodies and other organizations, protecting and promoting CPAs' interests.

[2]Mike McNamee, Accounting Watchdog-or lapdog? Here's how you'll know. BusinessWeek, Nov. 11, 2002.

[3]Speech by SEC Commissioner: The Sarbanes-Oxley Act of 2002: Goals, Content, and Status of Implementation, February 5, 2003.

2007, the AICPA Auditing Standards Board (ASB) announced a discussion paper entitled "Improving the Clarity of ASB standards".[4]

These facts raise interesting questions. Why was the authority for establishing auditing standards for publicly held companies transferred from the AICPA to the PCAOB in the U.S.? Why are different boards now trying to improve the clarity of auditing standards? This thesis provides analytical predictions that different parties (investors, and auditors with heterogeneous wealth) differ in their preferences concerning the properties of auditing standards, and that these preferences vary with the strength of legal regimes.

This study focuses on two properties of auditing standards: toughness and vagueness. I define the average level of audit work required by the standards as the "toughness" or "stringency" of auditing standards. In contrast, the magnitude of judgment variation concerning possible audit effort levels that could be considered as "in compliance" with the auditing standards represents the "vagueness" or "imprecision" of auditing standards. Standards with less variance concerning a "due diligent" audit effort are more precise. Detailed examples illustrating the concept of toughness and vagueness of auditing standards can be found in Chapter 2.

I analyze how the properties of auditing standards affect auditors' behavior and compare different parties' preferences for the toughness and vagueness of auditing standards. As shown in prior literature, an auditor (with a short time horizon) is motivated to work by imposed liability. Because of limited liability, the auditor's incentive to work is limited by his wealth.[5] Hence, I also study how the auditor's wealth affects his preference towards the properties of the auditing standards. Moreover, prior auditing literature shows that the impact of auditing standards on auditors and the auditors' performance varies with the strength of legal liability regimes (Schwartz 1998, Choi et al. 2008). The strength of legal regimes is represented by the probability that the auditor will be sued and found liable after an audit failure.[6] In a stronger legal regime, auditors face higher expected liability to investors. No matter what type of legal regime a country has, all countries

[4] http://www.aicpa.org/download/auditstd/Clarity_of_ASB_Standards_Discussion_Memo.pdf

[5] I use an auditor to represent an audit firm. The auditor's wealth represents an audit firm's wealth, not his/her personal wealth. However, in a limited liability partnership, an auditor is liable with respect to his/her personal wealth if he/she is found guilty of negligence or worse.

[6] I use the term "strength" instead of "strictness" (as used in Choi et al. 2008) in order to prevent confusion with the term "strict liability regimes". The strongest legal regime is a strict liability regime where the auditor will always be sued and found liable when audit failure occurs.

have auditing standards to regulate the auditors, but auditing standards differ among countries. Therefore, I explore how variations in the strength of legal liability regimes affect the auditors'/investors' choices of the properties of auditing standards.

Based on Dye (1993), I present a model in which the perceived audit quality is linked to the auditor's wealth. The key difference between my model and Dye's is that I consider the uncertainty of auditing standards. The vagueness of auditing standards affects the perceived probability of compliance and thereby influences the auditor's expected liability. This allows me to analyze how vagueness affects the auditor's effort and the auditor's or investors' attitudes towards it. I also introduce the strength of legal liability regime into the model and investigate how this parameter affects players' choices of properties of auditing standards. The position of this thesis in the current audit literature is summarized in Appendix A.

I show that when auditing standards are precise, investors generally choose tougher auditing standards than the auditors' professional organization. This result is driven by auditor wealth heterogeneity. (In the audit market, there are auditors with different levels of wealth.) My analysis shows that small auditors prefer to choose less tough rules than large auditors, while investors have the same preference as large auditors. Since the professional organization represents all the auditors' interests, the equilibrium toughness of the auditing standards depends on these different auditors' power in the auditors' professional organizations, and on average, it may be lower than the toughness that would have been chosen by investors. This result is consistent with the transfer of authority from the AICPA (representing auditors' interests) to the PCAOB (representing investors' interests) in the U.S.

Concerning the preference for vagueness, both auditors and investors weakly prefer precise auditing standards if they can also choose the toughness of auditing standards, because they can adjust the toughness according to the minimum attainable vagueness of auditing standards to induce the wealth-maximizing level of effort. Moreover, they can also set the toughness to the optimal level and choose a larger vagueness than the minimum to achieve this optimal level of effort. If the toughness is fixed at a non-optimal level (e.g., regulators did not want to take the blame for potential accounting scandals, and therefore they set auditing standards to be too tough), then both auditors and investors may prefer vaguer auditing standards.

When the legal regime becomes stronger, the standard setters (auditors or investors) initially prefer tougher auditing standards, but when the regime is stronger than a critical point, they would prefer less tough auditing stan-

dards when the regime is stronger. This critical point is the negligence-based liability regime with auditing standards defining due care. Furthermore, if the toughness is fixed at an optimal level, then as the legal regime becomes stronger, the standard setters tend to prefer more precise auditing standards. This is consistent with the fact that in the U.S., as the legal regime became stronger (the regime was stronger after SOX), the auditing standards became more precise (PCAOB auditing standards were more precise than the AICPA auditing standards). The U.S. has the strongest legal regime, and it also has the most precise auditing standards.

This thesis's theoretical predictions generate several empirical hypotheses. First, the model predicts that auditors are expected to have been working harder since the PCAOB became the standard setter in the United States, because the PCAOB is expected to set tougher rules than the AICPA. Second, both auditors and investors are expected to lobby for vaguer auditing standards when the PCAOB requests comments. Third, the PCAOB Auditing Standards No. 5 (A.S.5) would be vaguer than the previously proposed PCAOB Auditing Standards No. 2 (A.S.2), since the A.S.5 is a revision of the A.S.2 (an audit of internal control over financial reporting performed in conjunction with an audit of financial statements). The empirical evidence supports these hypotheses.

My study contributes to the literature by investigating the standard setters' economic incentives in choosing the properties of auditing standards. By understanding the fundamental economic driving forces, regulators, investors, and auditors are more able to anticipate the implications of a change in the auditing standards. This research is timely given the recent transfer of authority over auditing standards for public companies from the AICPA to the PCAOB in the U.S., and the world-wide trend of improving the clarity of auditing standards. It helps to explain why the auditing standards are as they are and how they vary with different legal liability regimes.

This thesis is organized as follows. Chapter 2 illustrates the properties of auditing standards by using real world examples and presents the possible mathematical representations. Chapter 3 analyzes the different parties' choices of the properties of auditing standards under one particular legal liability regime. Chapter 4 explores how the strength of legal liability regime affects the players' choices of the properties of auditing standards. Chapter 5 examines the empirical predictions and related evidence.

Chapter 2

The Properties of Auditing Standards

Auditing standards provide the objectives to be achieved in an audit and the methods to be used by an auditor. They relate to the auditor's qualifications, the performance of his or her examination and the preparation of his or her report. Although compliance with professional standards may not immunize the auditor from liability, a defense of complying with the standards can help reduce liability.[7] Auditing standards are important in influencing auditors' behavior and audit quality. High audit quality can improve investors' decisions and prevent unnecessary resource waste in the capital market, and auditing standards can therefore impact the capital market significantly.

Dye (1993) shows that auditors' attitudes toward the toughness of auditing standards depend on whether the auditors' levels of wealth are observable to the parties who purchase the audits and make decisions based on the audits. When auditors' wealth figures are observable to outsiders, complying auditors typically prefer higher standards than noncomplying auditors; when auditor wealth is not publicly observable, the reverse is true.

Accounting and auditing standards, or any standards or laws for that matter, are inherently vague, since such standards cannot possibly anticipate every possible future event. There is always room for interpretation as required in each context (Lo 2007). As is well known, the vagueness (uncertainty) of auditing standards varies among different countries, and may vary within any given country over time.[8] Calfee and Craswell (1984) find

[7]For example, American International Group (AIG) was fined $1.6 billion by the U.S. Securities and Exchange Commission (SEC) in February 2006 to resolve claims related to improper accounting, bid rigging and practices involving workers' compensation funds. However, its auditor PricewaterhouseCoopers complied with the Generally Accepted Auditing Standards (GAAS) and met the appropriate standards. Therefore, the auditor was found to have acted with due diligence and was not fined.

[8]For example, the auditing standards in the U.S. are generally viewed as being the most detailed and precise in the world, while auditing standards in developing countries have been both few in number and vague.

that uncertainty about the application of legal standards can give parties economic incentives to "overcomply" or to "undercomply", that is, to modify their behavior to a greater or lesser extent than a legal rule requires. Since there are no legal standards for auditors, professional auditing standards can serve as a substitute. Hence, uncertainty about the application of auditing standards affects auditors' behavior. However, little research has been undertaken to analyze how the vagueness of auditing standards affects auditor effort, and how the vagueness is determined by standard setters.

Since the level of toughness of auditing standards affects auditors' and investors' preferences towards the vagueness of the standards, it is important to investigate the interaction between the toughness and vagueness of auditing standards in order to analyze players' incentives when setting the standards. Therefore, this thesis analyzes the auditing standards setting process by considering two properties of the standards: "toughness" and "vagueness".

As discussed in Chapter 1, this thesis explores how auditing standards are set by players with different economic incentives and how these choices vary with different legal liability regimes. This is done by forming an economic model and by empirically examining the theoretical hypotheses. Before I present the model, it is important to clarify key concepts. Thus, this chapter defines the toughness and vagueness of auditing standards. It also illustrates the variation of auditing standards, and demonstrates possible approaches to representing the properties of auditing standards mathematically.

2.1 Definitions and Examples

The first property of auditing standards under consideration is "toughness" (or stringency). This concept is important in analyzing auditing standards because the standards determine the amount of work auditors must undertake. I define the toughness of auditing standards as:

Definition D1: The toughness of auditing standards is the average level of audit work required by the standards.

The second property of auditing standards analyzed here is "vagueness". With perhaps the exception of certain mathematical concepts and categories, virtually all concepts or categories used in everyday life are vague, and therefore it follows that auditing standards also suffer from vagueness. (Penno 2007a)

Penno (2007a) reviews two types of vagueness: unidimensional vague-

ness and multidimensional vagueness. Multidimensional vagueness refers to the classification problem where there are usually many dimensions on which items can differ. Unidimensional vagueness is a "soritical" form of vagueness, meaning it is unclear whether items belong to a category or not. Unidimensional vagueness as described in Penno (2007a) is classified into two categories: "epistemic vagueness" and "semantic vagueness". Epistemic vagueness occurs when a sharp boundary between one category and another is presumed to exist, but the boundary's location is unclear (measurement uncertainty), while semantic vagueness occurs when the category is binary (e.g., right or wrong) and language is incapable of making the classification. While some residual measurement uncertainty (epistemic vagueness) is inherent in any measurement, frequently the measure can be improved to the point where the error is insignificant. In contrast, for semantic vagueness, indeterminate instances cannot be "verified" as belonging to one category or another (even after all of the evidence has been gathered), and the role of judgment becomes just as important as fact-finding.

This thesis focuses on epistemic vagueness, since I analyze vagueness concerning the level of audit effort (compliance effort) that can be considered as in compliance with auditing standards. Vagueness is a measure of the uncertainty related to this compliance effort. The uncertainty can be reduced by increasing audit effort, which is costly to auditors. The audit effort includes the collection of audit evidence and the auditor conferring with the manager when the two parties disagree. This thesis assumes that a higher level of audit effort is associated with higher audit quality. Moreover, I consider "clarity" as a synonym of "precision", which is an antonym of "vagueness". Formally, I define the vagueness of auditing standards as the following:

Definition D2: The vagueness of auditing standards is the range of possible audit effort levels that could be considered by different parties as "in compliance" with auditing standards.

Note that my focus is on the vagueness of *auditing* standards rather than the vagueness of *accounting* standards. The vagueness of accounting standards is related to the representational faithfulness of different transactions. I do not consider the impact of such vagueness on auditors.

2.1.1 Distinguishing Accounting Standards from Auditing Standards

Auditors are financial reporting experts. They verify the accuracy of financial statements and interpret accounting standards to ensure that financial

information represents the phenomena it purports to disclose. Auditing standards relate to the auditor's qualifications, the performance of his examination and the preparation of his report. The vagueness of accounting standards and the vagueness of auditing standards have different impacts on auditors, and depending on whether they are considered as a professional whole or as individuals, auditors have different preferences regarding these two sets of standards.

With respect to accounting standards, there have been extensive discussions about principle-based vs. rule-based accounting standards, such as those in work by Schipper (2003), Vincent et al. (2003), Caplan and Kirschenheiter (2004), Nelson (2003). Principle-based accounting standards require the application of judgment and expertise by both managers and auditors. Rule-based accounting standards leave no room for judgment or disagreement about the accounting treatment. Some researchers also call them "bright-line" standards. Caplan and Kirschenheiter (2004) model auditors' preferences for bright-line financial reporting standards. They find that auditors' preferences depend on whether auditor expertise is observable to investors. If expertise is observable, expert auditors prefer standards that are not bright-line, whereas auditors without such expertise prefer bright-line standards. If investors cannot observe auditor expertise, all auditors prefer bright-line standards, and the average level of auditor expertise increases under bright-line standards.

In contrast, the vagueness analyzed in this paper concerns uncertainty related to the level of *audit* effort that can be considered as in compliance with *auditing standards*, not the vagueness of financial reporting (accounting) standards. With respect to principle-based vs. rule-based auditing standards, Institute of Chartered Accountants in England & Wales, the Audit and Assurance Faculty (2006) explores the relation between audit quality and principle-based auditing standards. As in the case of accounting standards, principle-based auditing standards require auditors to exercise professional judgment and rule-based auditing standards are more detailed and prescriptive. However, whether principle-based or rule-based auditing standards improve audit quality remains controversial. Principle-based auditing standards can be considered to be vaguer than rule-based auditing standards.

Auditing standards determine how much work auditors need to exert, and courts use auditing standards to define auditors' liability. Violation of auditing standards is considered evidence of negligence. The average work required by the auditing standards indicates how tough the standards are. In contrast, accounting standards do not determine the level of audit effort and

there is no toughness concept in accounting standards. Auditors interpret accounting standards. The vagueness of accounting standards relates to the representational faithfulness to different transactions. In this thesis, I analyze uncertainty within the auditing standards concerning the level of audit effort necessary to be "in compliance" with those standards.

2.1.2 Examples

I use several examples to illustrate variation in the vagueness of auditing standards in practice. First, I compare Canadian Generally Accepted Auditing Standards (General Assurance and Auditing Section 5100) with U.S. GAAS (AU Section 150), then compare Canadian GAAS and International Auditing Standards (IAS) with the U.S. GAAS using an example focused on the auditor's responsibility in relation to subsequent discovery of misstatements. Next, I compare the Public Company Accounting Oversight Board (PCAOB) standards with U.S. GAAS through an audit documentation example. Finally, I show how The Canadian Auditing and Assurance Standards Board and the International Auditing and Assurance Standards Board (IAASB) as well as the AICPA Auditing Standards Board have improved the clarity of auditing standards.

Canadian General Assurance and Auditing Section 5100.02 vs. U.S. AU Section 150.02

Canadian auditing standards are developed based on General Assurance and Auditing Section 5100.02. Canadian General Assurance and Auditing Section 5100.03 states, "The auditing standards in Canadian General Assurance and Auditing Section 5100.02 apply to engagements in which the objective is the expression of an audit opinion on financial statements. The Recommendations in the Canadian Institute of Chartered Accountants' (CICA) Handbook - Assurance concerning an audit of financial statements are developed based on paragraph 5100.02".

U.S. auditing standards are developed based on U.S. AU Section 150 paragraph ".02", the general, field work, and reporting standards (the 10 standards). U.S. AU Section 150.03 states, "Rule 202, Compliance with Standards, of the AICPA Code of Professional Conduct [ET section 202.01], requires an AICPA member who performs an audit (the auditor) to comply with standards promulgated by the Auditing Standards Board (ASB). The ASB develops and issues standards in the form of Statements on Auditing Standards (SASs) through a due process that includes deliberation in meet-

ings open to the public, public exposure of proposed SASs, and a formal vote. The SASs are codified within the framework of the 10 standards."

I compare Canadian General Assurance and Auditing Section 5100.02 with U.S. AU Section 150.02 and summarize the differences in the basic rules between these two countries. (These two documents almost identical aside from these differences.)

- Canadian General Assurance and Auditing Section 5100.02 uses the word 'should' throughout, but U.S. AU Section 150.02 uses the word 'shall'. "Should" indicates suggestions, while "shall" indicates obligations and is therefore a stronger term. Using "shall" rather than "should" more clearly identifies requirements that professional accountants are expected to follow in the vast majority of engagements.

- The standards of field work in U.S. AU Section 150.02 state that sufficient competent evidential matter is to be obtained through inspection, observation, inquiries, and confirmations to afford a reasonable basis for an opinion regarding the financial statements under audit. The relevant content for the Canadian context is found in the CICA Handbook Section 5100.02 examination standards: the auditor should obtain sufficient appropriate audit evidence to be able to draw reasonable conclusions on which to base the audit opinion. U.S. AU Section 150.02 provides more instructions about how to obtain sufficient evidence (e.g. "through inspection, observation, inquiries, and confirmations") than CICA Handbook Section 5100.02.

- The standards of reporting in U.S. AU Section 150.02 include two additional items than Canadian reporting standards in Section 5100.02:

    1. The report shall identify those circumstances in which such principles have not been consistently observed in the current period in relation to the preceding period, and
    2. informative disclosures in the financial statements are to be regarded as reasonably adequate unless otherwise stated in the report.

In summary, the basic auditing rules differ in terms of toughness and precision between the U.S. and Canada. U.S. AU Section 150.02 is tougher and more precise than Canadian General Assurance and Auditing Section 5100.02.

Canadian GAAS, International Auditing Standards (IAS), vs. U.S. GAAS on Subsequent Discovery of A Misstatement in the Financial Statements

In this example, I compare Canadian GAAS, IAS, and U.S. GAAS with respect to the Subsequent Discovery of A Misstatement in the Financial Statements. "Subsequent discovery of a misstatement" occurs when, after the release of his audit report, the auditor becomes aware of a possible misstatement in the financial statements which is related to an incorrect accounting treatment or amount, or to insufficient or inappropriate disclosure. Canadian GAAS, IAS, and U.S. GAAS provide guidance for this scenario that differs in terms of precision. The following example demonstrates that the precision of auditing standards varies across countries.

Canadian Auditing Standards Section 5405 "Date of Auditor's Report" concerning the subsequent discovery of a misstatement in the financial statement states that "there may be situations, however, when there are unresolved differences of opinion between management and the auditor with respect to such matters as the auditor's further involvement, whether a misstatement was made, whether users of the original report should be informed of this misstatement, how promptly they should be informed and in what manner. If the auditor believes that such matters have not been dealt with appropriately, *he would consider seeking legal advice as to the action he should take to discharge his responsibilities.*" [Emphasis added.]

The IAASB 2007 handbook states that "when management does not take the necessary steps to ensure that anyone in receipt of the previously issued financial statements together with the auditor's report thereon is informed of the situation and does not revise the financial statements in circumstances where the auditor believes they need to be revised, *the auditor would notify those charged with governance of the entity that action will be taken by the auditor to prevent future reliance on the auditor's report. The action taken will depend on the auditor's legal rights and obligations and the recommendations of the auditor's lawyers.*" [Emphasis added.]

American Auditing Standards AU Section 561 "Subsequent Discovery of Facts Existing at the Date of the Auditor's Report" states, "if the client refuses to make the disclosures specified in paragraph .06, the auditor should notify each member of the board of directors of such refusal and of the fact that, in the absence of disclosure by the client, the auditor will take steps as outlined below to prevent future reliance upon his report. The steps that can appropriately be taken will depend upon the degree of certainty of the auditor's knowledge that there are persons who are currently relying or

who will rely on the financial statements and the auditor's report, and who would attach importance to the information, and the auditor's ability as a practical matter to communicate with them. Unless the auditor's attorney recommends a different course of action, *the auditor should take the following steps to the extent applicable:*

a. *Notification to the client* that the auditor's report must no longer be associated with the financial statements.

b. *Notification to regulatory agencies* having jurisdiction over the client that the auditor's report should no longer be relied upon.

c. *Notification to each person* known to the auditor to be relying on the financial statements that his report should no longer be relied upon. In many instances, it will not be practicable for the auditor to give appropriate individual notification to stockholders or investors at large, whose identities ordinarily are unknown to him; notification to a regulatory agency having jurisdiction over the client will usually be the only practicable way for the auditor to provide appropriate disclosure. Such notification should be accompanied by a request that the agency take whatever steps it may deem appropriate to accomplish the necessary disclosure. The Securities and Exchange Commission and the stock exchanges are appropriate agencies for this purpose as to corporations within their jurisdictions." [Emphasis added.]

The Canadian and international auditing standards suggest only that auditors seek legal advice from their lawyers, but the U.S. standards provide specific guidance about actions the auditors can take when an auditor learns of facts that existed at the balance sheet date that cause the financial statements to be materially misstated and the client refuses to cooperate or disagrees that financial statements are materially misstated. Therefore, the above example indicates that the American standards are more precise in terms of the actions that auditors should take in the case of a client's refusal to cooperate after the discovery of material misstatements.

PCAOB Rules vs. AICPA Auditing Standards for Audit Documentation

The vagueness of auditing standards varies over time. For example, in 1989 the American Institute of Certified Public Accountants (AICPA) issued ten new standards - including a new, longer format for audit reports - in an effort to clarify its standards. To further illustrate this point, I compare PCAOB rules with the AICPA auditing standards through the example of audit documentation. The following example indicates that PCAOB auditing standards for audit documentation are more precise than the AICPA

auditing standards.

The PCAOB published PCAOB Auditing Standard No. 3 (A.S.3) "Audit Documentation" which superseded AU Section 339 "Audit Documentation" issued by the AICPA. PCAOB A.S.3 is more precise than AU Section 339. For example, A.S.3 paragraph 6 states that "the auditor must document the procedures performed, evidence obtained, and conclusions reached with respect to relevant financial statement assertions. *Audit documentation must clearly demonstrate that the work was in fact performed.* This documentation requirement applies to the work of all those who participate in the engagement as well as to the work of specialists the auditor uses as evidential matter in evaluating relevant financial statement assertions. Audit documentation must contain sufficient information to enable an experienced auditor, having no previous connection with the engagement:

a. To understand the nature, timing, extent, and results of the procedures performed, evidence obtained, and conclusions reached, and

b. to determine who performed the work and the date such work was completed as well as the person who reviewed the work and the date of such review." [Emphasis added.]

AU Section 339.06 states that "audit documentation should be *sufficient* to (a) enable members of the engagement team with supervision and review responsibilities to understand the nature, timing, extent, and results of auditing procedures performed, and the evidence obtained; (b) indicate the engagement team member(s) who performed and reviewed the work; and (c) show that the accounting records agree or reconcile with the financial statements or other information being reported on."

PCAOB A.S.3 is more precise about what should be documented during an audit. It excludes part (c) in AU Section 339.06, but adds one additional paragraph to describe the sufficiency of audit documentation:

"5. Because audit documentation is the written record that provides the support for the representations in the auditor's report, it should:

a. demonstrate that the engagement complied with the standards of the PCAOB,

b. support the basis for the auditor's conclusions concerning every relevant financial statement assertion, and

c. demonstrate that the underlying accounting records agreed or reconciled with the financial statements."

Clarity Improvement of Auditing Standards

In this example, I show how auditing standards boards from different countries try to improve the clarity of auditing standards.

On October 31, 2005, the IAASB announced that it intends to improve the clarity of its ISAs by:"

- changing the wording to:
  - use the word "shall" to clearly identify requirements that the professional accountant is expected to follow in the vast majority of engagements; and
  - eliminate possible ambiguity about the requirements a professional accountant needs to meet arising from the use of the present tense in current ISAs, including elevating some present tense sentences to requirements;
- setting an objective in each ISA; and
- making structural improvements to enhance the overall readability and understandability of the standards."

In 2006, the Canadian Auditing and Assurance Standards Board set out the following proposed changes to several sections of the CICA Handbook to improve the clarity of the auditing standards:"

- use of the world "shall" instead of "should" in all Recommendations;
- new Recommendations paragraphs, consistent with those in the proposed ISAs on which these Sections are based, to eliminate ambiguity arising from the use of the present tense in current standards;
- changes to Recommendations to conform with proposed changes to requirements in the comparable ISAs;
- changes to Canada-only text (i.e., text not appearing in the comparable ISAs) intended to improve the clarity of such text; and
- the addition of an objective to each of the Sections. "

On March 20, 2007, the AICPA Auditing Standards Board (ASB) announced a discussion paper entitled "Improving the Clarity of ASB standards". This discussion paper requests comments on the following issues being considered by the ASB:

- "Establishing objectives for each of the standards that provide a conceptual framework for the application of professional judgment, and the obligation related to the objective.
- Making structural and drafting improvements to make the standards easier to read and understand.
- Including special considerations in the audits of public sector entities and small entities in the explanatory material of a Statement on Auditing Standard.
- Establishing a glossary of terms that would be presented in a separate section of the Codification of Statements on Auditing Standards."

(AICPA Auditing Standards Board 2007)

In general, each standards board tries to improve the clarity of auditing standards by adding objectives for each standard, and making structural improvements that lead to greater ease of reading and understanding. To summarize, the vagueness of auditing standards differs across countries and varies over time. Therefore, it is important to analyze the underlying economic forces driving variation in the precision of auditing standards.

2.2 Mathematical Representations

In this section, I illustrate possible approaches to representing the toughness and vagueness of auditing standards mathematically. I first define each approach, then give examples that correspond directly from a mathematical approach to possible auditing standards (either hypothetical or real auditing standards), and finally discuss the advantages and disadvantages of the approach. I apply one of these approaches in the next chapter to analyze how the toughness and vagueness of auditing standards affect auditors' behavior and how different parties' preferences towards these properties of auditing standards vary.

2.2.1 The Mean-variance Approach

The mean-variance approach assumes that the level of audit effort implied in the auditing standards is a random variable. A set of standards "s" has density $f(s)$ (or distribution $F(s)$) with mean m and variance δ^2. A "tougher" standard is represented by an increase in the mean of the distribution. A "vaguer" standard is characterized by an increase in the uncertainty in F,

i.e., in the sense of second-order stochastic (SS) dominance. In other words, if standard No. 1 (s1) SS-dominates standard No. 2 (s2) at the same mean, then s1 is less vague than s2. Under this approach, the variance of the distribution represents the vagueness of auditing standards and the mean represents the toughness of auditing standards.

The mean-variance approach is reasonable, because the auditing standards are uncertain in reality. For example, paragraph 6 of PCAOB Auditing Standard No. 3 (A.S.3), "Audit Documentation", states that "the auditor must document the procedures performed, evidence obtained, and conclusions reached with respect to relevant financial statement assertions. Audit documentation must clearly demonstrate that the work was in fact performed...." This standard requires auditors to document the procedures, evidence, and conclusions, but the extent of the documentation required is uncertain. A.S.3 paragraph 7 states that, "In determining the nature and extent of the documentation for a financial statement assertion, the auditor should consider the following factors: (1)...(5). Application of these factors determines whether the nature and extent of audit documentation is adequate." This paragraph reduces the uncertainty associated with the documentation procedures.

The event of compliance varies with the distribution of the auditing standards. If the standards can be set precisely, then the board chooses the level of the standards ('s') and compliance occurs if the level of audit effort exerted by the auditor (a) is greater than or equal to s. If auditing standards are vague, then the probability of compliance increases with the level of effort in general. To calculate the probability of compliance, I need to assume that s follows a particular type of distribution. To illustrate the impacts of the properties of auditing standards on auditors, I analyze the simplest and most intuitive distribution: s distributed uniformly.

Uniform Distribution

Suppose s is distributed uniformly within the support of lower bound s_l and upper bound s_h, then $m = \frac{s_l+s_h}{2}$ and $\delta^2 = \frac{(s_h-s_l)^2}{12}$. The lower bound can be denoted by $m - \sqrt{3}\delta$, and the upper bound is $m + \sqrt{3}\delta$. The toughness of the auditing standards is represented by m. Thus, the vagueness of the auditing standards is represented by the variance δ^2 (or the standard deviation δ). The probability of compliance equals one if the effort is greater than or equal to the upper bound of the distribution; the auditor is considered liable with probability one if the effort is smaller than the lower bound; and the probability of compliance is between zero and one, and increases with the level of effort if the level of effort is between these

two bounds.

Assume the level of effort implied by standards is distributed uniformly. Assume also that Standard A states that the auditor may perform five procedures, which implies 'one procedure' is the lower bound and 'five procedures' is the upper bound. The mean of Standard A is 'three procedures' and the variance is $\frac{4}{3}$. If Standard B states that the auditor shall perform three procedures, then Standard B has the same mean as Standard A, but is more precise than Standard A. If Standard C states that the auditor's tasks include, but are not limited to, two procedures and may include four additional other procedures, then Standard C has a higher mean than Standard A, but the same variance as Standard A.

Overall, the advantage of this mean-variance approach is that it allows me to analyze how the vagueness affects audit effort while holding the toughness constant, and how standard setters would choose the vagueness given the toughness. Given the same mean, s1 SS-dominates s2, if and only if the variance of s1 is smaller than that of s2. However, this approach imposes an artificial distribution assumption on the auditing standards, which might not hold true in the real world.

2.2.2 Two-bounds Approach

Among the possible audit effort levels that could be considered as "in compliance" with the auditing standards, there is a minimum effort below which the auditors will always be judged as being liable (lower bound s_l), and a maximum effort above which the auditors will always be judged in compliance (upper bound s_h). The difference between s_h and s_l indicates how vague the auditing standards are, and the locations of the two bounds indicate the toughness of auditing standards. I assume the probability of compliance increases with effort within the two bounds, but I do not make specific distribution assumptions.

The variation of toughness and vagueness is measured by changes in the two bounds. Moving one bound while holding the other constant will change the vagueness as well as the toughness, but if I move two bounds together for the same distance in the same direction, then the vagueness remains constant while the toughness changes. Moreover, if I keep the average of the two bounds constant, spreading or shrinking the two bounds together, then the toughness is constant while the vagueness is changed. By analyzing how an auditor reacts to the variation of toughness and vagueness, I can determine the preferences different parties have toward these two properties of auditing standards. Note that this approach does not generate a "mean"

of the standards, nor a numerical representation of probability of compliance within two bounds.

I use the following example to illustrate the mapping from this mathematical representation to auditing standards in the real world. CICA Handbook Assurance Recommendations Specific Items Section 6030 "Inventories" states that "while the inventory of stock-in-trade as set out in the financial statements is primarily the responsibility of the management, auditors cannot ignore their responsibility to satisfy themselves as to the validity of the client's representations as to inventories and of the inventory records. In brief, while auditors do not take, determine or supervise the inventory, they must be reasonably satisfied as to the physical existence and condition of the goods, the ownership, the pricing and the arithmetical accuracy of the calculations." In this example, the lower bound is indicated by the phrase, "they must be reasonably satisfied as to the physical existence and condition of the goods, the ownership, the pricing and the arithmetical accuracy of the calculations." The upper bound is signified by, "they must be completely satisfied as to the physical existence and condition of the goods, the ownership, the pricing and the arithmetical accuracy of the calculations".

One advantage of this method is that it is more realistic than the mean-variance approach. In reality, when standard setters make the standards more precise, they at the same time raise the toughness of auditing standards. This approach can simulate this situation by holding one bound constant while moving the other bound. Moreover, one can usually observe the two bounds implied by the auditing standards, but not a specific distribution. Thus, this approach is reasonable in the sense that it maps the change of auditing standards.

The disadvantage of this approach is that although conceptually it is possible to hold the mean constant and change the variance, it is difficult to distinguish the effects resulting from the toughness or vagueness. The mean cannot be determined unless a particular distribution assumption is made. Moreover, whether the upper bound exists is a controversial issue. For example, PCAOB A.S.3 paragraph 12 states, "The auditor must document significant findings.... Significant findings...include, but are not limited to, the following: a...b...f...g. Any matters that could result in modification of the auditor's report." In this example, the upper bound can be "any matters", and is therefore difficult to define.

2.2.3 Fineness Approach

More precise auditing standards are finer. "Finer" means that the information partition is given in greater detail. For example, Standard A states that the auditor may perform No.1, No.2 and/or No.3 procedures in any situation. Standard B states that the auditor shall perform No.1 in situation a, perform No. 2 in situation b, and No. 3 in situation c. Standard B is finer than Standard A. The primary disadvantage of the fineness approach is that one might not be able to compare the toughness of two sets of standards given a certain level of fineness, because this approach does not provide a measurement for toughness. The measurement of toughness under the mean-variance approach is the mean of a distribution, and the measurement of toughness under the two-bounds approach is the locations of the two bounds. The toughness concept is important in analyzing the vagueness of auditing standards since the auditing standards determine the amount of work the auditors need to exert. Hence, I will not use the fineness approach for later analyses.

To summarize, I have outlined possible approaches to representing the toughness and vagueness of auditing standards mathematically. A comparison of the advantages and disadvantages of these approaches demonstrates that the mean-variance approach is the most useful, because the toughness concept is important in analyzing auditing standards and the two-bounds and fineness approaches can not pinpoint this concept. Therefore, I will analyze the properties of auditing standards in the next chapter using the mean-variance approach.

Chapter 3

The Choice of Auditing Standards

3.1 Introduction

Chapter 2 defines the toughness and vagueness of auditing standards, illustrates the variation of standards across countries and over time, and demonstrates possible approaches to representing the properties of auditing standards mathematically. Since I analyze auditing standards by considering their toughness and vagueness, Chapter 2 laid the foundation for answering the two questions under exploration in this thesis: how auditing standards are set by players with different economic incentives and how those choices of auditing standards vary with different legal liability regimes. This chapter analyzes how auditing standards are set by players with different economic incentives under a negligence-based liability regime with due care defined by auditing standards. The next chapter explores how the parties' preferred auditing standards would vary with the strength of legal liability regimes.[9]

I present a model in which prospective investors in a firm might hire an auditor to verify the financial statements. Once hired, the auditor chooses his level of effort by maximizing his total profit (audit fee minus resource cost and expected liability cost). The vagueness of the auditing standards is incorporated into the model, because it affects the auditor's expected liability to investors and thereby affects the auditor's choice of effort. If investors can set the auditing standard, then they choose a level of vagueness to induce the auditor to exert the optimal level of effort to maximize their payoff. If the auditor sets the auditing standards, then the toughness and vagueness of auditing standards are used as a device for the auditor to commit to the optimal level of effort.

[9]In a negligence-based liability regime with due care defined by auditing standards, auditors will be found liable in the case of lawsuits if they did not exercise professional due care. I assume that under this regime, auditors will not be found liable by courts as long as they complied with auditing standards. This assumption will be released and analyzed in the next chapter.

As presented in Chapter 2, I define the average level of audit work required by the standards as the "toughness" of auditing standards, and the uncertainty of audit effort levels that could be considered by different parties as "in compliance" with the auditing standards as the "vagueness" of the standards. Chapter 2 also illustrates several different approaches to representing the vagueness of auditing standards mathematically: the mean-variance approach, the two-bounds approach, and the fineness approach. This chapter applies the mean-variance approach to represent the vagueness of auditing standards. The mean-variance approach assumes the level of audit effort implied in the auditing standards to be a random variable. The standard-setting board (either an organization representing investors' interests or the professional organization for auditors) created a set of standards 's' that has density $f(s)$ (or distribution $F(s)$) with mean m and variance δ^2. The variance of the distribution represents the vagueness of auditing standards and the mean represents the toughness.

I demonstrate that when auditing standards are precise, investors generally choose tougher auditing standards than those which the auditors' professional organization would choose. This result is driven by auditor wealth heterogeneity. (In the audit market, there are auditors with different levels of wealth.) My analysis shows that small auditors prefer less tough (stringent) rules than large auditors, while investors have the same preference as large auditors. Small auditors would choose less tough rules than large auditors and investors, since the wealth of small auditors is maximized if they can credibly commit to a level of effort. Due to their limited wealth, small auditors cannot commit to as high a level of audit effort as large auditors can. Since the professional organization represents all the auditors' interests, the equilibrium toughness of the auditing standards depends on the different levels of power held within the auditors' professional organizations by small and large auditors, and on average, it may be lower than the toughness that would have been chosen by investors. This result is consistent with the transfer of authority from the AICPA (representing auditors' interests) to the PCAOB (representing investors' interests) in the U.S.

Concerning vagueness preferences, both auditors and investors weakly prefer precise auditing standards if they can also choose the toughness of auditing standards, because they can adjust the toughness according to the minimum attainable vagueness of auditing standards to induce the wealth-maximizing level of effort. Moreover, they can also set the toughness to the optimal level and choose greater vagueness than the minimum to achieve this optimal level of effort. If the toughness is fixed at a non-optimal level (e.g., regulators did not want to take the blame for potential accounting

scandals, and therefore set auditing standards to be too tough), then both auditors and investors may prefer vaguer auditing standards.

This chapter's theoretical predictions allow for the generation of several empirical hypotheses. First, auditors are expected to have been working harder since the PCAOB became the standard-setter in the United States, because the PCAOB is expected to set tougher rules than the AICPA. Second, both auditors and investors are expected to lobby for vaguer auditing standards when the PCAOB requests comments. Third, PCAOB Auditing Standard No. 5 (A.S.5) should be vaguer than the previously proposed PCAOB Auditing Standard No. 2 (A.S.2), since the A.S.5 is a revision of the A.S.2 (an audit of internal control over financial reporting performed in conjunction with an audit of financial statements). These hypotheses will be tested in Chapter 5.

Recently, Dye (1993) and Schwartz (1998) have explored the relation between auditing standards and audit effort. However, one important underlying assumption in their papers is that the Generally Accepted Auditing Standards (GAAS) provide a precise constraint, that is, the audit effort specified in the GAAS is clearly defined. I work with no such constraint in this thesis.

Dye (1993) develops a model of the audit market relating auditor liability to auditing standards, and demonstrates how equilibrium audit fees depend on both the information value of the audit and the option value of the claim financial statement users have on the auditor's wealth in the event the audit is determined to have been substandard. Dye also studies auditors' attitudes toward and responses to the toughness of auditing standards. Although I also find that the option value of the claim financial statement users have on the auditor's wealth plays important roles, my analysis differs from Dye (1993) in many ways. First, Dye (1993) assumes ex ante that there are complying auditors and non-complying auditors. In contrast, I find the conditions under which the auditor will comply or not comply. Second, I analyze how the vagueness of auditing standards affects the auditor's effort choice and the auditor or investors' attitudes towards the vagueness of auditing standards. Dye (1993) considers only the "hardness" (equivalent to the term "toughness" in this thesis) of the auditing standards.

Schwartz (1998) demonstrates that a legal regime under which audit standards are used as a benchmark to evaluate negligence differs from a legal regime that defines due care clearly. My analysis of how the toughness of auditing standards affects the auditor's effort is similar, but my overall analysis differs. First, I analyze how the vagueness of auditing standards affects auditors' choice of effort. Schwartz (1998) investigates the relationship

between legal liability and professional standards, and does not consider the vagueness of auditing standards. Second, I examine the optimal vagueness level chosen by different standard-setters. Third, I show how an auditor's wealth affects the auditor's preferences for the properties of auditing standards.

As discussed in Chapter 2, the vagueness of auditing standards varies between countries and over time. Moreover, the vagueness of auditing standards affects auditors' perceived liability. However, little research analyzes how the vagueness of auditing standards affects auditor effort, and how the vagueness of auditing standards is determined by standard-setters. Willekens and Simunic (2007) model the economic implications of variations in the precision of standards for managers, auditors and third parties. They conclude that decreasing the precision of the GAAS initially induces an auditor to produce higher audit quality by exerting more effort, but that beyond a certain critical value, decreasing precision leads to decreasing effort. When vagueness exceeds a second critical value, auditors exert no effort at all.

My analysis differs from that of Willekens and Simunic (2007) in the following ways. First, I not only examine the economic implications of the vagueness of auditing standards, but also analyze what economic factors motivate standard-setters when choosing the vagueness of their pronouncements. Second, I consider the toughness and vagueness of auditing standards, rather than only the vagueness. Since the level of toughness of auditing standards affects the auditors' or investors' preferences towards the vagueness of auditing standards, it is important to investigate the interaction between toughness and vagueness. Third, Willekens and Simunic (2007) model the interaction between the managers of the firm and the auditor, and assume they all share the litigation risks. This chapter models the interaction between potential investors in the firm and the auditor. The managers of the firm do not play a strategic role. By constructing the model this way, I can analyze and compare directly how the preferences for toughness and vagueness differ between investors and auditors.

This chapter contributes to the auditing literature by addressing the lack of analysis of the toughness and vagueness of auditing standards, and provides policy implications concerning the setting of auditing standards. This is of importance for regulators, auditors, and investors. The majority of capital market participants expect that auditor self-interest typically drives the standard-setting process and that standard-setting is still controlled by auditors in most countries. But in the U.S., control was transferred to the PCAOB in 2002 for American publicly traded companies, following the massive accounting scandals of the 1990s. Moreover, since precise auditing stan-

dards can be more prescriptive (rule-based) and vague auditing standards require more professional judgment (principle-based), this research is timely given recent debates concerning the merits of principle- versus rule-based auditing standards.

The remainder of the chapter is organized as follows. Section 3.2 presents the model. Section 3.3 illustrates the players' objectives, the contracts, and how the toughness and vagueness of auditing standards affect the auditor's effort choice. Section 3.4 demonstrates the different parties' preferences for the toughness of auditing standards given perfectly precise auditing standards. Section 3.5 explores preferences related to vagueness. In section 3.6, I check whether the results are sensitive to selected other assumptions. Section 3.7 concludes the chapter.

3.2 The Model

This is a single-period model with two sets of players (prospective investors in a firm and an auditor) who are both risk neutral. A firm is seeking to raise capital in the form of additional equity to start a project. (The firm plays no strategic role in the model.) With probability β this project is a good project and generates a cash flow of B (which belongs to the prospective investors), whereas with probability $1-\beta$ it is a bad project and yields zero return in the future. This project needs $\$I$ upfront investment from prospective investors.[10] The above information is known to the investors, but they do not know the type of project when they make the investment decision. Assume that $\beta(B-I)+(1-\beta)(0-I)>0$, so that the investors will invest in the project without knowing the project's type, but will not make the investment if they know that the project is bad.[11]

The firm manager issues a report in the form of financial statements that disclose his evaluation of the project.[12] The investors can hire an auditor (there is only one auditor in the market) to issue an audit report with respect

[10] I will use "investors" to represent "prospective investors" throughout the remainder of the thesis.

[11] This assumption ensures that the investors will invest when the auditor reports a good signal even if ex ante they know there is possibly a Type-II error, and that they will not invest when the auditor reports a bad signal.

[12] To keep the model simple, I do not consider the manager's disclosure incentives, his decision concerning internal control, or litigation against the manager. It is assumed that the manager will always claim that the project type is good. The auditor may be viewed as obtaining information about the veracity of the manager's assertions about the project type. The auditor will provide either a qualified or unqualified opinion.

to the financial statements in order to obtain an independent assessment of the project.[13]

The auditor exerts effort $a \in [0, 1]$ in the audit process and obtains a binary signal about the project's type (i.e., signal $\in \{\text{good}, \text{bad}\}$). I assume the auditor is independent. He will issue a qualified or an adverse opinion if he detects material misstatements on the financial statements. Thus, audit quality is correlated with audit effort. Higher audit effort is associated with higher audit quality. The level of audit effort is not publicly observable when the auditor's report is issued: it becomes observable when the auditor is sued. The auditor might not be able to detect material misstatements due to audit technology limitations or poor audit effort. As is common in the literature, the relation between audit report and project type is as follows:

$$\Pr(g|good, a) = 1 \text{ and } \Pr(b|bad, a) = a,$$

where g denotes the auditor's signal that the project is good, and b denotes the bad signal (financial statements have material misstatements). This assumption indicates that the auditor will make no mistakes when there is no misstatement in the financial reports (i.e., no Type-I error), and that he may fail to detect misstatements depending on his audit effort (i.e., possible Type-II error).[14]

Audit failure is the situation in which the project is bad but the auditor issues a "good" report; in other words, he does not detect material misstatements in the financial statements. The investors will make inappropriate investment decisions in these cases and incur loss $\$I$. The probability of audit failure conditional on the project being bad is represented by $1-a$.[15] The investors will sue the auditor if an audit failure occurs and the probability of the auditor being found liable is positive.[16] The auditor may be found liable for the loss by the court. Once the auditor is found liable, he is required to pay the entire amount of the loss I or his wealth, whichever is smaller.[17] The sequence of events is summarized in Figure 3.1.

[13] I will first assume there is only one auditor/audit firm in the market and then analyze how the results will change if there are many audit firms.

[14] I assume no Type-I error since I consider only auditor liability resulting from the failure to detect misstatements. Moreover, I use a to denote the level of effort as well as the probability of detecting the bad project conditional on a bad project and effort a.

[15] Assuming the probability of audit failure to be $exp(-a)$ as in Newman et al. (2005) will not change the analyses.

[16] For simplicity, the investors' suing decision is not analyzed in detail in this thesis. Further analysis unreported here shows that if the exogenous variables (e.g., audit technology, the risk of the project, etc.) satisfy certain conditions, there exists equilibrium

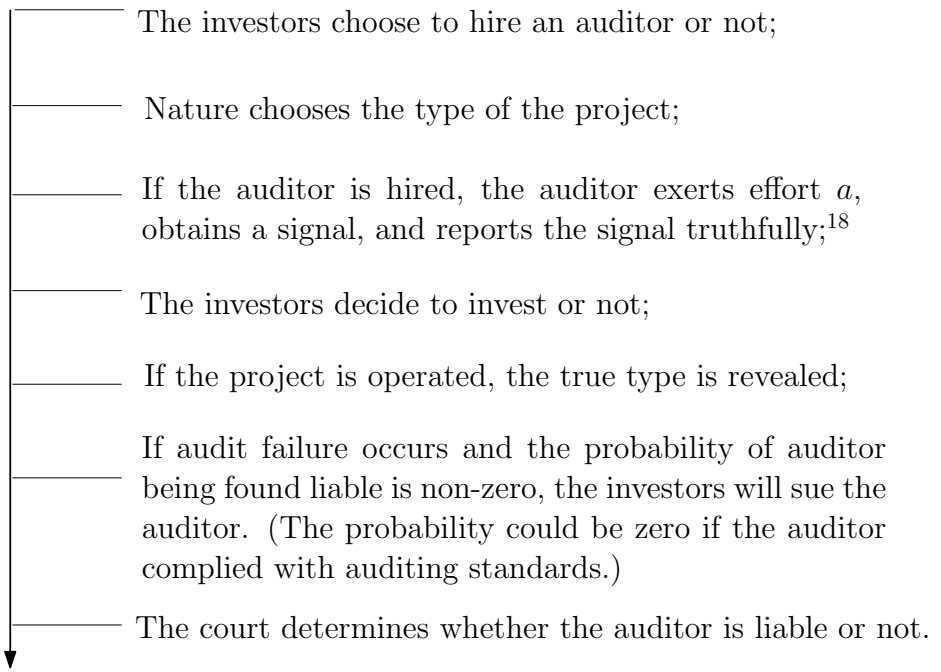


Figure 3.1: Event timeline

The key factor that makes this model different from others is the assumption that in addition to the above events, there is one more event that occurs in the first stage of the game: the standard-setting board (either an organization representing investors' interests or the professional organization for auditors) sets the auditing standards "s". The auditing standards affect the auditor's perceived liability and thereby his effort choice.

The standard s is intended to represent the level of effort that an auditor must exert in order to avoid liability under a negligence-based liability regime. Since this chapter uses the mean-variance approach as discussed in

that the investors will always sue the auditor if audit failure occurs.

[17] Changing the liability payment from I to any amount less than I will not affect the analyses.

[18] The auditor has incentives to always report "bad", since audit failure (e.g., when the auditor reports "good" whereas the true type of the project is bad.) would not occur and the auditor would not be sued. However, this scenario is not interesting, because the auditor would not work when there is no liability. Under equilibrium, the investors can conjecture audit effort and would not hire the auditor. This scenario can also be avoided by assuming that the auditor will be punished severely if he reports "bad" and the project type can be revealed later and turns out to be good.

Chapter 2 to represent the vagueness of the auditing standards, I assume the standard s is random with density $f(s)$ and distribution $F(s)$. The legal (statutory) standard that the court will impose should a bad outcome be realized is known at the outset of the game.

I assume that the standard-setting board can set the entire density. If auditing standards can be set with perfect precision, then the board chooses the level of the standards ('s') and compliance occurs if $a \geq s$. If auditing standards are vague, I assume the standard is distributed uniformly on $[\underline{s}, \overline{s}]$. This is a reasonable assumption since auditing standards in the real world can be described in this way (as discussed in the previous chapter). The assumption will be released later in this chapter and I will show that my findings are not sensitive to it. Under the uniform distribution assumption, compliance occurs with probability one if the effort is greater than or equal to the upper bound of the distribution; the auditor is considered liable with probability one if the effort is smaller than the lower bound; and the probability of compliance is between zero and one if the effort is between these two bounds.

According to the mean-variance approach as discussed in Chapter 2, a "tougher" standard corresponds with an increase in the mean of the distribution. A "vaguer" standard relates to an increase in the uncertainty in F, in other words, in the sense of second-order stochastic (SS) dominance. So, if standard No. 1 (s1) SS-dominates standard No. 2 (s2) at the same mean, then s1 is less vague than s2.

To analyze the relationship between auditing standards and auditor behavior, I must explore the link between auditing standards and auditors' legal liability, since the impact of auditing standards on auditors is affected by the strength of legal regimes. Schwartz (1998) suggests that the interaction between auditing standards and auditor liability occurs only because due care for auditors is not clearly defined, which induces courts to resort to auditing standards for reference on due care.

Under a strict liability regime, the auditor is liable for losses resulting from reliance on the misstated financial reports, independent of the amount of effort exerted. Thus, the probability of being held liable equals "one" at all effort levels if the auditor fails to detect misstatements. In other words, the auditor will be found liable if audit failure occurs, no matter how much effort he exerted. Auditing standards may increase audit effort because of a higher probability of detecting misstatements, but will not help to reduce the probability of being found liable by courts once audit failure occurs.

Under a negligence-based liability regime, the auditor is liable for the losses incurred by investors only if he failed to exercise due care. Due care

is the minimum effort level that the auditor is required to exercise in order to avoid liability. When due care is not specified in the law (i.e., when due care is vague), the courts resort to auditing standards in order to determine the due care level and auditor negligence. Currently in the U.S., the legal liability regime for auditors is negligence-based and the due care level expected from an auditor is not defined by law. Hence, the professional auditing standards affect auditors' liability, and thereby auditors' behavior, under a negligence-based liability regime with vague due care.

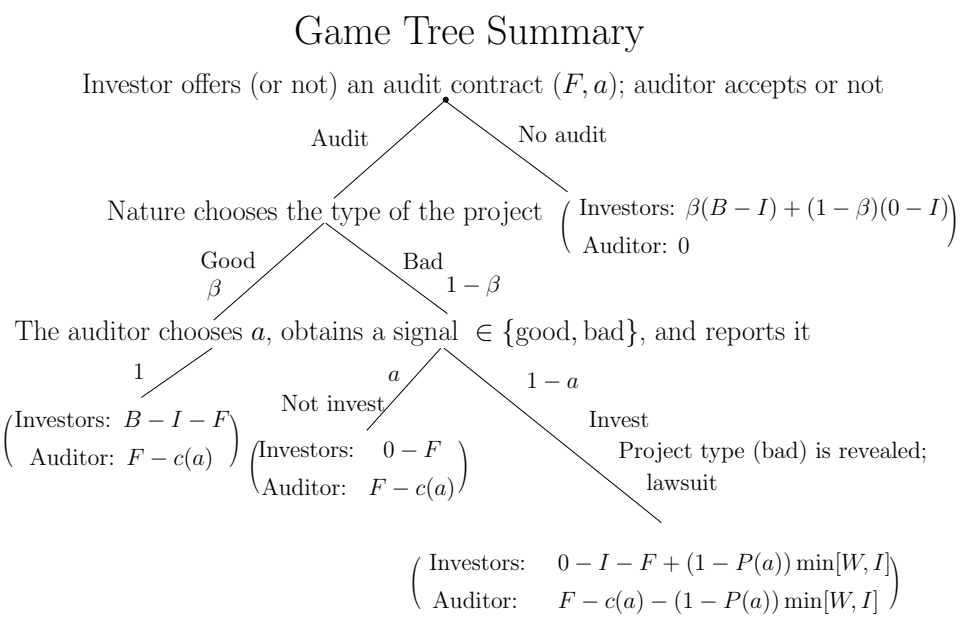
Recall that I assume a monopolistic audit firm and regard the audit firm as one player: the auditor. If the auditor can control the setting of auditing standards, then under equilibrium he will choose the properties of the auditing standards strategically to maximize his profit. Moreover, since the auditor's incentive to work is limited by his wealth and in the actual audit market the auditors have heterogeneous wealth, I will analyze how the auditor's wealth affects his preferences towards the properties of the auditing standards. In reality, people can judge whether the auditor is relatively wealthy, although they may not know exact figures. Here, I simply assume the auditor's wealth to be observable.

To summarize, this section completes the description of the basic model and the key assumptions. In the following sections, I first demonstrate the players' objectives and the first-best solution. Next, I analyze the second-best contract in a strict liability regime in which auditing standards do not impact the auditor, and in a negligence-based liability regime in which auditing standards affect the auditor's effort choice. I discuss how the auditor's behavior varies with the toughness and vagueness of auditing standards and how this variation is affected by the auditor's wealth. Finally, I explain how different parties - the audit profession and investors - will choose the properties of auditing standards if either of these parties represents the standard-setting board, and how auditors' preferences are influenced by wealth.

3.3 The Players' Objectives, First-best, and Second-best Contracts

Figure 3.2 summarizes the investors' and auditor's objectives and the sequence of events that determines whether or not a project is audited and invested, and the result of the audit, after considering the effect of legal liability regimes and auditing standards.

Investors' objectives are derived as follows. When an audit is conducted, the auditor can detect a bad project with a probability of a. The investors



Objectives

Investors: $(1-\beta)aI - F + (1-\beta)(1-a)(1-P(a))\min[W, I]$

Auditor: $F - c(a) - (1-\beta)(1-a)(1-P(a))\min[W, I]$

In a negligence-based liability regime with due care defined by auditing standards, $P(a)$ varies with the distribution of auditing standards.

Figure 3.2: Game tree summary and players' objectives

will not invest if they know it is a bad project, thus saving $\$I$. The probability of the project being bad is $1-\beta$. Hence, the gross benefit the investors can obtain by hiring an auditor is $\$(1-\beta)aI$. Moreover, these potential investors may retrieve some money if there is an audit failure and they sue the auditor. They must also pay an audit fee to hire the auditor.[19] Therefore, the net benefit or value of hiring an auditor includes three components: (1) gross benefit $\$(1-\beta)aI$; (2) the expected liability payment investors can obtain from the auditor; and (3) audit fee. The sum of the first two components (i.e., $(1-\beta)aI + EL(a)$) is the benefit of the audit. The audit fee

[19]The hypothetical setting of investors rather than the manager of the company hiring an auditor is for modeling convenience only. The analysis will not be sensitive to the inclusion of the manager if the manager does not play a strategic role.

is the cost of hiring an auditor. Note that in the case of litigation, both the investors and auditor are responsible for their legal costs. I do not consider the deadweight loss resulting from litigation at this point, because adding in constants into each player's objectives will not affect the following analysis. Formally, the net benefit is calculated as follows:

$$V(a) = (1-\beta)aI + EL(a) - F. \tag{3.3.1}$$

The expected liability the investors can obtain from the auditor who exerts effort a is given by:

$$EL(a) = (1-\beta)(1-a)(1-P(a))\min[W, I], \tag{3.3.2}$$

where $1-\beta$ is the probability of the project being bad; $1-a$ is the probability of audit failure; $P(a)$ is the probability of compliance (i.e., the probability that given an effort a the auditor will be found in compliance, or prob$(s \leq a)$); $1-P(a)$ is the probability of being found liable; I represents the investment losses; and W is the auditor's wealth. Due to limited liability, the auditor's liability will be either W if $W \leq I$ or I if $I < W$.[20] In a strict liability regime, the probability of compliance $P(a)$ is always zero if the auditor fails to discover material misstatements and is sued by the investors. I analyze the strict liability regime since it serves well as a benchmark for the analysis in a negligence-based liability regime. In a negligence-based liability regime with vague due care, $P(a)$ is determined by the auditing standards. Therefore, the investors' objective is to induce the auditor to exert the level of effort that maximizes the value of the audit, as indicated by equation 3.3.1.

The auditor's objective is to choose an effort level to maximize his profit, which is the audit fee, denoted by F, minus the total expected cost, which is the sum of the costs of the effort expended on the audit plus the auditor's expected liability payments to the investors.[21] Formally, the auditor's objective is:

$$a = \underset{[0,1]}{\text{argmax}} \;\; F - c(a) - EL(a), \tag{3.3.3}$$

where $c(a)$ is the auditor's resource cost of producing an audit effort level a. It is convex and increasing in a. To derive a closed form solution, I assume

[20] The audit fee is only a small part of the auditor's final wealth.

[21] Since this is a one-period model, I do not incorporate reputation effect into the auditor's cost function.

$c(a) = \frac{1}{2}ca^2$.[22] The expected liability $EL(a)$ is as defined in Equation 3.3.2.

In this game, the investors propose a contract $z = (F, a)$, which the auditor then accepts or rejects. If the auditor accepts the proposed contract, he then chooses his action. There are two constraints representing the equilibrium conditions: individual rationality constraint (IR) and incentive compatibility constraint (IC). These two conditions state that it is incentive compatible for the auditor to accept the contract and take the action specified by the investors. Under currently assumptions, there is only one pair of (F, a) that satisfies the two constraints, since IC ($a \in \text{argmax}_{\widehat{a}\in[0,1]} F - c(\widehat{a}) - EL(\widehat{a})$) determines audit effort a and IR ($F - c(a) - EL(a) \geq 0$) determines audit fee F.

3.3.1 First-best Contract

The first-best contract is made if the incentive constraints are absent. When the level of audit effort is observable, the first-best result can be achieved. In this setting, there is "no incentive problem" and the optimal contract achieves fully Pareto efficient action choice. I will solve for the first-best optimal level of effort and audit fee in this section. This first-best result serves as a benchmark for the later analysis of the second-best contracts, which are made when the level of effort is not contractible or observable.

The investors' problem is:

$$\begin{aligned} \max_{F,a} \quad & (1-\beta)aI - F \\ s.t. \quad & F - c(a) \geq 0, \end{aligned}$$

where $c(a) = \frac{1}{2}ca^2$. Solving the above problem, I obtain the first-best level of effort $c'(a) = (1-\beta)I$ (marginal cost equals marginal benefit). Under the functional form assumption $c(a) = \frac{1}{2}ca^2$, the first-best level of effort equals

$$a^* = (1-\beta)I/c.$$

Note that the first-best contract is a forcing contract where the auditor is penalized to the maximum extent possible if $a < a^*$ is observed. This is the entire legal regime.

[22] Assuming this quadratic form simplifies the exposition as commonly used in the auditing literature. The results presented in the remainder of this thesis are robust to other specifications of (positively sloped) convex cost functions.

3.3.2 Second-best Contract

I have studied the first-best contract when the level of audit effort is contractible. However, in reality the level of audit effort is not contractible; the incentive constraints will be binding. The auditor's incentive to work is provided by his liability under current assumptions. Under equilibrium, the auditor will choose a level of effort that maximizes his profit given the audit fee being fixed. The investors anticipate the auditor's strategy and set the audit fee equal to his reservation payoff so that he is indifferent to accepting or declining the audit engagement. Therefore, IR specifies the audit fee and IC induces the second-best level of audit effort. Note that IC is $a \in \text{argmax}_{\widehat{a}\in[0,1]} F - c(\widehat{a}) - EL(\widehat{a})$, and IR is $F - c(a) - EL(a) \geq 0$, where $c(a) = \frac{1}{2}ca^2$ and $EL(a) = (1-\beta)(1-a)(1-P(a))\min[W, I]$ as defined in Equation 3.3.2.

Since the auditor's expected liability varies with the legal liability regime and might vary with the auditing standards, I will analyze the second-best contracts under different legal liability regime assumptions in the following sections.

Strict Liability

Under a strict liability regime, the auditor will be held liable with probability "one" at all effort levels if he fails to detect misstatements. Hence, the expected liability of an auditor who exerts effort a is given by:

$$EL(a) = (1-\beta)(1-a)\min[W, I]. \tag{3.3.4}$$

The incentive compatibility constraint $a \in \text{argmax}\, F - c(a) - EL(a)$ is equivalent to $a \in \text{argmin}\, \frac{1}{2}ca^2 + (1-\beta)(1-a)\min[W, I]$ since the audit fee is fixed at the beginning of the engagement. Therefore, the second-best action is

$$a_s = \frac{(1-\beta)\min[W, I]}{c}.$$

The effort chosen by the auditor a_s is the same as the optimal effort maximizing the investors' payoff a^* if the auditor's wealth W is larger than the amount of investment I. However, if his wealth is smaller than I, then a_s is smaller than a^*. Hence, the auditor's incentive to exert effort is limited by his wealth.

The investors conjecture that the auditor will exert effort equal to $a^\dagger$. The equilibrium audit fee F will be such that the participation constraint

is binding. The binding participation constraint implies that the audit fee equals the auditor's total cost:

$$TC(a_s) = (1-\beta)\min[W,I] - \frac{(1-\beta)^2(\min[W,I])^2}{2c}.$$

The investors' payoff will be

$$\frac{(1-\beta)^2\min[W,I](2I-\min[W,I])}{2c},$$

which is greater than the payoff of not hiring the auditor and less than or equal to the first-best payoff $\frac{(1-\beta)^2 I^2}{2c}$ depending on the auditor's wealth.

Comparing the second-best level of effort (i.e., $a_s = \frac{(1-\beta)\min[W,I]}{c}$) with the first-best level of effort (i.e., $a^* = (1-\beta)I/c$), I obtain $a_s \leq a^*$ since $\min[W,I] \leq I$. Lemma 1 summarizes the argument.[23]

Lemma 1. *The level of effort chosen by the auditor under a strict liability regime is equal to the effort that maximizes investors' payoff if the auditor's wealth is larger than or equal to the amount of investment, and the effort level is lower in the case of less wealth.*

Wealth Effect on Auditor Effort in a Strict Liability Regime

In the audit market, there are firms with more and less wealth (i.e., Big 4 auditors versus Non-Big 4 auditors).[24] This particular audit market structure draws researchers' attention to auditor wealth heterogeneity. As is well known, in practice and theory large audit firms have incentives to undertake higher-quality audits. Prior research finds that wealthier firms are perceived to supply higher-quality audits (DeAngelo 1981), and an auditor chooses a higher-quality audit as his wealth increases, because his wealth is in effect a bond he posts to ensure the performance of an audit of acceptable quality (Dye 1993). Moreover, I noted in the prior section that the auditor's effort choice is a function of his wealth. Therefore, it is interesting to analyze in detail how the heterogeneity of auditor wealth affects auditor effort

[23] Lemma 1 of Schwartz (1998) states that the effort induced by strict liability may be lower than the socially optimal effort because the auditor's liability is limited by his wealth. Lemma 1 in this thesis is consistent with this argument. Additionally, it shows the conditions under which the level of effort will be the same or different.

[24] Big 4 auditors are PricewaterhouseCoopers, Deloitte Touche Tohmatsu, Ernst & Young, and KPMG. They are the four largest international accountancy and professional services firms, which perform audits for the vast majority of publicly traded companies and many private companies.

choice. This section analyzes the relation in a strict liability regime that serves as a benchmark for the later analyses. I analyze the relation in a negligence-based liability regime in later sections.

The analysis in the previous section shows that the auditor chooses a level of effort to minimize his total cost. Thus, the first-order condition of the auditor's total cost $c(a) + (1-\beta)(1-a)\min[W, I]$ implies:

$$\frac{dc(a)}{da} = (1-\beta)\min[W, I]. \tag{3.3.5}$$

The marginal cost of effort chosen in equilibrium by the auditor, $\frac{dc(a)}{da}$, increases with wealth if the auditor's wealth is less than I, because $c(a)$ is increasing and convex. If the auditor's wealth is greater than I, then the effort will not increase with his wealth. Thus, a wealthier auditor will exert more effort than a less wealthy firm in a strict liability regime if both firms' possess wealth less than I or the less wealthy firm's wealth is less than I. Note that auditor insurance can be a substitute for wealth.

Negligence-based Liability Regime

Under negligence-based liability rules, the auditor is liable for the losses incurred by investors only if he failed to exercise due care. Due care is the minimum effort level that the auditor is required to exercise in order to avoid liability. When due care is not specified with perfect precision in the law (i.e., when due care is vague), the probability of being liable decreases with audit effort rather than being equal to one and independent of audit effort as in the strict liability regime. The probability of being judged in compliance equals one minus the probability of being liable. Figure 3.3 presents the probability of compliance when due care is vague.

When due care is not specified in the law, courts resort to auditing standards to determine negligence. A substandard care level would be considered negligent by the court, since violation of auditing standards is considered prima facie evidence of negligence. So, any effort level lower than the professional standard is considered negligent. On the other hand, setting a perfectly precise standard reduces the probability that any effort level higher than the standard will be found negligent. To simplify the analysis, I assume that performing an audit in accordance with auditing standards defines due diligence.

Perfectly precise auditing standards specify rules for all occasions and are perfectly clear about the amount of audit work the auditor must conduct in order to be free of liability. Perfectly precise auditing standards provide clear

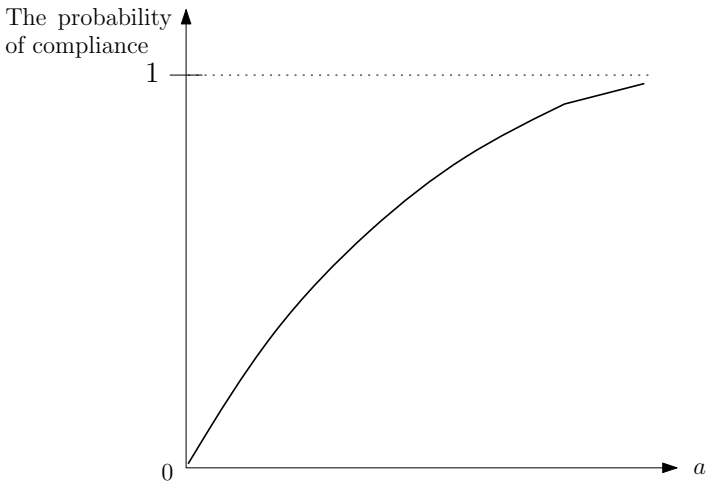


Figure 3.3: The probability of compliance when due care is vague

due care information, and the standard s is not random. This liability regime is the same as the "Clear Negligence" regime described in Schwartz (1998). The probability of compliance when perfectly precise auditing standards define due care is illustrated in Figure 3.4.

Figure 3.4 shows that if the auditor exhibits an effort lower than the standard, he is liable with probability one for the investors' loss. There will be an increase of the ex ante expected liability of all effort levels less than the standard, since the actual probability of being found liable equals one if the standards are perfectly precise, as opposed to a probability between zero and one if the standards are vague. However, if the auditor exerts an effort that is equal to or higher than the standard, he will be judged as due diligence as assumed. So, perfectly precise standards decrease the expected liability for all effort levels that are equal to or greater than the standard, and increase the expected liability for all effort levels less than the standard. Formally, the probability that courts will judge that a complies with the auditing standards s and is not liable for the damages is

$$P(a|s) = \begin{cases} 0 & \text{if } a < s, \\ 1 & \text{if } a \geq s. \end{cases}$$

If the audit effort specified in the auditing standards is not clearly defined, then the vagueness of the auditing standards does affect how the court judges auditor due diligence. Thus, the vagueness of auditing standards affects the probability of compliance given a specific level of effort.

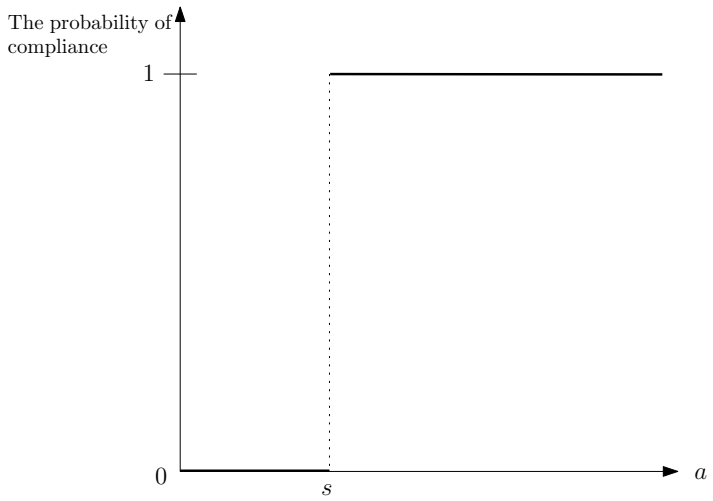


Figure 3.4: The probability of compliance if perfectly precise auditing standards define due care

As discussed in Chapter 2, there are different approaches to representing the vagueness of auditing standards. I adopt the mean-variance approach in this chapter. It represents the vagueness of auditing standards in the sense of second-order stochastic (SS) dominance and the toughness of auditing standards by the mean of the standards. Given the same mean, if Standard No. 1 SS-dominates Standard No. 2, then Standard No. 1's variance is less than that of Standard No. 2 within the uniform or normal distribution family. Hence, I use the variance to represent the vagueness when I compare the vagueness of different standards with the same mean. The distribution of s determines the probability of compliance given a specific level of effort.

Recall that if a set of auditing standards s is distributed uniformly within the support of s_l and s_h and I denote the mean by m and variance by δ^2, then $s_l = m - \sqrt{3}\delta$ and $s_h = m + \sqrt{3}\delta$. The toughness is m and vagueness is δ. The probability of compliance will be zero if effort is less than $m - \sqrt{3}\delta$, $\frac{1}{2}(\frac{a-m}{\sqrt{3}\delta} + 1)$ if $m - \sqrt{3}\delta \leq a < m + \sqrt{3}\delta$, and one if $a \geq m + \sqrt{3}\delta$. In the following analysis, I derive the observations under the uniform distribution assumption. Later, in the sensitivity-check section, I discuss the application of results for other distributions.

Perfectly Precise Auditing Standards

One component of the auditor's objective function (the auditor's expected liability) is affected by auditing standards in a negligence-based liability regime. The auditing standards are inherently vague. To better understand how the vagueness of auditing standards affects the auditor's behavior and how the auditor or investor will eventually set the standard, I analyze the equilibrium results given perfectly precise auditing standards in a negligence-based liability regime in this section. For tractability, I assume the auditing standards can be perfectly precise. This section serves as a benchmark for the analysis of the vagueness of the auditing standards.

Under a strict liability regime, the auditor exerts $a = a_s$ to minimize his cost of $TC(a) = c(a) + EL(a)$. In contrast, under a negligence-based liability regime with due care defined by precise auditing standards, the auditor can reduce the probability of being held liable to "zero" if his effort is greater than or equal to the level specified in the standards. In this case, his total cost will be limited to the resource cost. If he does not comply with the auditing standards, he will then definitely be found liable if audit failure occurs, and his total cost will be the sum of resource cost and expected liability payment (i.e., $TC(a_s) = \frac{1}{2}ca_s^2 + (1-\beta)(1-a_s)\min[W,I]$ where $a_s = \frac{(1-\beta)\min[W,I]}{c}$). Thus, there is a range of s within which the auditor will comply.

Let $\overline{s}$ be the highest standard with which the auditor will comply. As illustrated in Figure 3.5, if the standard equals s', then the auditor's cost of complying is $c(s')$, which is less than $TC(a_s)$. Moreover, if the standard equals s'', then the auditor's cost of complying $c(s'')$ is greater than $TC(a_s)$. Therefore, the highest standard with which the auditor will comply is such that the auditor is indifferent between compliance and noncompliance (i.e., $c(\overline{s}) = TC(a_s)$).

Moreover, the highest standard with which the auditor will comply is greater than or equal to the effort chosen by the auditor in a strict liability regime (i.e., $\overline{s} \geq a_s$) since $c(a_s) + EL(a_s) = c(\overline{s}) \Rightarrow c(\overline{s}) - c(a_s) = EL(a_s) \geq 0$ and $c(a)$ increases with a, $\forall a \in [0,1]$. If $c(a) = \frac{1}{2}ca^2$, then $\overline{s}^2 - a_s^2 = \frac{2}{c}(1-\beta)(1-a_s)\min[W,I] \geq 0$. Since both $\overline{s}$ and a_s are greater than zero, the highest standard $\overline{s}$ is greater than a_s. Additionally, $\overline{s} = \sqrt{\frac{2}{c}(1-\beta)\min[W,I] - \frac{(1-\beta)^2(\min[W,I])^2}{c^2}}$ and $a_s = \frac{(1-\beta)\min[W,I]}{c}$.

The above argument is summarized in Lemma 2.[25] The proof can be

[25]Proposition 1 (b) in Schwartz (1998) states that the highest level of due care with which the auditor will comply should be set such that the auditor is indifferent between

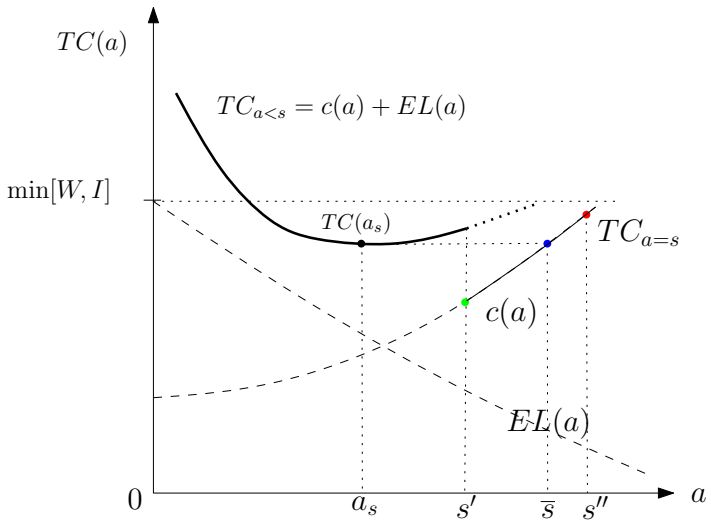


Figure 3.5: The standards with which the auditor will comply

found in the Appendix C.

Lemma 2. *The auditor will comply with the auditing standards if* $s \leq \overline{s}$*, where* $c(\overline{s}) = TC(a_s)$ *under a negligence-based liability regime.*

Therefore, the second-best results under this assumption are $a^{\dagger} = s$ if $s \leq \overline{s}$ and $a^{\dagger} = a_s$ if $s > \overline{s}$, where $\overline{s} = \sqrt{\frac{2}{c}(1-\beta)\min[W,I] - \frac{(1-\beta)^2(\min[W,I])^2}{c^2}}$ and $a_s = \frac{(1-\beta)\min[W,I]}{c}$. The auditor will comply with the auditing standards as long as the toughness of auditing standards is less than or equal to the critical value $\overline{s}$. Otherwise, the auditor will not comply. Note that $\overline{s}$ varies with auditor wealth.

The audit fee F and the investors' payoff will be the same as in the strict liability regime if $s > \overline{s}$. If $s \leq \overline{s}$, then the audit fee will be $\frac{1}{2}cs^2$ and the investors' payoff will be $(1-\beta)sI - \frac{1}{2}cs^2$.

complying with it and exerting the effort he would have exerted if the legal regime consisted of the strict liability rule. Lemma 2 in this thesis is the same as Proposition 1 (b) in Schwartz (1998) except that I assume that professional auditing standards are the same as legal standards, since courts do not write detailed standards for audit services. Court decisions may expand on or clarify the auditing standards when the auditing standards are vague.

Vague Auditing Standards in A Negligence-based Liability Regime

As discussed in Chapter 2, the vagueness of auditing standards varies across countries and over time. In this section, I analyze how the vagueness of auditing standards affects auditor effort choice. This has important implications for standard-setters, and forms the foundation for the analysis of standard-setters' economic incentives when choosing the vagueness of auditing standards.

The incentive constraint implies that the auditor's objective is to choose a level of effort to minimize his total cost, which is the sum of resource cost and expected liability $(1-\beta)(1-a)(1-P(a))\min[W,I]$. The expected liability is affected by the probability of compliance $P(a)$.

As described above, I assume the standard s follows a uniform distribution with mean m and variance δ^2. Hence, the probability of compliance equals zero if the audit effort is less than $s_l = m - \sqrt{3}\delta$, and one if the auditor exerts effort greater than or equal to $s_h = m + \sqrt{3}\delta$, and equals $\frac{1}{2}(\frac{a-m}{\sqrt{3}\delta} + 1)$ within the bound. The vagueness of auditing standards is represented by the variance of the distribution δ^2 (or the standard deviation of the distribution δ), and the toughness of auditing standards is indicated by m, the mean of the distribution.

The auditor's cost-minimizing choice of effort is represented as:

$$\begin{cases} \frac{1}{2}ca^2 + (1-\beta)(1-a)\min[W,I] & \text{if } 0 \le a < m - \sqrt{3}\delta \quad (1), \\ \frac{1}{2}ca^2 + (1-\beta)(1-a)[\frac{1}{2} - \frac{1}{2}\frac{a-m}{\sqrt{3}\delta}]\min[W,I] & \text{if } m - \sqrt{3}\delta \le a < m + \sqrt{3}\delta \quad (2), \\ \frac{1}{2}ca^2 & \text{if } m + \sqrt{3}\delta \le a \le 1 \quad (3). \end{cases}$$

(1) definitely liable if audit failure occurs

(2) liable with positive probability

(3) never liable

Within the range of $[0, m - \sqrt{3}\delta)$, the auditor's problem is similar to his problem in a strict liability regime if the effort is in this range. He will exert $a = a_s = \frac{(1-\beta)\min[W,I]}{c}$. Note that this level of effort is the same as the level exerted in a strict liability regime. Hence, I use the same notation for that level of effort.

The auditor will never exert effort greater than $m + \sqrt{3}\delta$ since the auditor's expected liability is zero as long as $a = m + \sqrt{3}\delta$ and his resource

cost is $\frac{1}{2}ca^2$, which increases with a. If he exerts a level of effort higher than $m+\sqrt{3}\delta$, there will be no additional benefit, since it does not decrease the expected liability payment, but increases the resource cost.

If $m-\sqrt{3}\delta \le a < m+\sqrt{3}\delta$, then $TC(a) = \frac{1}{2}ca^2 + (1-\beta)(1-a)[1-\frac{1}{2}(\frac{a-m}{\sqrt{3}\delta}+1)]\min[W,I]$. The first-order condition with respect to a implies

$$a_v = \frac{(1-\beta)\min[W,I](1+\sqrt{3}\delta+m)}{2\sqrt{3}\delta c + 2(1-\beta)\min[W,I]}.$$

To demonstrate how the vagueness of auditing standards affects a_v, I take the derivative of a_v with respect to δ and obtain:

$$\frac{da_v}{d\delta} = \frac{2\sqrt{3}c(1-\beta)\min[W,I](\frac{(1-\beta)\min[W,I]}{c}-1-m)}{(2\sqrt{3}\delta c + 2(1-\beta)\min[W,I])^2} < 0.$$

Since $a_s = \frac{(1-\beta)\min[W,I]}{c}$ and $a \in [0,1]$ implies $\frac{(1-\beta)\min[W,I]}{c} - 1 \le 0$, the level of effort a_v decreases with the vagueness δ. The assumption that $a \in [0,1]$ will be released in the sensitivity-check section, and I will analyze how the level of effort a_v varies with δ if $a \in [0,+\infty]$.

Therefore, the auditor's total cost evaluated at the (conditional) optimum within each range is:

$$\begin{cases} \frac{1}{2}ca_s^2 + (1-a_s)(1-\beta)\min[W,I] & \text{if } 0 \le a < m-\sqrt{3}\delta, \\ \frac{1}{2}ca_v^2 + \frac{1}{2}(1-\frac{a_v-m}{\sqrt{3}\delta})(1-a_v)(1-\beta)\min[W,I] & \text{if } m-\sqrt{3}\delta \le a < m+\sqrt{3}\delta, \\ \frac{1}{2}c(m+\sqrt{3}\delta)^2 & \text{if } m+\sqrt{3}\delta \le a \le 1. \end{cases}$$

Substituting the conditional optimal effort into the cost function and simplifying the function, I obtain the total cost evaluated at each conditional optimum:

$$TC(a_s) = (1-\beta)\min[W,I] - \frac{(1-\beta)^2\min^2[W,I]}{2c}$$

$$TC(a_v) = \frac{(1-\beta)\min[W,I][4\sqrt{3}c\delta(m+\sqrt{3}\delta) - (1-\beta)\min[W,I](1-m-\sqrt{3}\delta)^2]}{8\sqrt{3}\delta[\sqrt{3}\delta c + (1-\beta)\min[W,I]]}$$

$$TC(m+\sqrt{3}\delta) = \frac{1}{2}c(m+\sqrt{3}\delta)^2$$

where $a_s = \frac{(1-\beta)\min[W,I]}{c}$, and $a_v = \frac{(1-\beta)\min[W,I](1+\sqrt{3}\delta+m)}{2\sqrt{3}\delta c+2(1-\beta)\min[W,I]}$.

To determine the second-best level of audit effort given vague auditing standards that distribute uniformly under a negligence-based liability regime, I must determine which of the costs is the lowest. The auditor will choose the conditional optimal level of effort when he achieves the lowest cost by exerting that level of effort.

$$a^{\dagger} = \begin{cases} m+\sqrt{3}\delta & \text{if } TC(m+\sqrt{3}\delta) \le TC(a_s) \text{ and } TC(m+\sqrt{3}\delta) \le TC(a_v), \\ a_v & \text{if } TC(a_v) \le TC(a_s) \text{ and } TC(a_v) \le TC(m+\sqrt{3}\delta), \\ a_s & \text{if } TC(a_s) \le TC(m+\sqrt{3}\delta) \text{ and } TC(a_s) \le TC(a_v). \end{cases}$$

The audit fee equals $TC(a^{\dagger})$ and the investors' payoff is $(1-\beta)a^{\dagger}I - \frac{1}{2}ca^{\dagger 2}$.

To determine the particular regions of δ where the auditor will choose one of the three conditional optimal effort choices, I compare the three total costs: $TC(m+\sqrt{3}\delta)$, $TC(a_v)$, and $TC(a_s)$. The solution of the auditor's effort reaction function of the vagueness will be divided into three regions by two cutoff points. I will demonstrate how I determine those cutoff points.

First, I determine that $TC(m+\sqrt{3}\delta)$ is greater than or equal to $TC(a_v)$ if a_v is in the region of $[m-\sqrt{3}\delta, m+\sqrt{3}\delta)$.

To see this, denote $(1-\beta)\min[W,I]/c$ by a_s and $m+\sqrt{3}\delta$ by s.

$$\begin{aligned} & TC(m+\sqrt{3}\delta) - TC(a_v) \\ &= \frac{c}{8\sqrt{3}\delta(\sqrt{3}\delta+a_s)}[4\sqrt{3}\delta(\sqrt{3}\delta+a_s)s^2 - 4\sqrt{3}a_s s\delta + a_s^2(1-s)^2] \\ &= \frac{c}{8\sqrt{3}\delta(\sqrt{3}\delta+a_s)}[12s^2\delta^2 - 4\sqrt{3}a_s s(1-s)\delta + a_s^2(1-s)^2] \\ &= \frac{c}{8\sqrt{3}\delta(\sqrt{3}\delta+a_s)}[2\sqrt{3}s\delta - a_s(1-s)]^2 \\ &\ge 0 \end{aligned}$$

By the definition of a_v, it must be in the region of $[m-\sqrt{3}\delta, m+\sqrt{3}\delta)$. Therefore, $TC(m+\sqrt{3}\delta)$ is greater than or equal to $TC(a_v)$ if $a_v \in [m-\sqrt{3}\delta, m+\sqrt{3}\delta)$.

The above analysis shows that if $a_v \in [m-\sqrt{3}\delta, m+\sqrt{3}\delta)$, then $TC(m+\sqrt{3}\delta) \ge TC(a_v)$. Hence, the auditor will choose effort equal to a_v if a_v is less than $m+\sqrt{3}\delta$. Since the probability of compliance equals "one" if the level of effort is equal to or greater than $m+\sqrt{3}\delta$, the auditor will choose effort equal to $m+\sqrt{3}\delta$ in the region where a is greater than $m+\sqrt{3}\delta$. Letting a_v equal $m+\sqrt{3}\delta$, I obtain the first cutoff point of δ:

$$\delta_1 = \frac{1}{4\sqrt{3}}[\sqrt{(a_s-2m)^2+8a_s} - (a_s+2m)].$$

In the region where $\delta \in [0, \delta_1)$, the effort a_v is greater than $m + \sqrt{3}\delta$. This contradicts the definition of a_v. Therefore, if δ is less than or equal to δ_1, then $a^\dagger$ equals $m + \sqrt{3}\delta$.

Second, comparing $TC(a_v)$ with $TC(a_s)$, I find that $TC(a_v)$ is less than $TC(a_s)$ if δ is less than δ_2.[26] This cutoff point is lower than the point where a_v equals a_s and the cutoff point where a_v equals $m - \sqrt{3}\delta$. Therefore, the auditor will choose $a^\dagger$ equal to a_v if δ is less than or equal to δ_2 and greater than δ_1.

If δ is greater than or equal to δ_2, then $TC(a_s)$ is less than $TC(a_v)$, and therefore, the auditor chooses $a^\dagger$ equal to a_s.

Figure 3.6 illustrates the auditor's effort choice as a function of m and δ.

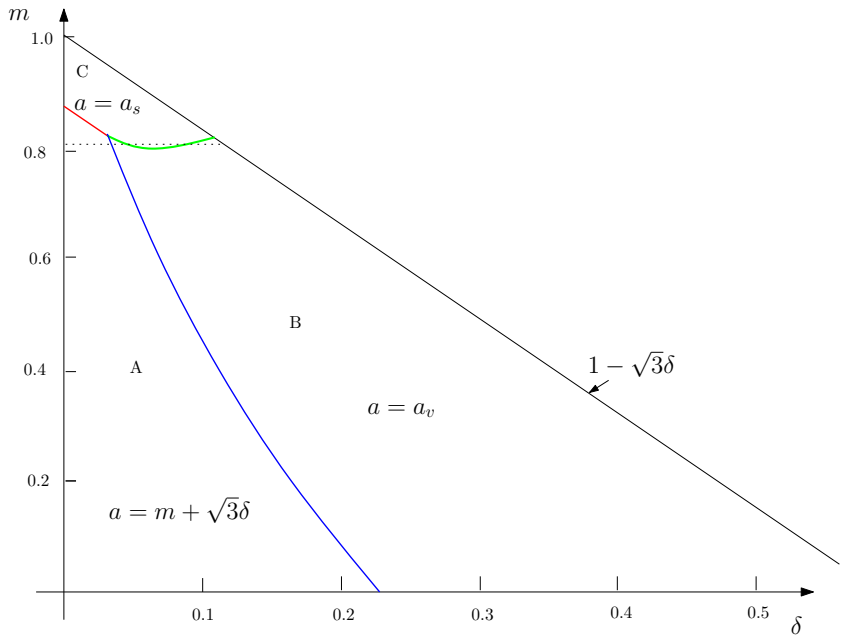


Figure 3.6: How auditor's effort varies with toughness and vagueness

The blue line is the indifference curve where $m + \sqrt{3}\delta$ is equal to a_v. The red line provides the values of m and δ for which the auditor is indifferent in choosing $m + \sqrt{3}\delta$ or a_s. At the green line, the auditor is indifferent between a_s and a_v. The line indicated by $1 - \sqrt{3}\delta$ is the boundary for m,

[26] The cutoff δ_2 equals $\frac{2a_s^2+2m-ma_s-3a_s-2\sqrt{a_s^2m^2-ma_s^3-2a_sm^2+2ma_s^2+a_s^4-3a_s^3+m^2-a_sm+3a_s^2-a_s}}{\sqrt{3}(4-3a_s)}$, where $a_s = (1-\beta)\min[W, I]/c$.

since $m + \sqrt{3}\delta$ should be less than or equal to one. The feasible region, which is below $1 - \sqrt{3}\delta$, is partitioned into three sets by the blue, red, and green lines. When m and δ fall into region A, the auditor chooses his effort equal to $m + \sqrt{3}\delta$. When the toughness and vagueness are in region B, the auditor will choose a_v to be his effort level. When m and δ is in the upper corner, region C, the auditor will choose a_s.

In order to show auditor's effort reaction towards increased vagueness at a given value of m, I choose a particular m and draw a figure illustrating the auditor's effort choice as a function of δ. Suppose m is quite high, for example, $m = 0.81$ as indicated by the dotted line. In this case, we can see that as δ increases, an auditor first chooses effort equal to $m + \sqrt{3}\delta$; then a_v; then a_s; and then a_v once again. Figure 3.7 illustrates this case.

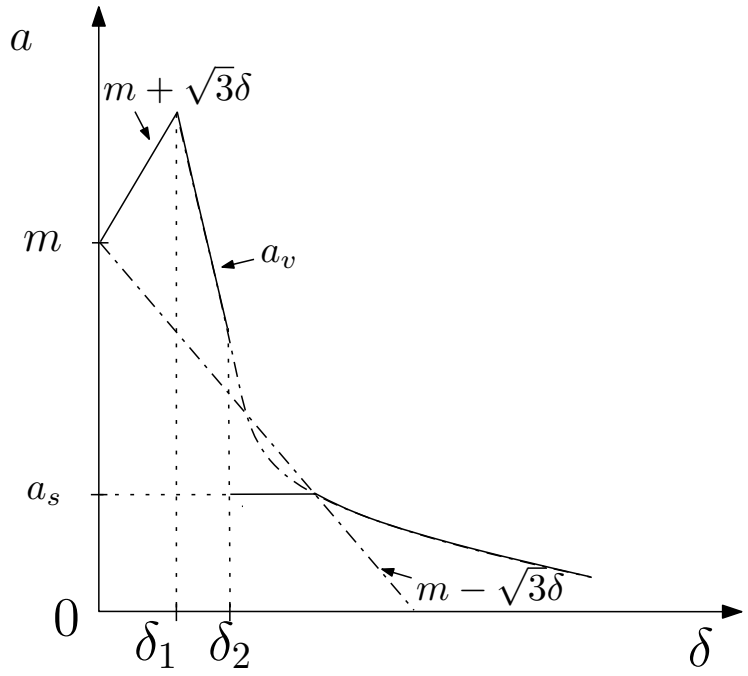


Figure 3.7: How audit's effort varies with the vagueness given a level of toughness

Figure 3.7 indicates that the auditor's effort will increase with the vagueness of auditing standards when the equilibrium level of effort is $m + \sqrt{3}\delta$, and will decrease with the vagueness if the equilibrium level of effort is a_v. If $a^\dagger = a_s$, then the vagueness of auditing standards will not affect the auditor's effort.

Thus, varying the vagueness of auditing standards can change the level of audit effort in unexpected ways. An increase in the vagueness of auditing standards can decrease as well as increase audit effort. When the vagueness is very low, the auditor will attempt to comply with the upper bound to avoid liability. As the vagueness increases, however, his effort increases. But after the vagueness passes a critical point, the auditor will choose an effort level between the two bounds, and the level of effort decreases as vagueness increases. When the vagueness passes the second critical value, the cost of complying with the auditing standards will be greater than noncompliance, and the auditor therefore chooses noncompliance. Note that when a_v is less than a_s, the effort level is so small that I consider this a_v as non-compliance effort as well.

Lemma 3 summarizes the findings formally.

Lemma 3. *The auditor's effort initially increases with the vagueness, but after the vagueness passes the first critical point, the auditor's effort decreases as it increases, and his effort remains constant if the vagueness passes the second critical point.*

Note that when m is fixed at other values, auditor's effort choice as a function of δ will change accordingly. If m is fixed at a very high value, the auditor will not comply with the standards and choose a_s. If m is fixed at a relatively high value, the auditor will choose effort equal to $m + \sqrt{3}\delta$ and then a_s. If m is small or at a medium value, the auditor's effort will be $m + \sqrt{3}\delta$ and then a_v. For the vast majority value of (fixed) m, an auditor will initially increase his effort as vagueness increases, then choose a non-compliance effort a_s or a_v.

To this point, I have examined the change in auditor's effort with variations in the vagueness of the auditing standards. The next question is how different standard-setters will choose the vagueness of auditing standards to maximize their payoffs under equilibrium. I analyze this question in the following sections.

3.4 Preference over Toughness Given Perfectly Precise Auditing Standards

In the previous sections, I have shown how the properties of auditing standards affect auditor behavior. In the real world, the auditing standards are set by different organizations. In the U.S., the auditing standards were set

by the American Institute of Certified Public Accountants (AICPA) for audits conducted for both public and private companies prior to 2002. After 2002, the Public Company Accounting Oversight Board (PCAOB) was authorized to establish auditing and related professional practice standards for publicly held companies. Since the AICPA is a professional organization for auditors, and the PCAOB is an organization protecting investors' interests, there has been an authority transfer from auditors to investors. Therefore, it is interesting to analyze how investors and auditors will choose the auditing standards if they have the power to do so. Mathematically, I assume that the auditing standards can be set in such a way that the compliance audit effort implied by the standards is distributed uniformly and it can be set by choosing the properties (toughness and vagueness) of the standards. Chapter 2 illustrates in detail the importance of studying the toughness and vagueness of auditing standards. Moreover, given recent debates concerning the relative advantages of principle-based (vague) vs. rule-based (precise) accounting and auditing standards, this is an opportune time to analyze auditors' and investors' economic incentives to choose more precise or vaguer auditing standards and to provide explanations for these parties' preferences. Before doing so, I analyze how different parties choose the toughness when the auditing standards are perfectly precise. This is a benchmark for studying the choice of vagueness of auditing standards. In this section, I investigate the levels of toughness the auditor and investors will choose if the auditing standards are perfectly precise under a negligence-based liability regime with due care defined by auditing standards.

An important concept in bargaining theory is Pareto efficiency. A contract is Pareto efficient if there does not exist another contract that makes one individual better off without making any other individual worse off. Pareto efficiency implies that the auditor's preference towards the properties of the auditing standards will be the same as the investors' preference under the current assumptions. The following analysis supports this prediction. Moreover, to make the analytical model more realistic, I extend the analysis to a scenario in which there are many auditors with heterogeneous wealth rather than one monopolistic auditor in the market.

3.4.1 Auditor's Preference

This section analyzes how the auditor will set the toughness of auditing standards if the standards can be set with perfect precision. The previous sections assume that the investors make a take-it or leave-it offer to the auditor and have all the bargaining power. Since the audit fee generally

varies with the auditing standards, the one who sets the standards should have the bargaining power. I assume that the auditor makes a take-it or leave-it offer and obtains all the rents.

The auditor's objective would be to minimize his total cost if audit effort were his only choice. However, when he can choose the toughness of auditing standards, his objective becomes maximizing his total profit, since the audit fee generally increases with the toughness of auditing standards and the auditor can use the auditing standards as a device to commit to a level of effort. Since audit effort is unobservable, an auditor with low wealth can not credibly commit to what from his perspective is the optimal level of effort. He has incentive not to comply, because the cost of not complying with the auditing standards will be lower than compliance.

Therefore, under equilibrium the auditor chooses the auditing standards in view of audit fee and the audit effort to which he would like to commit. The central idea behind the auditor's choice of auditing standards is to convey a level of credibility in relation to the quality of service that he will provide. The investors will hire the auditor if their expected payoff is greater than the reservation payoff. Formally, the auditor's problem is:

$$\begin{aligned} \max_{a,s} \quad & F(s) - c(a) - EL(a) \\ s.t. \quad & (1-\beta)aI - F(s) + EL(a) \geq 0 \\ & a \in \operatorname*{argmax}_{\widehat{a}} F(s) - c(\widehat{a}) - EL(\widehat{a}), \end{aligned}$$

where s is the toughness of the auditing standards, and $EL(a) = 0$ if $a \geq s$ and $EL(a) = (1-\beta)(1-a)\min[W, I]$ if $a < s$, and $c(a) = \frac{1}{2}ca^2$.

Under the assumption that the auditor's wealth is observable to the investors, the investors know $a = s$ if $s \leq \overline{s}$ and $a = a_s$ if $s > \overline{s}$. They will hire the auditor as long as their expected payoff is greater than or equal to zero. The maximum fee that the auditor can set and that is acceptable for the investors is:

$$\begin{cases} (1-\beta)sI & \text{if } s \leq \overline{s}, \\ (1-\beta)a_sI + (1-\beta)(1-a_s)\min[W, I] & \text{if } s > \overline{s}, \end{cases}$$

where $a_s = \frac{(1-\beta)\min[W,I]}{c}$ and $\overline{s} = \sqrt{\frac{2}{c}(1-\beta)\min[W, I] - \frac{(1-\beta)^2(\min[W,I])^2}{c^2}}$.

The auditor's objective function can be expressed as:

$$\max_{s} \ (1-\beta)sI - \frac{1}{2}cs^2 \text{ if } s \leq \overline{s},$$

$$\max_s \ (1-\beta)a_s I - \frac{1}{2}ca_s^2 \text{ if } s > \overline{s}.$$

The auditor's effort choice and total profit will then be:

$$\text{Total Profit} = \frac{(1-\beta)^2 I^2}{2c} \text{ when } a^\dagger = s = \frac{(1-\beta)I}{c} \leq \overline{s};$$

$$\text{Total Profit} = \frac{(1-\beta)^2 \min[W,I](2I - \min[W,I])}{2c} \text{ when } a^\dagger = a_s \text{ and } s > \overline{s}.$$

Since the auditor's wealth is observable, the condition under which the auditor will comply with the auditing standards $\frac{(1-\beta)I}{c}$ is also public knowledge. That is, if the level of auditing standards $\frac{(1-\beta)I}{c}$ is lower than or equal to $\overline{s} = \sqrt{\frac{2}{c}(1-\beta)\min[W,I] - \frac{(1-\beta)^2(\min[W,I])^2}{c^2}}$, which is the highest level of standards with which the auditor will comply, then it is common knowledge that the auditor will comply with the standards. The highest level of auditing standard with which the auditor will comply, $\overline{s}$, varies with the auditor's wealth. Hence, whether $\frac{(1-\beta)I}{c}$ is greater than or less than $\overline{s}$ depends on the auditor's wealth.

Next, I show that auditors with greater wealth will choose tougher auditing standards than auditors with less wealth. When the auditor is wealthier $W > I$, the condition under which the auditor will comply with the auditing standards is satisfied (i.e., $\frac{(1-\beta)I}{c} \leq \overline{s}$). The auditor will set $s = \frac{(1-\beta)I}{c}$ and exert effort equal to the standards.

When the auditor's wealth is less than the investors' investment I, the auditor will still comply with the standards $\frac{(1-\beta)I}{c}$ under the condition that $\frac{(1-\beta)^2 I^2}{c^2} \leq \frac{2}{c}(1-\beta)\min[W,I] - \frac{(1-\beta)^2(\min[W,I])^2}{c^2}$. Simplifying this condition, I obtain $\frac{1-\beta}{2c} < \frac{W}{I^2+W^2} \Rightarrow W > \frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c}$. Hence, although his wealth is less than the amount of investment, as long as the auditor's wealth is greater than a specific threshold, the auditor will comply with the standards.

In the above two cases, the auditor's total profit is $\frac{(1-\beta)^2 I^2}{2c}$ since he set the level of standards to maximize his profit and exerts effort $a^\dagger = s = (1-\beta)I/c$.

If $I > W$ and $\frac{1-\beta}{2c} > \frac{W}{I^2+W^2}$ (i.e., $W < \frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c}$), then it is too costly for him to comply with $s = (1-\beta)I/c$, since $(1-\beta)I/c$ will be greater than $\overline{s}$. However, as a standard-setter, he can set the toughness to be lower than $(1-\beta)I/c$ and higher than $a_s = (1-\beta)W/c$. For example, the toughness s equals $(1-\beta)W/c + \epsilon$, where ϵ is a small positive number and is less than $(1-\beta)(I-W)/c$. Therefore, if $(1-\beta)W/c + \epsilon \leq \overline{s}$, then the equilibrium toughness of auditing standards can be $(1-\beta)W/c + \epsilon$ and

the auditor is able to commit to this level of effort. Since the auditor's rent increases with the level of effort if it is less than $(1-\beta)I/c$, the auditor will choose ϵ such that $(1-\beta)W/c+\epsilon=\overline{s}$.

To summarize, an auditor with greater wealth will set the toughness equal to the first-best level of effort (i.e., $(1-\beta)I/c$), and an auditor with less wealth will set the toughness equal to the highest possible auditing standards to which his wealth allows him to commit (i.e., $(1-\beta)W/c+\epsilon=\overline{s}$), which is less than $(1-\beta)I/c$ but higher than the noncompliance effort (i.e., $(1-\beta)W/c$). In other words, auditors with more wealth will set tougher rules than auditors with less wealth. Proposition 1 summarizes the argument.

Proposition 1. *An auditor with wealth greater than the cutoff point will set the toughness equal to the first-best level of effort (i.e., $(1-\beta)I/c$), and an auditor with wealth less than the cutoff point will choose a lower toughness, but this toughness increases with his wealth.*[27]

Since the professional organization represents all auditors' interests and auditor wealth varies within the audit market, the equilibrium toughness of the auditing standards may be a number between $(1-\beta)I/c$ and $(1-\beta)W/c+\epsilon$ and it depends on different auditors' levels of power within the professional organization.

3.4.2 Investors' Preference when Choosing the Auditing Standards

If the standards are set by the auditor, investors are indifferent to the toughness of auditing standards, since they will only accept the contract if their payoff is greater than or equal to their reservation payoff. However, the massive accounting scandals of 2002 (e.g., Enron, WorldCom, Sunbeam, AOL, etc.) in the U.S. aroused investors' concerns about the effectiveness of self-regulation. The Sarbanes-Oxley Act of 2002 established the Public Company Accounting Oversight Board (PCAOB) to set the auditing standards. The PCAOB's mission is to protect the interests of investors. Hence, authority over auditing standards has been transferred from the auditors to the investors. This raises the issue of how the investors will choose the toughness of the auditing standards when they are in a position to do so. Their choices and incentives are explored in this section.

In this scenario, the investors have the bargaining power and the second-best results as shown in Section 3.3.2 can be applied. That is, the investors

[27] The cutoff point is $\frac{1-\sqrt{1-(1-\beta)^2I^2/c^2}}{(1-\beta)/c}$.

set the auditing standards, which determine the audit fee such that the auditor is indifferent to accepting or declining the audit engagement.

The process through which the investors choose the auditing standards is illustrated as follows. Investors anticipate that the auditor will choose $a^{\dagger} = s$ if $s \leq \overline{s}$ and choose $a^{\dagger} = a_s$ if $s > \overline{s}$. The investors' payoff is maximized at $a^* = (1-\beta)I/c$. This optimal level of effort a^* is less than or equal to $\overline{s}$ if the auditor's wealth is greater than the cutoff point (i.e., $W > \frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c}$). It is greater than $\overline{s}$ if the auditor's wealth is below the point (i.e., $W < \frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c}$). On the other hand, if the toughness is slightly higher than a_s but lower than a^* (i.e., $s = (1-\beta)W/c + \epsilon$, where ϵ is a small positive number), the auditor with less wealth will still comply. Thus, the auditor will exert $a = s = (1-\beta)I/c$ if his wealth is greater than the cutoff point, and exert $a = s = (1-\beta)W/c + \epsilon$ otherwise. The investors' payoff given $a = (1-\beta)W/c + \epsilon$ is higher than the payoff given $a = a_s = (1-\beta)W/c$.

Therefore, the investors will set $s = (1-\beta)I/c$ if the auditor has more wealth and set $s = (1-\beta)W/c + \epsilon$ if the auditor has less wealth. Their corresponding payoff is $(1-\beta)sI - \frac{1}{2}cs^2$ where $s = (1-\beta)I/c$ or $(1-\beta)W/c+\epsilon$. This result is derived under the assumption of one firm and one auditor. If the market is composed of one firm but many auditors, the investors will set $s = (1-\beta)I/c$ and choose the auditor whose wealth is greater than the cutoff point. In this case, the investors have the same preference as large auditors.

I have shown in section 3.4.1 that small auditors prefer less tough rules than large auditors. Since there are more small auditors than large auditors in the auditing standard board of the AICPA and each board member has an equal vote, the toughness of the auditing standards set by the AICPA is likely to be lower than the toughness that would have been chosen by investors. This result is consistent with the authority transfer from the AICPA to the PCAOB in the U.S., since the PCAOB represents investors' interests.

Thus, the investors will choose the same toughness as the auditor if there is only one auditor in the market, and the investors will choose a higher toughness than that chosen by auditors if there are many auditors in the market.

To summarize, given the assumption that there is one firm and one auditor, I show that the auditor and investors have the same preferences related to toughness given that perfectly precise auditing standards define

due care. This result can be explained by the fact that Pareto efficiency implies that the optimal contract maximizes the total wealth independent of bargaining power. Regardless of who has the bargaining power, the wealth-maximizing level of effort will be the same, and only the audit fee will vary with the bargaining power. However, when there is one firm and many auditors, the toughness set by the investors is likely to be higher than the toughness set by the auditors' professional organization, since small auditors prefer less tough rules than large auditors and investors, and the bargaining power among heterogeneous auditors affects the equilibrium toughness.

Formally, Proposition 2 summarizes the findings in Section 3.4, and it is based on the assumption that the auditing standards are perfectly precise.

Proposition 2.

a. The investors will choose the same level of toughness as that chosen by the auditor given the assumption of one auditor and one group of investors.

b. When there are many auditors, the toughness set by the investors is likely to be higher than that set by the auditors' professional organization.

3.5 Vagueness Preference

Accounting and auditing standards, or any standards or laws for that matter, are inherently vague, since such standards cannot possibly anticipate every possible future event. There is always room for interpretation as required in each context (Lo 2007). As explained in Chapter 2, the vagueness of the auditing standards varies across countries and within one country over time. Since in the real world the legal liability regime for auditors is negligence-based and there are no legal standards for auditors, courts often resort to auditing standards to determine the auditors' liabilities. The vagueness of auditing standards affects the auditors' perceived expected liabilities and thereby their effort choices. The standard-setters consider these factors when they set the auditing standards. The conventional conjecture contends that the standard-setters (auditors or investors) will set the auditing standards precisely, since this prevents under-compliance and over-compliance. However, the following analyses show that the vagueness of auditing standards can be a strategic choice.[28] In this section, I analyze how and why

[28]The conventional view is that vagueness in auditing standards, or in regulatory rules in general, is an unfortunate byproduct of the need for flexibility in rule-setting. Future

different parties choose the vagueness strategically.

3.5.1 Auditor's Preference

I derive the auditor's preference regarding the vagueness of auditing standards by analyzing the auditor's objectives. As in subsection 3.4.1, the auditor's objective is maximizing his total profit. The only difference is that auditing standards can be vague instead of perfectly precise. The auditor's problem is to choose both the toughness and vagueness, and a level of effort to maximize his total profit conditional on the individual rationality constraint (that the investors are willing to participate) and the incentive compatibility constraint.

The auditor's effort reaction function of vagueness is illustrated in Figure 3.8. This diagram indicates that there are many combinations of toughness m and vagueness δ that can generate the desired level of effort: $a^* = (1-\beta)I/c$ for auditors with wealth greater than $\frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c}$, and $(1-\beta)W/c + \epsilon$ for auditors with wealth less than $\frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c}$.

Since the auditor would not be worse off by setting standards precisely, he weakly prefers precise auditing standards. However, this preference is affected by the feasibility of setting the standards to be precise. Since auditing standards are inherently vague, there is a minimum attainable vagueness that exists in the standards. Thus, the vagueness that can be chosen by the auditor will vary with the minimum attainable vagueness that the auditor can actually achieve.

When the minimum attainable vagueness is very small, the auditor will

circumstances cannot be predicted precisely and so rules must be set with enough flexibility in their interpretation to provide for decisions under a variety of circumstances. Rules, like any other law, are necessarily vague ex post because it is impossible to write them so precisely as to anticipate every possible circumstance.

This thesis explores an entirely different facet of vagueness. Vagueness is not an unfortunate by-product of the need for flexibility, but rather a dimension of standards in which agents have a strategic interest. Each of the various decision-makers affected by standards will, it turns out, strategically prefer vagueness (when toughness has been determined at a level that is different from his own, most-preferred level).

In comparing agents' most preferred levels of toughness and vagueness in my model I am not assuming that in reality any single individual agent, or type of agent, can completely determine the distribution of standards. In terms of generating empirical predictions, the predictions of the model regarding the "choice" of an individual as to his optimal toughness and vagueness should be interpreted simply as the direction in the individual will to influence standards when the standards-setting mechanism changes in a way as to increase the individual's influence.

set the toughness at the optimal level and the vagueness at the minimum attainable level. Moreover, since the auditor is the standard-setter, he can also change the toughness as the minimum attainable vagueness increases. To maintain the optimal level of effort, he could simply adjust the toughness as the minimum attainable vagueness increases. Therefore, the auditor can set the vagueness at the minimum attainable level and reduce the toughness as minimum attainable vagueness increases. On the other hand, the auditor could also set the toughness at the optimal level and set vagueness to be greater than the minimum (i.e., δ^* rather than $\delta_{\min}$ in Figure 3.8).

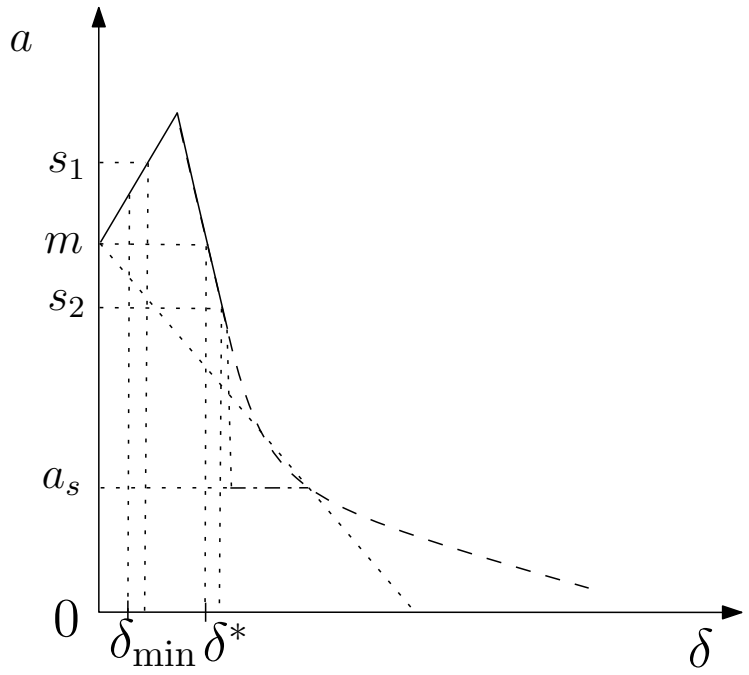


Figure 3.8: Preference over vagueness if toughness is fixed at a non-optimal level

The above observations are derived based on the assumption that toughness is also the auditor's choice. But if toughness is not his choice, the auditor's preference regarding vagueness will be affected as the minimum attainable vagueness grows. Therefore, in the next subsection, I show how his preference related to vagueness varies with the minimum attainable vagueness if the toughness is fixed.

The Auditor's Preference after Considering Minimum Attainable Vagueness and with Discretion over Toughness

In response to American investors' requests for tougher auditing standards after the massive accounting scandals of 2002, the regulators authorized the PCAOB to set the auditing standards. Since the regulators do not want to be blamed for any potential accounting scandals, they tend to choose very tough auditing standards, perhaps even tougher than optimal. In this scenario it is difficult for auditors to lobby for less tough rules. Therefore, this situation implies that the toughness of auditing standards was fixed when the PCAOB set the auditing standards. I will analyze the auditor's preference in the case where the toughness of auditing standards is a constant.

If the toughness of auditing standards is fixed at the level most preferred by the auditor (optimal level), either perfect precision or a certain level of vagueness can help him commit to this level of effort. As illustrated in Figure 3.8, when the vagueness δ equals zero or δ^*, the auditor exerts the optimal level of effort m. However, the auditor's preference can vary with the minimum attainable vagueness. As the minimum attainable vagueness increases, the auditor will over-comply with the standards. For example, if the minimum attainable vagueness is indicated by $\delta_{\min}$ as in Figure 3.8, then the auditor will choose effort equal to $m + \sqrt{3}\delta_{\min}$, which is greater than m. Since it is not optimal for the auditor to exert effort greater than m, the auditor will choose a higher level of vagueness than the minimum attainable vagueness to commit to the optimal level of effort. Since the wealth-maximizing level of effort is $m = (1 - \beta)I/c$, the auditor will prefer the vagueness to be δ^*, which is greater than $\delta_{\min}$, in order to reduce the equilibrium level of effort to m. In this case, the auditor strictly prefers vaguer auditing standards.

If the toughness is too low, the auditor will prefer standards vaguer than perfect precision, since he can commit to a higher level of effort if the standards are vague. Suppose s_1 is the optimal level of effort. Figure 3.8 shows that the vagueness that induces s_1 is larger than the minimum attainable vagueness. If the toughness is too high, the auditor will prefer vaguer standards in order to commit to the optimal level of effort. Suppose s_2 is the optimal level of effort. The vagueness that induces s_2 is greater than the minimum attainable vagueness. (The minimum attainable vagueness is small by definition, so these statements are generally true.)

The intuition is as follows. Uncertainty plays a positive role (holding constant the level of stringency of the standards) in mitigating the agency problem inherent in auditing by allowing the auditor to commit to a higher

level of effort: an auditor with wealth at risk will work harder to avoid the risk of liability when the uncertainty in standards increases.

Greater uncertainty is preferred as well when the level of stringency is higher than a party to the contract would prefer. A different set of arguments applies here. Greater uncertainty allows more flexibility. Auditors can exercise their professional judgment and avoid undertaking unnecessary effort.

Proposition 3 summarizes the above arguments in section 3.5.1:

Proposition 3.

a. The auditor weakly prefers precise auditing standards.

b. If the toughness is fixed at a non-optimal level, then the auditor will choose vaguer auditing standards than the standards with minimum attainable vagueness.

In summary, the auditor will choose a certain toughness and vagueness strategically to commit to an optimal level of effort. When the toughness is fixed at a non-optimal level, the auditor will choose a higher vagueness than the minimum attainable level. When the auditor can also choose the toughness, then the auditor weakly prefers to set auditing standards precisely.

Wealth Effect on the Vagueness Preference

When the auditing standards are perfectly precise, I find that small auditors will prefer the standards to be less tough than the large auditors, because their net payoff is larger if they can credibly commit to a higher level of effort than the noncompliance effort. Due to their limited wealth, small auditors cannot commit to as high a level of effort as large auditors. This section analyzes how auditors with different wealth will choose the properties of the auditing standards when the auditing standards are uncertain. The conventional conjecture is that smaller auditors prefer less tough and vaguer auditing standards, compared to large auditors. However, I will show that this situation is more complex than it appears.

The level of effort to which an auditor can commit varies with his wealth. Auditors can be classified into three categories based on their wealth: $W \geq I$ (large auditors), $\frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c} \leq W < I$ (medium auditors), and $W < \frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c}$ (small auditors). Recall that $\overline{s}$ is the highest standard with which an auditor complies. Since $\overline{s}$ varies with auditor wealth, I denote the highest standard with which small auditors will comply by $\overline{s}_s$, which is

smaller than the highest standard with which medium and large auditors comply($\overline{s}_m$ and $\overline{s}_b$). Since the optimal level of effort $(1-\beta)I/c$ is less than or equal to $\overline{s}_m$ or $\overline{s}_b$, both medium and large auditors can commit to this optimal level of effort. But the cutoff points of the vagueness δ in the auditor's reaction function differ between these two groups of auditors. For the small auditors, the optimal level of effort $(1-\beta)I/c$ is greater than $\overline{s}_s$, so they can not credibly commit to $(1-\beta)I/c$. However, this group of auditors can credibly commit to $\overline{s}_s$, which is less than the optimal level of effort, but greater than the minimum level of effort (or noncompliance effort): $a_s = (1-\beta)W/c$.

The effort reaction function of auditors with different wealth is illustrated in Figure 3.9.

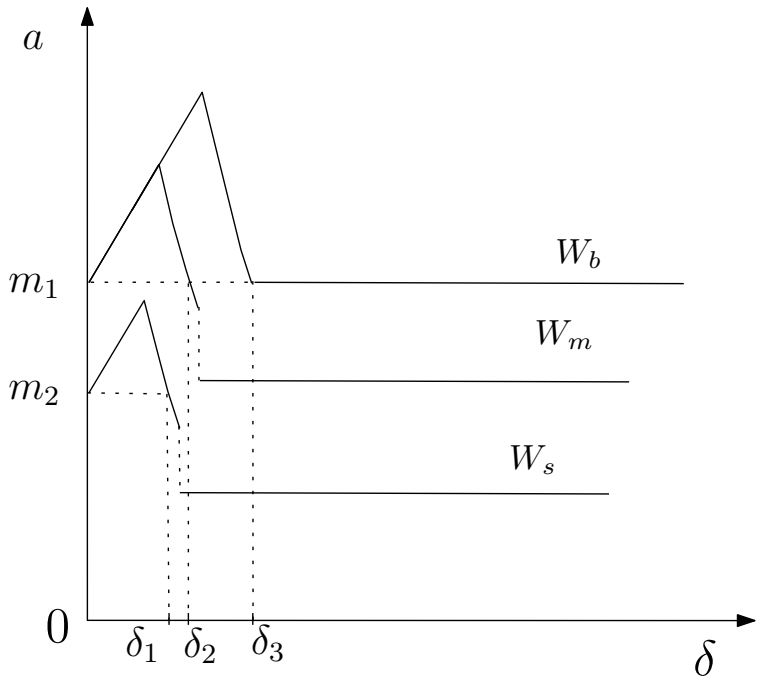


Figure 3.9: Effort reaction curve over vagueness when the auditors have different wealth levels

Suppose m_1 is $(1-\beta)I/c$, which is optimal for auditors with both medium and large wealth. And m_2 is $\overline{s}_s$, which is optimal for auditors with smaller wealth. Figure 3.9 shows that if the auditors can choose the toughness of auditing standards as well as the vagueness, then auditors with different wealth will all choose precise auditing standards, but the smallest auditors

will choose less tough rules than the medium and largest auditors.

It is also likely that the largest auditor will choose the vaguest auditing standards, and the smallest auditors will select the least vague auditing standards. To commit to m_1 or m_2, the auditors can choose positive vagueness (i.e., δ_1, δ_2, and δ_3). It is clear from Figure 3.9 that $\delta_1 < \delta_2 < \delta_3$. Because of their small wealth, small auditors cannot credibly commit to a level of effort higher than the noncompliance effort (i.e., a_s) when the vagueness of auditing standards increases. Larger auditors can commit to a high level of effort even with high vagueness. This gives them a competitive advantage when auditing standards are vaguer.

Since there are different combinations of toughness and vagueness of auditing standards that can help the auditor commit to the optimal level of effort, there can be a combination of toughness and vagueness that is preferred by both small and large auditors. Suppose the toughness is set at $m_2 = \overline{s}_s$. It is possible there exists a δ that makes the small auditor commit to $a_v = \overline{s}_s$ and the large auditor commit to $(1-\beta)I/c = m_2 + \sqrt{3}\delta$. Figure 3.10 illustrates this special case. The auditing standards with toughness m_2 and vagueness δ_1 can induce auditors with different wealth to commit to their optimal level of effort. However, this is only true if small auditors have the same wealth so that $\overline{s}_s$ is the same for all small auditors.

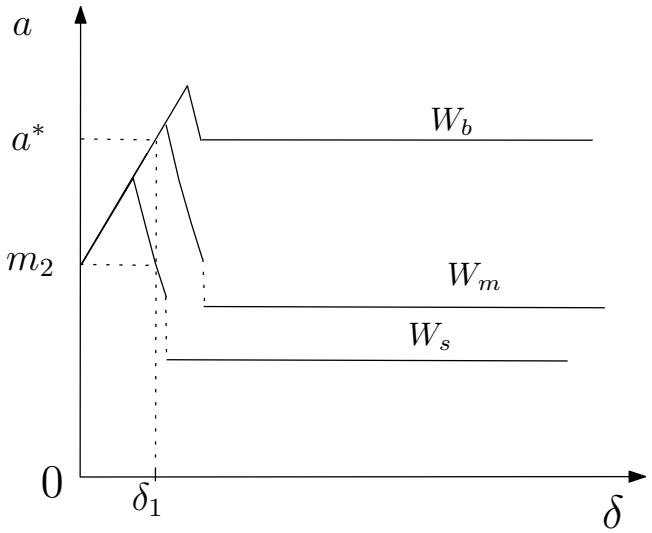


Figure 3.10: The optimal toughness and vagueness set by auditors with different wealth levels

3.5.2 Investors' Preference

If there is one firm and one auditor, the investors weakly prefer to set the auditing standards precisely and set the toughness equal to either $\frac{(1-\beta)I}{c}$ or $(1-\beta)W/c+\epsilon$ depending on auditor wealth. If the auditor's wealth is below the cutoff point (i.e., $\frac{1-\sqrt{1-(1-\beta)^2I^2/c^2}}{(1-\beta)/c}$), then the investors will set the toughness and vagueness to induce $(1-\beta)W/c+\epsilon$, which is the same as that which would be set by the auditor. If the auditor wealth is above the cutoff point, then the investors will set the toughness and vagueness to induce $(1-\beta)I/c$, which is also the auditor's preference. In a scenario with one firm and many auditors, the investors weakly prefer to set the auditing standards precisely with toughness $s=\frac{(1-\beta)I}{c}$ and hire an auditor with greater wealth. Proposition 4 summarizes the argument.

Proposition 4. *Like auditors, investors weakly prefer precise auditing standards.*

Since the auditing standards are inherently vague, there are minimum attainable vagueness the standard-setters can choose. Under this constraint, the investors essentially will choose the same level of toughness and vagueness to induce the desired level of audit effort as the auditor would, since the wealth-maximizing level of effort is the same under equilibrium regardless of bargaining power and the properties of auditing standards that induce this level of effort will be the same.

In summary, I find that in a perfect world in which auditing standards could be set precisely, both the auditor and the investors would weakly prefer precise auditing standards. The auditing standards chosen by the investors would be tougher than those chosen by the auditors' professional organization. This result is driven by the auditor's limited wealth constraint and unobservable audit effort. Furthermore, if the toughness of auditing standards is fixed at a non-optimal level, then both investors and auditors would prefer vaguer standards than the standards with minimum attainable vagueness. In addition, because of their high level of wealth, large auditors can choose vaguer auditing standards than small auditors if the toughness of the standards can be set optimally for each type of auditors.

3.5.3 An Example of Other Combinations of Toughness and Vagueness

As discussed in Section 3.5.1, there are many combinations of toughness and vagueness that can generate the optimal level of effort. This section

illustrates one such example. I first show how this combination of toughness and vagueness is derived, and then discuss wealth effects on these properties.

Based on the previous analyses, I have determined that the auditor's net payoff is maximized at $a^* = (1-\beta)I/c$. Suppose the auditor chooses effort equal to either a_v or $m+\sqrt{3}\delta$ since auditing standards do not affect a_s. Let both a_v and $m+\sqrt{3}\delta$ equal $(1-\beta)I/c$. By solving these two equations with two variables, I obtain

$$m = \frac{(1-\beta)I}{c} + \frac{(1-\beta)\min[W,I]}{2c} - \frac{\min[W,I]}{2I},$$

$$\delta = \frac{1}{2\sqrt{3}}\left(\frac{\min[W,I]}{I} - \frac{(1-\beta)\min[W,I]}{c}\right).$$

If $W > I$, then

$$m_b = \frac{(1-\beta)3I}{2c} - \frac{1}{2}$$

and

$$\delta_b = \frac{1}{2\sqrt{3}}\left(1 - \frac{(1-\beta)I}{c}\right).$$

Moreover, $a_s = (1-\beta)I/c$. Thus, it is credible for the auditor to set (m_b, δ_b) to commit to the optimal effort $(1-\beta)I/c$ since all three effort choices result in the same level of effort. Since $\delta_b = \frac{1}{2\sqrt{3}}(1 - \frac{(1-\beta)I}{c})$, I find the vagueness decreases with the optimal level of effort $(1-\beta)I/c$. Hence, the higher the optimal level of effort, the more precise the auditor will prefer the auditing standards to be.

If $W < I$, then $a_s = (1-\beta)W/c$. As shown in the analysis of the scenario in which the auditing standards are perfectly precise, as long as the auditor's wealth satisfies the condition that $(1-\beta)I/c \leq \overline{s}$ (i.e., $W \geq \frac{1-\sqrt{1-(1-\beta)^2I^2/c^2}}{(1-\beta)/c}$), then the total cost of complying with $s = (1-\beta)I/c$ is less than shirking (i.e., exerting effort equal to a_s), and the auditor can credibly commit to $(1-\beta)I/c$. Denote the auditor's wealth by W_m. Note that since the auditor's wealth is less than I, the toughness and vagueness of auditing standards chosen by this auditor will differ from those chosen by an auditor whose wealth is greater than I, since a_v varies with auditor wealth. In this case, a_v equals $\frac{(1-\beta)W_m(1+\sqrt{3}\delta+m)}{2\sqrt{3}\delta c+2(1-\beta)W_m}$. Let both a_v and $m+\sqrt{3}\delta$ equal $(1-\beta)I/c$. By solving these two equations with two variables, I obtain

$$m_m = \frac{(1-\beta)I}{c} + \frac{(1-\beta)W_m}{2c} - \frac{W_m}{2I},$$

$$\delta_m = \frac{1}{2\sqrt{3}}(\frac{W_m}{I} - \frac{(1-\beta)W_m}{c}).$$

In order to show how the properties vary with the auditor's wealth, I compare m_m with m_b, and δ_m with δ_b, and obtain $m_b - m_m = \frac{I-W_m}{2}(\frac{1-\beta}{c} - \frac{1}{I})$ is less than or equal to zero, and $\delta_b - \delta_m = \frac{1}{2\sqrt{3}}(I - W_m)(\frac{1}{I} - \frac{1-\beta}{c})$ is greater than or equal to zero. Therefore, an auditor with medium wealth will prefer tougher and more precise standards than a large auditor in order to commit to the same level of effort as the large auditor.

If $W_s < \frac{1-\sqrt{1-(1-\beta)^2 I^2/c^2}}{(1-\beta)/c}$, then the total cost of exerting effort equal to $a_s = (1-\beta)W_s/c$ is less than the cost of complying with $s = (1-\beta)I/c$. Hence, it is not credible for the auditor to choose m and δ such that a_v and $m + \sqrt{3}\delta$ equal $(1-\beta)I/c$. However, he can choose m and δ such that a_v and $m + \sqrt{3}\delta$ equal $(1-\beta)W_s/c + \epsilon$, where ϵ is a small positive number. As defined in Section 3.4.1, the factor ϵ equals $\overline{s} - (1-\beta)W_s/c$ where $\overline{s}$ is the level of standards that results in auditor indifference between complying and noncomplying (i.e., $\overline{s} = \sqrt{\frac{2}{c}(1-\beta)W_s - \frac{(1-\beta)^2 W_s^2}{c^2}}$). This level of effort is credible because the total cost of exerting effort equal to a_s will not be smaller than the cost of committing to $(1-\beta)W_s/c + \epsilon$.

Let both a_v and $m + \sqrt{3}\delta$ equal $(1-\beta)W_s/c + \epsilon$. By solving these two equations with two variables, I obtain

$$m_s^* = \frac{(1-\beta)3W_s}{2c} + \epsilon - \frac{1}{2}\frac{(1-\beta)W_s/c}{(1-\beta)W_s/c + \epsilon},$$

$$\delta_s^* = \frac{1}{2\sqrt{3}}[\frac{(1-\beta)W_s/c}{(1-\beta)W_s/c + \epsilon} - \frac{(1-\beta)W_s}{c}].$$

In order to show how the properties vary with the auditor's wealth, I compare m_s^* with m_m, and δ_s^* with δ_m, and find that the relations are uncertain. $\delta_m - \delta_s^* = \frac{1}{2\sqrt{3}}(\frac{W_m}{I} - \frac{(1-\beta)W_m}{c} - \frac{(1-\beta)W_s/c}{(1-\beta)W_s/c+\epsilon} + \frac{(1-\beta)W_s}{c})$. $-\frac{(1-\beta)W_m}{c} + \frac{(1-\beta)W_s}{c} < 0$, and whether $\frac{W_m}{I} - \frac{(1-\beta)W_s/c}{(1-\beta)W_s/c+\epsilon}$ is greater than or less than zero depends on W_s/W_m.

Comparing the properties chosen by the wealthiest auditor with those set by the least wealthy auditor (m_b vs. m_s^* and δ_b vs. δ_s^*), I obtain

$$\delta_s^* - \delta_b = \frac{1}{2\sqrt{3}}[\frac{(1-\beta)(I-W_s)}{c} - \frac{\epsilon}{(1-\beta)W_s/c + \epsilon}],$$

$$m_b - m_s^* = \frac{(1-\beta)(I-W_s)}{2c} + [\frac{(1-\beta)I}{c} - \frac{(1-\beta)W_s}{c} - \epsilon] - \frac{\epsilon}{2((1-\beta)W_s/c + \epsilon)},$$

where $\epsilon+(1-\beta)W_s/c = \overline{s} = \sqrt{(2-(1-\beta)W_s/c)(1-\beta)W_s/c} < (1-\beta)I/c$.

I find that $\delta_s^* - \delta_b$ can be greater than zero as well as less than zero depending on the exogenous parameters. To explain this point, I simplify $\delta_s^* - \delta_b$ to

$$\delta_s^* - \delta_b = \frac{1}{2\sqrt{3}}(a^* - a_s - 1 + \sqrt{\frac{a_s}{2-a_s}}),$$

since $a_s = (1-\beta)W_s/c$ and $a^* = (1-\beta)I/c$. This shows that the sign of $\delta_s^* - \delta_b$ depends on two effects: $a^* - a_s > 0$ and $-1+\sqrt{\frac{a_s}{2-a_s}} < 0$. Since there are four exogenous variables β, c, W_s, and I, the conditions under which $\delta_s^* - \delta_b$ is greater than zero or less than zero depends on all these variables. Figure 3.11 illustrates the plot of how the levels of vagueness chosen by auditors with different wealth levels varies with the exogenous variables.

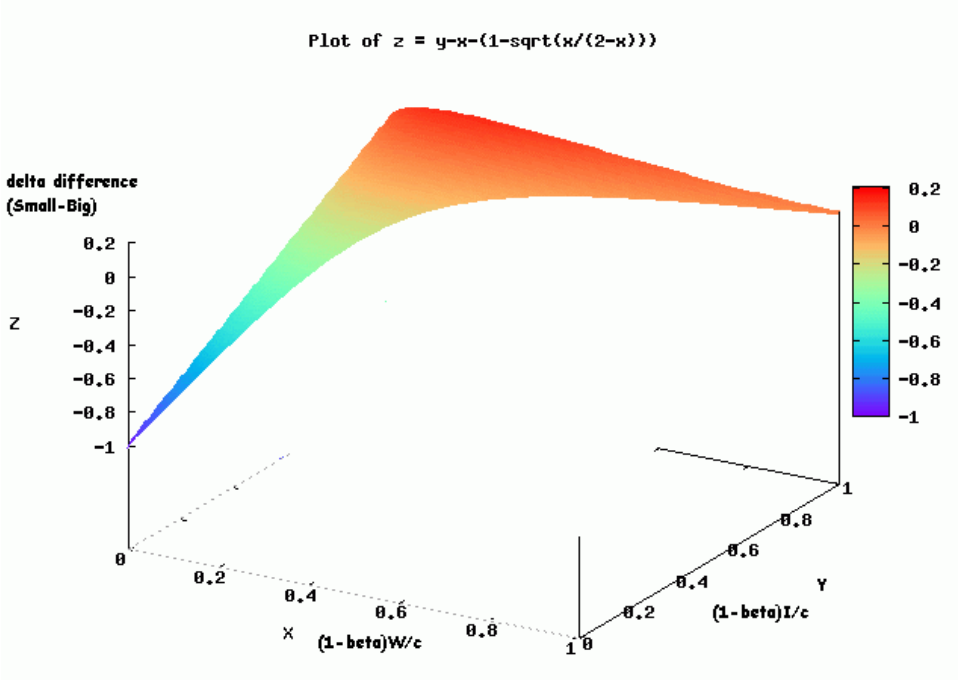


Figure 3.11: How $\delta_s^* - \delta_b$ varies

As shown in the previous section, the auditors can be classified into three categories based on their wealth: $W \geq I$ (large auditors), $\frac{1-\sqrt{1-(1-\beta)^2I^2/c^2}}{(1-\beta)/c} \leq W < I$ (medium auditors), and $W < \frac{1-\sqrt{1-(1-\beta)^2I^2/c^2}}{(1-\beta)/c}$ (small auditors). They have different preferences over the vagueness, although auditors within

each group may have the same preference. For the first two groups of auditors, the optimal level of effort $(1-\beta)I/c$ is greater than $\overline{s}$, but medium auditors choose tougher and more precise auditing standards than larger auditors to commit to the same level of effort. For the third group, the optimal level of effort $(1-\beta)I/c$ is less than or equal to $\overline{s}$. Whether the third group of auditors prefer more or less precise auditing standards than the second group is uncertain. The relation is similar to that between the third and first group. Figure 3.11 shows the different vagueness preferences of auditors whose wealth falls into the first vs. third category. It indicates that in a certain region, small auditors will set more precise auditing standards than large auditors. When the optimal level of effort $a^* = (1-\beta)I/c$ is close to "one" (very large, or in the upper left corner in Figure 3.11), then large auditors prefer more precise standards than small auditors (i.e., $\delta_s^* - \delta_b > 0$). The intuition is that the large auditor would like the auditing standards to be precise in order to avoid exerting too high level of effort when the optimal level of effort is very already high.

To summarize, the auditor chooses the toughness and vagueness of auditing standards to commit to the optimal level of effort. In this example, auditors with medium wealth will choose tougher and more precise auditing standards than large auditors in order to commit to the same level of effort as the large auditors. However, small auditors might choose vaguer and less tough or more precise and tougher auditing standards than the medium and large auditors, because the effort level to which they can commit is less than that of the other two types of auditors. Figure 3.11 indicates that for the same level of high a^*, the difference of vagueness increases as the small auditor's wealth decreases. Hence, for the same level of high a^*, as the small auditor's wealth decreases, small auditors will set more and more vague auditing standards as compared to large auditors. When the optimal level of effort a^* is small, as small auditors' wealth decreases, they will set more and more precise auditing standards compared to large auditors.

3.6 Sensitivity Check

3.6.1 The Generalization of Results to Other Distribution Assumptions

In this section, I show that the above results are not restricted by the uniform distribution assumption. Shavell (1987) proved that the injurer will exercise more care than the average level of due care as long as the distributions of due care exhibit the following two properties:

1. there is uncertainty over the level of due care;

2. the probability that the absolute size of the deviation from the demanded effort exceeds any given positive magnitude approaches zero as the variance approaches zero.[29]

Many families of distributions satisfy the above two properties (for instance, uniform distribution or normal distribution). Note that there is no need for the distributions to be symmetric about zero; it is required only that there be some positive probability that due care is higher than the average level.

Shavell (1987) states that if the distribution is highly dispersed, then it is possible that injurers will choose a level of effort less than the average level of due care. For example, suppose that the error/deviation of average due care is uniformly distributed over an extremely large interval and the average level of due care is set at the optimal level. In this case, injurers will be found negligent with a probability of about 0.5 over a wide range of the care level. Hence, their situation would approximate that of parties who would be held strictly liable with a probability of 0.5, and they would thus choose a care level lower than the average level of due care.

Applying Shavell's idea to the audit setting, one observes that it is consistent with my finding that the audit effort is mostly greater than the mean of the distribution, that is, the average level of due care. It is less than the mean only if the vagueness level is quite high.

To demonstrate that the results in which the audit effort first increases with vagueness and then decreases after vagueness passes a critical point are robust to other distribution assumptions, I assume that the level of auditing standards is distributed normally. Since the cumulative distribution function (CDF) of normal distribution includes an "erf" function which can not be solved numerically, I analyze this problem using a figure. Figure 3.12 illustrates the CDF of a normal distribution and the CDF of another distribution with the same mean and different variance. The distribution indicated by a dotted line has a greater variance than the one by a solid line.

If the optimal effort chosen by the auditor is greater than the mean, then a distribution with a greater variance will cause a lower probability of compliance than a distribution with less variance. A lower probability of compliance induces the auditor to work harder. Hence, in this case, auditor effort will increase as the vagueness increases. This is consistent with the increasing section of the auditor's reaction function over vagueness. If the optimal effort chosen by the auditor is less than the mean, then a distribution

[29] An injurer is the one who causes physical harm or damage to others.

with less variance will cause a lower probability of compliance than one with greater variance. More precise auditing standards lead to a larger audit effort in this case. This result is consistent with the decreasing section of the auditor's reaction function over vagueness.

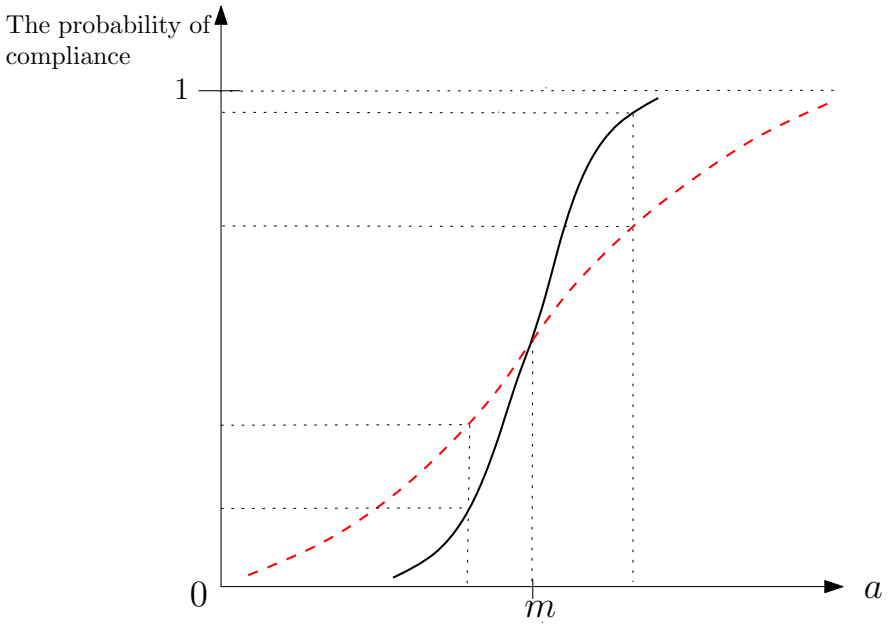


Figure 3.12: CDFs of normal distributions with the same mean and difference variance

To summarize, since the analysis of the standard-setters' choices of auditing standards is based on the auditor's effort reaction function of the vagueness, the results derived from this analysis should be robust to other distribution assumptions that have the above-mentioned two properties.

3.6.2 New Functional Form Assumptions

In the previous model, I assume the probability of audit failure given a bad project is $1 - a$, which implies that $a \in [0, 1]$. However, the audit effort should be only greater than or equal to zero and it can be a large positive number. Therefore, in this section I examine whether the previous results are sensitive to specific function forms by changing the functional form assumptions. Now I assume that the probability of audit failure is $\exp(-a)$ which is between zero and one when $a \geq 0$. To solve a closed form

solution, I also assume that the audit resource cost is ca instead of $\frac{1}{2}ca^2$.

Under the new assumptions, the investors' net payoff is:

$$(1-\beta)I(1-\exp(-a)) - F + (1-\beta)\exp(-a)(1-P(a))\min[W,I]. \quad (3.6.1)$$

IR is

$$F - ca - (1-\beta)\exp(-a)(1-P(a))\min[W,I] \geq 0. \quad (3.6.2)$$

IC is

$$a \in \operatorname{argmax} F - ca - (1-\beta)\exp(-a)(1-P(a))\min[W,I]. \quad (3.6.3)$$

The first-best level of audit effort is $a^* = \ln\frac{(1-\beta)I}{c}$ and the second-best level of audit effort under a strict liability regime is $a_s = \ln\frac{(1-\beta)\min[W,I]}{c}$. The rent, either obtained by the investors or the auditor, is $(1-\beta)I(1-\exp(-a)) - ca$ and it is maximized at $a^* = \ln\frac{(1-\beta)I}{c}$.

It is straightforward to prove that the previous results are robust to these changes. In the previous assumption, I obtain $\frac{da_v}{d\delta} < 0$ due to the restriction that $a \in [0,1]$. Under the current assumption that the probability of audit failure given a bad project is $\exp(-a)$, the relation between a_v and δ becomes unclear.

To solve for a_v, I have

$$a_v = \operatorname{argmin}\ ca + (1-\beta)\exp(-a)(1-\frac{1}{2}(\frac{a-m}{\sqrt{3}\delta}+1))\min[W,I].$$

The first-order condition implies

$$\frac{2\sqrt{3}\delta c}{(1-\beta)\min[W,I]} = \exp(-a)(\sqrt{3}\delta + m + 1 - a).$$

Taking derivative with respect to δ on both sides of the equation implies

$$\frac{da}{d\delta} = \frac{\sqrt{3}\left(1 - \frac{2c}{\exp(-a)(1-\beta)\min[W,I]}\right)}{(\sqrt{3}\delta + m + 2 - a)}.$$

Therefore, if $a \leq \ln\frac{(1-\beta)\min[W,I]}{2c}$, then $\frac{da}{d\delta} \geq 0$, and if $a > \ln\frac{(1-\beta)\min[W,I]}{2c}$, then $\frac{da}{d\delta} < 0$. However, the lowest possible level of effort is $a_s = \ln\frac{(1-\beta)\min[W,I]}{c}$, thus it is not reasonable to have $a \leq \ln\frac{(1-\beta)\min[W,I]}{2c}$. Therefore, the auditor's reaction function indicates that auditor effort will increase with the vagueness of auditing standards when the equilibrium level of effort is $m + \sqrt{3}\delta$,

and it will decrease with the vagueness if the equilibrium level of effort is a_v. If $a^\dagger = a_s$, then the vagueness of auditing standards will not affect the auditor's effort. The basic result related to the auditor's choice of the properties of the auditing standards is not changed. The auditor will still choose a certain m and δ to signal his effort to be the optimal effort level.

3.6.3 Compliance with Auditing Standards is not Sufficient to Protect the Auditor from Liability

Prior literature claims that professional standards are not a perfect substitute for due care because complying with GAAS does not immunize the auditor from liability (Schwartz 1998, Zhang 2007, and Jurinsky 1987). Hence, I relax the assumption that compliance with auditing standards defines due care. As discussed in Schwartz (1998), the probability of being found liable is lower when there is an auditing standard and auditors comply with it than when there is no auditing standard. The probability of being found liable is reduced if the auditor complies with the auditing standards, even if it is not reduced to zero. This reduction motivates the auditor to comply with the auditing standards, and use the toughness and vagueness of auditing standards to signal his choice of effort. Therefore, the prior results are not sensitive to the change of this assumption. This case will be discussed in detail in Chapter 4 section 4.4.

3.6.4 Empirical Predictions

The model predictions generate several testable empirical hypotheses. Proposition 2 (b) states that when there is one firm and many auditors in the market, the toughness set by the investors will likely be higher than the toughness set by the auditors' professional organization. In the U.S., the AICPA, which is the national professional organization for auditors, was at one time able to set the auditing standards for both public and private firms. However, in 2002 the Securities and Exchange Commission (SEC) established the PCAOB, which represents investors' interests, and authorized this organization to set auditing standards for public firms. This authority transfer provides a unique setting for the examination of this analytical prediction. It implies that the auditing standards set by the PCAOB are tougher than those set by the AICPA. Tougher auditing standards will induce auditors to work harder, and therefore I form the first hypothesis:

H1: Auditors are expected to have been working harder since the PCAOB became the standard-setter in the United States.

Proposition 3 (b) predicts that the auditor will choose auditing standards vaguer than the minimum attainable vagueness if the toughness is fixed at a non-optimal level. After the massive accounting scandals in the U.S., the regulators want to avoid blame for potential future scandals, and so set up the PCAOB to oversee the auditors and authorized the PCAOB to set the auditing standards. The PCAOB will set tough auditing standards, and it is quite unlikely that the auditors will lobby for less tough auditing standards. It is difficult for auditors to lobby for less tough rules, because it places them under suspicion of conducting low-quality audits. Hence, this situation implies that the toughness of auditing standards was too tough when the PCAOB set the standards. Therefore, I form the second hypothesis:

H2: Both auditors and investors would have lobbied for vaguer auditing standards when the PCAOB requested comments.

On April 8, 2004, the SEC proposed PCAOB Auditing Standard No. 2 (A.S.2) and requested public comments. A.S.2 ("An audit of internal control over financial reporting performed in conjunction with an audit of financial statements") establishes requirements and provides directions that apply when an auditor is engaged to audit both a company's financial statements and the management's assessment of the effectiveness of internal control over financial reporting. On June 7, 2007, the PCAOB proposed Auditing Standard No. 5 (A.S.5), "An audit of internal control over financial reporting that is integrated with an audit of financial statements, and related independence rule and conforming amendments". These two standards relate to the same issue. Since A.S.5 is the revision of A.S.2, Proposition 3 (b) implies that A.S.5 should be vaguer than A.S.2. Therefore, I form the third hypothesis:

H3: The revised PCAOB auditing standards (A.S.5) should be vaguer than the previously proposed PCAOB auditing standards (A.S.2).

In summary, this section described the empirical hypotheses that were generated by the analytical findings in this chapter. I will conduct these empirical tests in Chapter 5.

3.7 Conclusion

Most studies in the current audit literature assume that auditing standards are precise. In practice, the auditors cannot simply apply the standards, since the standards are not specified in every situation. It was expected by the majority of capital market participants that auditor self-interest could

drive the standard-setting process. However, after the massive accounting scandals of 2002 (e.g., Enron, WorldCom, Sunbeam, AOL, etc.), people began to question the effectiveness of self-regulation.

This chapter provides an analytic framework for determining how standard-setters choose the toughness and vagueness of auditing standards. I first build a model that assumes the auditing standards are perfectly precise, and determine the toughness of auditing standards chosen by auditors and investors, as well as the wealth effect on the choice of the toughness. Next, I assume the auditing standards are vague, and analyze how the vagueness affects the auditor's effort choice. Third, I find the optimal vagueness level of auditing standards set by different parties.

The model predicts that when auditing standards are vague, if the toughness and vagueness of auditing standards are choice variables, both the auditor and the investors weakly prefer precise auditing standards. However, if the toughness is fixed at a non-optimal level, then both would prefer auditing standards vaguer than the minimum vagueness. Moreover, large audit firms prefer vaguer auditing standards than small audit firms, because they have larger wealth at risk and uncertainty can help them commit to a higher level of effort.

The analysis in this chapter yields several testable empirical implications:

H1: Auditors are expected to have been working harder since the PCAOB became the standard-setter in the United States.

H2: Both auditors and investors would have lobbied for vaguer auditing standards when the PCAOB requested comments.

H3: The revised PCAOB auditing standards (A.S.5) should be vaguer than the previously proposed PCAOB auditing standards (A.S.2).

I develop the empirical results related to these predictions in Chapter 5.

To summarize, this chapter analyzes the economic forces driving the process of setting auditing standards under a negligence-based liability regime with due care defined by auditing standards. My analysis shows that the auditor and investors may have the same preferences concerning the vagueness and toughness of auditing standards if there is only one auditor in the market. They both weakly prefer precise auditing standards and choose the toughness of auditing standards to be the level of effort that maximizes their wealth. However, if there are many auditors in the market and the auditors' professional organization represents all auditors' interests, then the toughness chosen by the audit organization would be lower than that chosen by the investors.

Chapter 4

The Strength of Legal Liability Regimes

4.1 Motivation

Chapter 3 illustrates the economic driving forces behind the process of setting auditing standards given a specific type of legal liability regime: a negligence-based liability regime with due care defined by auditing standards. I have studied the standard-setters' (auditors' or investors') preferences for the properties of auditing standards under this type of legal regime. I find that both auditors and investors weakly prefer precise auditing standards if they can also choose the toughness of auditing standards. If the toughness is fixed at a non-optimal level, the players would prefer vaguer auditing standards. Moreover, auditors' preferences concerning the properties of the auditing standards are affected by their wealth.

The "strength" of legal liability regimes refers to the probability that an auditor will be sued and found liable after an audit failure. Note that I assume investors will always sue the auditor if an audit failure occurs, and litigation friction and damage payment are constant. Hence, in this thesis, the strength of legal regimes is only the likelihood of an auditor being found liable after an audit failure.

Prior auditing literature shows that the impact of auditing standards on auditors varies with legal liability regimes. Schwartz (1998) explores the relation between professional standards and auditors' legal liability. She points out that the commitment to auditing standards can not help the auditor avoid liability if liability is determined based on the strict liability rule or based on a negligence rule with a clearly specified due care that is not based on auditing standards, because under these two liability rules courts do not need to refer to auditing standards to establish fault.

Auditors' performances vary with the legal liability regimes as discussed in Choi et al. (2008). They analyze the effect of the strength (or strictness) of legal regimes on auditor effort and audit fees. Since the legal liabilities

associated with audit failures are an important factor motivating auditors to expend effort in the performance of audits, the audit effort/fee will vary with the strength of legal liability regimes. Choi et al. find that audit fees increase monotonically with the strength of a country's legal liability regime.

The litigation liability environment faced by U.S. auditors varies over time. Beginning around the mid-1980s, concerns about auditor liability became very intense. Litigation relating to auditors fell under a "joint and several" liability regime. Under this regime, an auditor who is held jointly and severally liable must also pay damages on behalf of a bankrupt company, even if the auditor is found responsible for only a small fraction of the total liability (Narayanan 1994). Reacting to the litigation crisis, the Big Six (the six wealthiest American auditing companies existing until the 1990s) issued a statement of position in 1992 calling for extensive reforms of federal and state liability laws affecting public accountants (ArthurAndersen et al. 1992). In response to this proposal, the Private Securities Litigation Reform Act of 1995 replaced "joint and several" liability with "proportionate" liability. The proportionate liability rule requires the defendants to pay damages in proportion to their degree of fault (Chan and Pae 1998). The stunning collapse of Arthur Andersen just a few years following the passage of legislation that limits auditors' legal liability triggered the passage of the Sarbanes Oxley Act (SOX) of 2002. This move again changed the litigation environment considerably.

The history of auditing standards has been shaped by responses to a series of accounting scandals in the U.S. Under the joint and several liability rule, the legal regime was so strong that compliance with auditing standards did not necessarily help auditors reduce the risk of liability, since they would have to pay for all damages in the case of a bankrupt client company, even if they complied with auditing standards. Under a proportionate liability rule, compliance with auditing standards can help reduce the auditor's liability, because under this regime, the auditor is only liable according to the degree of fault, and the courts resort to auditing standards to define due care. The auditing standards became more important for audit regulation after the legal regime changed to the proportionate liability rule. Audit quality was supposed to be improved by this 1995 regime change. However, the surprising accounting scandals around 2002 aroused public investors to question the regulatory effect of auditing standards set by the AICPA. They requested tougher and more precise auditing standards to regulate the auditors.

The strength of legal liability regimes for auditors also differs between countries. The regimes in some countries are fairly weak, such that even if the auditors do not comply with the auditing standards, they might not be

held liable. On the other hand, the legal regimes in some countries are very strong, such that even if the auditors comply with the auditing standards, they can still be held liable. Wingate (1997) developed a measure called the "litigation index" to capture the strength of a country's legal regime.[30] The index ranges from 1 to 15, with the U.S. (Pakistan) taking the highest (lowest) value of 15 (1). In the U.S., violation of auditing standards is considered prima facie evidence of having provided a negligent audit, but compliance does not immunize the auditor from liability. In contrast, the auditors' litigation risk is very low in European countries where the audit firm pays very little to investors after an auditor failure.

Regardless of what legal regime a country has, there are always auditing standards to regulate the auditors, and these standards differ between countries. For example, the legal liability regime in the U.S. is strongest and the auditing standards are also the toughest and most precise compared to those of other countries. It is interesting to investigate why auditing standards are as they are under different legal liability regimes. I have discussed how auditing standards are determined under one type of legal regime, but I have not yet analyzed how this standard-setting process is affected by the strength of various legal liability regimes. To understand the process of setting auditing standards, I need to look into how the standard-setters' preferences regarding the properties of auditing standards are affected by the strength of legal regimes.

There are two main possibilities. On the one hand, in a stronger legal regime, the auditor will have a higher probability of being held liable for a given level of effort, and therefore may prefer the auditing standards to be more precise and may exert effort equal to the standards to reduce liability. On the other hand, when the legal regime becomes stronger, the auditing standards become less important to the auditors since it is less likely that compliance will help them reduce liability. Thus, the auditor may be indifferent to the auditing standards when the legal liability regime becomes stronger. The answer is not clear a priori, and detailed analysis is required. Therefore, the objective in this section is to analyze how the variation of strength of legal liability regimes affects auditors' or investors' choices of the properties of auditing standards.[31]

[30]The Wingate litigation index is derived from an assessment of litigiousness related to doing business as an auditor in each country, and was developed by an international insurance underwriter for one of the Big 4 audit firms. The index was computed taking into account various institutional factors such as a country's legal, regulatory, political, and economic environments.

[31]Note that the strength of legal liability regimes varies exogenously and it is not the

4.2 The Model

As in Chapter 3, this is a single-period model with two sets of players (prospective investors and an auditor) who are both risk neutral. A firm is seeking to raise capital in the form of additional equity to start a project. (The firm plays no strategic role in the model.) With probability β this project is a good project and generates a cash flow of B (which belongs to the prospective investors), whereas with probability $1-\beta$ it is a bad project and yields zero return in the future. This project needs $\$I$ upfront investment from investors. Assume that $\beta(B-I)+(1-\beta)(0-I) > 0$, so that the investors will invest in the project without knowing the project type, but will not make the investment if they know that the project is bad. The firm manager issues a report in the form of financial statements, which disclose that the project is good. The investors can choose to hire an auditor to issue an audit report with respect to the financial statements in order to obtain an independent assessment of the project. If the auditor is hired, the auditor exerts effort a, obtains a signal, and report the signal. The investors make the investment decisions based on the audit report. If the project is operated, the true type is revealed. If audit failure occurs and the probability of the auditor being found liable is positive, the investors will sue the auditor. The court then determines whether or not the auditor is liable.

To investigate how the strength of legal regimes affects auditors' preferences regarding the vagueness of auditing standards, I include in the model a parameter r to capture the strength of legal regimes of different countries.[32] The higher r is, the stronger the liability regime, and the higher expected liability the auditor will face. Hence, the auditor's expected liability is revised to $EL(a) = (1-\beta)(1-a)r(1-P(a))\min[W, I]$. This r is the probability that the courts judge the auditor to be liable conditional on audit failure and non-compliance with auditing standards. For example, if r equals one, then the court will definitely regard the auditor as liable if an audit failure occurs and if the auditor did not comply with the auditing standards. If r equals $\frac{1}{2}$, then the court will hold the auditor liable with probability $\frac{1}{2}$ conditional on audit failure and non-compliance. If r equals 0, then the regime is the weakest, such that the court will never hold the auditor liable even if an audit failure occurs and the auditor did not comply with the auditing standards.

This notion captures only the types of legal liability regimes weaker than

investors' or auditors' choice.

[32]Note again that the investors' suing strategy is not modeled in this thesis.

the negligence-based liability regime with auditing standards defining due care. The reasons are as follows: when r equals zero, regardless of whether or not the auditor complies with the auditing standards, his expected liability is zero; when r is between zero and one, the probability of being found liable will be discounted by r; and when r equals one, the probability of being found liable is determined by whether the auditor complied with the auditing standards (which is the type of legal regime analyzed in Chapter 3).

There are stronger types of legal regimes. In these regimes, the auditor will be found liable with positive probability even if he complied with the auditing standards, and as the liability regime becomes stronger, it is more likely he will be found liable. Prior research on the U.S. auditing market claims that professional standards are not a perfect substitute for due care, because complying with Generally Accepted Auditing Standards (GAAS) does not immunize the auditor from liability (Zhang 2007, Schwartz 1998, and Jurinsky 1987). To capture this scenario, I assume the probability of being found liable is $1-P(a)+R$ instead of $r(1-P(a))$, where R increases with the strength of legal liability regimes and is conditional on vague auditing standards. The factor R falls into the following region:[33]

$$R \in \begin{cases} 0 & \text{if } a < m - \sqrt{3}\delta \Rightarrow P(a) = 0 \ , \\ [0, P(a)) & \text{if } m - \sqrt{3}\delta \leq a < m + \sqrt{3}\delta \Rightarrow 0 < P(a) < 1, \\ [0, 1] & \text{if } a \geq m + \sqrt{3}\delta \Rightarrow P(a) = 1 \ . \end{cases}$$

Through the definitions of r and R, I find that when $r = 1$ or $R = 0$, the legal liability regime is the negligence-based liability regime with auditing standards defining due care. I use two different models to capture the variation of legal liability regimes. The first model captures the regimes from the weakest type to the negligence-based liability regime with auditing standards defining due care. The second model describes the regimes from the negligence-based liability regime with auditing standards defining due care to the strongest regime. Thus, the negligence-based liability regime with auditing standards defining due care is in the middle in terms of strength, forming the division between stronger and weaker regimes. I refer to this regime as the "benchmark" regime.

I will examine two issues in the following sections: how the variation of legal liability regimes affects the relationship between auditing standards and auditor effort, and how this variation affects the auditor's or investors' preferences concerning the properties of auditing standards. I first examine

[33]This restriction is to ensure that the probability of being found liable is between zero and one.

the case in which the legal regimes are weaker than the benchmark regime (i.e., $EL(a) = (1-\beta)(1-a)r(1-P(a))\min[W,I]$), and then examine how the results in section 4.3 change for the case in which the legal regimes are stronger than the benchmark regime (i.e., $EL(a) = (1-\beta)(1-a)(1-P(a)+R)\min[W,I]$).

4.3 Liability Regime Weaker than the Benchmark Regime

If the auditor exerts an effort level lower than that indicated by the standards, he will be found liable with the probability r instead of 1. If he exerts an effort greater than or equal to the standards, he will not face any liability. Hence, this r discounts the auditor's probability of being found liable. The legal liability regime analyzed in this section is weakly less strict than the negligence-based liability regime with due care defined by the auditing standards.

Since the basic model structure is the same as in Chapter 3, the investors' net payoff, individual rationality (IR) constraint, and incentive compatibility (IC) constraint remain:

$$(1-\beta)aI - F + EL(a), \tag{4.3.1}$$

$$F - c(a) - EL(a) \geq 0 \quad \text{IR}, \tag{4.3.2}$$

$$a \in \underset{\widehat{a}\in[0,1]}{\operatorname{argmax}} F - c(\widehat{a}) - EL(\widehat{a}) \quad \text{IC}, \tag{4.3.3}$$

where the expected liability $EL(a) = (1-\beta)(1-a)r(1-P(a))\min[W,I]$, audit fee is F, the level of effort exerted by the auditor is a, the probability of the project being bad is $1-\beta$, the amount of investment is I, and the auditor's resource cost is $c(a) = \frac{1}{2}ca^2$. In the auditor's expected liability function, there is an additional variable r (the strength of legal regime) multiplied the previous liability function in Chapter 3.

When audit effort is observable, the IC constraint is not binding. I obtain the first-best level of effort:

$$a^* = (1-\beta)I/c. \tag{4.3.4}$$

To determine how the strength of legal liability regimes affects the auditor's choice of first-best level of effort, I compare the above result with the result that does not consider r and find that the total wealth-maximizing level of effort a^* is not affected by the strength of legal liability regimes,

since the expected liability is simply a wealth transfer between the auditor and the investors. The r changes only the expected liability, and therefore the first-best level of effort is not affected by this variable.

4.3.1 Second-best Effort and Perfectly Precise Auditing Standards

For tractability, I assume in this section that the auditing standards are perfectly precise. I analyze how legal regime strength affects the relationship between the auditor's effort and the toughness of the auditing standards, and how the strength of the legal regime influences the auditor's or investors' preferences for the toughness of auditing standards.

How does the Strength of the Legal Regime Affect the Relation between the Toughness of Auditing Standards and Audit Effort?

When audit effort is unobservable, the IC constraint is binding. If the auditor chooses not to comply with the auditing standards, then his effort choice will be

$$a_s = \frac{r(1-\beta)\min[W,I]}{c}. \tag{4.3.5}$$

If he complies with the auditing standards, his effort choice will equal s.

To determine the conditions under which the auditor will comply with the auditing standards, I compare his total cost of complying (i.e., $\frac{1}{2}cs^2$) with his cost of non-compliance (i.e., $\frac{1}{2}ca_s^2 + (1-\beta)(1-a_s)r\min[W,I]$) and obtain the cutoff point where the auditor is indifferent between compliance and noncompliance.

$$\overline{s} = \sqrt{\frac{2}{c}r(1-\beta)\min[W,I] - \frac{r^2(1-\beta)^2(\min[W,I])^2}{c^2}}. \tag{4.3.6}$$

If the standard s is tougher than $\overline{s}$, the auditor will choose not to comply with the auditing standards, and his effort choice will be a_s as defined in Equation 4.3.5. If the auditing standard is less than or equal to $\overline{s}$, then the auditor will choose to comply with the auditing standards, and his effort choice will be s.

After analyzing how the auditor reacts to the toughness of auditing standards, I show how the strength of legal liability regime (i.e., the variation of r) affects the auditor's reaction to the toughness of auditing standards. The static analyses show that the cutoff point $\overline{s}$ increases with the strength r. This implies that as the legal liability regime becomes stronger, the auditor

will comply with a tougher auditing standard. Lemma 4 summarizes the finding. The proof can be found in Appendix C.

Lemma 4. *The highest auditing standards with which auditors will comply increase as the legal liability regime becomes stronger and closer to the benchmark regime.*

How does the Strength of the Legal Regime Affect the Players' Preferences Regarding Toughness?

Auditor's Preference

If the auditor can control the auditing standard-setting process and audit effort is observable, then he will choose the toughness of auditing standards to be the first-best level of effort (i.e., $a^* = (1-\beta)I/c$) to maximize his total wealth. However, since the auditor's effort is unobservable, the toughest auditing standard to which the auditor can credibly commit is $\overline{s} = \sqrt{\frac{2}{c}r(1-\beta)\min[W,I] - \frac{r^2(1-\beta)^2(\min[W,I])^2}{c^2}}$. Therefore, if the first-best level of effort is less than $\overline{s}$, then the auditor can choose the toughness of auditing standards to be the first-best level and credibly commit to it. But if the first-best level of effort is greater than $\overline{s}$, then the auditor will choose the toughness to be $\overline{s}$ instead of a^*. Solving the problem, I obtain that as r increases, it is more likely for an auditor to choose toughness to be a^* rather than $\overline{s}$. Moreover, when the auditor chooses the toughness to be $\overline{s}$, this level of toughness increases with r.[34]

To summarize, the toughness chosen by the auditor increases with the strength of legal liability regimes. The highest toughness that the auditor will choose is the first-best level of effort $(1-\beta)I/c$. Due to their conflicting interests, auditors with different wealth will have different preferences towards the toughness of auditing standards. Since the auditors' professional organization represents all auditors' interests, the toughness chosen

[34]The conditions for an auditor to choose either a^* or $\overline{s}$ is shown as follows. Solving the inequality $(1-\beta)I/c \leq \overline{s}$, I obtain that the auditor with wealth satisfying $\frac{1-\sqrt{1-\frac{(1-\beta)^2I^2}{c^2}}}{r(1-\beta)/c} \leq W < I$ can commit to $a^* = (1-\beta)I/c$, and if $(1-\beta)I/c \leq \frac{2r}{1+r^2}$, then the auditor with $W \geq I$ can commit to $a^* = (1-\beta)I/c$. Therefore, this auditor will choose the toughness of auditing standards to be $(1-\beta)I/c$. Although r does not affect the level of toughness, the higher r is, the more likely it is that the conditions for an auditor to be able to commit to the first-best level of effort can be satisfied. If $W < \frac{1-\sqrt{1-\frac{(1-\beta)^2I^2}{c^2}}}{r(1-\beta)/c}$ or $W > I$ with $(1-\beta)I/c > \frac{2r}{1+r^2}$, then the level of effort to which the auditor can commit is $\overline{s}$, and therefore he will choose the toughness to be $\overline{s}$, which is less than $(1-\beta)I/c$ in this case. This $\overline{s}$ increases with r.

by the organization will be an average depending on different audit firms' bargaining power.

Investors' Preference

If the investors have the power to choose the toughness of auditing standards, their choices also vary with the strength of legal liability regimes. Under the assumption that there is only one auditor in the market, investors will choose the same level of toughness as the auditor. The optimal contract maximizes the total wealth independent of bargaining power. No matter who has the bargaining power, the wealth-maximizing level of effort will be the same. Since the toughness chosen by the auditor increases with the strength of legal liability regimes, the investors' preference for the toughness of auditing standards also increases with legal regime strength. Note that if there are many auditors in the market, then the investors can set the toughness to be the first-best level of effort and hire the auditor who can commit to this level of effort. Since the auditors' professional organization can only set the toughness to be an average of the preferences of different auditors, which is lower than the first-best, the auditing standards set by investors will be tougher than those chosen by the professional organization. Therefore, I obtain the same results as Proposition 2 and one additional finding.

Proposition 5 summarizes formally the additional finding relative to Proposition 2.

Proposition 5. *The toughness of auditing standards chosen by the auditor or investors increases with the strength of legal liability regimes.*[35]

4.3.2 Vague Auditing Standards

The above section shows how the strength of legal liability regimes affects the auditor's choice of effort and influences the auditor's or investors' preferences for the toughness of auditing standards. The auditing standards, like any other standards, are inherently vague, and the vagueness varies between different countries. In this section, I analyze how the strength of legal liability regimes affects the relation between the vagueness of auditing standards and auditor effort, and how the strength of the regime influences the auditor's or the investors' preferences with regard to the vagueness of the standards.

[35]The highest toughness that the auditor will choose is the first-best level of effort $(1-\beta)I/c$.

How does the Strength of the Legal Regime Affect the Relation Between Vagueness and Effort?

I follow the same method as used in Chapter 3 to find the auditor's effort reaction towards vagueness. The results are very similar except that there is a new parameter in the auditor's expected liability function. The incentive constraint implies that the auditor's objective is to choose a level of effort to minimize his total cost, which is the sum of resource cost and expected liability $(1-\beta)(1-a)r(1-P(a))\min[W,I]$. The expected liability is affected by the probability of compliance $P(a)$ and r.

As assumed previously, the standard s follows a uniform distribution with mean m and variance δ^2. Hence, the probability of compliance equals zero if the audit effort is less than $s_l = m - \sqrt{3}\delta$, equals one if the auditor exerts effort greater than or equal to $s_h = m + \sqrt{3}\delta$, and equals $\frac{1}{2}(\frac{a-m}{\sqrt{3}\delta} + 1)$ within the bound. The vagueness of auditing standards is represented by the variance of the distribution δ^2 (or the standard deviation of the distribution δ), and the toughness of auditing standards is indicated by m, the mean of the distribution.

The auditor will choose a level of effort to minimize his total cost, which is:

$$\begin{cases} \frac{1}{2}ca^2 + (1-\beta)(1-a)r\min[W,I] & \text{if } 0 \le a < m - \sqrt{3}\delta \quad (1), \\ \frac{1}{2}ca^2 + (1-\beta)(1-a)r[\frac{1}{2} - \frac{1}{2}\frac{a-m}{\sqrt{3}\delta}]\min[W,I] & \text{if } m - \sqrt{3}\delta \le a < m + \sqrt{3}\delta \quad (2), \\ \frac{1}{2}ca^2 & \text{if } m + \sqrt{3}\delta \le a \le 1 \quad (3). \end{cases}$$

(1) liable with probability r if audit failure occurs

(2) liable with probability $r \times [\frac{1}{2} - \frac{1}{2}\frac{a-m}{\sqrt{3}\delta}]$

(3) not liable at all

Within the range of $[0, m - \sqrt{3}\delta)$, the first-order condition implies that the auditor will exert $a = \frac{r(1-\beta)\min[W,I]}{c}$. Denote this level of effort by a_r.

The auditor will never exert effort greater than $m + \sqrt{3}\delta$, since the auditor's expected liability is zero as long as $a = m + \sqrt{3}\delta$ and his resource cost is $\frac{1}{2}ca^2$, which increases with a. If he exerts a higher level of effort than $m + \sqrt{3}\delta$, there will be no additional benefit since it does not decrease the expected liability payment but increases the resource cost.

If $m - \sqrt{3}\delta \leq a < m + \sqrt{3}\delta$, then $TC(a) = \frac{1}{2}ca^2 + (1-\beta)(1-a)r[1 - \frac{1}{2}(\frac{a-m}{\sqrt{3}\delta} + 1)]\min[W, I]$. The first-order condition with respect to a implies

$$a_{vr} = \frac{r(1-\beta)\min[W, I](1 + m + \sqrt{3}\delta)}{2\sqrt{3}\delta c + 2r(1-\beta)\min[W, I]}.$$

To show how the vagueness of auditing standards affects a_{vr}, I take the derivative of a_{vr} with respect to δ and obtain:

$$\frac{da_{vr}}{d\delta} = \frac{2\sqrt{3}cr(1-\beta)\min[W, I](\frac{r(1-\beta)\min[W,I]}{c} - 1 - m)}{(2\sqrt{3}\delta c + 2r(1-\beta)\min[W, I])^2} < 0.$$

Since $a_r = \frac{(1-\beta)r\min[W,I]}{c}$ and $a \in [0, 1]$ implies $\frac{(1-\beta)r\min[W,I]}{c} - 1 \leq 0$, the level of effort a_{vr} decreases with the vagueness δ. Moreover, the a_{vr} increases with r.

Therefore, the auditor's total cost evaluated at the (conditional) optimum within each range is:

$$\begin{cases} \frac{1}{2}ca_r^2 + (1-a_r)r(1-\beta)\min[W, I] & \text{if } 0 \leq a < m - \sqrt{3}\delta, \\ \frac{1}{2}ca_{vr}^2 + \frac{1}{2}(1 - \frac{a_{vr}-m}{\sqrt{3}\delta})(1-a_{vr})r(1-\beta)\min[W, I] & \text{if } m - \sqrt{3}\delta \leq a < m + \sqrt{3}\delta, \\ \frac{1}{2}c(m + \sqrt{3}\delta)^2 & \text{if } m + \sqrt{3}\delta \leq a \leq 1, \end{cases}$$

Substituting the conditional optimum effort into the cost function and simplifying the function, I obtain the total cost evaluated at each conditional optimum:

$$TC(a_r) = (1-\beta)rM - \frac{(1-\beta)^2r^2M^2}{2c}$$

$$TC(a_{vr}) = \frac{(1-\beta)rM[4\sqrt{3}c(m + \sqrt{3}\delta) - (1-\beta)rM(1 - m - \sqrt{3}\delta)^2]}{8\sqrt{3}\delta[\sqrt{3}\delta c + (1-\beta)rM]}$$

$$TC(m + \sqrt{3}\delta) = \frac{1}{2}c(m + \sqrt{3}\delta)^2$$

where $M = \min[W, I]$, $a_r = \frac{(1-\beta)rM}{c}$, and $a_{vr} = \frac{(1-\beta)rM(1+\sqrt{3}\delta+m)}{2\sqrt{3}\delta c+2(1-\beta)rM}$.

To determine the second-best level of audit effort given vague auditing standards which distribute uniformly under a negligence-based liability regime, I compare these three costs and determine which is lowest. The auditor will choose the conditional optimal level of effort when he achieves the lowest cost by exerting that effort level.

$$a^{\dagger} = \begin{cases} m + \sqrt{3}\delta & \text{if } TC(m + \sqrt{3}\delta) \leq TC(a_r) \text{ and } TC(m + \sqrt{3}\delta) \leq TC(a_{vr}), \\ a_{vr} & \text{if } TC(a_{vr}) \leq TC(a_r) \text{ and } TC(a_{vr}) \leq TC(m + \sqrt{3}\delta), \\ a_r & \text{if } TC(a_r) \leq TC(m + \sqrt{3}\delta) \text{ and } TC(a_r) \leq TC(a_{vr}). \end{cases}$$

The audit fee equals $TC(a^{\dagger})$ and the investors' payoff is $(1-\beta)a^{\dagger}I - \frac{1}{2}ca^{\dagger 2}$.

To determine the particular regions of δ where the auditor will choose one of the three conditional optimal effort choices, I compare the three total costs $TC(m + \sqrt{3}\delta)$, $TC(a_{vr})$, and $TC(a_r)$. The solution of the auditor's effort reaction function towards the vagueness will be divided into three regions by two cutoff points. I will demonstrate how I obtain these cutoff points.

First, I obtain the result that $TC(m + \sqrt{3}\delta)$ is greater than or equal to $TC(a_{vr})$ if a_{vr} is in the region of $[m - \sqrt{3}\delta, m + \sqrt{3}\delta)$.

To see this, denote $(1-\beta)r\min[W, I]/c$ by a_r and $m + \sqrt{3}\delta$ by s.

$$\begin{aligned} & TC(m + \sqrt{3}\delta) - TC(a_{vr}) \\ &= \frac{c}{8\sqrt{3}\delta(\sqrt{3}\delta + a_r)}[4\sqrt{3}\delta(\sqrt{3}\delta + a_r)s^2 - 4\sqrt{3}a_r s\delta + a_r^2(1-s)^2] \\ &= \frac{c}{8\sqrt{3}\delta(\sqrt{3}\delta + a_r)}[12s^2\delta^2 - 4\sqrt{3}a_r s(1-s)\delta + a_r^2(1-s)^2] \\ &= \frac{c}{8\sqrt{3}\delta(\sqrt{3}\delta + a_r)}[2\sqrt{3}s\delta - a_r(1-s)]^2 \\ &\geq 0 \end{aligned}$$

By the definition of a_{vr}, it must be in the region of $[m - \sqrt{3}\delta, m + \sqrt{3}\delta)$. Therefore, $TC(m + \sqrt{3}\delta)$ is greater than or equal to $TC(a_{vr})$ if $a_{vr} \in [m - \sqrt{3}\delta, m + \sqrt{3}\delta)$.

The above analysis shows that if $a_{vr} \in [m - \sqrt{3}\delta, m + \sqrt{3}\delta)$, then $TC(m + \sqrt{3}\delta)$ is greater than or equal to $TC(a_{vr})$. Hence, the auditor will choose effort equal to a_{vr} if a_{vr} is less than $m + \sqrt{3}\delta$. Since the probability of compliance equals "one" if the level of effort is equal to or greater than $m + \sqrt{3}\delta$, the auditor will choose effort equal to $m + \sqrt{3}\delta$ in the region where a is greater than $m + \sqrt{3}\delta$. Letting a_{vr} equal $m + \sqrt{3}\delta$, I obtain the first cutoff point of δ:

$$\delta_1 = \frac{1}{4\sqrt{3}}[\sqrt{(a_r - 2m)^2 + 8a_r} - (a_r + 2m)].$$

In the region where $\delta \in [0, \delta_1)$, the effort a_{vr} is greater than $m + \sqrt{3}\delta$. This contradicts the definition of a_{vr}. Therefore, if δ is less than or equal to δ_1, then $a^{\dagger}$ equals $m + \sqrt{3}\delta$.

Second, comparing $TC(a_{vr})$ with $TC(a_r)$, I find that $TC(a_{vr})$ is less than $TC(a_r)$ if δ is less than δ_2.[36] This cutoff point is less than the point where a_{vr} equals a_r and the cutoff point where a_{vr} equals $m - \sqrt{3}\delta$. Therefore, the auditor will choose $a^\dagger$ equal to a_{vr} if δ is less than or equal to δ_2 and greater than δ_1. If δ is greater than or equal to δ_2, then $TC(a_r)$ is less than $TC(a_{vr})$ and, therefore the auditor chooses $a^\dagger$ equal to a_r.

The auditor's effort reaction function towards δ indicates that the auditor's effort will increase with the vagueness of auditing standards when the equilibrium level of effort is $m + \sqrt{3}\delta$, and it will decrease with the vagueness if the equilibrium level of effort is a_{vr}. If $a^\dagger = a_r$, then the vagueness of auditing standards will not affect the auditor's effort. Therefore, the figure that represents this relationship (Figure 4.1) is very similar to Figure 3.7. However, since the cutoff points δ_1 and δ_2 increase with a_r and a_r increases with r, as r becomes higher, the auditor's effort will increase or decrease with the vagueness to a greater extent. Figure 4.1 illustrates the impact of increasing the strength of legal regimes on the relation between auditor effort choice and the vagueness of auditing standards.

How does the Strength of the Legal Regime Affects the Players' Preferences Regarding Vagueness?

Under regimes weaker than the benchmark regime, the auditor will not be worse off if he chooses precise auditing standards and sets the toughness to be the optimal level to which he can commit or chooses any combination of toughness and vagueness that leads to the committable level of effort. But the committable level of effort and these toughness and vagueness combinations will be influenced by the strength of legal regimes.

Figure 4.1 illustrates the impact of increasing the strength of legal regimes on the relationship between the auditor's effort choice and the vagueness of auditing standards. The figure illustrates that if the toughness is set at an optimal level, then as the legal regime becomes stronger (i.e., r becomes larger), the auditors prefer more precise auditing standards. Since the extent of over-compliance increases with the strength of legal regimes and the auditors are better off if the level of effort is optimal, the auditor will prefer the vagueness to be as low as possible in order to reduce over-compliance. When the regime becomes stricter, the auditor has stronger incentives to choose precise standards. Therefore, if the toughness is fixed at the opti-

[36] The cutoff point $\delta_2 = \frac{2a_r^2+2m-ma_r-3a_r-2\sqrt{a_r^2m^2-ma_r^3-2a_rm^2+2ma_r^2+a_r^4-3a_r^3+m^2-a_rm+3a_r^2-a_r}}{\sqrt{3}(4-3a_r)}$, where $a_r = (1-\beta)r\min[W, I]/c$.

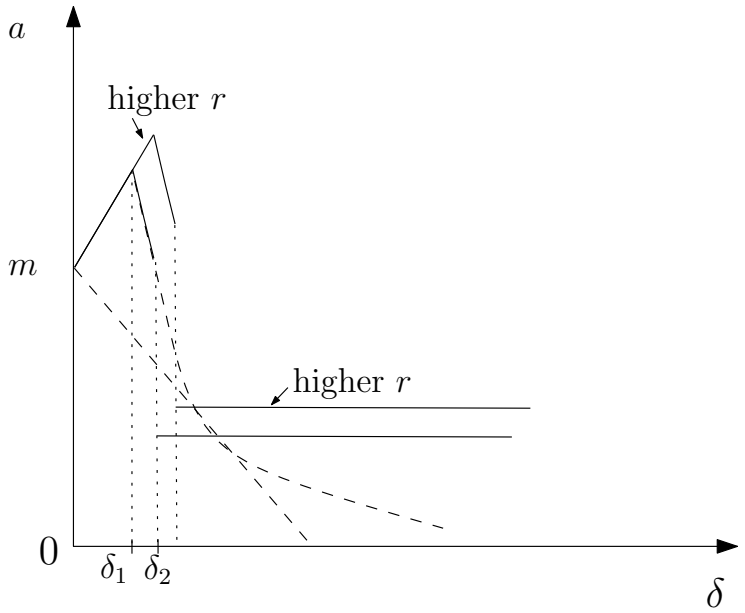


Figure 4.1: The strength of the impact of legal standards on the relation between auditor effort choice and the vagueness of auditing standards if the regime is weaker than the benchmark regime

mal level, the auditor will prefer more precise standards as the legal regime becomes stronger. Proposition 6 summarizes the argument formally.

Proposition 6. *If the toughness is fixed at the optimal level, the auditor prefers more precise auditing standards as the legal liability regime becomes stronger and closer to the benchmark regime.*

4.4 Liability Regime Stronger than the Benchmark Regime

In this section, I analyze a situation in which the liability regime is stronger than the negligence-based liability regime with due care defined by auditing standards. I examine how the strength of legal liability regimes affects the auditor's effort choice under different auditing standards and how the standard-setters (auditor or investors) will choose the properties of auditing standards. In these kinds of legal regimes, compliance with auditing standards does not immunize the auditor from liability. As the regime becomes

stronger, the more likely it is that the auditor will be found liable even if he complied with the auditing standards.

Since the basic model structure is not changed, the investors' net payoff, individual rationality (IR) constraint, and incentive compatibility (IC) constraint remain:

$$(1-\beta)aI - F + EL(a), \tag{4.4.1}$$

$$F - c(a) - EL(a) \geq 0 \quad \text{IR}, \tag{4.4.2}$$

$$a \in \underset{\widehat{a}\in[0,1]}{\operatorname{argmax}} F - c(\widehat{a}) - EL(\widehat{a}) \quad \text{IC}, \tag{4.4.3}$$

where $EL(a) = (1-\beta)(1-a)(1-P(a)+R)\min[W, I]$. In the auditor's expected liability function, the probability of being found liable is determined by $1-P(a)+R$ rather than $1-P(a)$. If the auditor does not comply with the auditing standards at all, then R equals zero, and the probability of being found liable will be one. If the auditor complies with the auditing standards, the probability of being found liable will be indicated by R and in this case R is between zero and one. This notation captures the situation in which the auditor complies with the auditing standards and is still judged liable with probability R.

When audit effort is observable, the IC constraint is not binding. I obtain the first-best level of effort

$$a^* = (1-\beta)I/c.$$

The expected liability is simply a wealth transfer between the auditor and the investors. The R changes only the expected liability, and therefore the first-best level of effort is not affected by adding this variable. It is the same as the first-best level of effort in any other regime.

4.4.1 Second-best Effort and Perfectly Precise Auditing Standards

For tractability, I assume in this section that the auditing standards are perfectly precise. I analyze how the strength of the legal regime affects the relation between auditor effort and the toughness of auditing standards, and how legal regime strength influences the auditor's or investors' preferences regarding the toughness of auditing standards.

How does the Strength of the Legal Regime Affect the Relation Between Toughness and Effort?

When audit effort is unobservable, the IC constraint is binding. The auditor will only comply with the auditing standards if his total cost of compliance $\frac{1}{2}cs^2 + (1-\beta)(1-s)R\min[W,I]$ is less than or equal to the total cost of noncompliance $\frac{1}{2}ca_s^2 + (1-\beta)(1-a_s)\min[W,I]$. Let these two costs equal each other. I obtain the highest level of standards $\overline{s}$ with which the auditor will comply.

$$\overline{s} = \frac{(1-\beta)RM}{c} + \sqrt{\frac{2(1-R)(1-\beta)M}{c} - \frac{(1-\beta)^2M^2(1-R^2)}{c^2}},$$

where $M = \min[W,I]$.

If the standard s is tougher than $\overline{s}$, then the auditor will choose not to comply with the auditing standards, and his effort choice will be

$$a_s = \frac{(1-\beta)\min[W,I]}{c}.$$

If the auditing standard s is less tough than $\overline{s}$, then the auditor will choose to comply with the auditing standards, and his effort choice will be s. The auditor will not have incentive to exert a level of effort greater than s.[37]

After analyzing how the auditor reacts to the toughness of auditing standards, I now show how the strength of legal liability regimes (i.e., the variation of R) affects the auditor's reaction towards the toughness of auditing standards. In contrast to the finding in the section that explores the legal regime weaker than the negligence-based regime with auditing standards defining due care, the static analyses show that the cutoff point $\overline{s}$ decreases with the strength R. This implies that as the legal liability regime becomes stronger, the auditor will comply with a less tough auditing standard. Lemma 5 summarizes the finding. The proof can be found in Appendix C.

Lemma 5. *As the legal liability regime becomes stronger, the toughest auditing standards with which the auditor will comply decrease in toughness. In other words, the auditor will choose to comply with a weaker level of auditing standards.*

[37] Although the expected liability decreases due to lower probability of audit failure, the resource cost increased more than the decrease of expected liability. The auditor's total cost is minimized at $a_r = \frac{R(1-\beta)\min[W,I]}{c}$, which is less than a_s and s. Since the auditor's total cost increases with his effort if the effort is greater than a_r, the cost of exerting effort greater than s will be greater than the total cost of exerting effort equal to s. Therefore, the auditor has no incentive to exert effort greater than s.

The intuition behind the finding is as follows. When the legal regime becomes stronger, the probability of being found liable increases even if the auditor complies with the standards. It will be less costly for him not to comply with the standards. Therefore, the highest possible auditing standards with which the auditor will comply decrease in toughness as the legal regime becomes stronger.

How does the Strength of the Legal Regime Affect the Players' Preference Regarding Toughness?

Auditor's Preference

The auditor's preference for the auditing standards is driven by his objective to maximize his net payoff. The previous analysis shows that if audit effort is observable, his payoff is maximized at the first-best level of effort $(1-\beta)I/c$. Since audit effort is normally unobservable, the auditor can choose a second-best level of effort. If the auditor can control the process of setting the auditing standards, then he might be able to use the auditing standards as a device to commit to this level of effort or commit to a level of effort that is relatively lower but still higher than the noncompliance effort.

To determine the auditor's choice for the toughness of auditing standards, I must first determine the level of effort to which the auditor can commit and the conditions under which this commitment will be credible. The analysis in the previous subsection shows that the auditor will comply with the auditing standards if the toughness is less than or equal to $\overline{s}$, and he will not comply if the toughness is greater than $\overline{s}$. Since the auditor's wealth is observable, the conditions under which the auditor will comply with the auditing standards are public knowledge.

Since the level of effort $(1-\beta)I/c$ is the auditor's first-best choice, the auditor will set the toughness equal to $(1-\beta)I/c$. However, he can only commit to this level of effort if $\frac{(1-\beta)I}{c}$ is less than or equal to $\overline{s} = \frac{(1-\beta)RM}{c} + \sqrt{\frac{2(1-R)(1-\beta)M}{c} - \frac{(1-\beta)^2M^2(1-R^2)}{c^2}}$. The highest level of auditing standard with which the auditor will comply, $\overline{s}$, varies with the auditor's wealth and the strength of legal liability regimes R. Hence, whether $\frac{(1-\beta)I}{c}$ is greater than or less than $\overline{s}$ depends on the auditor's wealth and the strength of legal regimes R.

I will obtain the conditions under which the auditor can set the toughness to a certain level in the following analysis. Solving the inequality $(1-\beta)I/c \leq \overline{s}$, I obtain that the auditor with $W \geq I$ or $\overline{W} \leq W < I$ can commit to

$a^* = (1-\beta)I/c$.[38] Therefore, this auditor will choose the toughness of auditing standards to be $(1-\beta)I/c$. Note that R does not affect this level of toughness. But the cutoff point $\overline{W}$ increases with R. Hence, as the legal regime becomes stronger, it is less likely for an auditor to choose the first-best level of toughness. If $W < \overline{W}$, then the level of effort to which the auditor can commit is $\overline{s}$, and he will therefore choose the toughness to be $\overline{s}$, which is less than $(1-\beta)I/c$, but greater than a_s. Since $\overline{s}$ decreases with the strength of the legal regime, the toughness chosen by small auditors will decrease as the legal regime becomes stronger.

To summarize, the toughness chosen by the auditor decreases with legal liability regime strength. The highest toughness the auditor will choose is the first-best level of effort $(1-\beta)I/c$. As the legal regime becomes stronger, it is less likely for an auditor to choose the first-best level of toughness. In contrast, he will choose toughness to be $\overline{s}$, which decreases with the strength of the legal regime. If there are many auditors with heterogeneous wealth in the market, then, as a result of their conflicting interests, the auditors with different levels of wealth will have different preferences towards the toughness of auditing standards. Since the auditors' professional organization represents all auditors' interests, the toughness chosen by this organization will be an average depending on different audit firms' bargaining power.

Investors' Preference

Under the assumption that there is only one auditor in the market, the investors will choose the same level of toughness as the auditor. As discussed in section 4.3.1, the optimal contract maximizes the total wealth independent of bargaining power. Regardless of who has the bargaining power, the wealth-maximizing level of effort will be the same. Since the toughness chosen by the auditor decreases with the strength of legal liability regimes, the investors' preference for the standards' toughness also decreases with the strength of legal liability regimes. Note that if there are many auditors in the market, then the investors can set the toughness to be the first-best level of effort and hire an auditor who can commit to this level of effort. Since the auditors' professional organization can only set the toughness to be an average of the preferences of different auditors, which is lower than the first-best, the auditing standards set by investors will be tougher than those chosen by the auditors' organization. Therefore, I obtain the same results as Proposition 2 and one additional finding. Proposition 7 summarizes formally the additional finding relative to Proposition 2.

[38] $\overline{W} = RI + \frac{(1-R)c}{1-\beta} - \sqrt{(RI + \frac{(1-R)c}{1-\beta})^2 - I^2}$ and $\overline{W}$ increases with R.

Proposition 7.

a. As the legal liability regimes become stronger than the benchmark regime, small auditors will choose less tough rules, but the large auditors' choice will not be affected.

b. The wealth cutoff point increases with R, meaning that if the regime becomes stronger, more auditors will be classified as small auditors and prefer less tough rules.

As described in Proposition 5, the investors' preference is the same as that of the auditor if there is only one auditor in the market. Otherwise, their preference is the same as that of the large auditors.

Note that Proposition 7 differs from Proposition 5. This result indicates that overall the strength of legal liability regimes can have the opposite impact on the standard-setters' choice of auditing standards as it moves from weaker to stronger than the negligence-based liability regime with due care defined by auditing standards.

Intuitively, if the legal regime is weaker than the negligence-based liability regime with due care defined by auditing standards, then even if the auditor does not comply with the auditing standards, the probability of being found liable decreases as the legal regime becomes weaker, so the auditor will exert less effort than that needed to comply with the standards. If the strength of the legal regime comes closer to that of the negligence-based liability regime, it is more likely that the auditor will be found liable if he does not comply with the standards, so he will work harder as the strength increases. Since the auditor's net payoff increases with his effort in the region of $[0, (1-\beta)I/c]$, the auditor will choose tougher auditing standards (the toughest level is $(1-\beta)I/c$) as the legal regime becomes stronger.

On the other hand, if the legal regime is stronger than the negligence-based liability regime with due care defined by auditing standards, the impact of legal regime strength on the auditor's effort and choice of toughness of auditing standards can be the opposite. The key reason is that even if the auditor chooses to comply with the auditing standards, he can still be judged liable. The probability of being found liable increases when the legal regime becomes stronger. Thus, as the legal regime strengthens, the auditor has less incentive to comply with the auditing standards since it will be too costly for him to comply. But the auditor is better off if he can commit to a level of effort close to $(1-\beta)I/c$, which is greater than $a_s = (1-\beta)\min[W, I]/c$. Since large auditors can credibly commit to $(1-\beta)I/c$ ($(1-\beta)I/c < \overline{s}$), they will choose toughness $(1-\beta)I/c$ and their toughness choice will not

increase with the strength of the legal regime. However, small auditors can only commit to $\overline{s}$, which decreases when the legal regime becomes stronger. Hence, small auditors prefer less tough auditing standards as the strength of the legal regime increases beyond that of the negligence-based liability regime with due care defined by auditing standards.

4.4.2 Vague Auditing Standards

The above section shows how the strength of legal liability regimes affects the auditor's choice of effort and the auditor's or investors' preference toward the toughness of auditing standards. The auditing standards, like any other standards, are inherently vague. The vagueness of auditing standards varies between countries and over time. In this section, I analyze how the strength of legal liability regimes affects the relation between the vagueness of auditing standards and auditor effort, and how regime strength influences the auditor's or investors' preferences regarding the vagueness of auditing standards. Note that the strength discussed in this section falls into the region where the legal regime is stronger than the negligence-based liability regime with due care defined by auditing standards. In other words, even if the auditor complies with the auditing standards, he can still be found liable if audit failure occurs.

How does the Strength of the Legal Regime Affect the Relation Between Vagueness and Effort?

I follow the same method as discussed in the previous sections to determine the auditor's effort reaction towards vagueness. The difference is that the new parameter R is now an additive rather than multiplicative item in the probability of being found liable function, creating the case in which when the auditor complies with the auditing standards (i.e., $1 - P(a) = 0$), the probability of being found liable can still be a positive number R instead of zero.

The incentive constraint implies that the auditor's objective is to choose a level of effort to minimize his total cost, which is the sum of resource cost and expected liability $(1-\beta)(1-a)(1-P(a)+R)\min[W, I]$. The expected liability is affected by the probability of compliance $P(a)$ and R.

As previously assumed, the standard s follows a uniform distribution with mean m and variance δ^2. Hence, the probability of compliance equals zero if the audit effort is less than $s_l = m - \sqrt{3}\delta$, equals one if the auditor exerts effort greater than or equal to $s_h = m + \sqrt{3}\delta$, and equals $\frac{1}{2}(\frac{a-m}{\sqrt{3}\delta} + 1)$

within the bound. The vagueness of auditing standards is represented by the variance δ^2 or the standard deviation δ of the distribution, and the toughness of auditing standards is indicated by m, the mean of the distribution. By definition, the probability of being found liable $1 - P(a) + R$ should be between zero and one, so R falls into the following region:

$$R \in \begin{cases} 0 & \text{if } a < m - \sqrt{3}\delta, \\ [0, P(a)) & \text{if } m - \sqrt{3}\delta \leq a < m + \sqrt{3}\delta, \\ [0, 1] & \text{if } a \geq m + \sqrt{3}\delta \ . \end{cases}$$

Therefore, the auditor will choose a level of effort to minimize his total cost, which is:

$$\begin{cases} \frac{1}{2}ca^2 + (1-\beta)(1-a)\min[W, I] & \text{if } 0 \leq a < m - \sqrt{3}\delta \quad (1), \\ \frac{1}{2}ca^2 + (1-\beta)(1-a)[\frac{1}{2} - \frac{1}{2}\frac{a-m}{\sqrt{3}\delta} + R]\min[W, I] & \text{if } m - \sqrt{3}\delta \leq a < m + \sqrt{3}\delta \quad (2), \\ \frac{1}{2}ca^2 + (1-\beta)(1-a)R\min[W, I] & \text{if } m + \sqrt{3}\delta \leq a \leq 1 \quad (3). \end{cases}$$

(1) liable with probability 1 if audit failure occurs

(2) liable with probability $\frac{1}{2} - \frac{1}{2}\frac{a-m}{\sqrt{3}\delta} + R$

(3) liable with probability R if audit failure occurs

Within the range of $[0, m - \sqrt{3}\delta)$, the first-order condition implies that he will exert $a = \frac{(1-\beta)\min[W,I]}{c}$. Denote this level of effort by a_s. Note that this effort level does not vary with the vagueness or the strength of legal regimes.

The auditor will never exert effort greater than $m + \sqrt{3}\delta$, since the auditor's total cost will increase as a result. The reason is similar to the reason described in Footnote 37.

If $m - \sqrt{3}\delta \leq a < m + \sqrt{3}\delta$, then $TC(a) = \frac{1}{2}ca^2 + (1-\beta)(1-a)[1 - \frac{1}{2}(\frac{a-m}{\sqrt{3}\delta}+1)+R]\min[W, I]$. The first-order condition with respect to a implies

$$a_{vr2} = \frac{(1-\beta)\min[W, I](1 + m + \sqrt{3}\delta + 2\sqrt{3}\delta R)}{2\sqrt{3}\delta c + 2(1-\beta)\min[W, I]}.$$

To analyze how this level of effort a_{vr2} varies with the vagueness of auditing standards, I take the derivative of a_{vr2} over δ.

$$\frac{da_{vr2}}{d\delta} = \frac{2\sqrt{3}c(1-\beta)\min[W, I](\frac{(1+2R)(1-\beta)\min[W,I]}{c} - 1 - m)}{(2\sqrt{3}\delta c + 2(1-\beta)\min[W, I])^2}.$$

It is straightforward to see that the sign of $\frac{da_{vr2}}{d\delta}$ varies with the exogenous variables. Since a_s equals $(1-\beta)\min[W,I]/c$, I substitute a_s into the derivative directly to simplify the notations. I find that if R is greater than or equal to $\frac{1+m-a_s}{2a_s}$, then a_{vr2} increases with the vagueness δ, and if R is less than $\frac{1+m-a_s}{2a_s}$, then a_{vr2} decreases with the vagueness δ. If I take the derivative of $\frac{da_{vr2}}{d\delta}$ over R, I find that R has a positive impact on the relation of a_{vr2} and δ. Hence, I can draw the conclusion that the initial relation of a_{vr2} and δ is negative. In other words, when the legal regime is only slightly stronger than the negligence-based liability regime, the audit effort a_{vr2} decreases with the vagueness δ. When the legal regime becomes considerably stronger than the negligence-based liability regime, the auditor will increase his effort when the vagueness increases. Lemma 6 summarizes the argument formally.

Lemma 6.

a. If the legal regime is slightly stronger than the benchmark regime, the effort the auditor exerts to attempt to be considered in compliance will be reduced as the vagueness increases.

b. If the legal regime is stronger than a critical point, this effort will increase with the vagueness of auditing standards.

The auditor's total cost evaluated at the (conditional) optimum within each range is:

$$\begin{cases} \frac{1}{2}ca_s^2 + (1-a_s)(1-\beta)\min[W,I] & \text{if } 0 \le a < m-\sqrt{3}\delta, \\ \frac{1}{2}ca_{vr2}^2 + \frac{1}{2}(1-\frac{a_{vr2}-m}{\sqrt{3}\delta}+R)(1-a_{vr2})(1-\beta)\min[W,I] & \text{if } m-\sqrt{3}\delta \le a < m+\sqrt{3}\delta, \\ \frac{1}{2}c(m+\sqrt{3}\delta)^2 + (1-(m+\sqrt{3}\delta))(1-\beta)R\min[W,I] & \text{if } m+\sqrt{3}\delta \le a \le 1, \end{cases}$$

To determine the second-best level of audit effort given vague auditing standards that distribute uniformly under a negligence-based liability regime, I must determine which of the costs is lowest. The auditor will choose the conditional optimal level of effort when he obtains the lowest cost by exerting that effort level.

$$a^{\dagger} = \begin{cases} m+\sqrt{3}\delta & \text{if } TC(m+\sqrt{3}\delta) \le TC(a_s) \text{ and } TC(m+\sqrt{3}\delta) \le TC(a_{vr2}), \\ a_{vr2} & \text{if } TC(a_{vr2}) \le TC(a_s) \text{ and } TC(a_{vr2}) \le TC(m+\sqrt{3}\delta), \\ a_s & \text{if } TC(a_s) \le TC(m+\sqrt{3}\delta) \text{ and } TC(a_s) \le TC(a_{vr2}). \end{cases}$$

The audit fee equals $TC(a^{\dagger})$ and the investors' payoff is $(1-\beta)a^{\dagger}I - \frac{1}{2}ca^{\dagger 2}$.

To determine the particular regions of δ where the auditor will choose one of the three conditional optimum effort choices, I compare the three total costs $TC(m+\sqrt{3}\delta)$, $TC(a_{vr2})$, and $TC(a_s)$. The solution of the auditor's effort reaction function towards the vagueness will be divided into three regions by two cutoff points. Both cutoff points increase with R.

The auditor's effort reaction function towards δ indicates that the auditor's effort will increase with the vagueness of auditing standards when the equilibrium level of effort is $m+\sqrt{3}\delta$, and it will either decrease or increase with the vagueness if the equilibrium level of effort is a_{vr2}, depending on R. If $a^{\dagger} = a_s$, then the vagueness of the auditing standards will not affect the auditor's effort. Moreover, since the cutoff points δ_1 and δ_2 increase with R, as R becomes higher, the auditor's effort will increase or decrease with the vagueness to a greater extent. The reaction curves under the two different regime strengths will be similar to the depiction in Figure 4.1. When R is very small, the reaction curve will be the same as that in Figure 4.1. But when R becomes larger, the curve a_{vr2} increases with δ rather than decreases. I provide a figure based on the latter case in order to examine the differences.

Figure 4.2 illustrates the impact of legal regime strength increasing beyond that of the negligence-based liability regime with due care defined by auditing standards on the relation between auditor's effort choice and the vagueness of auditing standards.

How does the Strength of the Legal Regime Affect Preferences Regarding Vagueness?

I have examined how when the legal regime is weaker than the benchmark regime, the auditor's preference for vagueness is affected by the strength of legal regimes. I find that if the toughness is fixed at an optimal level, the auditor prefers more precise auditing standards as the legal liability regime becomes stronger and closer to the benchmark regime. Now, I will demonstrate how this relation changes if the regime is stronger than the benchmark regime.

Figure 4.2 illustrates the impact of increasing legal regime strength (compared to the benchmark regime) on the relationship between auditor effort choice and the vagueness of auditing standards. In comparison with Figure 4.1, I find that the auditor's effort increases with the vagueness before the second cutoff point, rather than increasing and then decreasing. The auditor will have stronger incentives to choose precise auditing standards

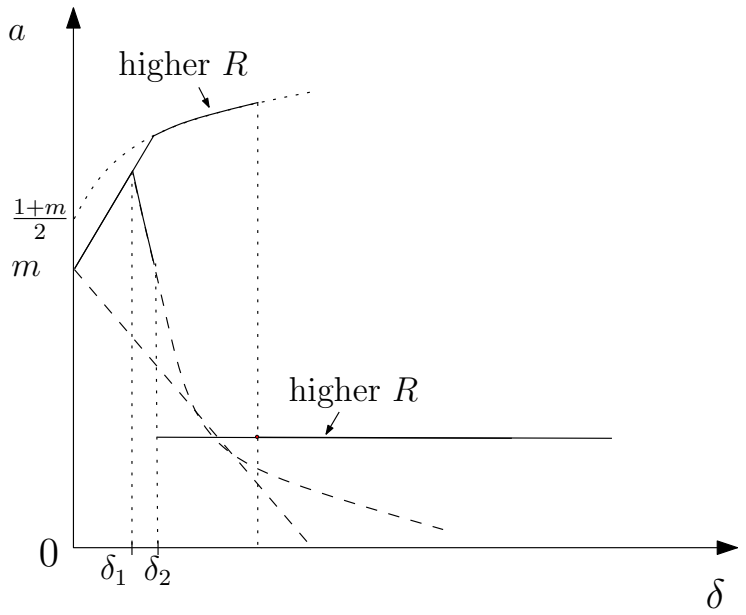


Figure 4.2: The strength of the impact of legal standards on the relation between auditor's effort choice and the vagueness of auditing standards if the regime is stronger than the benchmark regime

as the legal regime becomes stronger (i.e., R becomes larger), if the toughness is set at an optimal level. This is the same result as in Proposition 6. Proposition 8 summarizes the argument formally.

Proposition 8. *If the toughness is fixed at an optimal level, the auditor prefers more precise auditing standards as the legal liability regime becomes stronger.*

Intuitively, when the legal regime becomes stronger, the auditor is more likely to be found liable after an audit failure. He will not choose a vaguer standard that increases his probability of being found liable.

If the investors have the power to determine the properties of the auditing standards, their choices also vary with the strength of legal liability regimes. Under the assumption that there is only one auditor in the market, the investors will set the standards at the same level as the auditor. The optimal contract maximizes the total wealth independent of bargaining power. Regardless of who has the bargaining power, the wealth-maximizing level of effort will be the same, and so will the properties of auditing standards that induce this level of effort. If there are many auditors in the market,

the investors' preference is the same as that of the large auditors due to the limited liability constraint.

Therefore, overall, the standard-setting board (auditors or investors) will choose more precise auditing standards when the legal liability regime becomes stronger, regardless of whether the regime is stronger or weaker than the benchmark case. This result is consistent with the fact that in the U.S., as the legal regime became stronger, the auditing standards became more precise. The legal regime in the U.S. is the strictest compared to other countries, and it also has the most precise auditing standards.

4.5 Conclusion

I have analyzed how variation in the strength of legal liability regimes affects the auditors'/investors' choices of the properties of auditing standards. Since an increase in the strength of the legal regime may have differing impacts on the probability of being found liable function for regimes weaker than the negligence-based liability regime with auditing standards defining due care (benchmark regime) and regimes stronger than the benchmark regime, I investigate this issue in two scenarios: legal regimes weaker and legal regimes stronger than the benchmark regime.

I find that in both scenarios, if the toughness is fixed at the optimal level, then as the legal regime becomes stronger, the auditor tends to prefer more precise auditing standards. This result explains why as the legal regime became stronger in the U.S., the auditing standards became more precise. For example, the regime is stronger after the Sarbanes-Oxley Act of 2002 (SOX) and the PCAOB auditing standards are more precise than the AICPA auditing standards were. The legal regime in the U.S. is stricter than that of any other country, and it also has the most precise auditing standards.

The auditor's preference towards the toughness varies in these two scenarios. In the weaker-than-benchmark case, the auditor prefers the auditing standards to be tougher when the legal regime becomes stronger and closer to the benchmark regime. In the stronger-than-benchmark case, small auditors prefer less tough rules when the legal regime is stronger. There is no impact on large auditors' toughness preference, but more auditors will be classified as small auditors. The investors' preference is the same as the auditor if there is only one auditor in the market. Otherwise, their preference is the same as that of the large auditors.

If the legal regime is weaker than the negligence-based liability regime with auditing standards defining due care, then even if the auditor does not

comply with the auditing standards, the probability of being found liable decreases as the legal regime becomes weaker, so the auditor will exert less effort than that necessary to comply with the standards. If the strength of the legal regime becomes closer to this negligence-based liability regime, it is more likely that the auditor will be found liable if he does not comply with the standards, so he will work harder as legal regime strength increases. Since the auditor's net payoff increases with his effort in the region between zero and first-best effort, the auditor will choose a tougher auditing standard (the toughest level is the first-best level of effort) as the legal regime becomes stronger.

On the other hand, if the legal regime is stronger than the negligence-based regime with auditing standards defining due care, the impact of the strength of legal regime on the auditor's effort and choice of toughness of auditing standards will be the opposite. The key reason is that even if the auditor chooses to comply with the auditing standards, he can still be judged liable. This probability of being found liable increases when the legal regime becomes stronger. Thus, as the legal regime becomes stronger, the auditor has less incentive to comply with the auditing standards, since it will be too costly for him to comply. But the auditor is better off if he can commit to a level of effort close to the first-best level. Since large auditors can credibly commit to the first-best level of effort, which is because the first-best level of effort is less than the toughest level of standard with which they will comply, the toughness they choose will be the first-best level of effort and will not vary as the legal regime becomes stronger than the negligence-based regime. However, small auditors can only commit to a level of standard that decreases when the legal regime becomes stronger. Hence, small auditors prefer less tough auditing standards and more auditors will be classified as small auditors as the strength of the legal regime increases beyond that of the benchmark liability regime. On average, auditors prefer less tough rules when legal liability regimes become stronger.

Chapter 5

Empirical Tests

Chapter 3 generates several testable hypotheses. I examine these hypotheses in this chapter.

5.1 H1: Auditors Have Been Working Harder since the PCAOB Became the Standard-setter in the United States.

5.1.1 Hypothesis Development

Proposition 2 (b) states that when there is one firm and many auditors in the market, the toughness of the auditing standards set by the investors will likely be higher than that set by the auditors' professional organization.[39] In the U.S., the AICPA (the national professional organization for auditors) was at one time able to set the auditing standards for both public and private firms. However, in 2002 the SEC established the PCAOB, which represents investors' interests, and authorized this organization to set auditing standards for public firms. This authority transfer provides a unique setting for the examination of the analytical prediction made in Proposition 2 (b). It implies that the auditing standards set by the PCAOB are tougher than those set by the AICPA. Tougher auditing standards will induce auditors to work harder, and therefore I form the first hypothesis:

H1: Auditors are expected to have been working harder since the PCAOB became the standard-setter in the United States.

5.1.2 Research Method

A direct way to test H1 is to examine whether audit hours increased significantly after the PCAOB became the standard-setter. Audit hours can

[39]This result is derived under the assumption that auditing standards are perfectly precise. It can also be generalized to the case in which vagueness is held constant, that is, given the same level of vagueness, investors will likely set tougher standards than the auditors' professional organization.

be regressed on a dummy variable that equals to "one" in the new auditing standards regime and "zero" otherwise, controlling for firm characteristics. However, the data related to audit hours are not available. I will use audit fee as a proxy for audit effort, because the audit fee increases when auditors work harder. A common methodology has been developed for examining the determinants of audit fees following work by Simunic (1980). As summarized in Hay et al. (2006), the audit fee model takes the following form:

$$\ln f_i = b_0 + b_1 \ln A_i + \sum b_k g_{ik} + \sum b_e g_{ie} + e_i,$$

where $\ln f_i$ is the natural log of the audit fee, $\ln A_i$ is the natural log of a size measure (total assets or revenue or the multiple of assets and revenue), and g_{ik} and g_{ie} are two groups of potential fee drivers. g_{ik} are control variables that have been shown to be significant in prior studies, and g_{ie} are the experimental variables.

Hence, to test H1, I use a univariate t-test and the following regression:

$$\ln \text{Hours or } \ln \text{Fee} = \beta_0 + \alpha \text{ASC} + \beta_1 \text{Complex} + \beta_2 \text{Risk} + \beta_3 \ln \text{Assets} + \epsilon, \tag{5.1.1}$$

where *ASC* is a dummy variable that equals "one" in the new auditing standards regime (2004-2005) and "zero" in the old regime (2000-2001), *Complex* is client complexity (number of business segments), and *Risk* is client business risk or audit risk (leverage, debt divided by total assets). H4 predicts a positive value for α. The Sarbanes-Oxley Act of 2002 (SOX) authorized the PCAOB to establish auditing and related professional practice standards to be used by registered public accounting firms, but the first auditing standards were released by the PCAOB on May 14, 2004. Thus, I regard 2002 to 2003 to be the event transition period. I obtain audit data from the Audit Analytics database, which provides data starting from 2000. So, I have only two years' data before the event period. To match the length of the examining period, I define year 2004 to 2005 as the post-event period. Moreover, Compustat only provided data up to 2005 at the time of data collection.

5.1.3 Sample, Data and Results

Audit fee information is available in the Audit Analytics database. Client characteristics data can be obtained from Compustat North America Industrial Annual and Segment sections. Audit hours data are currently unavailable. Figure 5.1 shows the trend of the natural log of the audit fees from 2000 to 2006. It indicates that the mean (median) audit fee decreases in the event transition period, 2002 to 2003, and increases later on. The mean

(median) and the change of mean (median) for the audit fees from 2000 to 2006 are listed in Table D.1, Table D.2 and Table D.3.

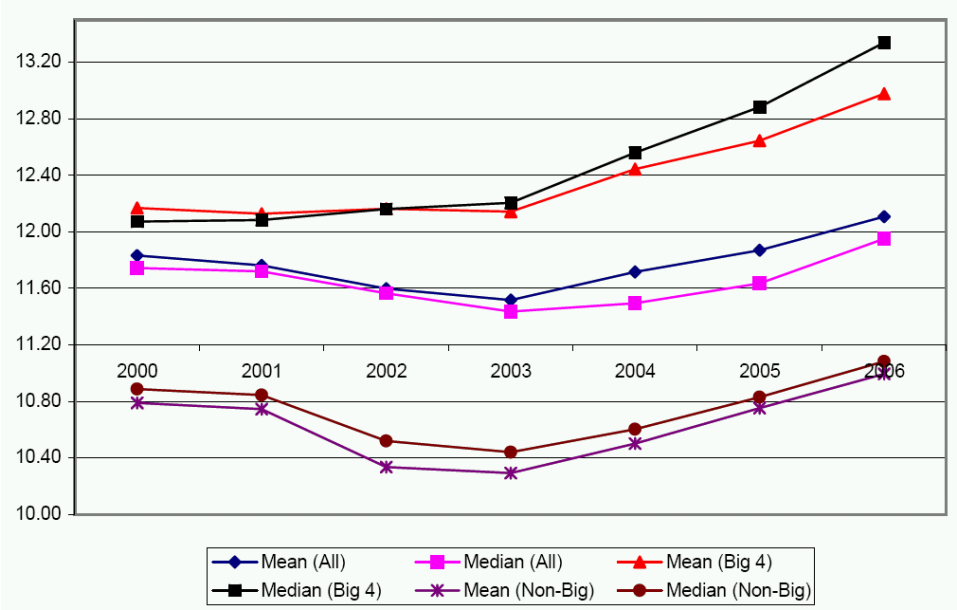


Figure 5.1: Mean (median) audit fee trend

Insert Table D.1, Table D.2, and Table D.3 here.

Overall, the univariate test supports the contention in H1 that auditors have been working harder since the PCAOB became the standard-setter in the United States.

To examine H1 further, I run regression 5.1.1. The descriptive statistics on *Audit Fee*, *Complex*, *Risk* and *LnAsset* appear in Table D.4. The descriptive statistics are based on firm-years in the period 2000 to 2001, and 2004 to 2005, with all data available for the regression. Spearman correlations between variables in audit fee regression 5.1.1 are shown in Table D.5. The regression results appear in Table D.6.

Insert Table D.4, Table D.5, and Table D.6 here.

The coefficient of the treatment variable *ASC* is significantly positive, suggesting that the average audit fee increases after the regulation transition period. This implies that the auditors have, indeed, been working

harder since the PCAOB became the standard-setter in the United States. Consistent with prior research, all of the control variables are significantly positive. The audit fee is higher for larger, more complex, and more risky firms. Therefore, the preliminary empirical results support H1.

5.1.4 Robustness Tests

The Sarbanes-Oxley Act of 2002, Section 404 (SOX 404) requires management and the external auditor to report on the adequacy of the company's internal control over financial reporting. This is the most costly aspect of the legislation for companies to implement, as documenting and testing important financial manual and automated controls requires enormous effort. Therefore, the alternative explanation for the above finding is that the increased fee is caused by the SOX 404 rather than by tougher auditing standards. To exclude this possibility, I focus on the non-accelerated filers and examine whether their audit fee increased when they did not need to comply with the SOX 404 while the PCAOB auditing standards have been effective.

A company that is an "accelerated filer," as defined in Exchange Act Rule 12b-2, as of the end of its first fiscal year ending on or after June 15, 2004, must begin to comply with the management report on internal control over financial reporting disclosure requirements in its annual report for that fiscal year. A company that does not meet this criterion, including foreign private issuers, must begin to comply with the annual internal control report for its first fiscal year ending on or after April 15, 2005 (Securities and Exchange Commission 2003).

To examine the contention that the increased audit effort is caused by tougher auditing standards rather than SOX 404, I must determine what relevant auditing standards issued by the PCAOB were in place before the non-accelerated filers needed to comply with SOX 404. From May 2004 to April 15, 2005, the PCAOB issued and approved three auditing standards: A.S.1 ("Reference in auditors' reports to the standards of the public company accounting oversight board") requires registered public accounting firms to refer to PCAOB standards in their audit reports, rather than using the AICPA GAAS; A.S.2 ("An audit of internal control over financial reporting performed in conjunction with an audit of financial statements") establishes requirements and provides directions that apply when an auditor is engaged to audit both a company's financial statements and the management's assessment of the effectiveness of internal control over financial reporting; and A.S.3 ("Audit documentation") establishes general

requirements for documentation that the auditor should prepare and retain in connection with engagements conducted pursuant to the standards of the PCAOB.

A.S.1 requires registered public accounting firms to refer to the PCAOB standards in their audit reports, and A.S.2 relates to SOX 404. Only A.S.3 relates to a particular auditing issue, and it was approved on August 25, 2004, which was before the non-accelerated filers were required to comply with SOX 404. Therefore, I examine changes in audit fees for a group of non-accelerated filers with fiscal year end between January 1 and April 14, and between August 31 and December 31. The sample selection process is shown in Table 5.1.

Table 5.1: Sample selection

	Observations
Initial sample in Audit Analytics (2000 - 2006)	81,499
Less:	
Firms audited by Arthur Anderson	2,315
Accelerated filers and firms that did not disclose their type	58,818
Firms with fiscal year end between April 15 and Aug 24th	1,987
Total	18,379

Figure 5.2 shows the trend of the natural log of the audit fees of non-accelerated filers from 2000 to 2006. It indicates that the mean (median) audit fee increases significantly in 2004. The mean (median) and the change of mean (median) for the audit fees from 2000 to 2006 are listed in Table D.7, Table D.8 and Table D.9.

Insert Table D.7, Table D.8, and Table D.9 here.

Overall, the univariate test supports the contention in H1 that auditors have been working harder since the PCAOB became the standard-setter in the United States.

To examine H1 further, I run regression 5.1.1. The descriptive statistics on *Audit Fee*, *Complex*, *Risk* and *LnAsset* appear in Table D.10. The descriptive statistics are based on firm-years in the periods 2000 to 2001, and 2004 to 2005, with all data available for the regression. Spearman correlations between variables in the audit fee regression 5.1.1 are shown in Table D.11. The regression results appear in Table D.12. The coefficient

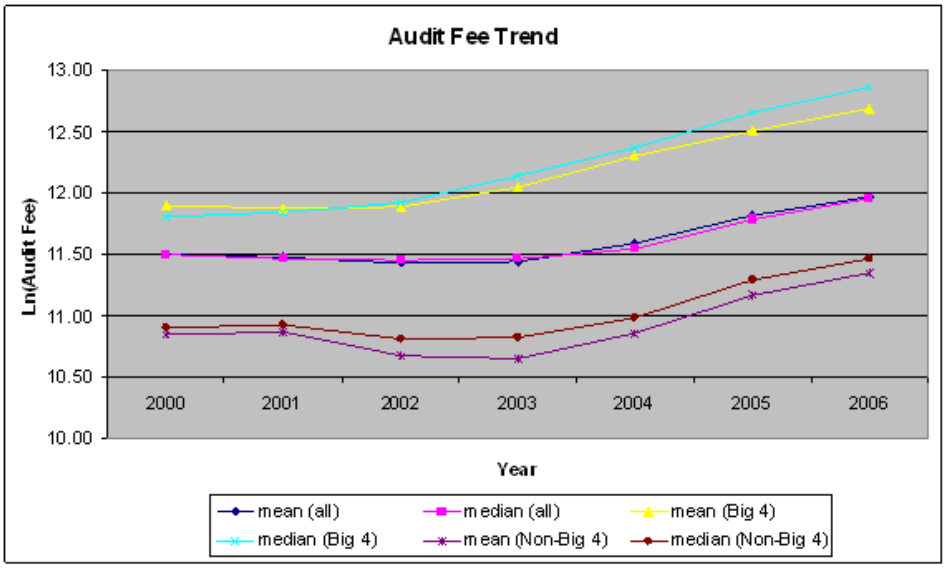


Figure 5.2: Mean (median) audit fee trend (non-accelerated filers)

of the treatment variable *ASC* is still significantly positive, suggesting that the average audit fee increased after the regulation transition period for non-accelerated filers. This result confirms that the auditors have been working harder as a result of the tougher auditing standards set by the PCAOB.

Insert Table D.10, Table D.11, and Table D.12 here.

5.2 H2: Both Auditors and Investors Would Have Lobbied for Vaguer Auditing Standards when the PCAOB Requested Comments.

5.2.1 Hypothesis Development

Proposition 3 (b) predicts that the auditor will choose vaguer auditing standards if the toughness is fixed at a non-optimal level. After the massive accounting scandals in the U.S., regulators sought to avoid blame for potential future scandals, and so created the PCAOB to oversee auditors and authorized the PCAOB to set the auditing standards. The PCAOB will set tough auditing standards, and it is quite unlikely that the auditors will lobby for weaker standards. It is potentially unwise for auditors to lobby for less

tough rules, because it puts them under suspicion of conducting low-quality audits. Hence, this situation implies that the auditing standards were too tough when set by the PCAOB. Therefore, I form the second hypothesis:

H2: Both auditors and investors would have lobbied for vaguer auditing standards when the PCAOB requested comments.

5.2.2 Research Method

As in Lo (2003) and Hochberg et al. (2007), I study the comment letters submitted to the SEC in response to its request for comments on the PCAOB auditing standards. Since the order issued by the SEC approving the proposed auditing standards includes a discussion paragraph that summarizes the comments received, I cite these comments as empirical evidence.

5.2.3 Sample and Data

On April 6, 2004, the SEC proposed PCAOB Auditing Standard No. 1 (A.S.1) and requested public comments. The comment letters are available on the SEC website: http://www.sec.gov/rules/pcaob/pcaob200310.shtml. Note that the standards are quote verbatim.

A.S.1 ("References in Auditors' Reports to the Standards of the Public Company Accounting Oversight Board") requires registered public accounting firms to refer to the standards of the PCAOB in their audit reports, rather than using the GAAS.

On April 8, 2004, the SEC proposed PCAOB Auditing Standard No. 2 (A.S.2) and requested public comments. The comment letters can be found at http://www.sec.gov/rules/pcaob/pcaob200403.shtml.

A.S.2 ("An Audit of Internal Control Over Financial Reporting Performed in Conjunction with An Audit of Financial Statements") establishes requirements and provides directions that apply when an auditor is engaged to audit both a company's financial statements and the management's assessment of the effectiveness of internal control over financial reporting.

On July 14, 2004, PCAOB Auditing Standard No. 3 (A.S.3) was proposed and comments were requested. The comment letters can be downloaded from: http://www.sec.gov/rules/pcaob/pcaob200405.shtml.

A.S.3 ("Audit Documentation") establishes general requirements for documentation that the auditor should prepare and retain in connection with engagements conducted pursuant to the standards of the PCAOB.

On December 21, 2005, PCAOB Auditing Standard No. 4 (A.S.4) was proposed and comments were requested. The comment letters can be found

at: http://www.sec.gov/rules/pcaob/pcaob200501.shtml.

A.S.4 ("Reporting on Whether a Previously Reported Material Weakness Continues to Exist") establishes requirements and provides directions that apply when an auditor is engaged to report on whether a previously reported material weakness in internal control over financial reporting continues to exist as of a date specified by management.

On June 7, 2007, the SEC proposed PCAOB Auditing Standard No. 5 (A.S.5) and requested public comments. The comment letters can be found at: http://www.sec.gov/comments/pcaob-2007-02/pcaob200702.shtml.

A.S.5 ("An Audit of Internal Control Over Financial Reporting That Is Integrated with An Audit of Financial Statements") establishes requirements and provides direction that applies when an auditor is engaged to perform an audit of management's assessment of the effectiveness of internal control over financial reporting that is integrated with an audit of the financial statements.

5.2.4 Results

Order Approving Proposed Auditing Standard No. 1 by the SEC summarized the comments letters for A.S.1 as follows: "The Commission received five comment letters in response to its request for comments on Auditing Standard No. 1. Several commenters sought clarification with respect to certain implementation issues...."

Order Approving Proposed Auditing Standard No. 2 by the SEC summarized the comments letters for A.S.2 as follows: "The Commission received 31 comment letters in response to its request for comments on Auditing Standard No. 2. The comment letters came from issuers, registered public accounting firms, professional associations and others. In general, issuers expressed opposition to the proposed standard, and accounting firms, professional associations, and others expressed support for the proposed standard. Most commenters, irrespective of affiliation or position on the proposed standard, recommended that the Commission and the PCAOB provide additional guidance with respect to a number of different issues. Several commenters issued concerns over some issues..."

Order Approving Proposed Auditing Standard No. 3 by the SEC summarized the comments letters for A.S.3 as follows: "The Commission received eight comment letters. The comment letters came from five registered public accounting firms and three professional associations. In general, commenters expressed appreciation for changes made by the PCAOB to its initially proposed standard. Four commenters expressed concern with the proposed

effective date and recommend the final standard be effective for periods beginning on or after November 15, 2004...."

Order Approving Proposed Auditing Standard No. 4 by the SEC summarized the comments letters for A.S.4 as follows: "The Commission received six comment letters. The comment letters came from four registered public accounting firms and two professional associations. None of the comment letters received were from issuers or investors. In general, the respondents expressed support for the proposed standard. As part of their comment letters, two accounting firms and a professional organization representing the internal audit profession requested guidance on questions regarding the acceptable forms for use in filing management's report and the auditor's report...."

Order Approving Proposed Auditing Standard No. 5 by the SEC summarized the comments letters for A.S.5 as follows: "The Commission received 37 comment letters in response to its request for comments on Auditing Standard No. 5, the related independence rule, and conforming amendments. The comment letters came from issuers, registered public accounting firms, professional associations, investors, and others. In general, many commenters expressed support for the proposed standard....A number of the commenters noted that the new audit standard includes appropriate investor safeguards, will facilitate a more effective and efficient approach to the implementation, and that the PCAOB appropriately responded to concerns raised by issuers, auditors, investors and others. Specifically, some commenters noted that the standard's focus on *principles* rather than *prescriptive requirements* expands the opportunities for auditors to apply well-reasoned professional judgment...." [emphasis added]

Overall, the public (auditors, investors, companies, professional associations) support the PCAOB auditing standards. Among the comments letters for the five auditing standards, there were comments requesting additional guidance for several of the standards. In terms of preferences regarding imprecision or vagueness, the comments letters for A.S.5 show clearly that both auditors and investors asked for vaguer auditing standards. Therefore, the empirical evidence supports the second hypothesis that both auditor and investors would have lobbied for vaguer auditing standards when the PCAOB requested comments.

5.3 H3: Revised PCAOB Auditing Standard No. 5 (A.S.5) Should be Vaguer than the Previously Proposed PCAOB Auditing Standard No. 2 (A.S.2).

5.3.1 Hypothesis Development

On April 8, 2004, the SEC proposed PCAOB Auditing Standard No. 2 (A.S.2) and requested public comments. A.S.2 ("An Audit of Internal Control Over Financial Reporting Performed in Conjunction with An Audit of Financial Statements") establishes requirements and provides directions that apply when an auditor is engaged to audit both a company's financial statements and the management's assessment of the effectiveness of internal control over financial reporting. On June 7, 2007, the PCAOB proposed Auditing Standard No. 5 (A.S.5), "An Audit of Internal Control Over Financial Reporting That Is Integrated with An Audit of Financial Statements". These two standards relate to the same issue. Since A.S.5 is the revision of A.S.2, my model prediction implies that A.S.5 should be vaguer than A.S.2. Therefore, I form the third hypothesis:

H3: Revised PCAOB auditing standard (A.S.5) should be vaguer than the previously proposed PCAOB auditing standards (A.S.2).

5.3.2 Research Method

I primarily use two statistics to measure the vagueness (imprecision) of auditing standards: the Fog index from computational linguistics and the length of the standards. These statistics are usually used to measure readability. For example, Li (2008) uses them to measure annual report readability. The reasons that I use them to measure the vagueness of auditing standards are as follows. Since every audit case is different, more precise (vaguer) auditing standards should have more (less) words describing the requirements for auditors in most audit situations and should be more (less) difficult to read than vaguer (more precise) standards. Therefore, readability can be used as a proxy for vagueness, and the more (less) difficult the auditing standards are to read, the more (less) precise they are.

The Fog index, also called the Gunning Fog index, is a test designed to measure the readability of a sample of English writing. The resulting number is an indication of the number of years of formal education a person requires in order to easily understand the text on the first reading. That is, if a passage has a Fog index of 12, it requires the reading level of a U.S.

high school senior.[40] The index is calculated as follows:

$$\text{Fog} = (\text{words\_per\_sentence} + \text{percentage\_of\_complex\_words}) \times 0.4.$$

According to the index, a complex word consists of three or more syllables. The higher the Fog number, the more difficult the text is to read.

The second measurement is the length of the standards. The more detailed the standards, the longer they are. As in Li (2008), I define the length of the auditing standards as:

$$\text{Length} = \ln(\text{NWords}),$$

where *NWords* is the number of words in the standards. The natural logarithm, rather than the raw number of words, is used in order to eradicate the skewness.

There are two other measures of readability: the Flesch Reading Ease index and the Kincaid index. The Flesch Reading Ease score rates text on a 100-point scale. The higher the score, the easier it is to read the text. This score can be calculated as follows:

$$\text{Flesch} = 206.835 - (1.015 \times \text{words\_per\_sentence}) - (84.6 \times \text{syllables\_per\_word}).$$

The Kincaid index rates text on a U.S. grade school level. So, a score of 8.0 means that the document can be understood by an eighth grader. The higher the score, the more difficult the text is to read. This score is calculated by:

$$\text{Kincaid} = (11.8 \times \text{syllables\_per\_word}) + (0.39 * \text{words\_per\_sentence}) - 15.59.$$

5.3.3 Sample and Data

The auditing standards issued by the PCAOB can be downloaded from the PCAOB website: http://www.pcaob.org/Standards/index.aspx. I will compare PCAOB A.S.2 with A.S.5. H3 predicts that A.S.5 should be vaguer than A.S.2, and therefore the Fog index of A.S.5 should be smaller than that of A.S.2. A.S.5 will have fewer words, a higher Flesch index and a lower Kincaid index.

5.3.4 Results

I use the Lingua::EN::Fathom package and Lingua::EN::Syllable package of the PERL language to calculate the Fog index, Length, the Flesch Reading Ease index and the Kincaid index.[41] Table 5.2 reports these indices for

[40] Cited from http://en.wikipedia.org/wiki/Gunning-Fog_Index.

[41] The PERL is a programming language.

PCAOB A.S.2 and PCAOB A.S.5.

Table 5.2: Comparison of PCAOB A.S.2 and PCAOB A.S.5

Measures	PCAOB A.S.2	PCAOB A.S.5
Fog	22.88	21.52
Length	10.95	10.46
Flesch	10.48	19.89
Kincaid	17.80	15.54

The results in Table 5.2 show clearly that PCAOB A.S.5 is vaguer than PCAOB A.S.2. The Fog index for PCAOB A.S.5 (21.52) is lower than the Fog index for PCAOB A.S.2 (22.88). The length of PCAOB A.S.5 (10.46) is less than the length of PCAOB A.S.2 (10.95). The Flesch index score for A.S.5 is higher than the Flesch index of A.S.2, and the Kincaid score for A.S.5 is lower than that of A.S.2. These results are consistent with H3: A.S.5 should be vaguer than A.S.2.

5.4 Conclusion

This chapter examines the empirical hypotheses generated in Chapter 3: auditors would have been working harder after the PCAOB became the standard-setter in the United States, because the PCAOB would set tougher rules than the AICPA as predicted by the model; both auditor and investors would lobby for vaguer auditing standards when the PCAOB requested comments; the revised PCAOB auditing standards about an audit over internal control (A.S.5) should be vaguer than the previously proposed PCAOB auditing standards (A.S.2). The empirical evidence supports these hypotheses.

Chapter 6

Conclusion

In U.S. accounting history, whenever massive accounting scandals occurred, auditing standards became one of the targets of public criticism. The most recent accounting scandals around 2002 (e.g., Enron, WorldCom, Sunbeam, AOL, etc.) caused the introduction of the Sarbanes-Oxley Act of 2002, the establishment of PCAOB auditing standards, and substantial debates over principle-based vs. rule-based standards. Moreover, auditing standards evolve over time and vary across countries, as does the strength of legal liability regimes. This thesis provides an analytic framework for determining how standard setters choose the toughness and vagueness of auditing standards and how their preferences are affected by the strength of legal liability regimes.

The model predicts that when auditing standards are vague, if the toughness and vagueness of auditing standards are choice variables, both the auditors and the investors weakly prefer precise auditing standards. However, if the toughness is fixed at a non-optimal level (either too high or too low), then both of auditors and investors may prefer vaguer auditing standards.

Small audit firms prefer less tough rules than large audit firms. Investors have the same preference as large audit firms. Since there are more small auditors than large auditors in the auditing standard board of the AICPA and each board member has an equal vote, the toughness of the auditing standards set by the AICPA is likely to be lower than the toughness that would have been chosen by investors. This result is consistent with the authority transfer from the AICPA to the PCAOB in the U.S., since the PCAOB represents investors' interests.

The standard setters' preference regarding toughness varies with the strength of legal regimes. They initially prefer tougher auditing standards as the legal regime becomes stronger. If the legal regimes are stronger than the benchmark regime (negligence-based liability regime with due care defined by auditing standards), they prefer less tough rules as the legal regimes become stronger. Moreover, if the toughness is fixed at an optimal level, then as the legal regime becomes stronger, the standard setters (auditors or investors) tend to prefer more precise auditing standards. This result

is consistent with the fact that in the U.S., as the legal regime became stronger, the auditing standards became more precise. The U.S. has the strongest legal regime, and it also has the most precise auditing standards.

The theory part of the thesis generates several testable hypotheses. Auditors would have been working harder after the PCAOB became the standard-setter in the United States, because the PCAOB would set tougher rules than the AICPA as predicted by the model; both auditor and investors would lobby for vaguer auditing standards when the PCAOB requested comments; the revised PCAOB auditing standards about an audit over internal control (A.S.5) should be vaguer than the previously proposed PCAOB auditing standards (A.S.2). The empirical evidence supports these hypotheses.

This thesis's findings are limited by a set of assumptions (e.g., observable auditor wealth, no Type I error, and etc.). I did not incorporate investors' suing strategy and litigation friction into the model, either. Despite its limitations, this thesis sheds light on different standard setters' economic incentives in influencing the auditing standards-setting process.

In the future research, I will incorporate investors' suing strategy into the analysis and examine how the impacts of the strength of legal regimes on the auditing standards-setting process change. Under the assumption that suing strategy is fixed across different legal regimes, Narayanan (1994) argues that a switch to a proportionate liability regime may increase audit quality levels. In contrast to Narayanan, Chan and Pae (1998) demonstrate that replacing joint and several liability with a proportionate liability rule can decrease the equilibrium audit effort after considering the investors' litigation behavior. When the strength of legal liability regimes increases, investors might be more likely to sue the auditor when an audit failure occurs. Therefore, it would be interesting to regard the "strength" of legal regimes as the joint probability of auditor being sued and found liable, and analyze whether the results will vary.

In October 2002, the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) announced the issuance of a memorandum of understanding ("Norwalk Agreement"), marking a significant step toward formalizing their commitment to the convergence of U.S. and international accounting standards. Since then, FASB and IASB have been working on joint projects to further the goal of convergence of U.S. GAAP with International Financial Reporting Standards (IFRS). Compared to U.S. GAAP, IFRS are more principle-based. Caplan and Kirschenheiter (2004) analyze auditors' preferences for principle-based or rule-based accounting standards. This thesis has shown auditors' preferences for the toughness and vagueness of auditing standards. The next

question is what preferences auditors will have towards the properties of auditing standards given principle-based (or rule-based) accounting standards.

Another assumption used in this thesis is that the firm needs to raise capital from outside investors and auditing standards are for audits of public issuers. In many parts of the world, as in the United States, the vast majority of audits are of nonpublic entities. Because the PCAOB auditing standards are not mandatory for auditors of private issuers, there arises the possibility that an auditing firm with a combination of public and nonpublic clients worldwide must be mindful of the standards of the International Auditing and Assurance Board (IAASB), the PCAOB, and the AICPA's Auditing Standards Board (ASB), as well as the Government Accountability Office (GAO) "Yellow Book" standards. Under these circumstances, should auditing standards be convergent and will auditors and investors benefit from one set of global auditing standards?

The International Auditing and Assurance Standards Board's (IAASB's) 2002 and 2003 annual reports note that more than 70 countries have either adopted its International Standards on Auditing (ISA) or exhibit no material differences between their national standards and the ISAs. The AICPA, one of the organizations that helped found the International Federation of Accountants (IFAC), has supported the global convergence effort and the common goal of developing one set of high-quality auditing and assurance standards.[42] Since other countries have adopted internal auditing standards, should the U.S. do the same? The fact is that the PCAOB has declined to discuss convergence. Therefore, the research question is whether convergence of auditing standards is better than divergence?

To summarize, there are many "open" research questions in auditing standards and standard setting to be discovered and investigated. In spite of its limitations, the thesis captures the fundamental economic elements of auditing standards that have attracted considerable attention in the auditing practice and literature.

[42]IFAC is a nonprofit global professional organization of national accounting groups, including the AICPA, that represent audit and accounting professionals all over the world. Similar to the manner in which the Auditing Standards Board (ASB) writes auditing and assurance standards under the auspices of the AICPA, the IAASB writes standards under the auspices of IFAC. (Giles et al. 2004)

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Appendix A

Summary of Contributions

This thesis explores the economic incentives of auditing standard setters when choosing the properties of auditing standards (i.e., toughness and vagueness), and how the strength of legal liability regimes affects their choices. These are important and timely questions given the introduction of the Sarbanes-Oxley Act of 2002 (SOX) and new auditing standards established by the Public Company Accounting Oversight Board (PCAOB). No existing auditing research addresses these questions.

Dye (1993) analyzes auditors' attitudes toward and responses to the toughness of auditing standards. He does not consider the interaction between legal liability regimes and auditing standards, or the fact that auditing standards are inherently vague. The toughness of auditing standards is assumed to be determined exogenously.

Schwartz (1998) explores the link between auditing standards and an auditor's legal liability. She finds that the commitment to auditing standards is not credible if the audit liability regime is based on strict liability or negligence-based liability with clear due care. She shows that under a negligence-based liability regime with vague due care, the commitment to auditing standards can improve audit effort. However, the auditing standards are assumed to be perfectly precise.

Willekens and Simunic (2007) model how audit effort varies with the vagueness of auditing standards. The auditing standards are assumed to be exogenously determined, and they do not consider the interaction of the toughness and vagueness of auditing standards. I analyze how different standard setters (auditors vs. investors) set the auditing standards. Since the level of toughness of auditing standards affects the auditors' and investors' preferences towards the vagueness of auditing standards, I consider the interaction of toughness and vagueness when standard setters choose the properties of the standards. Moreover, I incorporate auditor wealth and the audit legal liability regime into the model, while Willekens and Simunic (2007) do not.

Choi et al. (2008) analyze the effect of the strength of legal regimes on auditor effort and audit fees. They do not consider the impact of auditing

standards and auditor wealth on auditor effort, nor do they analyze how the strength of legal liability regimes affects standard setters' choices of auditing standards.

To summarize, this thesis explores the process of setting auditing standards by considering two properties of auditing standards. It links the setting of auditing standards with legal liability regimes and auditor wealth by employing a contracting model between an auditor and prospective investors. It contributes to the field by synthesizing critical ideas within the current literature and advancing understanding of standard setting. The position of this thesis in the auditing literature is summarized in Figure A.1.

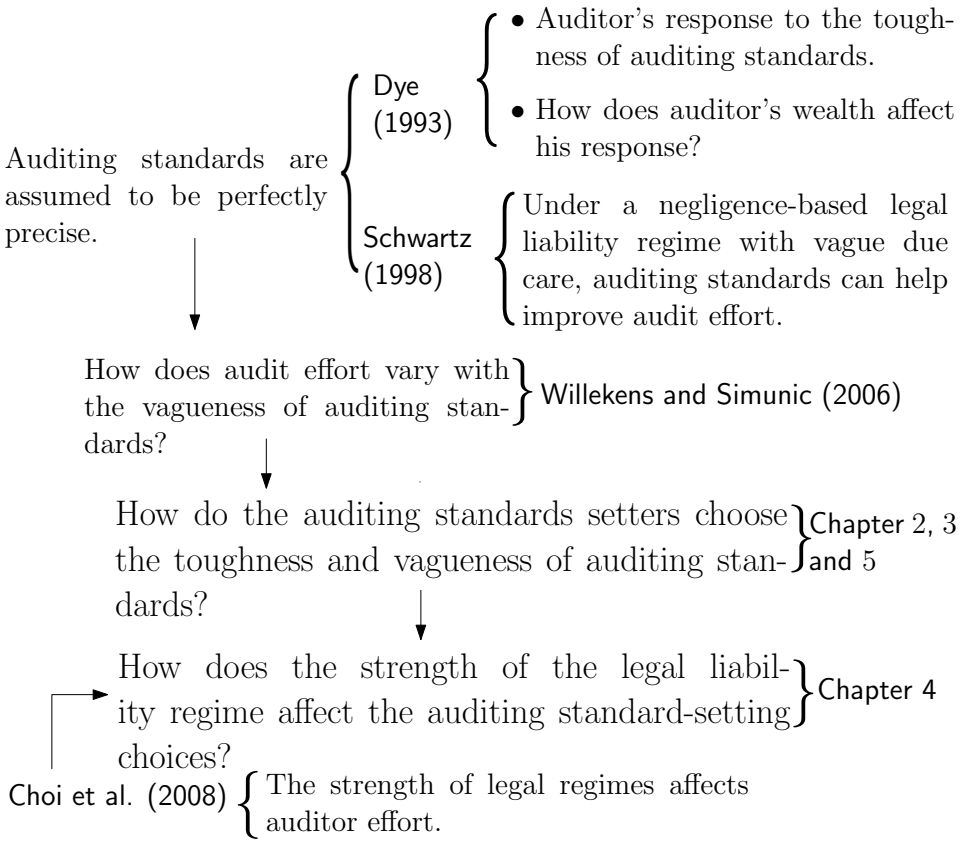

Figure A.1: Position in the literature

Appendix B

Notation

Notation	Description
a	Level of auditor effort exerted by the auditor
s	Level of auditor effort required by the auditing standards
m	Toughness of auditing standards
δ	Vagueness of auditing standards
I	Amount of investment
W	Auditor wealth
β	Probability of project being good
B	Cash flow generated by the good project
g	Good signal received by the auditor
b	Bad signal received by the auditor
$P(a)$	Probability of compliance given effort a
$EL(a)$	Auditor's expected liability
F	Audit fee
a_s	Noncompliance effort
a^*	First-best level of effort
r	Strength of legal regimes weaker than the benchmark regime
R	Strength of legal regimes stronger than the benchmark regime

Appendix C

Proofs

C.1 Proof of Lemma 2

Assume the auditing standards set due care at $s = a_s + \epsilon$, where ϵ is a small positive number. The auditor's total cost will equal the resource cost, $c(a_s + \epsilon)$. Since $c(a)$ is continuously increasing in a and $EL(a_s)$ is positive, $c(a_s + \epsilon) < c(a_s) + EL(a_s) = TC(a_s)$. Therefore, the auditor will choose $a = a_s + \epsilon > a_s$ given perfectly precise auditing standards.

The highest level of due care with which the auditor will comply, denoted by $\overline{s}$, is such that $c(\overline{s}) = TC(a_s)$. If $s > \overline{s}$, the cost of complying, $c(s)$, will be greater than the cost of not complying $c(a_s) + EL(a_s)$. If $s \leq \overline{s}$, the cost of complying, $c(s)$, will be less than or equal to the cost of not complying, since $c(s) \leq c(\overline{s}) = c(a_s) + EL(a_s)$. So, when $s \leq \overline{s}$, the auditor will comply with the auditing standards. □

C.2 Proof of Lemma 4

$$\begin{aligned}
\frac{d\overline{s}}{dr} &= \frac{\frac{2}{c}(1-\beta)\min[W,I] - \frac{2r(1-\beta)^2(\min[W,I])^2}{c^2}}{2\sqrt{\frac{2}{c}r(1-\beta)\min[W,I] - \frac{r^2(1-\beta)^2(\min[W,I])^2}{c^2}}} \\
&= \frac{\frac{2}{c}(1-\beta)\min[W,I](1 - \frac{r(1-\beta)\min[W,I]}{c})}{2\sqrt{\frac{2}{c}r(1-\beta)\min[W,I] - \frac{r^2(1-\beta)^2(\min[W,I])^2}{c^2}}} \\
&\geq 0
\end{aligned}$$

□

C.3 Proof of Lemma 5

Denote $\min[W, I]$ to be M.

$$\begin{aligned}
\frac{d\overline{s}}{dR} &= \frac{(1-\beta)M}{c} + \frac{-\frac{(1-\beta)M}{c} + \frac{(1-\beta)^2M^2R}{c^2}}{\sqrt{\frac{2(1-R)(1-\beta)M}{c} - \frac{(1-\beta)^2M^2(1-R^2)}{c^2}}} \\
&= \frac{(1-\beta)M}{c} \times \left(\frac{\sqrt{\frac{2(1-R)(1-\beta)M}{c} - \frac{(1-\beta)^2M^2(1-R^2)}{c^2}} - (1 - \frac{(1-\beta)MR}{c})}{\sqrt{\frac{2(1-R)(1-\beta)M}{c} - \frac{(1-\beta)^2M^2(1-R^2)}{c^2}}}\right)
\end{aligned}$$

Thus, the sign of $\frac{d\overline{s}}{dR}$ depends on the sign of $\sqrt{\frac{2(1-R)(1-\beta)M}{c} - \frac{(1-\beta)^2M^2(1-R^2)}{c^2}} - (1 - \frac{(1-\beta)MR}{c})$.

$(\sqrt{\frac{2(1-R)(1-\beta)M}{c} - \frac{(1-\beta)^2M^2(1-R^2)}{c^2}})^2 - (1 - \frac{(1-\beta)MR}{c})^2$ is equal to $= -(\frac{(1-\beta)M}{c} - 1)^2$, which is less than or equal to zero.

Therefore, $\overline{s}$ decreases with R. □

Appendix D

Empirical Results

Table D.1: Audit fees from 2000 to 2006 (all firms)

		Audit fee		Difference			
Year	N	Mean	Median	Mean	t-stat	Median	Z
2000	4,307	11.832	11.744	N/A	N/A	N/A	N/A
2001	6,605	11.762	11.720	−0.070	−2.57	−0.024	−108.042
2002	11,417	11.597	11.565	−0.165	−6.64	−0.155	−145.791
2003	14,230	11.517	11.435	−0.080	−3.63	−0.130	−174.201
2004	14,652	11.716	11.494	0.199	9.06	0.059	176.431
2005	14,185	11.869	11.635	0.153	6.64	0.142	171.339
2006	10,144	12.107	11.951	0.238	9.26	0.316	157.019
2000 to 2001	10,912	11.789	11.735	N/A	N/A	N/A	N/A
2004 to 2005	28,837	11.791	11.553	0.002	0.10	−0.182	−8.316

N represents the number of observations
The difference is calculated by $Mean(Median)_t - Mean(Median)_{t-1}$

Table D.2: Audit fees from 2000 to 2006 (Big 4 firms)

		Audit fee		Difference			
Year	N	Mean	Median	Mean	t-stat	Median	Z
2000	3,255	12.168	12.073	N/A	N/A	N/A	N/A
2001	4,860	12.127	12.083	−0.041	−1.40	0.011	92.044
2002	7,887	12.162	12.162	0.035	1.31	0.078	121.400
2003	9,420	12.143	12.205	−0.019	−0.79	0.043	142.208
2004	9,166	12.444	12.560	0.301	11.66	0.355	141.078
2005	8,376	12.644	12.884	0.200	7.05	0.323	133.507
2006	5,697	12.977	13.339	0.333	10.20	0.456	119.218
2000 to 2001	8,115	12.144	12.078	N/A	N/A	N/A	N/A
2004 to 2005	17,542	12.539	12.698	0.395	17.14	0.619	25.014

Table D.3: Audit fees from 2000 to 2006 (Non-Big 4 firms)

		Audit fee		Difference			
Year	*N*	Mean	Median	Mean	t-stat	Median	Z
2000	1,052	10.789	10.886	N/A	N/A	N/A	N/A
2001	1,745	10.744	10.844	−0.045	−1.07	−0.042	−56.569
2002	3,530	10.334	10.519	−0.410	−11.07	−0.325	−80.722
2003	4,810	10.291	10.440	−0.043	−1.44	−0.078	−100.608
2004	5,486	10.501	10.602	0.210	7.70	0.161	105.943
2005	5,809	10.752	10.830	0.251	9.32	0.228	107.387
2006	4,447	10.993	11.082	0.241	8.23	0.252	102.181
2000 to 2001	2,797	10.761	10.859	N/A	N/A	N/A	N/A
2004 to 2005	11,295	10.630	10.714	−0.131	−4.52	−0.145	−6.358

Table D.4: Descriptive statistics

Variable	N	Mean	Std.	Median
Audit fee	19,665	12.585	1.517	12.479
Complex	19,665	2.058	1.530	1.000
Risk	19,665	0.305	0.509	0.176
LnAsset	19,665	5.025	2.636	5.075

Table D.5: Variable correlations

Variable	Audit fee	Complex	Risk
Complex	0.410		
	(< .0001)		
Risk	−0.140	−0.042	
	(< .0001)	(< .0001)	
LnAsset	0.831	0.403	−0.218
	(< .0001)	(< .0001)	(< .0001)

Table D.6: Audit fee regression results

Table D.6 reports the results of the following regression equation on all firm years with data available in the sample period of 2000 to 2001, and 2004 to 2005. The p-values in parentheses are based on two-sided t-tests.
$\ln Fee = \beta_0 + \alpha ASC + \beta_1 Complex + \beta_2 Risk + \beta_3 \ln Assets + \epsilon$.

	Predicted signs	Estimates
ASC	+	0.679
		(< .0001)
Complex	+	0.088
		(< .0001)
Risk	+	0.082
		(< .0001)
LnAsset	+	0.462
		(< .0001)
N		19,665
Adj. R-sq		0.7453

ASC = 1 in the new auditing standards regime and zero in the old regime
Complex = client complexity (number of business segments)
Risk = is client business risk or audit risk (debt divided by total assets)

Table D.7: Audit fees from 2000 to 2006 (all non-accelerated filers)

		Audit fee		Difference			
Year	N	Mean	Median	Mean	t-stat	Median	Z
2000	1,100	11.50	11.50	N/A	N/A	N/A	N/A
2001	1,520	11.47	11.47	−0.03	−0.62	−0.03	−51.18
2002	2,943	11.43	11.45	−0.04	−0.97	−0.02	−66.80
2003	3,386	11.45	11.46	0.02	0.41	0.01	79.55
2004	3,409	11.60	11.55	0.15	3.91	0.08	82.43
2005	3,208	11.83	11.79	0.23	5.97	0.24	81.34
2006	2,813	11.97	11.95	0.15	3.61	0.17	77.59
2000 to 2001	2,620	11.48	11.48	N/A	N/A	N/A	N/A
2004	3,409	11.60	11.55	0.11	3.07	0.06	1.72

N represents the number of observations
The difference is calculated by $Mean(Median)_t - Mean(Median)_{t-1}$

Table D.8: Audit fees from 2000 to 2006 (non-accelerated filers audited by Big 4 firms)

		Audit fee		Difference			
Year	*N*	Mean	Median	Mean	t-stat	Median	Z
2000	684	11.90	11.81	N/A	N/A	N/A	N/A
2001	911	11.87	11.85	−0.03	−0.52	0.04	39.92
2002	1,838	11.89	11.93	0.01	0.25	0.08	52.42
2003	1,926	12.05	12.14	0.17	3.61	0.21	61.34
2004	1,737	12.30	12.37	0.25	4.93	0.23	60.51
2005	1,578	12.51	12.66	0.21	3.75	0.29	57.57
2006	1,309	12.69	12.87	0.18	3.05	0.21	53.72
2000 - 2001	1,595	11.88	11.83	N/A	N/A	N/A	N/A
2004	1,737	12.30	12.37	0.42	9.00	0.54	12.00

Table D.9: Audit fees from 2000 to 2006 (non-accelerated filers audited by Non-Big 4 firms)

		Audit fee		Difference			
Year	*N*	Mean	Median	Mean	t-stat	Median	Z
2000	416	10.84	10.91	N/A	N/A	N/A	N/A
2001	609	10.87	10.93	0.03	0.54	0.02	32.00
2002	1,105	10.68	10.82	−0.19	−3.80	−0.11	−41.39
2003	1,460	10.65	10.82	−0.03	−0.65	0.00	50.64
2004	1,672	10.86	10.99	0.21	4.96	0.17	55.96
2005	1,630	11.17	11.29	0.31	7.20	0.31	57.45
2006	1,504	11.35	11.47	0.18	4.14	0.17	55.97
2000 to 2001	1,025	10.86	10.92	N/A	N/A	N/A	N/A
2004	1,672	10.86	10.99	0.00	0.01	0.07	2.01

Table D.10: Descriptive statistics

Variable	N	Mean	Std.	Median
Audit fee	3,605	11.895	1.121	11.813
Complex	3,605	1.810	1.299	1.000
Risk	3,605	0.311	0.438	0.182
LnAsset	3,605	3.982	1.965	3.792

Table D.11: Variable correlations

Variable	Audit fee	Complex	Risk
Complex	0.246		
	(< .0001)		
Risk	0.033	0.035	
	(0.049)	(0.037)	
LnAsset	0.718	0.261	−0.026
	(< .0001)	(< .0001)	(0.116)

Table D.12: Audit fee regression results

Table D.12 reports the results of the following regression equation on all firm years with data available in the sample period of 2000 to 2001, and 2004. The p-values in parentheses are based on two-sided t-tests. $\ln Fee = \beta_0 + \alpha ASC + \beta_1 Complex + \beta_2 Risk + \beta_3 \ln Assets + \epsilon$.

	Predicted signs	Estimates
ASC	+	0.292
		(< .0001)
Complex	+	0.060
		(< .0001)
Risk	+	0.090
		(0.001)
LnAsset	+	0.395
		(< .0001)
N		3,553
Adj. R-sq		0.588

ASC = 1 in the new auditing standards regime and zero in the old regime
Complex = client complexity (number of business segments)
Risk = client business risk or audit risk (debt divided by total assets)