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Auditor industry experience and initial public offerings

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Michigan State University, 1993

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AUDITOR INDUSTRY EXPERIENCE AND INITIAL PUBLIC OFFERINGS

By

Randal Jeffrey Elder

A DISSERTATION

Submitted to
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1993

ABSTRACT

AUDITOR INDUSTRY EXPERIENCE AND
INITIAL PUBLIC OFFERINGS

By

Randal Jeffrey Elder

This research examines the relationship between Big 6 audit firm industry experience and auditor selection, offering underpricing, and auditor compensation for initial public offerings (IPOs) of stock during the period 1988-1991. Auditor experience is hypothesized to be an element of audit firm quality. Although considerable theoretical and empirical research on audit quality exists, there is little evidence on dimensions of audit quality other than auditor size. Auditor selection, offering underpricing and auditor compensation are three empirical dimensions of audit quality that have been previously identified in the accounting literature. Audit firm experience is examined in an IPO context because previous research has found audit quality to be important in this setting.

This study uses multiple measures of auditor industry experience. These measures vary along three dimensions: sales-based and client-based measures, continuous and dichotomous measures, and three-digit and two-digit SIC code levels. Previous research on auditor experience has generally utilized one measure of audit firm experience.

The results of this study indicate that auditor experience is demanded by IPO companies, although not to a greater extent than existing publicly-traded companies. The demand for auditor experience was hypothesized to be related to measures of

the information risk of the stock offering. The demand for experience was found to be positively related to IPO company industry, but not significantly associated with company size or age.

Most auditor experience measures were not found to be associated with lower levels of offering underpricing. However, after controlling for individual firm reputation effects, there was some evidence that audit firm experience is associated with lower underpricing, especially for dichotomous measures of experience at the three-digit SIC code level.

Audit firm industry experience was generally associated with higher levels of audit fees. This relationship was found using both estimated audit fees, and total IPO cash compensation as a proxy for audit fees.

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CHAPTER 1 - INTRODUCTION

This study is an empirical investigation of the role of auditor industry experience in initial public offerings of common stock (IPOs). The purpose of this investigation is to assess whether auditor industry experience is an important dimension of audit quality. Several definitions of auditor experience are tested in an attempt to identify the types of experience valued by market participants. This study will help further our understanding of the nature of audit quality, and the economic role of auditing.

Several theories of the nature of audit quality exist. Based on these theories, extensive empirical evidence has documented that the largest audit firms, the so-called "Big 6 firms", provide quality-differentiated audit services (e.g., Palmrose [1986 and 1988], Francis and Wilson [1988]).[1] Little theory or evidence exists to support quality along a dimension other than auditor size.

The information quality theory of Titman and Trueman [1986] suggests that audit quality is reflected by the precision of the information provided by the auditor. Titman and Trueman further suggest that industry experience may be one dimension of audit quality. The practice literature also supports the importance of auditor industry experience. Professional standards require that the auditor have knowledge of the client's industry (AICPA [1991], AU 311.06).

This study examines the relationship between auditor experience and three dimensions of audit quality: auditor selection, the underpricing of the IPO, and auditor compensation.[2] Most studies of audit quality, including those that examine

auditor industry experience, have examined a single dimension of audit quality. The three dimensions of audit quality in this study are not independent. For example, the cost of audit quality may affect the extent to which audit quality is demanded. Examination of multiple dimensions of audit quality allows consideration of their interdependence, and increases the power of the empirical tests to assess whether auditor industry experience is an important dimension of audit quality.

This study is conducted in an IPO setting for offerings with a Big 6 auditor. This setting is chosen because previous studies have demonstrated that Big 6 auditors are demanded by IPO companies (Simunic and Stein [1987]; Menon and Williams [1991]), and selection of a Big 6 auditor affects the level of underpricing of the offering (Beatty [1989], Balvers, McDonald and Miller [1988]). Further, the information quality model of Titman and Trueman [1986] provides a theoretical basis for a relationship between audit quality and offering underpricing. Considerable research indicates that the Big 6 firms are quality-differentiated, and they are the only audit firms with meaningful levels of industry experience. Therefore, this study is restricted to Big 6 firms.

The remainder of this chapter is organized as follows. Section 1.1 discusses the theories and empirical dimensions of audit quality. Section 1.2 describes the IPO environment. Section 1.3 describes the motivation and expected contributions of the study. Section 1.4 is a summary of the research design. Section 1.5 summarizes the organization of the remainder of the dissertation.

1.1 Audit Quality

1.1.1 Theories of Audit Quality

Three main theories of audit quality exist. In the **independence** theory, audit quality is determined by the auditor's independence, which is a function of size. In the **risk-sharing** model, audit quality is a function of the auditor's ability to share risk. The ability to share risk is also a function of audit firm size. In the **information quality** theory, audit quality is a function of the quality of the information provided by the auditor.

The **independence** model developed by DeAngelo [1981] has been used to explain the existence of quality differentiation by the Big 6. DeAngelo defined audit quality as the "market-assessed joint probability that a given auditor will *both* (a) discover a breach in the client's accounting system. and (b) report the breach" (p. 186). DeAngelo focused on the reporting of the accounting breach, which is partially a function of the independence of the auditor. She argued that large firms are likely to be more independent.

The emphasis in DeAngelo's theory on size has become the theoretical underpinning for an extensive body of research that indicates that the Big 6 firms are quality-differentiated. The empirical evidence, excluding evidence related to initial public offerings, encompasses auditor selection (e.g., Francis and Wilson [1988]), audit performance outcomes (e.g., Palmrose [1988]), audit fees (e.g., Simunic [1980]; Palmrose [1986]), and the economic effects of auditor choice (e.g., Nichols and Smith [1983]; Ettredge, Shane and Smith [1988]). Cumulatively, these studies present convincing evidence the Big 6 firms are quality-differentiated.

Antle [1982] argued that one role of the auditor is to **share risk**. Because the ability to share risk is a function of auditor size, the implications of the risk-sharing theory are similar to the independence theory. However, the risk-sharing theory does not imply actual differences in audit quality.

Titman and Trueman [1986] developed a model in which the **information risk** of an IPO is reduced through use of a quality-differentiated auditor. Although the Titman and Trueman model is based on an IPO setting, it can be applied more generally to other auditor choice situations. Titman and Trueman defined audit quality as: "the accuracy of information supplied to investors; the information provided by a higher-quality auditor allows an investor to make a more precise estimate of the firms's value" (p. 160). Titman and Trueman suggested that knowledge of industry conditions is one aspect of auditor quality.

The empirical research on audit quality in non-IPO settings is mirrored by the research into the market for initial public offerings of stock. IPO research has demonstrated quality differentiation by the largest firms in auditor selection (Simunic and Stein [1986]; Menon and Williams [1991]); auditor compensation (Beatty [1989]), and offering underpricing (Balvers, McDonald and Miller [1988]).

The empirical tests in this study are based upon the information quality theory, as this theory allows for quality differentiation on a basis other than size. Whether auditor experience is a form of audit quality is an empirical issue.

It is important to note that the tests in this study do not constitute tests of one audit quality theory in favor of another. The theories of audit quality are not mutually exclusive, and it is likely that audit quality embraces all three concepts. For

example, while DeAngelo [1981] argued that audit quality is a function of independence, she also suggested that one benefit of auditor size is the increased industry experience of the auditor.

1.1.2 Dimensions of Audit Quality

This study identifies four empirical dimensions of audit quality. Audit quality can affect auditor selection, audit performance, audit fees, and the economic consequences of auditor choice. This study examines the relationship between auditor experience and each dimension of audit quality, except audit performance. Although audit performance may provide the clearest indication of audit quality, direct measures of audit performance are difficult to obtain. Multiple dimensions of audit quality are investigated, because studies along one dimension of auditor quality have not always yielded consistent results. In addition, the results along one dimension of audit quality can be confounded by another dimension. For example, auditor selection is related to auditor compensation and the economic consequences of auditor choice.

Auditor selection involves both the measurement of the extent to which audit quality is demanded, and the identification of specific company factors that will lead to the choice of a higher-quality auditor. According to the Titman and Trueman [1986] model, one benefit of the use of a high-quality auditor is the reduction of information risk and its effect on the underpricing of the offering. In the models developed in this study, the demand for high-quality auditors is a function of the information risk of the offering.

Economic theory has been used to predict that audit quality will be associated with higher audit fees. Several empirical studies, (e.g., Palmrose [1986]; Francis and Simon [1987]) demonstrate that Big 6 audit firms charge higher fees. However, in attempting to explain observed levels of auditor concentration within industries, it has also been argued that industry experience may lead to economies of scale that result in lower audit fees (Danos and Eichenseher [1986]). Measurement of the cost of audit quality is important, because cost is one determinant of demand.

The economic consequences of auditor choice are the economic benefits and costs associated with auditor choice. The economic consequences can include any benefit or cost associated with the choice of auditor. Although the costs include the audit fee, this generally has been regarded as a separate area of research. In this study, the economic consequence of auditor choice is the effect of auditor experience on the underpricing of the initial public offering of stock. Previous empirical studies by Balvers et al. [1988] and Beatty [1989] indicate that underpricing decreases with the use of a high-quality auditor. Offering companies wish to minimize underpricing since it reduces the amount of offering proceeds.

1.2 Initial Public Offerings of Stock

Initial public offerings have several features that make them desirable for study. The information environment is such that auditor reputation might be expected to play an important role in the process. As discussed in the previous section, the information quality theory of Titman and Trueman [1986] is based on

an IPO setting. Institutional features of the market also suggest a dynamic environment for audit choice.

The IPO environment is one marked by information asymmetry between the offering entrepreneurs and investors (Leland and Pyle [1977]). Ex ante uncertainty exists concerning the value of the investment because less information exists about the IPO company. While publicly-traded companies are subject to analyst and media scrutiny, privately-held companies are less scrutinized. Many IPO companies are young entities, so less of an operating history exists for estimating firm value.

The level of underpricing of the offering is related to the ex ante uncertainty concerning firm value (Rock [1982]; Beatty and Ritter [1986]). Previous studies by Balvers et al. [1988] and Beatty [1989] indicate that underpricing is less with a higher-quality auditor. Studies in other settings have generally been unable to find a significant economic consequence associated with auditor choice (Nichols and Smith [1983]; Ettredge, Shane and Smith [1988]).

Initial public offerings are also an ideal environment for examining auditor selection. IPOs have been associated with the decision to change auditors (Carpenter and Strawser [1971]; Menon and Williams [1991]). For many young IPO companies, the auditor at the time of the IPO will likely be the company's first auditor. For the sample of IPO companies in this study, the median company age was approximately four years. Accordingly, the relationship between auditor experience and company features may be less noisy for IPO companies than for existing publicly-traded companies.

It is known that the distribution of clients across industries is not random (Eichenseher and Danos [1981]). However, little is known about the process by which audit firms gain market share in particular industries. IPO companies are a potentially important part of the changes in industry client distributions.

1.3 Motivation of the Research

The primary purpose of this study is to determine whether auditor industry experience is an important element of audit quality. The empirical research on audit quality presents convincing evidence that the Big 6 are the quality providers of audit services in the market for publicly-traded clients. However, existing research provides no insight into specific factors, other than audit firm size, that accounts for the differential audit quality of these firms. Because the Big 6 dominate the market for publicly-traded companies, definitions of audit quality that partition the audit market between Big 6 and non-Big 6 firms are not very informative as to the nature of audit quality.

Differences in audit quality based on audit firm industry experience would significantly alter the way in which the audit market is viewed. Most empirical research views the Big 6 as having a relatively uniform level of audit quality. Experience-based differences in audit quality would not only allow for differences in audit quality among the Big 6 firms, but also within individual audit firms, dependent upon the client's industry. Audit quality would also not be restricted to the Big 6. Other national and regional firms could also be quality providers of audits in those industries where they have significant levels of experience.

Auditor quality differentiation is an important issue to auditors, clients and capital market participants. Knowledge of the economic benefit and cost of auditor choice should be of direct interest to clients and capital market participants. For clients, greater knowledge about the dimensions of auditor quality may help them make more informed auditor selection decisions. Capital market participants can better understand how auditor type affects information and the value of their investments. For CPA firms, knowledge of the role of auditor experience in auditor selection can benefit CPA firms in their marketing strategies. Although this study examines the IPO market for Big 6 firms, the results may potentially be of interest to non-Big 6 firms. By developing industry-specific expertise, these firms may be able to demonstrate a sufficient quality level to retain clients that go public. This issue is an important one for non-Big 6 firms since clients often change to a Big 6 auditor prior to going public (Carpenter and Strawser [1971]).

From a theoretical perspective, examining the role of experience provides a direct test of the information quality hypothesis in Titman and Trueman [1986]. The existence of quality differentiation on a basis other than size is not predicted by other theories of audit quality.

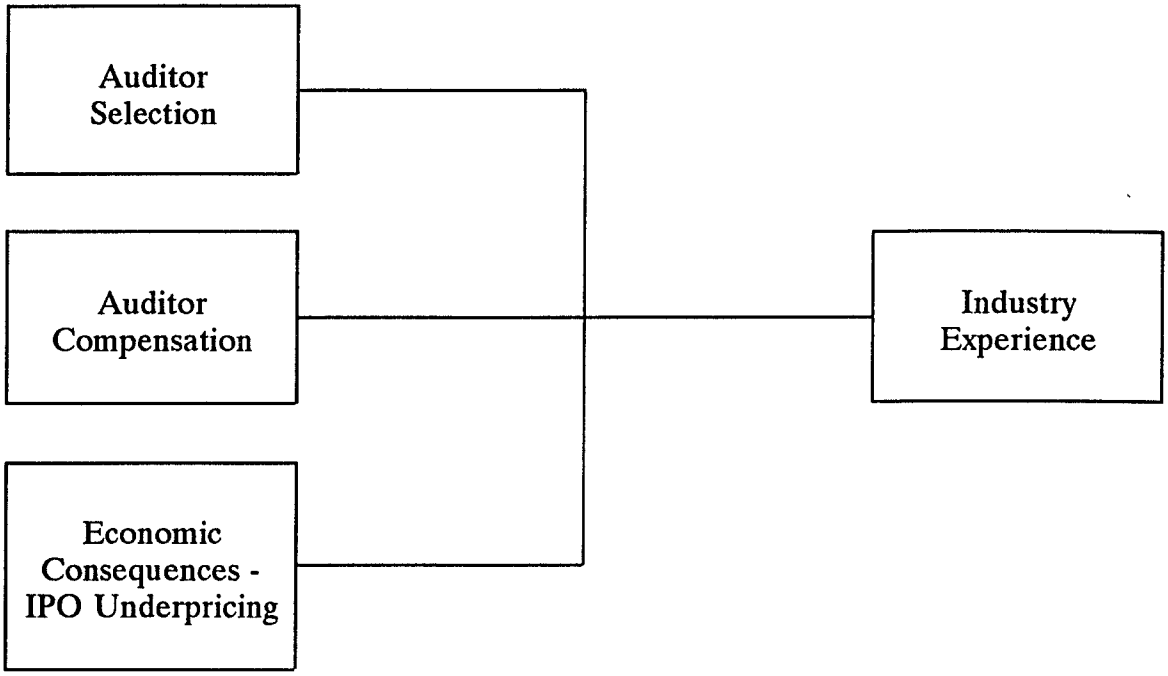
Auditor industry experience is the most promising area for examining audit quality on a basis other than size. Initial empirical studies into the role of auditor experience on audit pricing did not suggest that auditor experience was an important dimension of the audit market (Palmrose [1986]). However, more recent research suggests that auditor experience is related to the auditor change decision (Williams [1988]), and the change in fees due to a change in auditor (Ettredge and Greenberg

[1990]). Studies in the governmental sector have suggested the existence of an experience-related fee premium (Ward, Elder and Kattelus [1993]), and that auditors with industry experience perform audits of higher quality (Deis and Giroux [1992a]). Previous research has not demonstrated economic consequences associated with the choice of an experienced auditor, nor has it simultaneously considered multiple dimensions of the auditor choice decision. This researcher is unaware of any other audit firm attributes that have been empirically examined in a market setting, or that are directly referenced in the professional literature.

1.4 Summary of the Research Methodology

This study examines the relationship between industry experience and auditor selection, underpricing of the offering, and auditor compensation. Industry experience is hypothesized to be a dimension of audit quality and is the research variable of interest. Auditor selection, offering underpricing and auditor compensation represent three dimensions of the effects of audit quality in the audit market.

Regression models are developed for each element of the choice decision to control for other factors that affect auditor selection, auditor compensation, and offering underpricing. Initial public offerings of stock were chosen as the research environment because auditor choice has previously been identified as being important in this context. Figure 1.1 summarizes the research design.



Research Environment - Initial Public Offerings

Figure 1.1
Summary of Research Design

The first phase of the auditor selection decision is measuring the extent to which auditor experience is demanded by IPO companies. Models of auditor choice will then be developed in which auditor type is the dependent variable, and the independent variables are company characteristics expected to result in demand for auditor experience. Auditor experience is included as an independent variable in models of offering underpricing and auditor compensation. Auditor experience is predicted to be associated with lower offering underpricing, consistent with a reduction in the information risk associated with the offering. Auditor experience is also hypothesized to be associated with an audit fee premium.

IPOs issued during 1988-1991 were selected for examination. This is the most recent period for which data is available. This period also spans the period in which mergers reduced the Big 8 to the Big 6. Examination of the pre- and post-merger periods may provide insights into the impacts of these mergers on the reputational capital of the largest CPA firms.

1.5 Organization of the Dissertation

The remainder of the dissertation is organized into six chapters. Chapter Two contains a description and discussion of previous literature concerning auditor product differentiation. Included in Chapter Two is a review of theories of audit quality, a summary of empirical evidence on audit quality, and a review of the literature on auditor industry experience. Research hypotheses are developed in Chapter Three. A description of the experience measures and sample is also contained in Chapter Three. The remaining four chapters contain the results and

conclusions of the study. Chapter Four contains the results of the tests of auditor selection. Included in this chapter are measures of the demand for auditor experience, as well as models of the determinants of the demand for audit experience. The results of the tests of the relationship between auditor industry experience and offering underpricing are contained in Chapter Five. Tests of the relationship between auditor experience and auditor compensation are included in Chapter Six. Chapters Five and Six also present results of tests in which membership in the Big 6 is the measure of audit quality. These are presented as a replication of previous research, and as a basis of comparison for the results of the tests of auditor industry experience. Chapter Seven includes a summary of the findings of the research, a discussion of the limitations of the study, and suggestions for future research.

ENDNOTES

1. The Big 6 firms are Arthur Andersen, Coopers & Lybrand, Deloitte & Touche, Ernst and Young, KPMG Peat Marwick, and Price Waterhouse. In late 1989, the firms of Ernst & Whinney and Arthur Young merged to create Ernst & Young. In early 1990, the firms of Deloitte, Haskins and Sells and Touche Ross merged to create Deloitte and Touche. Although the period examined in this study spans these two mergers, the current Big 6 terminology is used.

2. Underpricing is a measure of the initial return on newly traded stock. The term underpricing refers to the fact that the average initial return is positive.

CHAPTER 2 - REVIEW OF RELATED RESEARCH

This chapter consists of a review of the theoretical and empirical literature on audit quality. The existing research is used a basis for developing empirical predictions concerning the relationship between auditor industry experience and auditor selection, offering underpricing, and audit fees for IPO companies.

Section 2.1 describes the theories of audit quality and summarizes their empirical predictions. Section 2.2 reviews empirical research on audit quality in non-IPO settings. Section 2.3 describes the environment for initial public offerings of stock and reviews previous research on auditor selection, audit fees, and offering underpricing in an IPO setting. Section 2.4 reviews previous research on auditor experience as a dimension of audit quality.

2.1. Theories of Auditor Product Differentiation

There are three main theories of auditor product differentiation. Each theory addresses a different dimension of auditor quality. These theories address the auditor's **independence, risk-sharing** ability, and the **information quality** provided by the auditor.

The theories differ in some of their implications along the four dimensions of audit quality: auditor selection, audit performance, audit fees, and the economic consequences of auditor choice. Except for audit performance, the empirical predictions derived from these theories are often dependent upon other theories or assumptions. Auditor selection models depend upon theories of specific factors

which give rise to the demand for audit quality. The economic consequences of auditor choice depend upon characteristics of the securities markets, such as the information environment. Finally, predictions about audit fees depend upon assumptions about the structure of the audit market.

The independence theory in DeAngelo [1981] states that audit quality is dependent upon the "market assessed joint probability that a given auditor will both a) discover a breach in the client's accounting system, and b) report the breach (p. 186). DeAngelo focused on the probability that the auditor will report the breach, which she posited is a function of the auditor's independence. She further argued that large firms are likely to be more independent since any one client is insignificant to the firm's practice. The implication of this model is that the largest audit firms are quality differentiated.

DeAngelo's theory is appealing because of its clear link between auditor size and auditor quality based on independence. Auditor independence is the foundation of the independent auditing function. It is probable that an audit firm will be less likely to withstand client pressure when that client constitutes a large portion of an audit firm's practice.

The independence theory is less appealing because it focuses on the **reporting**, rather than the **detection** element of the audit function. Auditing is primarily an evidence-gathering process, and it is likely that if firms differ in quality, it is on the basis of their audit procedures. Cushing and Loebbecke [1986] found that the largest audit firms differ in their audit approaches. Further, under the independence theory, quality-differentiation depends upon the apparent intentional failure to report an

error due to lack of independence. This researcher is unaware of any empirical evidence to support the contention that certain audit firms are more likely to report errors.

The independence theory is clear in its prediction that large audit firms perform audits of higher quality, because they are more likely to report errors. Accordingly, the demand for the largest audit firms should be related to those company characteristics that create a demand for audit quality. The market should react differently to information contained in the audit reports of these firms, because it is of higher quality. The largest firms will also receive a fee premium if quality is priced in the marketplace and there are no scale economies associated with auditor size.

Antle [1982] has suggested that one role of the auditor is to share risk. As with the independence theory, the implication of this model is that the largest firms are quality-differentiated. Larger firms with a greater capital base are better able to absorb risk, so their services are more valuable. That is, Big 6 firms are quality-differentiated on their ability to share risk. Although risk-sharing appears to be one plausible explanation for the choice of a Big 6 firm at the time of an IPO, this line of reasoning is seldom advanced in empirical tests.

Although both the independence and risk-sharing theories indicate that the largest firms are quality-differentiated, they differ in their empirical predictions. The risk-sharing theory does not by nature imply differences in actual audit quality. In the risk-sharing model, the demand for audit quality is also clearly linked to company risk characteristics. The consequences of use of a large audit firm are related to the

benefits of sharing risk. Large audit firms earn a fee premium due to the assumption of additional risk.

Titman and Trueman [1986] developed a theoretical model based on information quality of the effect of audit quality on the pricing of an IPO. In their model, an owner can signal private information about the value of the firm through the choice of the quality level of the auditor. Titman and Trueman do not define specific characteristics of high-quality auditors in their model. Although the model is applied to an IPO context, it is more general and can be applied to other auditor and non-auditor choice situations.

In their model, IPO quality is revealed by auditor choice. Because a high quality auditor reveals more accurate information to the market, only firms with favorable information to reveal will choose to disclose more accurate information through selection of a high quality auditor. Low-quality companies cannot mimic high-quality companies by hiring a better auditor because the high-quality auditor is more likely to reveal unfavorable information about the company.

Feltham, Hughes and Simunic [1991] have criticized the Titman and Trueman model for its assumption that the auditor produces new information. They argue that this is inconsistent with the audit process. They appeal to a model by Datar, Feltham and Hughes [1991] in which the auditor strictly provides an examination of the report proposed by the entrepreneur.[1]

Their criticism of the Titman and Trueman model takes a static view of the audit process. Auditing is a dynamic process in which both the entrepreneur's financial report and the auditor's opinion can change based on the actions of the

other party. The use of the term "proposed report" (p. 376) by Feltham, Hughes and Simunic is itself an indication that the report can change as a result of the audit process. That is, information is generated. Indeed, a focus of the audit is to detect intentional and unintentional errors. By their nature, unintentional errors would not be known to the entrepreneur or to investors.

The Titman and Trueman model is an attractive characterization of the audit market, because actual audit performance leads to product differentiation in their model. Further, this differentiation is not dependent on the size of the CPA firm. This is not to suggest that the largest CPA firms are not quality-differentiated. They have the resources to hire the best personnel, and can devote substantial resources to training and developing technical practice aids. However, the Titman and Trueman model does not preclude quality differences among the Big 6, nor does it preclude the performance of quality audits by non-Big 6 firms.

Figure 2.1 summarizes the potential implications of the three audit quality theories along the dimensions of auditor selection, audit quality, audit fees, and economic consequences of auditor choice. It is important to note that these theories are not mutually exclusive, and they have several overlapping predictions.

Only the information quality theory allows for quality differentiation on a basis other than size. The information quality theory provides a theoretical basis of investigating other potential dimensions of audit quality, including auditor industry experience. As the last column of Figure 2.1 indicates, if auditor industry experience is a relevant dimension of audit quality, it may be related to all four empirical dimensions of audit quality.

	Independence	Risk-Sharing	Information Quality
Auditor Selection	Not specified. Depends on other factors (i.e., agency factors) which would lead to a demand for auditor quality.	Risky firms choose higher quality auditors since they most benefit by the sharing of risk.	High quality companies choose high quality auditors.
Audit Performance	Function of independence which is based on audit firm size.	No quality effect based on risk-sharing.	Higher quality firms provide higher quality audits defined by information quality.
Audit Fees	Large firms earn a premium due to higher reputational quality.	Large firms earn a premium due to their ability to share risk.	High quality firms earn a fee premium.
Economic Consequences	Higher quality audit perceived as such by market, which presumably acts differently to higher quality information.	Sharing of risk affects overall risk of company. Market reacts to effect of lower risk.	Market reacts favorably to higher information quality.

Figure 2.1
Audit Quality Theories
Summary of Implications

2.2 Non-IPO Empirical Evidence on Auditor Quality Differentiation

In this section, existing empirical studies on audit quality in non-IPO settings are discussed. These studies almost exclusively compare Big 6 and non-Big 6 firms. The review of these studies is organized along the dimensions of auditor selection, audit performance, audit fees, and economic effects of auditor choice. Most of the empirical research relates to audit fees.

2.2.1 Auditor Selection

The auditor selection process can be characterized as a process of feature-matching between the auditor and client. Both client and auditor attributes can be the subject of study. In empirical audit quality studies, audit quality has generally been the dependent variable, and client attributes that give rise to the demand for a given level of audit quality are the variables of interest.[2] Most of the empirical research on auditor selection has focused on auditor changes. This reflects an inherent interest in the decision to change auditors.

Francis and Wilson [1988] have modeled the demand for auditor quality as a function of the agency costs of a company.[3] Francis and Wilson examined the association of auditor changes with both **changes** and **levels** of agency costs. The agency costs variables include individual variables that had been tested individually in previous studies of auditor choice.[4] The variables tested include managerial ownership, the existence of bonus plans, diffusion of ownership, leverage, and subsequent issues of stock or debt.

Francis and Wilson examined two models of audit quality, which they viewed as potentially competing theories. The continuous model of audit quality is based

on DeAngelo's theory of auditor independence. Audit quality in this model is measured as the log of sales dollars audited. The competing model is the **brand name** model, based on an economic theory of product differentiation by Klein, Crawford and Alchian [1978]. In the test of this model, audit quality is measured by the usual Big 6/non-Big 6 dichotomous classification.[5]

Francis and Wilson found that changes in audit quality in the brand name model are weakly associated with both levels and changes in agency costs. A change in quality in the brand name model is a change to (from) a Big 6 auditor from (to) a non-Big 6 auditor. They did not find support for the continuous model of audit quality. The overall explanatory power of each model was low. Their generally weak results are consistent with earlier studies which examined the relationship between specific agency variables and auditor choice.

The support of the brand name model over the continuous model can be interpreted as consistent with the information quality theory, since quality in the brand name model is on a dimension other than size. This interpretation should be made with caution. Their test is not a powerful test for discriminating the brand name and continuous models of quality since the definitions of audit quality in the two models are highly correlated.

2.2.2 Audit Performance

Very little direct research evidence on audit quality exists. Palmrose [1988] studied auditor litigation for the period 1960-1985 and found that non-Big 6 firms as a group have higher litigation activity than Big 6 firms. She interpreted this result as consistent with quality-differentiation by the Big 6. However, the lack of control

for client factors associated with litigation activities suggests caution in interpreting this result as a direct test of any theory of audit quality.

Palmrose also found significant differences in litigation activity within the Big 6, and that litigation activity varies within industry classifications. Her results support the existence of quality differentiation within the Big 6. However, her sample sizes were small, and the results were sensitive to the form of analysis.

Imhoff [1988] performed a survey of financial analysts to determine if perceived accounting quality differed among the clients of different CPA firms. Because the quality of reported accounting numbers is affected by the audit process, his study is an implied test of audit quality. Imhoff did not find significant differences in perceived accounting quality between clients of Big 6 firms, or between clients of Big 6 and non-Big 6 firms. His research suggests that there are not significant differences in audit quality between CPA firms. His research can also be interpreted that the demand for audit quality does not differ significantly among companies. This result is consistent with the Francis and Wilson [1988] study that found only a weak association between auditor changes and agency costs.

A recent study by Deis and Giroux [1992a] examined differences in audit quality among small CPA firms in the audits of Texas school districts. Audit quality was measured by the subjectively weighted score of the results of a Quality Control Review by the Audit Division of the Texas Education Agency.

Deis and Giroux found that audit quality increases with the number of school district clients. They interpreted this result as consistent with DeAngelo's independence theory, although they acknowledge that this result is potentially

confounded with industry experience effects. However, the independence theory suggests that independence is a function of total audit firm size, not size in a particular industry. Deis and Giroux could have controlled for total audit firm size. If they had controlled for total audit firm size, a significant relationship between industry experience and audit quality would have provided evidence that industry experience is a dimension of audit quality.

2.2.3 Audit Fees

The link between audit quality and audit fees is complex. Palmrose [1986] discusses three hypotheses that provide for a price differential between Big 6 and non-Big 6 firms. The first hypothesis is that the Big 6 charge higher prices due to monopoly power. The second hypothesis is that the Big 6 receive a fee premium because they provide a higher quality service. The third hypothesis is that the Big 6 charge lower prices due to scale economies. The three hypotheses are not mutually exclusive. In fact, all three relationships can be present in the market, hindering the ability to make any inferences about quality from pricing data. However, the maintained hypothesis in most audit fee studies is that the Big 6 receive a fee premium because they provide audits of higher quality.

In an early study of audit fees, Simunic [1980] found that on average the Big 6 charged lower fees than non-Big 6 firms, which he interpreted as consistent with the existence of scale economies.[6] The lower fees charged by the Big 6 was interpreted as supporting the existence of competition, and a lack of monopoly rents. However, most subsequent research has found a fee premium for the Big 6.

While Simunic found that the Big 6 on average charged lower fees, he found that Price Waterhouse did charge significantly higher fees. This is the first empirical evidence of potential reputational differences among the largest CPA firms.

Simon [1985] performed a replication of Simunic's study and was unable to demonstrate a fee premium for Price Waterhouse. Simon attributed the difference in results to increasing competition that diminished Price Waterhouse's ability to charge a premium. If this interpretation is correct, it would require a fairly sudden change in competitive forces. Simunic's sample consisted of audit fees for the year 1977; Simon studied audit fees for the period 1978-1983. A more plausible explanation is that the studies used different samples and different definitions of audit fees. Simunic gathered his data by survey, while Simon's sample was based on voluntary disclosures of audit fees. Simunic used the sum of audit fees and the cost of the internal audit function; Simon used the audit fee only.

Palmrose [1986] found that Price Waterhouse was able to charge a premium in the office equipment industry. Price Waterhouse had the largest market share in this industry, suggesting the existence of a fee premium for industry experience.

More recent fee studies have generally found a fee premium for the Big 6, at least for smaller publicly-traded companies (e.g., Palmrose [1986]; Francis and Simon [1987]). Audit fee studies in the Australian market by Francis [1984] and Francis and Stokes [1986] are also consistent with the existence of a fee premium for the Big 6. In a study of auditor changes, Ettredge and Greenberg [1990] found that first-year reduction in fee was smaller with the change from a non-Big 6 to Big 6 auditor. This result is also consistent with a fee premium for the Big 6.

There is also evidence that the Big 6 command a fee premium in the governmental sector. In a study of audit fees for large U.S. cities, Rubin [1988] found a fee premium for the Big 6. However, the fee premium was only significant (.10 level) for the largest cities. Copley [1990] also found a fee premium for the Big 6 in a study that largely replicated Rubin.

Fee research in the governmental sector suggests that size-related fee premiums extend beyond the Big 6. Deis and Giroux [1992b] found that audit fees for Texas school districts are positively related to the size of a local firm measured by the number of offices.

2.2.4 Economic Consequences of Auditor Choice

Two studies have examined the relationship between choice of auditor and capital market activity. The results of these studies were directionally consistent with quality-differentiation by the Big 6, but were not statistically significant.

In an early study, Nichols and Smith [1983] investigated the market reaction when a company changed from a non-Big 6 to a Big 6 auditor. Although Nichols and Smith found a positive reaction to the change to a Big 6 auditor, the reaction was not statistically significant.

In a similar vain, Ettredge, Shane and Smith [1988] compared the association between earnings forecast errors and security returns for companies audited by Big 6 firms versus companies audited by non-Big 6 firms. They expected a larger association for clients of Big 6 firms on the premise that the information provided by Big 6 firms is of higher quality. Their results were consistent with this hypothesis, but were not statistically significant.

2.2.5 Summary of Audit Quality Research

Figure 2.2 is a summary of the results of empirical tests in which audit quality is defined as membership in the Big 6. An extensive body of literature on audit quality exists. Although the results of individual studies are not always significant, the cumulative evidence in this area is overwhelmingly supportive that the Big 6 firms are quality-differentiated providers of audit services, at least in the market segments studied. There does not appear to be a strong need for further empirical work in this area unless it provides a test that discriminates among competing theories.

The research in this area has dealt almost exclusively with publicly-traded companies, a market dominated by the Big 6. Research in the governmental sector has provided preliminary evidence that audit quality is a function of size for non-Big 6 firms.

Dimension of Audit Quality	Results	Comment
Demand for Audit Quality	Strong support	Publicly-traded companies overwhelmingly prefer Big 6 auditors.
Determinants of the Demand for Audit Quality	Weak support	Explanatory power of models with size related variable is high. Relation to specific theories, such as agency theory, is weak.
Audit Performance	Support	Limited evidence based on litigation.
Audit Fees	Strong support	Many studies indicate the presence of a fee premium for the Big 6.
Economic Consequences	Not supported	Results directionally consistent, but not statistically significant.

Figure 2.2
Summary of Audit Quality Research

2.3 Audit Quality and IPOs

The research on auditor quality differentiation in IPOs mirrors the research in non-IPO settings, except there have been no direct attempts to measure audit quality. These empirical studies appeal either to the independence or information quality theories in supporting an expectation that Big 6 auditors will be quality-differentiated. Auditor quality is then inferred from the study of auditor selection, auditor fees, and the economic impact of auditor selection on offering underpricing.

IPOs have received considerable research attention because of the relationship between the information environment and the level of underpricing of the offering. Underpricing refers to the fact that the first return for newly traded stocks is on average, positive. The initial return is defined as (CP-OP)/OP, where CP is the closing (bid) price on the first day of trading, and OP is the offering price. Ritter [1991] reports that the initial returns on IPOs for the period 1960-87 was 16.4 percent.[7]

Underpricing models developed by Rock [1986] and Beatty and Ritter [1986] explain underpricing as a function of information asymmetry between informed and uninformed investors. Underpricing is necessary to maintain the interest of the uninformed investors. The presence of rationing of shares in the IPO market prevents uninformed investors from realizing the average return on IPOs. Rationing of shares is greatest for the shares which increase the most in price, so that uninformed investors are more likely to receive an allocation of overpriced shares. Without the presence of underpricing, uninformed investors would suffer losses on their IPO investments, and drop out of the market. The level of underpricing is

related to the level of ex ante uncertainty about the valuation of the issue, which reflects the degree of information asymmetry. Beatty and Ritter [1986] demonstrate that this pricing equilibrium is enforced by the reputation of the offering investment banker.

In a setting where valuation is related to the ex ante uncertainty regarding the value of the firm, there is a natural role for the auditor in reducing information risk. A high quality auditor can reduce the ex ante uncertainty of the offering by providing more precise information concerning firm value.

Initial public offerings also provide an environment where signaling is important. Leland and Pyle [1977] developed a signaling model in which the entrepreneur's private information about future cash flows of the firm is revealed by the percentage of ownership offered in the IPO. In the Titman and Trueman [1986] model, the choice of auditor is also a signal as to the owner's private information. However, the difference in information quality between high and low quality auditors prevents low-quality companies from mimicking the signal by hiring a high quality auditor. . That is, a high quality auditor will be more likely to reveal the entrepreneur's unfavorable information.

2.3.1 Auditor Selection in IPOs

Empirical studies which address the issue of auditor quality differentiation and auditor selection in IPOs include Simunic and Stein [1987] and Menon and Williams [1991]. The empirical tests in Menon and Williams are theoretically founded upon the quality differentiation theory of Titman and Trueman [1986], and DeAngelo [1981]. Simunic and Stein develop their own model of differentiation, but the

implications of their model are not substantively different from the DeAngelo [1981] and Titman and Truman [1986] models.

Simunic and Stein [1987] differentiate audit quality along three dimensions: control, credibility and product line. Control relates to how the audit firm contributes to organization control. Credibility relates to how the audit service is perceived by outside users.[8] Product line refers to the breadth of services offered by the CPA firm.

Simunic and Stein test for product differentiation using initial public stock offerings that occurred in 1981. In their sample they distinguish between Big 6, second tier and local firms, but delete the second tier from their tests. Because client size may also affect auditor choice, they include control variables for total assets, geographic dispersion, and whether the financial statements are consolidated. All three control variables are significant in a logistic regression of the choice between a Big 6 and local auditor.

Simunic and Stein model the demand for auditor credibility as an increasing function of leverage, the reputation of the investment banker, and the use of a firm commitment offering.[9] Consistent with their hypotheses, choice of a Big 6 auditor is positively associated with firm commitment offerings and the use of a ranked investment banker. Use of a Big 6 auditor is negatively correlated with leverage, contrary to their predictions. They interpret their results as consistent with higher auditor credibility for the Big 6.

Menon and Williams [1991] followed an approach similar to that found in Simunic and Stein, except they examine auditor changes in the two year period prior

to an IPO. They performed a logistic regression in which the dependent variable is whether a company retained its local firm or switched to a Big 6 firm. Consistent with the results in Simunic and Stein, the decision to replace a local auditor was associated with the type of offering, reputation of the investment banker, and size of the IPO company.

2.3.2 IPO Audit Fees

Beatty [1989] used the residuals from a regression of total cash compensation paid in the IPO as a proxy for auditor reputation. The total cash compensation in the IPO served as a proxy for audit fees. Total cash compensation includes auditor fees, legal fees, and miscellaneous expenses. The use of audit fees as a proxy for auditor reputation is based on the hypothesis that higher quality auditors receive a fee premium.

Estimated audit fees were available for part of Beatty's sample; the correlation between audit fees and total cash compensation was .77. Beatty interpreted the high degree of correlation as indication that total cash compensation is a good proxy for audit fees.

Beatty found that the average fee residuals for the Big 6 are positive, and the average fee residuals for the second tier and local firms are negative. His most notable finding is the existence of significant differences in the fee residuals among the Big 6 firms. This finding is important because it challenges the assumption of uniform quality among the Big 6. If this finding is correct, it suggests that other meaningful differences in audit quality may exist among the Big 6. However, caution is warranted in interpreting this result. The lower fee residuals of certain members

of the Big 6 are based upon tests which group these firms with the largest firms in the second tier. Empirical research on audit fees by Francis and Simon [1989] suggests that the second tier are more like local firms than the Big 6.

2.3.3 Offering Underpricing

Use of a high quality auditor is expected to be associated with lower underpricing of the offering through the reduction of information risk, or by signaling the entrepreneur's private information. Balvers, McDonald and Miller [1988] developed a model in which both investment banker and auditor reputation serve to reduce underpricing. An important feature of their model is the presence of an interaction term between investment banker and auditor reputation. The interaction term indicates that the effect of investment banker and auditor reputation is reduced when the value of both variables is high. Omission of the interaction term would tend to obscure the relationship between investment banker and auditor reputation and underpricing.

Balvers et al. obtained results consistent with their model. The coefficient for auditor reputation and investment banker reputation was significant and associated with lower underpricing. The coefficient for the auditor-investment banker interaction term was also significant and associated with higher underpricing.

Beatty [1989] used the residuals from the model of IPO cash compensation described in the previous section as a surrogate for auditor reputation. The fee residual proxy for auditor reputation was significantly associated with lower underpricing.

Beatty's approach is unique because of the way the audit fee residual is used in the underpricing model. The fee residual is allowed to vary across each observation, including IPO observations involving the same audit firm. The usual Big 6/non-Big 6 classification treats quality as a global characteristic of the firm. Allowing the reputation variable to vary across observations within the same firm is consistent with quality varying within the firm.

It should be noted that Beatty did not control for auditor size using the usual Big 6/non-Big 6 classification. Since fee residuals were positive for the Big 6 and negative for other firms, the significant relationship between underpricing and the fee residuals may be capturing differences between Big 6 and non-Big 6 firms.[10]

2.3.4 Summary of Audit Quality Research in IPOs

Figure 2.3 is a comparison of the results of studies of audit quality in an IPO setting with the results of studies in non-IPO settings. The research on audit quality in IPOs is generally consistent with the findings in non-IPO settings that the Big 6 provide quality-differentiated services. The IPO research is limited to auditor selection, economic consequences (offering underpricing), and auditor compensation. This researcher is unaware of any direct research into audit quality in IPO settings. In addition, the results in Beatty [1989] provide some indication of differences in reputational quality among the Big 6.

Dimension of Audit Quality	Results Non-IPO Studies	Results IPO Studies	Comment on IPO Studies
Demand for Audit Quality	Strong support	Strong support	IPO companies prefer Big 6 auditors
Determinants of the Demand for Audit Quality	Weak support	Moderate support	Big 6 auditors preferred in firm commitment offerings, and with use of ranked investment banker
Audit Performance	Support	No direct evidence	No direct evidence
Audit Fees	Strong support	Supported	Limited evidence
Economic Consequences	Not supported	Supported	Underpricing lower with high quality auditor.

Figure 2.3
Comparison of IPO and non-IPO
Audit Quality Research

2.4 Industry Experience As a Dimension of Audit Quality

Knowledge of the client's industry is an important element of the planning and performance of the audit (AICPA [1991], AU311.06). Specific references to industry experience are included in the quality models of DeAngelo [1981] and Titman and Trueman [1986]. DeAngelo suggests that one reason companies may change to a Big 6 auditor at the time of an IPO is their greater industry-specific knowledge in comparison to smaller CPA firms (p. 185). Titman and Trueman note that many IPO companies are start-up operations, and suggest "The auditor provides such firms with expertise in information processing as well as knowledge of industry conditions" (p. 162).

There are considerable differences in the client distributions between the Big 6 firms across industries (Rhode, Whitsell and Kelsey [1974], Eichenseher and Danos [1981]). Industry concentration is related to regulation of the industry (Danos and Eichenseher [1986]). Danos and Eichenseher suggest that this relationship is due to economies of scale. However, it is also plausible that regulation leads to differential demand for audit quality in the form of auditor industry experience.

Evidence linking auditor experience and audit quality is scant, although more recent research has addressed the role of auditor experience. Perhaps the most important is a study by Deis and Giroux [1992a]. Deis and Giroux found that audit quality for CPA firms which audited Texas school districts was increasing with the number of school districts audited. Although Deis and Giroux interpret this as consistent with the DeAngelo independence theory, it indicates that industry experience is an element of audit quality as evidenced by actual audit performance.

In a follow-up study, Deis and Giroux [1992b] examined whether audit quality and industry experience were determinants of audit fees and audit hours for Texas school districts. Of particular interest is the variable for industry specialization measured by the number of school district clients. This variable had a significant negative relationship with the number of audit hours. Industry experience was negatively associated with audit fees as well, although the t-statistic of 1.51 was not significant based on a two-tail test. Deis and Giroux interpreted their results as indicating the presence of efficiency due to industry specialization.

Although the industry experience variable in Deis and Giroux [1992b] was negatively associated with audit fees, it is important to note that part of the influence of industry experience on audit fees is indirect through its effect on audit quality. Deis and Giroux also find that audit fees and audit hours are positively associated with audit quality (more precisely, they find that audit hours and audit fees are negatively associated with lack of quality) and the size of the firm. Firm size and industry experience were associated with higher audit quality in their previous study.

Ward, Elder and Kattelus [1993] find the opposite relationship between audit fees and industry experience. They found that one firm with the largest share of the municipal audit market in Michigan received a significant fee premium. One possible explanation for the difference in results in the two studies is that the continuous measure of experience in Deis and Giroux captures economies of scale, while the dichotomous measure of auditor experience in Ward et al. captures brand name effects.

The studies by Deis and Giroux [1992b] and Ward, Elder and Kattelus [1993] relate to the governmental sector. Ettredge and Greenberg [1990] found a similar relationship in a study of fee cuts at the time of an auditor change for commercial entities. The fee cut was larger with the change to a more experienced auditor using a continuous sales-based measure of experience. This is consistent with greater audit efficiency associated with increasing auditor experience. However, the fee cut was smaller if the change was to an auditor cited by the company as having greater industry expertise. The result for this dichotomous variable is consistent with a fee premium for industry experience.

Palmrose [1986] included an indicator variable for auditor experience in her study of audit fees in the private sector. The variable was positive, but not significant in her model. As discussed in section 2.2.3, Palmrose found some evidence of fee premiums in specific industries.

The research on the relation of auditor experience to audit quality has been limited, but is rapidly growing. Except for Deis and Giroux [1992a], this evidence has related to audit fees, with conflicting results. Palmrose's inability to find a fee premium for industry experience may reflect the effects of using a broad-based sample. Both the Deis and Giroux, and Ward et al. studies are examples of studies which use a specific industry. Another alternative to use of a specific industry setting is to examine audit fees in a specific context, such as IPOs.

As in previous auditor experience research, this study tests the hypothesis that auditor industry experience is a dimension of audit quality. The current study differs from previous research in several ways. First, an attempt is made to link the

prediction that auditor experience is a dimension of audit quality to the information quality theory. Second, this study considers multiple experience measures, where previous research has considered singular measures of experience. Third, the current study also addresses the demand for auditor experience, and the economic consequences associated with selection of an experienced auditor. These dimensions of audit quality have not been addressed in previous research on auditor industry experience. Finally, this study investigates the role of auditor experience in IPOs, a unique private sector setting. Previous research on the relationship of audit fees and auditor industry experience in the private sector have used more general settings, with conflicting results.

In Chapter Three, specific hypotheses are developed as to the relationship between auditor industry experience and auditor selection, audit fees, and IPO underpricing. The experience measures used in the study are also described in Chapter Three.

ENDNOTES

1. The Datar, Feltham and Hughes (1991) model can be considered to be somewhat of a hybrid of the independence and informational quality theories since high quality auditors are assumed to be both more discriminating (information quality) and more resistant to client pressure (independence).

2. Several researchers have also attempted to identify audit firm characteristics associated with the decision to change auditors (e.g., Eichenseher and Shields [1983]), and audit quality (e.g., Schroeder, Solomon and Vickrey [1986]). These firm characteristics include firm-wide and audit team specific characteristics.

3. See Watts and Zimmerman [1990] for a review of the agency literature in accounting.

4. See Francis and Wilson [1988] for a review of these studies.

5. The term "brand name" is somewhat misleading in the sense that brand names are generally thought of as attaching to individual firms. In Francis and Wilson, brand name is indicated by belonging to a class of firms (the Big 6).

6. It is important to point out that Simunic reported results using the audit fee scaled by total assets, and the audit fee plus salaries paid to internal auditors scaled by total assets. The coefficient for the Big 6 (excluding Price Waterhouse) was negative in each model, but was only statistically significant in the model using audit fees alone. Most of Simunic's analysis is based on audit fees plus internal audit salaries.

7. Ritter [1991] indicates that underpricing is a short-term phenomenon. Over a longer period spanning three years following the offering, IPOs underperform the market.

8. Both Simunic and Stein (1987) and Menon and Williams (1991) use the term auditor credibility to refer to how audit quality is **perceived** by financial statement users. This is essentially the same as audit quality as used in this study.

9. In a firm commitment offering, the underwriter guarantees the sale of the specified number of shares at the specified price. In a best efforts offering, the underwriter attempts to sell as many shares as possible, subject to minimum and maximum numbers of shares.

10. Copley [1991] uses fee residuals as a proxy for audit quality in a model of financial statement disclosure quality by municipalities. The audit fee residual had greater explanatory power than a Big 6/non-Big 6 dummy variable in one model, but not in another model.

CHAPTER 3 - DEVELOPMENT OF RESEARCH HYPOTHESES, EXPERIENCE MEASURES AND SAMPLE DESCRIPTION

In the previous chapter, existing research was described that linked audit quality with auditor selection, audit performance, audit fees, and the economic consequences of auditor choice. Preliminary evidence in the governmental sector has provided evidence that auditor industry experience is a dimension of audit quality. This study examines whether auditor industry experience is a dimension of auditor quality for IPO companies. Specifically, the relationship between auditor experience and auditor selection, audit fees, and the underpricing of the offering for IPO companies that choose a Big 6 auditor is examined. Although direct measurement of audit performance in an IPO setting is a potentially important research issue, it is beyond the scope of this study.

The specific research hypotheses about the relationship between auditor experience and auditor selection, offering underpricing, and auditor compensation are developed in the following section. The measures of auditor experience are described in Section 3.2.

3.1 Development of Research Hypotheses

3.1.1 Demand for Auditor Experience

Menon and Williams [1991] found an increased demand for Big 6 audit firms over local audit firms by investment bankers and their clients at the time of an IPO, which they interpreted as a demand for increased auditor credibility. If auditor

industry experience is a relevant dimension of auditor quality, auditor experience will also be demanded by IPO companies.

H_1: IPO companies will have a positive demand for auditor industry experience.

Hypothesis 1 predicts that IPO companies will display a preference for experienced auditors. An explanatory model of the demand for auditor experience by IPO companies is developed in the following section.

3.1.2 Determinants of the Demand for Industry Experience

Models by Rock [1986] and Beatty and Ritter [1986] describe IPO underpricing as increasing with the information risk of the offering. Consistent with these theories, the demand for auditor experience is modeled as a function of the information risk of the IPO firm. Firms for which less information exists are perceived as being more risky due to greater uncertainty about future returns (Clarkson and Thompson [1990]). Datar, Feltham and Hughes [1991] predict a positive relationship between IPO company risk and auditor quality after controlling for the percentage of ownership offered.

The empirical proxies used in this study for information risk are IPO company size, IPO company age, and the industry of the IPO firm. The demand for auditor experience is predicted to be negatively associated with IPO company size and age. Auditor experience is predicted to be positively associated with IPO company membership in a specialized industry.

Greater information exists for large publicly-traded firms than for small publicly-trade firms (Freeman [1987]). Consistent with the information environment for publicly-traded firms, less information is expected to exist for smaller IPO companies, leading to an increase in information risk. Accordingly, the demand for experience is predicted to be negatively associated with the size of the company.[1]

H_{2A}: The industry experience of the auditor selected by the IPO company will be negatively associated with the size of the IPO company.

Hypothesis 2A predicts that smaller companies will demand greater levels of auditor industry experience due to the information environment. Similarly, less information is expected to exist for companies with shorter operating histories. Beatty [1989] argued that the amount of information for IPO companies is partially a function of company age, and he found that underpricing was higher for firms with shorter operating histories. Accordingly, the demand for auditor experience is expected to be negatively associated with the age of the IPO company.

H_{2B}: The industry experience of the auditor selected by the IPO company will be negatively associated with the age of the IPO company.

Hypotheses 2A and 2B predict that the demand for auditor experience will be greater when less information is available about the IPO company. The demand for auditor experience is also expected to be greater when the industry information environment is complex. An indicator variable for the existence of industry-specific

accounting standards or an industry audit guide is used as a proxy measure of industry accounting complexity.

H_{2C}: The industry experience of the auditor selected by the IPO company will be positively associated with IPO company membership in a specialized industry.

Hypothesis 2C predicts that the demand for auditor experience will be greater when the IPO company belongs to a specialized industry. In addition to company size, age, and membership in a specialized industry, the auditor selection models in Simunic and Stein [1987] and Menon and Williams [1991] suggest several additional variables associated with the auditor selection decision. The full specification of the model, including additional control variables, is included in Chapter 4.

3.1.3 Auditor Experience and Offering Underpricing

As described in section 2.1, Titman and Trueman [1986] have developed a model in which the use of a high quality auditor can decrease offering underpricing through the reduction of information risk. Previous research by Balvers, McDonald and Miller [1988] and Beatty [1989] have demonstrated that underpricing is lower for offerings with a Big 6 auditor. If auditor experience is a dimension of audit quality, greater levels of auditor industry experience will be associated with lower underpricing of the offering.

H_3: The underpricing of the IPO will be negatively associated with the industry experience of the auditor.

In addition to auditor experience, the underpricing models in Beatty [1989] and Balvers, McDonald and Miller [1988] have identified several additional factors associated with the underpricing of IPOs. The complete underpricing model, including additional control variables, is described in Chapter 5.

3.1.4 Auditor Experience and Auditor Compensation

In section 2.2.3, several existing studies were cited in which Big 6 audit firms received a fee premium. The maintained hypothesis in these studies is that a fee is consistent with higher audit quality for Big 6 firms. If auditor industry experience is a relevant dimension of audit quality, it will also be associated with a premium in the audit fee.

> H_4: Auditor industry experience will be associated with higher audit fees.

Hypothesis four predicts that experienced auditors will receive a fee premium. The audit fee is especially important because it affects the cost of choosing a quality auditor. The model for auditor compensation is based on Beatty [1989] and is described in Chapter 6.

A summary of the research hypotheses is contained in Figure 3.1.

Dimension of audit quality	**Research hypothesis**
Audit demand	H_1: IPO companies will have a positive demand for auditor industry experience.
Determinants of demand for auditor experience	H_{2A}: The industry experience of the auditor selected by the IPO company will be negatively associated with the size of the IPO company. H_{2B}: The industry experience of the auditor selected by the IPO company will be negatively associated with the age of the IPO company. H_{2C}: The industry experience of the auditor selected by the IPO company will be positively associated with IPO company membership in a specialized industry.
IPO underpricing	H_3: The underpricing of the IPO will be negatively associated with the industry experience of the auditor.
Auditor compensation	H_4: Auditor industry experience will be associated with higher audit fees for the audit of IPO companies.

Figure 3.1
Summary of Research Hypotheses

3.2 Selection and Measurement of Experience Variables

3.2.1 Selection of Experience Measures

In the development of the research hypotheses, auditor industry experience was referred to as if it were a unidimensional construct. However, there are many potential measures of auditor industry experience. Relevant dimensions of auditor experience include (1) the use of sales-based or client-based measures of experience, (2) the number of digits in the SIC codes used to measure experience, and (3) the use of continuous or dichotomous measures of experience.

This researcher is unaware of any theory to suggest whether experience based on sales dollars audited or number of clients audited is more relevant. Previous studies of auditor choice have referred to industry experience or expertise in a general sense (e.g., Eichenseher and Shields [1983], Shields [1984]). Studies that directly incorporate experience measures have used sales-based measures (Palmrose [1986]; Ettredge and Greenberg [1990]) and client-based measures (Deis and Giroux [1992a]). Studies of industry concentration (e.g., Eichenseher and Danos [1981]) have used client, sales and fee based measures.

This researcher believes that industry experience is best captured by client-based measures. This belief is based on the notion that experience is best gained by experience in many different settings. However, because no theory as to the relevant dimension of auditor experience exists, the empirical tests in this study incorporate both client-based and sales-based measures.

There are specific trade-offs associated with use of two-digit and three-digit SIC codes to measure experience. Three-digit SIC data captures more specific

industry experience. Industries at the three-digit level probably are more representative of what is thought of by an "industry". Danos and Eichenseher [1982] have posited that three-digit codes are most consistent with the in-house training of the largest CPA firms. Danos and Eichenseher [1986] have further argued that three-digit classifications conform with the classification of audit markets in most research. Most empirical studies which incorporate auditor experience measures have performed analysis at the three-digit level (e.g., Danos and Eichenseher [1982]; Palmrose [1986]), and even at the four digit-level (Ettredge and Greenberg [1990]). Accordingly, the primary research focus in this study is on three-digit experience measures.

Industries for empirical tests were limited to those with more than 25 companies. This requirement was imposed to ensure that the measures of experience were meaningful. The minimum industry size requirement resulted in the loss of a substantial number of observations for the empirical tests. To minimize data loss, empirical tests were also conducted using broader two-digit experience measures.

Continuous measures of experience allow for greater variation in the experience measures. However, dichotomous measures may provide greater power by capturing the perception of expertise. That is, a firm is either perceived as being experienced in an industry, or it is not. Ettredge and Greenberg [1990] and Deis and Giroux [1992a] used only continuous measures; Palmrose [1986] used both dichotomous and continuous measures. Dichotomous measures have a ready

economic interpretation, and also can be readily compared to results of tests in which membership in the Big 6 is the measure of audit quality.

Based on the previous discussion, this researcher prefers dichotomous measures based on number of clients at the three-digit SIC level. However, no theory as to how to measure firm experience exists, and alternative measures of auditor experience can be readily constructed. Accordingly, this study tests multiple measures of industry experience that include sales-based measures, continuous measures, and measures based on two-digit SIC codes.

Figure 3.2 summarizes the experience measures used in this study. The use of multiple experience measures increases the risk of finding a spurious relationship between auditor experience and auditor selection, IPO underpricing and audit fees. However, the use of multiple measures will also provide insights into the relationship between these various measures, and the trade-offs associated with their use.

Experience Measure	Definition
Continuous measures:	
CLSHARE	Individual Big 6 firm share of the market for that industry segment based on number of clients audited defined as:

$$CLS_{ij} = \frac{\sum_j C_{ij}}{\sum\sum_{ij} C_{ij}}$$

CLS_{ij} = Market share for firm i in industry j.
C_{ij} = Number of clients for firm i in industry j.

SASHARE — Individual Big 6 firm share of the market for that industry segment based on sales of clients audited defined as:

$$SAS_{ij} = \frac{\sum_k R_{ijk}}{\sum\sum_{ik} R_{ijk}}$$

SAS_{ij} = Market share for firm i in industry j based on sales audited.
R_{ijk} = Sales revenue of client k of firm i in industry j.

Dichotomous measures:

CLEXP
1 if the Big 6 firm is the industry client market leader
0 otherwise

SAEXP
1 if the Big 6 firm is the industry sales market leader
0 otherwise

LGEXP
1 if Big 6 firm audits the largest company in the industry based on total sales
0 otherwise

The number (2) or (3) after each of the above variables indicates measurement at the two-digit and three-digit SIC level, respectively.

Figure 3.2
Summary of Experience Measures

3.2.2 Audit Firm Experience Measures

Measures of individual audit firm industry experience were determined using the Disclosure, Inc. Compact Disclosure SEC (CD) database. This source was chosen for the experience measures because it includes the full population of publicly-traded companies.

The primary SIC code, revenues, and auditor name were obtained for each company in the CD database. Foreign firm and companies with zero sales were excluded. The data was sorted by SIC code and sorted within SIC code by auditor to calculate individual audit firm market shares for each industry. Industries were discarded if they contained less than 25 companies. This was done to limit the analysis to those industries of sufficient size such that industry experience was a meaningful measure. Industry measures were developed at both the two-digit and three-digit SIC code level.

The measures described in Figure 3.1 were initially calculated using the January 1988 version of the CD database. This version of the database was selected because it corresponds with the beginning of the period for which IPO data was collected. A summary of the continuous measures is contained in Appendix A. Appendix A.1 contains the measure CLSHARE3, and Appendix A.2 contains the measure SASHARE3. Appendix A.3 and A.4 contain the measures CLSHARE2 and SASHARE2, respectively.

The tables in the appendix support the existence of substantial variation in market share within industries. For example, for the measure CLSHARE3 in Appendix A.1, a chi-squared test rejects at the 5 percent significance level the

hypothesis that the number of clients is uniformly distributed among the eight audit firms that previously made up the Big 6 for 27 of the 87 industries.[2]

Many of the industries with substantial concentration levels are specialized industries. Industries were classified as being specialized if separate accounting rules or an industry audit guide exists for that industry. Using this procedure, 21 industries were classified as specialized. The chi-square test of industry concentration based on number of clients was significant for 13 of these 21 industries. As expected, a binomial test rejects at the .01 significance level the null hypothesis that the distribution of audit clients is unrelated to classification of the industry as specialized. This result is consistent with the finding in Eichenseher and Danos [1981] that industry concentration is related to industry regulation, since many of the specialized industries would also be considered to be regulated industries.

Several aspects of the experience data introduce noise that may mitigate against finding a significant relationship between experience and auditor selection. The use of primary SIC codes ignores the other industries in which a company may operate. However, it can be argued that except for a few conglomerates, most companies are identified with the industry of their primary SIC code. Similarly, the sales figures include sales from other industry segments.

During the period under study, two mergers occurred among the largest CPA firms, reducing the Big 8 to the Big 6. Appendix B contains a summary of the experience measures subsequent to these mergers. This data was calculated using the January 1990 version of the CD database.[3]

In the following section, the sample for performing empirical tests is described. Included in this section is a description of the correlations between the various experience measures used in this study.

3.3 Initial Public Offering Sample Data

3.3.1 Sample Description

Firm commitment offerings that took place during the period 1988 through 1991 were selected for study. The most recent period for which data was available was chosen for study to facilitate data collection. Four years of data was expected to generate a sufficient sample size. Because of the stock market crash of October, 1987, it was considered desirable not to include this year in the study. The test period spanned the period of two large mergers in the public accounting profession. Calculation of experience measures and performance of empirical tests in the post-merger period may provide additional insights into the effect of these mergers on the audit market and firm reputations.

Two primary data sources were used in this study. Offering data for the period 1988-1989 was collected from Going Public: The IPO Reporter (Going Public). Data for offerings which occurred in 1990 and 1991 was collected primarily from the Disclosure, Inc. Compact Disclosure D'33 (D33) database. Some additional observations were added from Going Public for 1990 and 1991. The D33 database begins in 1990 and is not available for the earlier period. The D33 database includes a more extensive set of variables than Going Public, including measures of auditor compensation. Primary information collected from Going Public and D33 includes

the offering date, offering proceeds, offer price, auditor, auditor compensation, and investment banker. The pricing data necessary to compute underpricing was collected from the Daily Stock Price Record. The age of the company was collect from Standard and Poor's Corporate Directory.

All offerings for the period 1988-1991 in Going Public and the D33 database were initially selected for testing, excluding IPOs for mutual funds and investment trusts. The sample includes unit offerings, in which shares and warrants to purchase additional shares are priced as a unit. Pricing tests for these offerings were done on a unit basis.

Going Public contains only firm commitment offerings. Best efforts offerings were excluded from the sample because of the difficulty associated with obtaining this data. Best efforts offerings are generally smaller and more risky, and less likely to use a Big 6 auditor. Accordingly, inclusion of best efforts offerings is less important for this study which examines auditor experience within the Big 6.

Table 3.1 is a summary of the number of offerings by year and auditor type for offerings for which the auditor could be identified. Consistent with previous research, most offerings involve Big 6 auditors. The primary focus of this study is the role of auditor experience within the Big 6. However, the preliminary data analyses include offerings with second tier and local audit firms as a manipulation check, and as a partial replication and comparison to previous research.

Table 3.1
Number of Offerings By
Year and Auditor Type

	1988	1989	1990	1991	Total
Big 6	140	128	127	319	714
Second Tier	16	10	16	16	58
Local	10	12	14	33	69
Total	166	150	157	368	841

Table 3.2 contains descriptive statistics for the sample, including offering proceeds, offer price and underpricing. Consistent with previous research (e.g., Balvers, McDonald and Miller [1988]), offerings with Big 6 auditors are much larger, are less underpriced, and are more likely to involve a ranked investment banker.

Table 3.2
Sample Descriptive Statistics

		Mean (standard deviation)			
	Number of Offerings	(Millions) Offering Proceeds	Offer Price	Under-Pricing	Percent with Ranked Investment Banker
Big 6	714	42.56 (82.40)	10.87 (5.42)	.119 (.208)	.458
Second tier	58	15.94 (23.38)	7.31 (3.83)	.198 (.319)	.190
Local	69	9.54 (21.78)	6.38 (4.56)	.188 (.277)	.058
All Offerings	841	38.01 (77.17)	10.26 (5.46)	.130 (.225)	.407

3.3.2 Experience Measure Correlations

In the preceding section, the sample used for conducting empirical tests was described. Of the 714 offerings with a Big 6 auditor in Table 3.1, a three-digit (two-digit) experience measure could be computed for 489 (662) of the offerings. Table 3.3 contains a correlation matrix of these variables for the IPO firms included in the study.[4] The SIC codes for the IPO companies were identified from the CD database.

Several relationships are apparent from Table 3.3. As expected, the highest correlations are between continuous and dichotomous variables within measures (sales or clients) at the same SIC code level (two or three digit), followed closely by the same measures across SIC code level. The lowest correlations are between the sales and client measures. The lower correlations between client and sales measures suggest that they potentially contain differential information as to auditor experience. These results are also consist with Eichenseher and Danos [1981] finding that industry concentrations vary substantially, dependent upon the concentration measure utilized. The correlations also suggest that two-digit measures are relatively good surrogates for three-digit measures.

The auditor experience measures will be incorporated into the models of auditor selection, offering underpricing and IPO cash compensation as tests of the research hypotheses. Empirical tests of auditor selection for the sample are reported in Chapter 4. The tests of IPO underpricing are included in Chapter 5, and tests of auditor compensation are contained in Chapter 6.

Table 3.3
Correlation Matrix of Experience Measures

	Clshr3	Sashr3	Clexp3	Saexp3	Lgexp3	Clshr2	Sashr2	Clexp2	Saexp2	Lgexp2
Clshr3	1.00									
Sashr3	.47	1.00								
Clexp3	.70	.39	1.00							
Saexp3	.41	.86	.39	1.00						
Lgexp3	.19	.73	.22	.67	1.00					
Clshr2	.78	.33	.58	.27	.12	1.00				
Sashr2	.44	.69	.32	.60	.50	.49	1.00			
Clexp2	.56	.23	.67	.17	.11	.64	.43	1.00		
Saexp2	.30	.59	.26	.66	.45	.33	.77	.33	1.00	
Lgexp2	.14	.37	.03	.35	.52	.23	.63	.20	.59	1.00

N = 489 for coefficients where one or two of the measures are at the three-digit Sic Code level.
N = 662 for coefficients involving only measures at the two-digit SIC Code level.

All correlations are significant at the .01 level (two-tail) tests, except for the correlation between Lgexp2 and Clexp3, which is not significant at conventional levels.

ENDNOTES

1. Smaller companies are less likely to have in-house expertise available for the production of information necessary for the offering. The operations of smaller firms may also receive greater benefit from the industry knowledge of the auditor.

2. The chi-square test is known to be unreliable when cell frequencies are less than 5 (Hoel, Port and Stone 1971; p. 5). When the analysis is restricted to industries where the Big 6 audit more than 40 companies, the chi-square test is significant for 18 of 40 industries.

   Although a uniform distribution assumption is consistent with homogeneity among the Big 6, the largest CPA firms do differ in size. When the expected industry distribution is based on overall market shares of each firm, the chi-square test is significant for 24 of the 87 industries.

3. This data could be created by adding the market shares of the firms involved. Because the mergers occurred approximately at the midpoint of the period under study, the experience measures were recomputed. The mergers may precipitate some auditor changes due to conflicts with client competitors. It is unlikely, however, that many of these changes were reflected in the January 1990 CD database.

4. It is possible to develop a correlation matrix for the experience measures for the full population of publicly-traded companies. However, the development of such measures is not the primary focus of this study.

CHAPTER 4 - DEMAND FOR AUDITOR EXPERIENCE RESULTS

4.1 Introduction

This research addresses the role of Big 6 audit firm industry experience in the initial public offering market. In Chapter 3, specific hypotheses were developed as to (1) the demand for auditor industry experience by IPO companies, (2) the determinants of the demand for experience by IPO companies, (3) the relationship of auditor experience to offering underpricing, and (4) the relationship of auditor experience to auditor compensation.

In this chapter, the hypotheses related to the demand for auditor experience are empirically tested for a sample of initial public offerings that occurred during the period 1988 to 1991. The sample, variables and data collection process were described in Chapter 3. The demand for auditor experience by IPO companies is examined in Section 4.2. The determinants of the demand for auditor experience are tested in section 4.3.

4.2 Demand for Auditor Experience by IPO Companies

The first research hypothesis predicted that IPO companies would have a positive demand for auditor industry experience.

H_1: IPO companies will have a positive demand for auditor industry experience.

Table 4.1 presents summary measures of auditor experience levels for the IPOs involving a Big 6 auditor for which experience measures could be computed. These variables are defined in Figure 3.2 in Section 3.2.

Table 4.1
Mean Auditor Experience Levels
IPO Sample

	(n=489) Three-digit SIC Level		(n=662) Two-digit SIC Level	
	Mean	Std. Dev.	Mean	Std. Dev.
CLSHARE	14.50	7.27	13.40	5.43
SASHARE	17.83	16.04	16.31	11.83
CLEXP	.28	.45	.26	.44
SAEXP	.23	.42	.20	.40
LGEXP	.19	.39	.17	.37

The auditor experience levels can be interpreted as follows, using client share at the three-digit SIC level as an example. For the average offering in the sample, the auditor's industry market share based on number of clients was 14.50 percent. The variable CLEXP indicates that the auditor was the industry leader based on client market share at the three-digit level for 28 percent of the offerings. The experience measures at the two-digit and three-digit levels are quite similar, although the values for the three-digit measures are higher.

The raw numbers do not interpret whether IPO companies demand auditor industry experience. In conducting empirical tests of this hypothesis, baseline prediction models must be developed to assess whether IPO companies display a preference for auditor experience. Three successively more stringent baseline models are used in the empirical tests. The three models are the random selection model, the market share weighted selection model, and the industry share weighted selection model. The sample mean for each experience variable will be compared to the expected mean implied under each of these models to assess whether there is a positive demand for auditor industry experience by IPO companies.

These comparisons will be made for all of the computed experience measures. However, because the selection decision for an IPO company involves the choice of an auditor by an individual IPO company, client-based experience measures appear to be the most appropriate basis of comparison. Client-based measures weight each audit client equally, and are not sensitive to the presence of large audit clients.

The random selection model assumes that selection of any of the Big 6 firms is equally likely. Geographic and other factors make this supposition untrue for an individual company's choice of auditor firm. However, such factors are assumed to average out over many observations. The random selection model is consistent with the theoretical and empirical literature that views the Big 6 as a homogenous group.

The market share weighted selection model recognizes that the Big 6 firms are not equal in size. Using this model, the probability that a given Big 6 firm will be chosen is equal to that firm's total market share based on the comparison metric used (sales or clients).

The third baseline model is the industry share weighted selection model. Under this model, the probability of an audit firm being chosen is the firm's market share within the industry of the IPO company. This model recognizes that the distributions of clients among the Big 6 is not uniform across industries (Eichenseher and Danos [1981]). This model provides a stringent test of whether IPO companies demand auditors with greater industry experience than non-IPO companies.

4.2.1 Random Selection Model Results

The first benchmark of comparison is a random selection model, in which the choice of auditor is made randomly among the Big 6 audit firms. The following example will serve to illustrate the computation of the benchmark. In industry SIC code 363, Big 6 firms audit 88.9 percent of the market based on number of clients. The expected auditor market share for an individual firm in this industry based on six firms is 14.82 (88.9 ÷ 6). Each sample observation has an expected value based on the industry of the IPO company.[1] The overall sample expected value is equal the mean for all observations. For all dichotomous measures, the appropriate expected value would be .167 (1 ÷ 6).[2]

Calculation of expected auditor experience levels is complicated by changes in the number of Big 6 audit firms due to mergers during the period. The offering sample was divided into periods based on the number of audit firms in the Big 6. The expected value for the entire period is equal to the weighted average of the expected value in the subperiods.

Table 4.2
Comparison of IPO Sample Experience Measures
To Expected Values Under Random Selection

	(n=489) Three-digit SIC Level			(n=662) Two-digit SIC Level		
	Sample Mean	Exp. Value	T-Stat.(1)	Sample Mean	Exp. Value	T-Stat.(1)
CLSHARE	14.50	12.02	8.31**	13.40	11.71	9.02**
SASHARE	17.83	14.62	4.56**	16.31	14.64	3.91**
CLEXP	.282	.153	6.39**	.261	.152	6.40**
SAEXP	.229	.153	4.04**	.196	.152	2.87**
LGEXP	.188	.153	2.03*	.166	.152	0.98

(1) Paired sample t-test of whether sample mean is greater than expected value under benchmark model.

** (*) Significant at the .01 (.05) level based on one-tail test.

Table 4.2 compares the observed sample values for auditor experience to the expected values based on a random selection model. The results of the paired sample t-test indicate that the choice of Big 6 auditor is not done randomly. Rather, IPO companies select auditors with relatively greater levels of experience. The levels of experience using both sales-based and client-based measures are greater than would be expected under random selection.[3]

4.2.2 Market Share Weighted Selection Model

The market share weighted selection model differs from the random selection model in that it controls for differences in size among the Big 6 audit firms. The market share weighted model assumes that Big 6 firms are selected in proportion to their overall market shares. This model would be expected to be more descriptive than the random selection model if the larger of the Big 6 have an advantage over smaller Big 6 firms. For example, the smaller Big 6 firms may have fewer offices, placing them at a competitive disadvantage in certain geographic regions.

Table 4.3 presents a comparison of the IPO sample experience measures to their expected values if auditor selection was done randomly in proportion to each firms overall share of the market. The expected value of the experience measures increases when weighted by each audit firm's overall market share compared to the random selection model. However, the differences between the sample values and expected values remain statistically significant based on a one-sample t-test.[4] This provides further evidence that auditor selection is not made randomly by IPO companies.

Table 4.3
Comparison of IPO Sample Experience Measures
To Expected Values Under Random Selection
Weighted by Total Market Share

	(n=489) Three-digit SIC Level			(n=662) Two-digit SIC Level		
	Sample Mean	Exp. Value	T-Stat.(1)	Sample Mean	Exp. Value	T-Stat.(1)
CLSHARE	14.50	12.76	5.29**	13.40	12.49	4.31**
SASHARE	17.83	15.09	3.78**	16.31	14.97	2.91**
CLEXP	.282	.206	3.80**	.261	.197	3.76**
SAEXP	.229	.163	3.47**	.196	.164	2.13*
LGEXP	.188	.156	1.78*	.166	.153	.93

(1) One sample t-test of whether sample mean is greater than expected value under benchmark model.

** (*) Significant at the .01 (.05) level based on one-tail test.

4.2.3 Industry Weighted Selection Model

The final benchmark of the demand for experience by IPO companies is the random selection model weighted by industry market share. Under this model, the likelihood that a given audit firm is chosen is equal to the firm's market share in the industry of the IPO company. This is a stringent benchmark since the distribution of clients among CPA firms within industries displays substantial levels of concentration. If the IPO sample mean exceeds the expected value under this model, this would suggest that IPO companies have a demand that exceeds the demand for experience by existing publicly-traded companies.

Table 4.4 presents a comparison of the IPO sample experience measures to the expected values under the industry weighted selection model. The client-based measures under the industry weighted model suggest that the demand for auditor industry experience by IPO companies is not greater than the demand for experience by publicly-traded companies. The sales-based measures indicate that the demand for sales-based experience is significantly less that the demand for experience by publicly-traded companies..

The sales-based measures are not likely an appropriate basis of comparison. As pointed out by Eichenseher and Danos [1981], sales-based measures are dominated by large-client relationships. This can be observed from the expected values for the dichotomous measures in Table 4.4. 28 percent of companies select the auditor with the largest industry market share based on clients, but 43 percent of the sales dollars are audited by the audit firm with the largest industry market share based on sales dollars audited.

Table 4.4
Comparison of IPO Sample Experience Measures
To Expected Values Under Random Selection
Weighted by Industry Market Share

	(n=489) Three-digit SIC Level			(n=662) Two-digit SIC Level		
	Sample Mean	Exp. Value	T-Stat.(1)	Sample Mean	Exp. Value	T-Stat.(1)
CLSHARE	14.50	14.66	-.48	13.40	13.59	-.90
SASHARE	17.83	28.44	-14.63**	16.31	23.63	-15.91**
CLEXP	.281	.284	-.15	.261	.253	.47
SAEXP	.229	.434	-10.79**	.196	.372	-11.73**

(1) One sample t-test of whether sample mean is greater than expected value under benchmark model.

** (*) Significant at the .01 (.05) level based on one-tail test.

It is not necessarily surprising that the demand for auditor industry experience by IPO companies does not exceed the demand by existing companies. This study models the demand for auditor industry experience as a function of the information risk of the offering. Studies such as Francis and Wilson [1988] model the demand for audit quality as a function of agency costs. As Francis and Wilson note, these agency costs generally increase with firm size. Existing publicly-traded companies are much larger, on average, than IPO companies. Ettredge and Greenberg [1990] find that auditor changes are, on average, associated with increase auditor industry experience for the successor auditor compared with the predecessor auditor.[5]

4.2.4 Summary of Test Results - Demand for Auditor Experience

The first research hypothesis predicted that IPO companies would have a positive demand for auditor industry experience. The overall results suggest that companies going public do have a positive demand for auditor experience. The demand for experience by IPO companies exceeds the expected levels of experience under models in which selection was made randomly among the Big 6 firms. However, the demand for experience by IPO companies does not exceed the demand for experience by existing publicly-traded companies.

The results of these tests are summarized in Figure 4.1. The results of these tests are consistent with observed levels of concentration in the audit market (e.g., [Eichenseher and Danos 1981]). However, very little knowledge exists as to how observed levels of auditor concentration have developed. As new publicly-traded entities, IPO companies represent an important component of industry concentration levels.

Model	Model Description	Result of Tests
Random selection	Auditor choice is made randomly among the Big 6 firms.	Demand for auditor industry experience by IPO companies exceeds demand predicted by random selection model.
Random selection - weighted by total market share	Auditor choice is made randomly in proportion to each Big 6 firm's total market share.	Demand for auditor industry experience by IPO companies exceeds demand predicted by random selection model weighted by total market share.
Random selection - weighted by industry market share	Auditor choice is made randomly in proportion to each Big 6 firm's share of the market in the IPO company industry.	Demand for auditor experience by IPO companies does not exceed demand for experience under random selection model weighted by industry market share.

Figure 4.1
Summary of Results
Demand for Auditor Experience

The results of the tests of the demand for auditor experience indicate that auditor experience is valuable in attracting new clients. This is not an obvious conclusion. Danos and Eichenseher [1986] found that the industry market shares held by the four largest firms in each industry decreased over the period 1950 to 1980. They attribute this result to increased competition. Auditor industry expertise was not an important consideration in auditor changes in a study by Eichenseher and Shields [1983].

The tests in this section indicate that IPO companies have a positive demand for auditor industry experience. A model of the determinants of the demand for auditor experience is tested in the following section.

4.3 Determinants of the Demand for Auditor Experience

4.3.1 Model Development

In section 3.1.2, it was hypothesized that the demand for auditor experience would be related to the information risk of the firm. The variables chosen to proxy for information risk were company age, company size, and membership in a specialized industry. The following are the hypothesized relationships for those variables:

H_{2A}: The industry experience of the auditor selected by the IPO company will be negatively associated with the size of the IPO company.

H_{2B}: The industry experience of the auditor selected by the IPO company will be negatively associated with the age of the IPO company.

H_{2C}: The industry experience of the auditor selected by the IPO company will be positively associated with IPO company membership in a specialized industry.

Additional control variables included in the regression model are the reputation of the investment banker and the percentage of ownership retained in the offering. In addition, an indicator variable is added for whether the IPO occurred before or after the mergers that resulted in the Big 6.

Menon and Williams [1991] find that the choice of a Big 6 auditor is positively associated with the use of a ranked investment banker (RBANK). Balvers, McDonald and Miller [1988] argue that the investment banker either implicitly or explicitly approves the choice of auditor. They suggest that a high reputation investment banker will want to signal its quality through choice of a high quality auditor. Accordingly, it is expected that high reputation bankers would prefer auditors with industry experience.

A dichotomous indicator variable is used for investment banker reputation. Eighteen investment banking firms are classified as ranked using the classification scheme in Balvers et al. Other criteria can be used to classify investment bankers as ranked; several studies use multichotomous classification schemes (e.g., Menon and Williams [1991]). Both Menon and Williams and Beatty [1989] indicate that their results are robust to alternative classifications of investment banker reputation.

Leland and Pyle [1977] developed a signaling model where the entrepreneur signals his or her private information as to the value of the firm by the percentage ownership retained in the company. A high level of retained ownership is a positive

signal of the future prospects of the firm. In the Datar, Feltham and Hughes [1991] model of auditor selection at the time of an IPO, the entrepreneur can substitute auditor quality for the percentage of ownership retained to communicate private information about the value of the firm. Because these signals are substitutes, they hypothesize a negative relationship between auditor quality and the percentage of retained ownership. If auditor experience is a dimension of auditor quality, this implies a negative relationship between auditor experience and retained ownership.

The mergers that reduced the Big 8 accounting firms to the Big 6 resulted in an upward increase in average industry market shares. Accordingly, an indicator variable is added to indicate whether the IPO occurred before or after these mergers. This indicator variable is included only in the models for the continuous measures of experience since the effect of the mergers is more pronounced on these variables.

The full model of the cross-sectional demand for auditor industry experience in the Big 6 audit market is as follows (predicted sign in parentheses - firm indicator subscript suppressed for convenience):

$$\text{AUDEXP} = \alpha + \overset{(-)}{\beta_1}\text{SIZE} + \overset{(-)}{\beta_2}\text{AGE} + \overset{(+)}{\beta_3}\text{SPEC} + \overset{(+)}{\beta_4}\text{RBANK} + \overset{(-)}{\beta_5}\text{REOWN} + \overset{(+)}{\beta_6}\text{PERIOD} + \epsilon \qquad (1)$$

Where:

AUDEXP	=	Industry market share of the audit firm.
SIZE	=	IPO company size, measured by total assets prior to the IPO, plus the offering proceeds.
AGE	=	Number of years the IPO company has been in existence.
SPEC	=	1 if IPO company industry accounting is complex, 0 otherwise.
RBANK	=	1 if a ranked investment banker is used, 0 if non-ranked.
REOWN	=	Percentage of ownership retained in the IPO.
PERIOD	=	1 if IPO is after the mergers which created the Big 6, 0 otherwise.

A preliminary test of this model was conducted using the choice of a Big 6 or non-Big 6 auditor as the dependent variable for the full sample of IPOs. The logistic regression model provides a partial replication of Menon and Williams [1991] using auditor levels rather than auditor changes. The test also offers a benchmark basis of comparison for variable performance in tests of the model. The results of the preliminary test of the model are reported in Table 4.5.

Table 4.5
Logistic Regression Model
IPO Auditor Selection - Preliminary Test

Variable	Predicted Sign	(n=660) Coefficient	Chi-square
Intercept		1.613	16.39***
Proceeds	+	.039	11.32***
Revenue	+	-.000	0.91
Age	-	-.063	9.08***
Banker	+	.868	5.01**
Reown	-	-.008	1.10
Model Chi-square = 69.09 (with 5 degrees of freedom)***			

** (***) Significant at the .05 (.01) level based on two-tail test.

Choice of a Big 6 auditor was positively associated with the size of the offering. Surprisingly, there was no significant relationship between auditor choice and company size measured by revenues. There was a negative relationship between auditor choice and the age of the firm. This suggests that start-up entities select auditors with higher reputations due to the greater information risk associated with these firms. Consistent with both Simunic and Stein [1987] and Menon and Williams [1991], there was a positive relationship between the reputation of the investment banker and choice of a Big 6 auditor.

4.3.2 Model Results

The auditor experience model was estimated using ordinary least squares regression for the continuous measures of experience, and using logistic regression for the dichotomous measures. Preliminary tests indicated that the relationship between the experience measures and IPO company age and the percentage of retained ownership were insignificant. Inclusion of the variables AGE and REOWN results in a loss of observations due to missing data. Accordingly, these variables were dropped from the regression models.

The lack of significance for the variable AGE fails to support hypothesis 2B. IPO company age was significantly associated with the decision to select a Big 6 auditor in Table 4.5. It is not clear why IPO companies with short operating histories would prefer Big 6 auditors, but not audit firms with industry experience.

Table 4.6 contains the results of the regression model for the continuous experience measures. Reported sample sizes are less than for the tests in Section 4.2 due to missing observations for the revenue variable. Chi-square values from White's test reported at the bottom of Table 4.6 indicate the presence of heteroskedasticity in three of the models. Accordingly, the reported significance levels are based on the z-statistics using the asymptotically consistent covariance matrix.

Table 4.6
Auditor Experience Model
Continuous Variables

		Estimated coefficient (z-statistic)			
		Dependent Experience Measure			
		(n=428)		(n=585)	
Independent variables	Predicted Sign	Clshare3	Sashare3	Clshare2	Sashare2
Intercept		11.129 (9.719)***	15.777 (6.103)***	9.693 (14.263)***	11.110 (7.157)***
Specialized Industry	+	4.011 (2.594)***	1.559 (.711)	1.493 (2.300)**	1.557 (1.315)
Revenue (Ln)	-	0.072 (.592)	0.083 (.348)	0.110 (1.735)**	0.243 (1.778)**
Banker	+	0.037 (.046)	-0.032 (-.018)	-0.028 (-.062)	1.075 (.998)
Period	+	3.124 (4.344)***	1.723 (1.012)	3.618 (7.883)***	3.196 (2.920)***
Adjusted R-Squared		0.070	-0.006	0.109	.022
F-Value		9.088***	.398	18.857***	4.201*
Chi-Squared		20.664**	8.292	61.345***	34.186***

*** (**) (*) - Significant at the .01 (.05) (.10) level. Z-statistics are one-tailed.

The overall explanatory power of all models is low. Consistent with the results in Eichenseher and Danos [1981], the demand for auditor industry experience is generally related to company membership in a specialized industry.[6] Hypothesis 2A had predicted that auditor experience would be negatively related to IPO company size. The results for the continuous measures generally support the opposite relation. There was little evidence of a relationship between investment banker reputation and auditor industry experience. As expected, experience levels were higher in the post-merger period.

Table 4.7 reports the results from the logistic regression for the dichotomous experience measures. The results are generally consistent with those for the continuous measures. The models lack overall explanatory power. The specialized industry variable is significant, but only for sales-based measures. The revenue variable is highly significant in the opposite direction for the model SAEXP2.

Table 4.7
Auditor Experience Logistic Regression Model
Dichotomous Measures

Independent variables	Predicted Sign	Estimated coefficient (Chi-squared statistic) Dependent Experience Measure Clexp	Saexp	Lgexp
Panel A: **Three-digit measures** (n=428)				
Intercept		-0.866 (8.813)***	-1.370 (17.801)***	-1.386 (16.884)***
Specialized Industry	+	0.327 (1.240)	0.485 (2.611)*	-0.089 (.062)
Revenue (Ln)	-	-0.019 (.371)	0.018 (.264)	-0.007 (.039)
Banker	+	-0.025 (.011)	0.116 (.067)	-0.077 (.081)
Model Chi-Squared		1.660	2.925	0.271
Panel B: **Two-digit measures** (n= 585)				
Intercept		-1.157 (18.247)***	-2.550 (43.424)***	-2.134 (35.883)***
Specialized Industry	+	0.196 (.819)	0.447 (3.75)**	0.578 (5.669)***
Revenue (Ln)	-	0.005 (.032)	0.103 (6.985)***	0.044 (1.45)
Banker	+	-0.053 (.067)	-0.023 (.010)	-0.198) (.663)
Model Chi-squared		0.862	13.600***	7.196*

*** (**) (*) - Significant at the .01 (.05) (.10) level. Test statistics are one-tailed where appropriate.

4.3.3 Summary on Determinants of the Demand for Auditor Experience

The demand for auditor experience does not appear to be easily modeled. A corollary can be drawn to studies of the choice of a Big 6 firm. Most of the explanatory power in selection models such as Simunic and Stein [1987] and Menon and Williams [1991] derive from size-dependent measures. Francis and Wilson [1988] found only a weak association between agency costs and the change to a Big 6 auditor.

The demand for auditor experience was hypothesized to be negatively associated with IPO company size and age, and positively associated with IPO company membership in a specialized industry. The results of these tests are summarized in Figure 4.2.

Hypothesis/ Variable	**Hypothesized relationship to auditor experience**	**Results**
H_{2A}: IPO company size	Negative	Not supported. Results somewhat support the opposite finding of a positive relationship between company size and the demand for auditor experience.
H_{2B}: IPO company age	Negative	No evidence of a relationship between IPO company age and the demand for auditor experience.
H_{2C}: Specialized industry	Positive	Results generally support the existence of a positive relationship between the demand for experience and membership in a specialized industry.

Figure 4.2
Summary of Results
Determinants of Demand for Auditor Experience

Although it had been hypothesized that smaller IPO companies would have a greater demand for auditor experience, the results were more consistent with the opposite relation. This is consistent with studies that have found the demand for a Big 6 auditor is positively related to company size [Simunic and Stein 1987; Menon and Williams 1991]. No evidence was found of a relationship between the demand for auditor experience and IPO company age.

Hypothesis 2C was generally supported. The demand for auditor experience is positively associated with IPO company membership in a specialized industry. This result is consistent with Eichenseher and Danos [1981] finding that observed auditor concentration levels are positively related to industry regulation. This study extends their result by demonstrating that this relationship exists for new entrants into the audit market for publicly-traded companies.

The inability to develop a better explanatory model of auditor experience is also consistent with the results in Feltham, Hughes and Simunic [1991]. They were unable to find an association between selection of a Big 6 auditor and measures of firm risk. The lack of model explanatory power is not inconsistent with the information quality theory of Titman and Trueman [1986]. In their model, high-quality firms select high-quality auditors. However, firm quality is unobservable, at least ex ante.

ENDNOTES

1. It is necessary to control for industry because the sample experience measures are based on audit firm shares of the total audit market, rather than the within Big 6 market. The Big 6 share of the market varies by industry.

2. The actual expected value for the variable CLEXP would be slightly higher due to ties in a few industries.

3. Similar results for the continuous measures are obtained using the nonparametric Wilcoxon signed ranks test, except the variables SASHARE3 and SASHARE2 are no longer statistically significant at conventional levels. Similar results are obtained for all dichotomous measures using a binomial test.

4. The tests in Table 4.3 are based on a one-sample t-test comparing the sample value to the expected value under the market weighted model. Limitations in the construction of the expected value in the market weighted model make it difficult to perform a paired-sample t-test. For comparative purposes, the reported results for the random selection model in Table 4.2 based on a paired-sample t-test do not differ significantly from the results that would have been reported using a one-sample t-test.

5. A preferable method for addressing the demand for auditor experience relative to existing publicly-traded companies would be to match IPO companies on size with existing companies. Preferably, these companies would not be recent IPO companies.

   Another method to address the demand for auditor experience would be to focus on auditor changes. If auditor industry experience is a dimension of quality, firms that incur the cost of changing auditors prior to the IPO should demand higher levels of auditor experience.

6. The ad hoc classification of industries as specialized was based on the existence of specialized industry accounting or auditing standards. The standards generally relate to industries as defined at the three-digit SIC level. In the regression model at the two-digit SIC level, industries were classified as specialized if at least one of the three-digit industries within that two-digit classification were specialized. The results were substantially unchanged if the definition of specialized industries was based solely on the three-digit classifications.

CHAPTER 5 - OFFERING UNDERPRICING RESULTS

5.1 Introduction

Hypothesis three in Section 3.1.3 predicted that underpricing would be negatively associated with the industry experience of the auditor.

> H_3: The underpricing of the IPO will be negatively associated with the industry experience of the auditor.

This hypothesis is empirically tested in this chapter. In section 5.2, a model of underpricing is developed. Preliminary tests of the model on the full sample of IPOs using membership in the Big 6 as the measure of audit quality are included in section 5.3. The results of the tests of the relationship between underpricing and auditor experience are reported in section 5.4. Additional specification tests are described in section 5.5. Section 5.6 is a summary and conclusion on the results of the underpricing tests.

5.2 Underpricing Model

A model of IPO underpricing is developed in this section to conduct empirical tests of the relationship between offering underpricing and auditor experience. This model is based primarily on the models in Balvers et al. [1988] and Beatty [1989].

Control variables for investment banker reputation (RBANK), age of the client (AGE), the percentage of ownership retained in the IPO (REOWN), and membership in a specialized industry (SPEC) are included in the model. These variables were described in the previous chapter. Additional control variables

include IPOIND, a measure of the market return for newly issued securities, and the exchange (EXCH) of the offering company. A further description of the control variables and the reason for their inclusion in the underpricing model is discussed in this section.

An important factor associated with underpricing of the IPO is the reputation of the investment banker. In the models in Beatty and Ritter [1986] and Balvers, McDonald and Miller [1988], the reputation of the investment banker reduces the uncertainty associated with the offering. Both Balvers et al. and Beatty [1989] found that underpricing is less with the use of a high reputation investment banker. An empirical link between investment banker reputation and underpricing is not surprising since the investment banker sets the price of the offering. Beatty and Ritter [1986] find that investment banking firms that, on average, set offering prices either too high or too low tend to lose market share in subsequent periods.

Beatty [1989] argued that the age of the IPO company is related to the ex ante uncertainty of the offering since a longer operating history provides investors with more information concerning managerial decision-making. As Beatty notes, age also may be associated with actual client risk. Beatty found that underpricing is negatively associated with the age of the IPO company.

Similarly, Beatty includes the percentage of ownership retained in the IPO [REOWN] as another variable to control for information risk. In the Leland and Pyle [1977] signaling model, REOWN is a signal of management's private information concerning the company's future prospects. This signal from management reduces the uncertainty regarding the future cash flows of the firm.

In section 3.1.2, it was argued that information risk is greater for companies in specialized industries. Accordingly, underpricing is predicted to be greater for companies in specialized industries.

IPOIND is a market index of securities on the CRSP NASDAQ tape that have traded for less than 20 days (Balvers et. al. [1988]). This variable attempts to control for market effects present in the market for newly issued securities. Ritter [1984] has shown that underpricing is greater in "hot" periods, when the IPO market is active. Table 3.2 in Chapter 3 indicated some clustering of the sample, as 368 of the 841 offerings occurred in 1991.

The variable IPOIND is constructed as follows. A daily market return is computed as the average return on all securities on the CRSP NASDAQ tape that have traded for less than 20 days. The monthly index for each day is equal to the cumulative return for the past 20 days of the daily index.[1] Defining the monthly index relative to the date of each IPO is a technical refinement over the approach in Balvers, McDonald and Miller. The monthly index in Balvers et al. is calculated on a calendar basis; IPOs are assigned a value of the index based on the month of offering. In this study, the monthly index is calculated on a daily basis so that the index is always based on returns for the 20 days prior to the IPO.

The exchange in which the IPO is offered is included to control for differences in liquidity across exchanges. The majority of offerings involve NASDAQ companies, although an increasing number of IPOs involve NYSE companies. Within the NASDAQ market, firms may trade over-the-counter (OTC) or through the National Market Service (NMS). NMS firms must meet certain

capital requirements, and market makers in NMS stocks provide real-time reporting of transactions. Baker and Edelman [1992] find that spread narrows and volume increases when firms switch from the OTC to NMS listings, consistent with greater liquidity for NMS offerings. Previous studies have not controlled for listing differences within the NASDAQ market.

Table 5.1 contains descriptive statistics for the sample by the exchange in which the IPO is offered. The table suggests that NMS offerings are more similar to AMEX offerings than OTC offerings. This is consistent with the finding in Edelman and Baker [1990] that NMS firms do not significantly increase their liquidity when they switch to the AMEX. Accordingly, the exchange variable distinguishes OTC listings from other offerings. The exchange variable is a dichotomous variable coded as 1 for NYSE, AMEX and NASDAQ-NMS offerings, and 0 for NASDAQ-OTC offerings.

Table 5.1
Descriptive Statistics by Exchange
IPO Sample 1988-1991

		Mean (standard deviation)				
	Number of Offerings	(Millions) Offering Proceeds	Offer Price	Under-Pricing	Percent with Ranked Investment Banker	Percent with Big 6 Auditor
Nasdaq - OTC	278	6.90 (7.79)	6.01 (3.63)	.200 (.331)	.054 (.226)	.705 (.456)
Nasdaq - NMS	427	30.02 (34.90)	11.24 (3.68)	.109 (.143)	.480 (.500)	.911 (.285)
AMEX	36	36.49 (31.24)	11.47 (4.56)	.063 (.095)	.694 (.467)	.972 (.165)
NYSE	100	160.34 (164.40)	17.41 (6.55)	.046 (.095)	.970 (.171)	.940 (.237)
All Offerings	841	38.01 (77.17)	10.26 (5.46)	.130 (.225)	.407 (.492)	.849 (.358)

The full underpricing model is as follows (predicted sign in parentheses; individual firm subscript deleted for convenience):

$$\text{UNDPRICE} = \alpha + \underset{(-)}{\beta_1}\text{RBANK} + \underset{(-)}{\beta_2}\text{AGE} + \underset{(+)}{\beta_3}\text{IPOIND} + \underset{(-)}{\beta_4}\text{REOWN} + \underset{(-)}{\beta_5}\text{EXCH} + \underset{(+)}{\beta_6}\text{SPEC} + \underset{(-)}{\beta_7}\text{EXP} + \epsilon \qquad (2)$$

Where:

UNDPRICE	=	The initial return on the newly traded security.
RBANK	=	1 if a ranked investment banker is used, 0 if non-ranked.
AGE	=	The number of years the IPO company has been in existence.
IPOIND	=	A market index of the return on securities traded less than 20 days.
REOWN	=	The percentage of ownership retained in the IPO.
EXCH	=	1 if offering is NYSE, AMEX or NMS, 0 if OTC.
SPEC	=	1 if IPO company industry accounting is complex, 0 otherwise.
EXP	=	The industry experience of the audit firm.

Preliminary tests of the model are conducted in the following section.

5.3 Preliminary Model Tests

As a preliminary test of the underpricing model, equation 2 was estimated using ordinary least squares regression on the full sample of IPOs. The following modifications to the model were made in conducting these empirical tests. In the preliminary tests using the full sample, the dichotomous Big 6/non-Big 6 reputation variable was used as the measure of audit quality. In addition, an auditor-investment banker interaction term was included since Balvers, McDonald and Miller [1988] suggest such an interaction term is important. The specialized industry variable is

excluded from this test because this variable was not measured for IPOs involving non-Big 6 auditors.

There are three reasons to estimate this model. First, as a replication of previous research and as a benchmark for evaluating the significance of the experience variable. Second, to evaluate performance of control variables for inclusion in the model. Third, to assess the importance of the variable EXCH which has not been incorporated in previous tests of offering underpricing.

The results of the preliminary regression model are included in Table 5.2. Three separate models are estimated. Model 2A includes AGE, REOWN, and an auditor-investment banker interaction term. In model 2B, AGE and REOWN are excluded because they do not achieve significance in Model 2A, and missing data for these variables results in a loss of observations. The auditor-investment banker interaction term is also excluded because it is highly collinear with the investment banker variable. Lastly, in model 2C the exchange variable is added to model 2B. This model is estimated separately to isolate the effect of the exchange variable on other variables.

Table 5.2
IPO Underpricing Model
Preliminary Test

Independent variables	Predicted Sign	Estimated coefficient (z-statistic) (n=680) Model 2A	(n=838) Model 2B	(n=838) Model 2C
Intercept		0.245 (6.245)***	0.201 (7.719)***	.221 (7.838)***
Banker	-	-0.132 (-2.361)***	-0.095 (-7.046)***	-0.065 (-5.788)***
Big 6 Auditor	-	-0.075 (-1.880)**	-0.046 (-1.661)**	-0.032 (-1.125)
Banker * Big 6	+	0.031 (0.536)		
IPOIND	+	0.482 (3.489)***	0.450 (3.559)***	0.469 (3.767)***
Age	-	-0.0009 (-0.596)		
REOWN	-	-0.0011 (-0.242)		
Exchange	-			-0.067 (-3.179)***
Adjusted R-Squared		0.083	0.067	0.080
F-Value		11.219***	20.874***	19.142***
Chi-Squared		39.16***	34.94***	37.58***

* (**) (***) Significant at the .10 (.05) (.01) level; one-tail tests where appropriate.

In Model 2A, the reputation of both the investment banker and auditor have a significant negative relationship with underpricing. The magnitudes of the coefficients for these variables are larger than, but consistent with the values reported in Balvers, McDonald and Miller [1988]. Specification tests using only NASDAQ offerings indicate that the higher reported values are largely due to the inclusion of NYSE and AMEX offerings. Balvers et al. excluded NYSE and AMEX offerings from their sample.

The banker-auditor interaction term was insignificant. The coefficient of .031 is approximately half the value of .058 reported by Balvers et al. One possible reason for the lack of significance for this variable is that it is highly correlated with the investment banker reputation variable.

Also as expected, there is a significant positive relationship between underpricing and IPOIND. Neither the variable AGE or REOWN were significant. Beatty [1989] found these variables to be significantly related to underpricing. However, his results were based on a sample of 2215 that also included best efforts offerings.

The primary result of model 2B is that deletion of the interaction term reduces the coefficient for investment banker reputation, while greatly increasing the significance of this variable. This result is consistent with the effect of a highly collinear variable (Belsley, Kuh and Welsch [1980]).

In Model 2C, the exchange variable is significant as predicted. More importantly, inclusion of this variable results in a reduction of the significance of the investment banker and auditor reputation variables. This is an important finding

since it suggests that the magnitude of the relationship between underpricing and auditor and investment banker reputations may have been overstated in previous studies that treated NASDAQ as a homogeneous market.

The results for Model 2C were substantively unchanged under different exchange classifications.[2] Because the exchange variable is highly correlated with size variables, different size measures were added to the model. The results were substantially unchanged when either revenue or offering proceeds were added to the model to control for IPO company size.

The model R-squared values are relatively low, but consistent with the range of values reported in previous studies. The chi-squared values from White's [1980] test indicate the presence of heteroskedasticity in each of the models. The reported significance levels are based on the z-statistics using White's asymptotically consistent covariance matrix. The reported results are generally consistent with previous empirical studies. This suggests that the model and data are appropriate for conducting empirical tests.

5.4 Research Results

Tests of hypothesis three of the relationship between auditor experience and underpricing were conducted using the experience measures described in section 3.2. The sample consists of IPOs with Big 6 auditors for which an industry experience measure could be calculated.

Consistent with the results reported in the previous section, preliminary tests of the model indicated no significant relationship between underpricing and company

age or the percentage of retained ownership. These variables were dropped from the model because they result in a number of missing observations.

The results of the regression model for the three-digit experience measures are included in Table 5.3. The chi-squared values reported at the bottom of the table indicate the presence of heteroskedasticity in each of the models. The reported significance levels are based on the z-statistics using the asymptotically consistent covariance estimates. Consistent with the preliminary results for the full sample, there is a significant relationship in each model between underpricing and the control variables for investment banker reputation, the IPO return index, and the exchange of the offering.

Surprisingly, underpricing was lower in specialized industries. Because many of these industries are regulated, one conjecture is that there is less uncertainty about future earnings for these companies due to the presence of regulation. Teets [1992] found that earnings response coefficients are smaller for electric utilities than for nonregulated companies, indicating that unexpected earnings are less permanent for utilities. He suggested that this is consistent with regulators buffering utilities from changes in the operating environment (p. 275).[3]

The relationship between underpricing and the experience measures is negative in four of the five models, but is statistically significant only for the variable SAEXP3. The relationship between underpricing and the continuous experience measures were very small. The direction of the coefficients for the dichotomous measures are at least suggestive of a relationship between underpricing and auditor experience.[4]

Table 5.3
IPO Underpricing Model
Three-digit Experience Measures

Independent variables	Predicted Sign	(n=449) Estimated coefficient (z-statistic) Experience Measure				
		Clshare	Sashare	Clexp	Saexp	Lgexp
Intercept		0.181 (5.379)***	0.195 (5.421)***	0.193 (5.637)***	0.197 (5.719)***	0.193 (5.659)***
Experience	-	.0007 (.692)	-.0003 (-.640)	-0.011 (-.565)	-0.031 (-1.816)**	-0.016 (-.798)
Banker	-	-0.073 (-5.032)***	-0.073 (-5.024)***	-0.073 (-5.021)***	-0.074 (-5.048)***	-0.073 (-5.021)***
IPOIND	+	0.338 (2.086)**	0.337 (2.081)**	0.337 (2.084)**	0.327 (2.007)**	0.339 (2.093)**
Exchange	-	-0.041 (-1.282)*	-0.039 (-1.242)	-0.040 (-1.245)	-0.039 (-1.232)	-0.040 (-1.248)*
Specialized industry	+	-0.071 (-4.579)***	-0.068 (-4.630)***	-0.067 (-4.578)***	-0.065 (-4.481)***	-0.068 (-4.622)***
Adjusted R-Squared F-Value		0.067 7.387***	0.067 7.383***	0.067 7.389***	.070 7.715***	.067 7.417***
Chi-Squared		26.569*	26.127*	25.041*	31.812**	27.424**

*** (**) (*) - Significant at the .01 (.05) (.10) level. One-tail tests used where appropriate.

The results for the underpricing model using the two-digit experience measures are reported in Table 5.4. Use of two-digit measures increases the sample size from 449 to 614 observations. The increase in sample size is associated with an increase in the statistical significance of the control variables. The chi-square statistic also indicates the presence of heteroskedasticity in each of these models. Reported significance levels are for the z-statistics based on the asymptotically consistent covariance estimates.

When experience is measured using two-digit SIC codes, the coefficients for all of the experience variables are very small, and inconsistent as to direction. The results at the two-digit SIC level provide little support for the existence of a relationship between underpricing and auditor industry experience levels.

Table 5.4
IPO Underpricing Model
Two-digit Experience Measures

Independent variables	Predicted Sign	(n=614) Estimated coefficient (z-statistic) Experience Measure				
		Clshare	Sashare	Clexp	Saexp	Lgexp
Intercept		0.153 (6.015)***	0.175 (6.259)***	0.171 (6.710)***	0.172 (6.752)***	0.171 (6.761)***
Experience	-	.0015 (1.154)	-.0003 (-.529)	0.00006 (.004)	-0.0078 (-.520)	0.0004 (.023)
Banker	-	-0.065 (-5.639)***	-0.064 (-5.185)***	-0.065 (-5.301)***	-0.065 (-5.287)***	-0.065 (-5.300)***
IPOIND	+	0.417 (3.172)***	0.416 (3.161)***	0.415 (3.126)***	0.415 (3.149)***	0.415 (3.147)***
Exchange	-	-0.037 (-1.406)*	-0.034 (-1.345)*	-0.035 (-1.355)*	-0.035 (-1.348)*	-0.035 (-1.358)*
Specialized industry	+	-0.039 (-2.331)***	-0.036 (-2.136)**	-0.037 (-2.184)**	-0.036 (-2.149)**	-0.037 (-2.175)**
Adjusted R-Squared F-Value		0.062 9.106***	0.061 8.914***	0.060 8.872***	.061 8.904***	.060 8.872***
Chi-Squared		38.783***	33.397***	33.236***	32.664***	34.631***

*** (**) (*) - Significant at the .01 (.05) (.10) level. One-tail tests used where appropriate.

The overall lack of significance for the experience variables is inconsistent with the third research hypothesis. One possible explanation is that the choice of auditor does not significantly affect offering underpricing. Although Balvers, McDonald and Miller [1988] and Beatty [1989] find that choice of a Big 6 auditor is associated with significantly lower underpricing of the offering, evidence reported in section 5.3 suggests that the relationship between auditor reputation and offering underpricing is reduced after controlling for the exchange of the offering. The lack of association between auditor reputation variables and offering underpricing is also consistent with previous studies of the economic consequences of auditor choice. In section 2.2.4, two studies were cited in which the relationship between choice of a Big 6 auditor and capital market activity was not statistically significant.

5.5 Specification Tests

A number of procedures were performed to further investigate the underpricing results. These tests relate to multicollinearity, outliers, the definition of experience, industry clustering, and the changing composition of the Big 6.

Multicollinearity does not appear to be a problem in the model. The largest condition index of approximately 5 is well below the threshold of 30 suggested by Belsley, Kuh and Welsch (p.105) as indicating harmful levels of multicollinearity. The highest variance inflation factors are approximately 1.30 for the banker and exchange variables. These variables were significant in each model. The experience variables were substantially uncorrelated with other variables. The variance inflation factors for the experience variables were close to 1.

Underpricing models can be influenced by a few extreme observations.[5] A few offerings enjoy substantial increases in price in the first day of trading. To limit the effect of these observations, underpricing was arbitrarily truncated at a maximum of .50 for the underpricing models at the three-digit level. In the truncated models, adjusted R-squared values increased to the .09 range. The control variables increased in significance, with the exception of the exchange variable which became insignificant.[6] The estimates and significance of the experience variables did not change significantly, and remained insignificant.

The strongest reported results for the experience measures are for the dichotomous measures at the three-digit level. These are the measures that had been expected to best capture auditor experience. In some instances, an audit firm is classified as the market leader even though its market share is not substantially larger than that of the firm with the next largest market share. In several industries, ties result in more than one firm being classified as the most experienced. To address this issue, the classification of the market leader was limited to audit firms with more than 25 (35) percent of the clients (sales dollars). Results did not change substantially when this definition of experience was used.

Approximately 40 percent of the offerings at the three-digit level came from five industries. Dummy variables were added to the underpricing model for each of these industries to assess whether underpricing was related to IPO company industry. Only one of the dummy variables was marginally significant, and inclusion of the dummy variables had little effect on the other regression coefficients.

5.5.1 Effects of Big 6 Mergers

An additional specification issue concerns the effects of the mergers of Ernst and Whinney with Arthur Young, and Deloitte, Haskins and Sells with Touche Ross. The combined market shares of these firms increased dramatically in many industries after the mergers. However, while the combined market shares of these firms may translate into industry experience that is valued in the marketplace, it is unlikely that this would occur immediately. To address this issue, the underpricing model was estimated separately for the pre-merger and post-merger period. In addition, the extent of underpricing by individual Big 6 firms was examined.

In the separate period regression tests, the primary focus was on the effect of auditor experience in the period prior to the mergers of the Big 6. The magnitude of the coefficients for the experience variables did not suggest the existence of a significant relationship between underpricing and auditor experience in the pre-merger period. However, the sample size is less than 200 in this period.

To further examine whether the effect of the mergers had any relationship with offering underpricing, underpricing levels were calculated by individual Big 6 firm. This was done for two reasons. First, the merged firms of Deloitte & Touche and Ernst & Young were involved in the largest number of IPOs in the 1990-1991 period. As previously indicated, the experience measures for these firms dramatically increased as a result of the mergers. Second, Beatty [1989] indicates that there are reputational differences among the Big 6. Mean and median underpricing for the Big 6 firms for the pre-merger and post-merger period are reported in Table 5.5.

Table 5.5
Underpricing by Audit Firm

Audit Firm	1988-1989			1990-1991		
	n	Mean (Std. Dev)	Median	n	Mean (std. dev.)	Median
Arthur Andersen	39	.085 (.149)	.025	68	.118 (.168)	.087
Coopers and Lybrand	42	.086 (.140)	.029	57	.114 (.146)	.056
KPMG Peat Marwick	47	.070 (.111)	.021	84	.119 (.169)	.073
Price Waterhouse	23	.074 (.137)	.023	35	.075 (.196)	.029
Deloitte, Haskins and Sells	33	.076 (.133)	.022			
Touche Ross	24	.194 (.317)	.062			
Deloitte and Touche				82	.198 (.291)	.098
Arthur Young	26	.087 (.152)	.048			
Ernst and Whinney	23	.059 (139)	.013			
Ernst and Young				120	.150 (.278)	.072
Total	257	.088 (.163)	.026	446	.137 (.229)	.075

The highest mean and median levels of underpricing in the 1990-1991 period are for the two newly-merged firms of Deloitte & Touche and Ernst and Young. The underpricing levels for Touche Ross are also high in the pre-merger period.

To assess the effect of the merged firms on the experience variables, a dummy variable was added to the model if the auditor was one of the two merged firms in the 1990-1991 period. This is an ad hoc procedure to the extent that it is known ex post that these firms had high levels of underpricing. However, an a priori concern was the effect of including merged entities in the calculation of experience measures. Also, Beatty [1989] suggests that the largest firms differ in their reputational capital. The model is reported in Table 5.6 for the variables CLEXP3 and SAEXP3.

The dummy variable for the merged firms is positive and statistically significant. The reported values and significance levels of the experience variables also increase in relation to the values reported in Table 5.3. Qualitatively similar results are obtained when the model is estimated with individual firm dummies for the two firms, and when the underpricing model is estimated for the post-merger period only. This provides evidence that the results for the auditor experience variables are reduced by the effects of the increased market shares of the merged firms.

The significance of the merged firm dummy variable suggests that the mergers may have lowered the reputational capital of the merged firms. Beatty [1989] included dummy variables for the 20 firms with more than 10 offerings during the period 1975-1984. Although Beatty had a much larger sample size, none of the indicator variables in his study was statistically significant.[7]

Table 5.6
IPO Underpricing Model
Merged Firm Dummy Model

Independent variables	Predicted Sign	(n=449) Estimated coefficient (t-statistic) Clexp3	(z-statistic) Saexp3
Intercept		0.179 (8.750)***	0.181 (6.000)***
Experience	-	-0.032 (-1.381)*	-0.041 (-2.137)**
Banker	-	-0.074 (-3.284)***	-0.075 (-5.019)***
IPOIND	+	0.291 (1.970)**	0.281 (1.698)**
Exchange	-	-0.042 (-1.684)**	-0.041 (-1.312)*
Specialized industry	+	-0.062 (-2.275)**	-0.061 (-4.204)***
Merger variable	?	0.073 (3.236)***	0.070 (2.412)**
Adjusted R-Squared		0.086	.088
F-Value		8.035***	8.245***
Chi-Squared		27.486	32.323*

*** (**) (*) - Significant at the .01 (.05) (.10) level. One-tail tests used where appropriate. Based on z-statistic from asymptotically consistent covariance matrix where model is heteroskedastic.

The results in Table 5.6 are important in that they apparently demonstrate differences in audit quality both within and between Big 6 firms. The results suggest that quality varies within firms as a function of industry experience, and between firms as a function of overall firm reputational capital. Because industry experience and overall firm reputation may be related, studies that do not control for differences in reputational capital may fail to find hypothesized relationships between measures of audit quality and auditor industry experience.

5.6 Summary and Conclusion for Underpricing Tests

The underpricing tests do not support the hypothesis that the general construct auditor experience is associated with lower underpricing of the offering. However, four (of five) measures at the three-digit SIC level had the hypothesized negative coefficient. The dichotomous measures of experience at the three-digit SIC code level each had the predicted negative sign, and the sales-based measure SAEXP was statistically significant at conventional levels. These results do not rule out the existence of a relationship between auditor industry experience and underpricing. Further, as reported in Table 5.6, both the sales-based and client-based dichotomous measures at the three-digit level were significant when an indicator variable is added for audit firms that had been involved in mergers.

The significance of the experience measure and merged firm indicator variable appears to suggest differences both within firms based on industry experience, and between firms based on overall reputational capital. The significance of the merged firm variable suggest that the reputational capital of the firms involved in these

mergers may have declined following the mergers. This subject deserves further investigation as additional data becomes available.

The underpricing results can also be compared to underpricing tests that use membership in the Big 6 as the measure of quality. Previous studies by Balvers, McDonald and Miller [1988] and Beatty [1989] suggest that Big 6 firms are associated with lower underpricing of the offering. However, the tests described in section 5.3 suggest that the relationship between this quality measure and underpricing is not statistically significant when the exchange of the offering is controlled for. Previous research on offering underpricing has not controlled for these exchange differences.

ENDNOTES

1. Since underpricing is a one day return, the use of a one-day index would seem appropriate. However, the number of observations for each daily index is generally small (an average of 25-30 observations). Comparison of the monthly and daily indices supported a slightly stronger relation between the monthly index and underpricing.

2. The alternative exchange classifications were as follows:

Nasdaq (OTC)	1	Nasdaq (OTC)	1
Nasdaq (NMS)	2	Nasdaq (NMS)	2
AMEX	3	NYSE and AMEX	3
NYSE	4		

3. As a regulated monopoly, electric utilities represent an extreme form of price regulation. It is an empirical issue whether there is less uncertainty about earnings for other regulated industries.

4. An economic interpretation of the coefficients may be helpful. The mean offering proceeds for offerings involving Big 6 auditors as reported in Table 3.2 is 42.56 million. A one percent reduction in underpricing is associated with a reduction in underpricing of $425,000.

5. This researcher is unaware of any underpricing research which addresses this issue.

6. It is not surprising that the exchange variable becomes insignificant when underpricing is truncated at .50, since most extreme underpricing observations involve OTC offerings.

   It should also be noted that OTC offerings are more likely to involve non-Big 6 auditors. The preliminary underpricing model 2C in Table 5.2 was reestimated, limiting underpricing to a maximum of .50. Although the magnitudes of all the coefficients were reduced, the statistical significance of each variable was unchanged.

7. Beatty reports coefficients of .063 for Peat Marwick and -.047 for Price Waterhouse. These coefficients represent large underpricing effects, but were not statistically significant. For comparison, the coefficient for the Big 6 reputation variable in Balvers et al. [1988] was -.043. One speculation is that Beatty's use of a longer time period without a time-varying intercept, or the inclusion of best efforts offerings, results in larger standard errors.

CHAPTER 6 - AUDITOR COMPENSATION RESULTS

6.1 Introduction

Hypothesis four in section 3.1.4 predicted that auditor experience would be positively associated with increased auditor compensation.

> H_4: Auditor industry experience will be associated with higher audit fees.

This hypothesis is empirically tested in this chapter. The model of auditor compensation is described in section 6.2. Preliminary tests of this model are included in section 6.3 using membership in the Big 6 as the measure of audit quality. Section 6.4 reports the results of the empirical tests of the research hypothesis. Section 6.5 is the summary and conclusion.

6.2 Auditor Compensation Model

The model of auditor compensation is based on Beatty [1989]. In his model, IPO cash compensation is a function of the offering proceeds, and pre-offering revenues and equity of the IPO company. Beatty's model is expanded in this study to include the specialized industry and exchange variables that were described in Chapter 5, as well as the auditor experience variables.

As in Beatty [1989], the total cash compensation in the IPO is used as the proxy for audit fees. Total cash compensation represents most of the costs of the IPO other than the underwriter fee, and includes legal fees, printing costs and the auditor fee. For the portion of his sample for which the audit fee is available, Beatty

reported a correlation between total cash compensation and estimated auditor compensation of .77. Beatty concluded that total cash compensation is a good surrogate for auditor cash compensation.

As described in section 3.3.1 in Chapter 3, data for this study was gathered from Going Public: the IPO Reporter (Going Public) and the Disclosure, Inc. SEC D'33 database (D33). Only total cash compensation is available from Going Public. Both total cash compensation and estimated auditor compensation are available on D33. The correlation between these two variables for the period 1990-1991 of .64 is comparable to the value of .77 reported by Beatty.

The three variables incorporated from Beatty's model (revenues, equity and offering proceeds) are all size variables designed to proxy for the marginal cost of the audit and are predicted to be positively associated with IPO cash compensation. In addition, it is likely that many of the cash expenses in the IPO vary directly with the offering proceeds. The model in Beatty is simpler than previous fee models such as those suggested by Simunic [1980] and Palmrose [1986]. Beatty's model does not control for such factors as entity complexity and risk. Nonetheless, Beatty argued that his model is a reasonably proxy for the marginal cost of the audit.

The specialized industry variable is added to test the prediction in Danos and Eichenseher [1986] that industry specialization leads to economies of scale in specialized industries. The competing hypothesis is that specialized industries are associated with higher audit fees because of greater accounting and auditing complexity. Accordingly, no prediction is made as to the direction of this variable.

The exchange of the IPO company is also added to the model. The inclusion of this variable is suggested by the use of total IPO cash compensation as a proxy for audit costs. Certain IPO costs are expected to be larger for NYSE, AMEX and NASDAQ-NMS offerings that are more widely distributed.

The auditor experience variables are also added to the model to test the research hypothesis that audit fees are positively related to the experience of the auditor. The full cash compensation model is as follows (predicted sign in parentheses; individual firm subscript deleted for convenience):

$$\text{CASH COMP} = \alpha + \beta_1 \text{EXP}^{(+)} + \beta_2 \text{PROC}^{(+)} + \beta_3 \text{REV}^{(+)} + \beta_4 \text{EQUITY}^{(+)} + \beta_5 \text{SPEC}^{(?)} + \beta_6 \text{EXCH}^{(+)} + \epsilon \quad (3)$$

Where:

CASH COMP	=	Cash expenses paid in the IPO.
EXP	=	Experience level of the auditor
PROC	=	Offering proceeds.
REV	=	Sales of the IPO company.
EQUITY	=	Book value of equity.
SPEC	=	1 if the company is in a specialized industry, 0 otherwise
EXCH	=	1 if the company is listed on NYSE, AMEX or NMS 0 otherwise

Preliminary tests of the model are conducted in the following section.

6.3 Preliminary Model Tests

As with the underpricing model, preliminary tests of the compensation model were conducted on the full sample of IPOs using the Big 6/non-Big 6 classification as the measure of audit quality. The results of these tests are reported in Table 6.1.

As in the tests of the offering underpricing model, the indicator variable for specialized industry is excluded because this variable was not measured for offerings with non-Big 6 auditors. Because the exchange variable is a modification of Beatty's model, the cash compensation model is estimated with (Model 3A) and without (Model 3B) the exchange variable to isolate the effect of this measure.

Table 6.1
IPO Cash Compensation Model
Preliminary Test

Independent variables	Predicted Sign	Estimated coefficient (z-statistic) (n=741) Model 3A	Model 3B
Intercept		392.435 (14.506)***	348.307 (14.506)***
Proceeds	+	0.0048 (16.110)***	0.0046 (15.440)***
Rev	+	0.00009 (2.941)***	0.00008 (2.937)***
Equity	+	0.00035 (.667)	0.00035 (.661)
Big 6 Auditor	+	104.846 (3.041)***	60.311 (1.884)**
Exchange	+		130.511 (3.596)***
Adjusted R-Squared		0.441	0.448
F-Value		146.687***	121.120***
Chi-Squared		23.67***	21.74***

* (**) (***) significant at the .10 (.05) (.01) level based on a one-tailed test.

As with the underpricing models, the chi-square value from White's test indicates the presence of heteroskedasticity. The reported significance levels are based on the z-statistics using the asymptotically consistent covariance matrix.

In model 3A, use of a Big 6 auditor is associated with a significant increase in IPO cash compensation. As expected, each of the additional three variables is positively associated with IPO cash compensation. In model 3B, the exchange variable is positive and significant. The addition of the exchange variable results in a reduction of the magnitude and significance of the auditor coefficient.

The model R-squared values of .44 are significantly higher than the .18 reported by Beatty [1989]. Additional tests indicate that the results are affected by the data source used. The 1988-89 data is from Going Public, which is the primary data source used by Beatty. Estimation of the cash compensation model for the 1988-1989 period resulted in a reported R-squared of approximately .14. The R-squared value for the 1990-91 subperiod was approximately .50. Data for this period was primarily gathered from the D33 database.

6.4 Research Results

Hypothesis four predicts that auditor experience will be associated with higher levels of auditor compensation. Empirical tests of this model are conducted using the experience measures described in section 3.2. Table 6.2 reports the results of this model for the three-digit experience measures.

Table 6.2
IPO Cash Compensation Model
Three-digit Experience Measures

	(N=408) Estimated coefficient (t-statistic)				
	Experience Measure				
Independent variables	Clshare	Sashare	Clexp	Saexp	Lgexp
Intercept	319.115 (4.986)***	368.877 (6.785)***	351.949 (7.020)***	389.077 (7.766)***	398.909 (8.001)***
Experience	6.236 (1.890)**	1.721 (1.197)	164.172 (3.086)***	41.524 (.736)	-0.214 (-.003)
Proceeds	0.0045 (12.157)***	0.0045 (12.321)***	0.0045 (12.376)***	0.0045 (12.293)***	0.0045 (12.258)***
Revenue	0.00008 (2.858)***	0.00009 (2.950)***	0.00008 (2.698)**	0.00009 (2.887)***	0.00009 (2.996)***
Equity	0.00033 (2.441)***	0.00030 (2.246)**	0.00032 (2.418)***	0.00031 (2.342)***	0.00031 (2.345)***
Specialized Industry	-74.026 (-1.101)	-52.841 (-.797)	-61.148 (-.931)	-54.880 (-.825)	-50.993 (-.768)
Exchange	126.113 (2.212)**	131.870 (2.311)**	140.296 (2.482)***	133.721 (2.341)***	133.249 (2.332)***
Adjusted R-Squared	0.430	0.427	0.438	.425	.425
F-Value	52.103***	51.473***	53.831***	51.212***	51.052***
Chi-Squared	32.401	31.706	28.556	33.389*	31.395

*** (**) (*) - Significant at the .01 (.05) (.10) level. One-tail tests used where appropriate.

Model performance and estimates of the control variables are consistent with those reported in Table 6.1. The variable for membership in a specialized industry (SPEC) was negative in all regressions, but was not statistically significant at conventional levels. The chi-square statistic from White's test did not indicate significant levels of heteroskedasticity.

The coefficient for the continuous and dichotomous measures of experience based on number of clients were positive and statistically significant. The coefficients for the measures based on client sales were positive, but were not statistically significant. The results suggest that client-based industry experience is associated with a statistically significant fee premium in the audit market.

It is interesting to compare the results of the compensation model to the results of the offering underpricing model. The only significant experience variable in the underpricing model was SAEXP, the dichotomous sales-based measure. In contrast, the fee premium is larger for client-based measures. This suggests that the value of auditor industry experience consists of factors other than its effect on underpricing of the offering. However, caution is warranted in drawing this conclusion. The results may be attributable to unknown omitted variables. Also, the underpricing tests may have lacked power to detect a relationship between auditor experience and underpricing.

The results for the dichotomous measures can also be contrasted with the results for the Big 6 indicator variable in Table 6.1. The coefficient for client experience of 164.17 is much larger than the Big 6 premium of 60.31 reported in Table 6.1. This suggests that at least a portion of the fee premium for Big 6 firms

is due to industry experience. To test this implication, the variable CLEXP was added to the compensation regression model for the full sample of IPOs. The variable CLEXP is as previously defined, and is equal to zero for all non-Big 6 firms. The results of the cash compensation model for the full sample of IPOs is reported in Table 6.3. The results are estimated with and without the experience variable.

When the dichotomous measure of client experience is added to the regression model, the coefficient for the Big 6 variable is reduced by a third, from 60.31 to 39.58. The variable for client experience is significant, while the Big 6 variable is not. Because the client experience variable was already found to be significant for IPOs with Big 6 auditors, it would not be appropriate to interpret this result as indicating that experience commands a fee premium, and membership in the Big 6 does not. However, the result is consistent with a portion of the fee premium for the Big 6 representing the effects of industry experience.

White's chi-square test indicates the presence of heteroskedasticity in the model. The reported results are based on the z-statistics using the asymptotically consistent covariance matrix.

Table 6.3
IPO Cash Compensation Model
Full Sample of IPOs With
Experience Variable

Independent variables	(N=741) Estimated coefficient (z-statistic) Without Experience Variable	With Experience Variable
Intercept	348.307 (14.506)***	347.529 (14.997)***
CLEXP		116.433 (2.230)**
Big 6	60.311 (1.884)**	39.578 (1.178)
Proceeds	0.0046 (15.440)***	0.0046 (15.447)***
Revenue	0.00008 (2.937)***	0.00008 (2.697)***
Equity	0.00035 (.669)	0.00035 (.698)
Exchange	130.511 (3.596)***	133.115 (3.670)***
Adjusted R-Squared	0.448	0.452
F-Value	121.120***	102.593***
Chi-Squared	29.044**	39.490**

*** (**) (*) - Significant at the .01 (.05) (.10) level based on a one-tailed test.

The results for the compensation model using experience measures at the two-digit SIC level are reported in Table 6.4. The specialized industry variable was deleted since it was not significant in the three-digit model. Excluding this variable from the three-digit model had little effect on other coefficients.

Although the coefficient for the variable CLEXP decreased significantly compared to the three-digit model, it was still statistically significant. Compared to the models at the three-digit level, the variable CLSHARE lost significance, while the variable SASHARE gained significance. The results at the two-digit level are somewhat consistent with a fee premium for auditor experience.

The chi-squared statistics at the bottom of Table 6.4 indicate the presence of heteroskedasticity in each of the models. Use of the asymptotically consistent covariance matrix did not effect the reported significance levels for the experience variables. Accordingly, the reported results are the t-statistics from the ordinary least squares regression to maintain comparability to the compensation models at the three-digit level reported in Table 6.2.

The lack of significance for the variable SAEXP2 is consistent with the results in Palmrose [1986]. She was unable to find a fee premium for auditor experience based on sales at the two-digit level. The results reported here suggest that both the use of experience at the two-digit level, and the use of sales-based measures, may have contributed to her inability to find a relationship between auditor experience and audit fees.

Table 6.4
IPO Cash Compensation Model
Two-digit Experience Measures

	(N=556) Estimated coefficient (t-statistic)				
	Experience Measure				
Independent variables	Clshare	Sashare	Clexp	Saexp	Lgexp
Intercept	382.333 (6.577)***	379.566 (8.525)***	401.798 (10.097)***	412.574 (10.567)***	411.608 (10.556)***
Experience	2.787 (.798)	2.612 (1.647)**	60.761 (1.397)**	29.144 (.607)	38.845 (.756)
Proceeds	0.0044 (15.436)***	0.0044 (15.595)***	0.0044 (15.615)***	0.0044 (15.618)***	0.0044 (15.584)***
Revenue	0.00009 (3.296)***	0.00009 (3.287)***	0.00009 (3.228)***	0.00009 (3.226)***	0.00010 (3.395)***
Equity	0.00030 (2.520)***	0.00028 (2.369)***	0.00029 (2.490)***	0.00029 (2.461)***	0.00029 (2.449)***
Exchange	109.187 (2.388)***	106.286 (2.329)***	112.182 (2.462)***	110.452 (2.419)***	110.989 (2.433)***
Adjusted R-Squared	0.472	0.474	0.473	.472	.472
F-Value	100.268***	101.060***	100.770***	100.165***	100.243***
Chi-Squared	34.463**	34.573**	29.657**	33.713**	31.624**

*** (**) (*) - Significant at the .01 (.05) (.10) level. One-tail tests used where appropriate.

6.4.1 Compensation Regression with Audit Fees

One concern with the results for the cash compensation models is the use of total IPO cash compensation as a proxy for audit fees. The data for the 1990-1991 period were drawn primarily from the Disclosure, Inc. D'33 database. This database includes an estimate of audit fees included in cash compensation. Table 6.5 includes an estimate of the compensation model at the three-digit SIC level using the estimated audit fees, rather than the total compensation.

When estimated audit fees are used, the model adjusted R-square values decrease, as do the individual coefficient values. This result is not unexpected since many IPO cash expenses other than audit fees are likely directly related to the size of the offering. The coefficient for membership in a specialized industry changes signs, but remains insignificant. There is little evidence of lower fees due to economies of scale in specialized industries. The exchange variable continues to be significant. This is consistent with either greater audit effort or greater audit risk for offerings on major exchanges.

As in Table 6.2, the variable CLEXP is significant. The continuous sales-based measure SASHARE is also significant. The variable of CLSHARE is negative, and very small. The overall results are supportive of a fee premium for auditor experience.

Table 6.5
IPO Audit Fee Model
Three-digit Experience Measures

	(N=265) Estimated coefficient (t-statistic) Experience Measure				
Independent variables	Clshare	Sashare	Clexp	Saexp	Lgexp
Intercept	89.541 (3.756)***	68.571 (3.568)***	71.845 (3.975)***	79.609 (4.495)***	83.731 (4.750)***
Experience	-0.364 (-.345)	0.780 (1.780)**	33.705 (2.107)**	18.690 (1.069)	0.872 (.044)
Proceeds	0.0005 (5.442)***	0.0005 (5.526)***	0.0005 (5.455)***	0.0005 (5.480)***	0.0005 (5.430)***
Revenue	0.00001 (1.297)*	0.000009 (1.168)	0.000006 (.980)	0.000008 (1.079)	0.00001 (1.269)
Equity	0.00007 (1.487)*	0.00005 (1.130)	0.00006 (1.343)*	0.00006 (1.371)*	0.00007 (1.445)*
Specialized industry	16.567 (.780)	13.421 (.649)	13.570 (.658)	13.319 (.640)	15.106 (.469)
Exchange	45.933 (2.346)***	47.918 (2.464)***	49.918 (2.566)***	46.771 (2.398)***	46.348 (2.371)***
Adjusted R-Squared	0.199	0.208	0.212	.202	.199
F-Value	11.965***	12.614***	12.884***	12.183***	11.940***
Chi-Squared	38.885	27.548	27.040	29.143	24.382

*** (**) (*) - Significant at the .01 (.05) (.10) level. One-tail tests used where appropriate.

6.4.2 Effects of Big 6 Mergers

In section 5.5.1 of Chapter 5, results were reported that suggested that underpricing is greater for the Big 6 firms that were formed as a result of mergers. If these mergers resulted in a loss of reputation capital, they may also have had an effect on the fees for these firms. Table 6.6 reports mean and median fee residuals for the members of the Big 6 for the period 1990-1991. Fee residuals are reported using both total cash compensation and the estimated accounting fee.

The residuals for total cash compensation are based on Model 3B in Table 6.1. The mean fee residual of 67.56 is comparable to the Big 6 coefficient of 60.311. The fee residual based on estimated accounting fees is from the regression model for CLEXP in Table 6.5. The positive mean residual is largely due to the exclusion of the experience variable in calculating the fee residual. As in Beatty, mean residuals are larger than median residuals.

The results do not provide strong evidence of lower fees for the merged firms of Deloitte & Touche and Ernst and Young. The mean residuals are lower than the Big 6 average, but the medians are higher than the Big 6 average. There also appears to be some evidence of the fee premium for Price Waterhouse documented by Simunic [1980].

Table 6.6
Fee Residual by Audit Firm
1990-1991

Audit Firm	IPO Cash Compensation			Estimated Audit Fee		
	n	Mean (Std. Dev)	Median	n	Mean (std. dev.)	Median
Arthur Andersen	63	102.74 (454.96)	8.27	62	45.50 (172.76)	6.17
Coopers and Lybrand	55	37.74 (444.65)	-48.03	49	13.10 (169.88)	-28.87
Deloitte and Touche	80	27.05 (339.29)	18.34	76	10.64 (91.40)	-5.33
Ernst and Young	116	34.13 (404.72)	7.27	114	10.32 (107.13)	-7.79
KPMG Peat Marwick	83	57.52 (456.55)	-16.96	78	-9.20 (114.91)	-40.88
Price Waterhouse	35	278.30 (722.29)	38.74	32	48.20 (136.22)	20.09
Total	432	67.56 (452.43)	1.81	411	15.26 (129.39)	-9.51

6.5 Summary and Conclusions for Auditor Compensation Tests

Hypothesis four predicted that auditor experience would be associated with higher audit fees. The general pattern of results suggests the presence of a fee premium for auditor experience. Significant relationships between auditor experience and compensation were found using both total IPO compensation and estimated audit fees. However, the relationship between auditor experience and auditor compensation is not significant in all models. This suggests that researchers should be careful in their selection of experience measures. Although no clear pattern of significance exists, the dichotomous client-based measures of experience was significant in all models. It was argued in section 3.2.1 of Chapter 3 that this measure best captured auditor experience.

The results of this study can be compared to Palmrose [1986] and Ettredge and Greenberg [1990]. Palmrose failed to find a fee premium for industry experience in audit fees. One possible explanation for her inability to find a fee premium is her use of sales-based experience measures calculated at a two-digit SIC code level. Ettredge and Greenberg [1990] found that fee reductions were larger with the change to a more experienced auditor. However, first-year fee reductions are not necessarily related to recurring audit fees, or the fees in a unique context, such as IPOs.

The evidence of a fee premium for auditor experience indicates that experience is valued by clients. In Chapter 4, evidence was presented that suggested that auditor experience was positively demanded by IPO companies. The results in this chapter suggest that auditor experience is demanded, even though it is costly.

CHAPTER 7 - SUMMARY, CONCLUSIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

This research investigated the relationship between auditor industry experience and auditor selection, offering underpricing, and auditor compensation for initial public offerings during the period 1988-1991. Section 7.1 summarizes and discusses the results of the study. These results are compared to the results of previous studies on audit quality in section 7.2. Additional results of research interest are summarized in section 7.3. Some of the limitations of the study and suggestions for future research are discussed in section 7.4.

7.1 Summary of Results

Four research hypotheses about auditor experience were tested in this study. The research hypotheses and the results of the empirical tests of the hypotheses are included in Figure 7.1

7.1.1 Demand for Auditor Experience

The first research hypothesis predicted that IPO companies would demand auditor experience. The results of the tests of this hypothesis are discussed in Chapter 4. These tests indicated that auditor experience is demanded by IPO companies, but not to a greater extent than by existing publicly-traded companies.

Tests of hypothesis one were conducted by comparing the auditor experience measures for the IPO companies to expected values under three random selection benchmarks. The demand for auditor experience by IPO companies exceeded the expected experience values under a random selection model, and under a model in

Research Hypothesis	Results	Comment
H_1: IPO companies will have a positive demand for auditor industry experience.	Supported	IPO companies demand experience, but not to a greater extent than existing publicly-traded companies.
H_{2A}: The industry experience of the auditor will be negatively associated with the size of the IPO company.	Not supported	
H_{2B}: The industry experience of the auditor will be negatively associated with the age of the IPO company.	Not supported	
H_{2C}: The industry experience of the auditor will be positively associated with IPO company membership in a specialized industry.	Supported	Statistically significant for 6 of 10 experience measures. Directionally consistent for all experience measures.
H_3: The underpricing of the IPO will be negatively associated with the industry experience of the auditor.	Some support	Directionally consistent for 4 of 5 measures at three-digit SIC level. One measure (SAEXP3) statistically significant. Some evidence that results for experience measures are reduced due to large market shares for merged firms.
H_4: Auditor industry experience will be associated with higher audit fees.	Supported	Statistically significant for 4 of 10 experience measures. Directionally consistent for 9 of 10 experience measures.

Figure 7.1
Summary of Research Results

which Big 6 auditors are chosen in relation to their share of the total audit market. These two results indicate that auditor experience is positively demanded by IPO companies. However, the IPO sample measures did not exceed the expected values for auditor experience under an industry weighted selection model. This latter result indicates that the demand for auditor experience by IPO companies does not exceed the demand for experience by existing publicly-traded companies.

Existing literature has indicated that there are substantial levels of auditor concentration within industries (e.g., Eichenseher and Danos [1981]). However, comparatively little is known about the elements of the audit market that lead to observed concentration levels. Since IPOs represent new entrants to the audit market for publicly-traded companies, understanding the demand for audit experience by IPO companies is an important element of understand industry concentration in the audit market.

7.1.2 Determinants of the Demand for Auditor Experience

The second set of research hypotheses made predictions about variables expected to be associated with auditor experience. Based on the information quality model in Titman and Trueman [1986], the demand for auditor experience was predicted to be negatively related to the size and age of the IPO company, and positively related to IPO company membership in a specialized industry.

The results of the tests of these hypotheses are also discussed in Chapter 4. The demand for auditor experience was positively related to IPO company membership in a specialized industry, but was not related to IPO company age or size. The auditor selection models had low levels of explanatory power.

The positive relationship between auditor industry experience and specialized industries is consistent with an increased demand for auditor experience in these industries due to increased information risk. However, the underpricing tests in Chapter 5 of this study found that underpricing is lower in specialized industries. This latter result is consistent with lower information risk in specialized industries. These two results are not necessarily inconsistent if information risk is a multidimensional construct. For example, there could be greater uncertainty about accounting information, but less uncertainty about the overall level of cash flows for specialized industries.

The positive relationship between the demand for auditor experience and membership in a specialized industry is also consistent with the finding in Eichenseher and Danos [1981] that auditor concentration within industries is related to industry regulation. Eichenseher and Danos speculated that the increased concentration levels in regulated industries are due to scale economies. However, the tests of auditor compensation in Chapter 6 of this study did not detect the existence of lower audit fees in specialized industries.

Little relationship was found between auditor experience levels and IPO company age. It is possible that company age is not an important element of a company's information environment, although Beatty [1989] has found that IPO underpricing is negatively related to company age. The tests also may have lacked power to detect the hypothesized relationship.

There was some evidence that the demand for auditor experience was positively related to IPO company size. The opposite relationship had been

hypothesized. Although less information exists for small firms (Freeman [1987]), IPO company size may not be an important element of the IPO company information environment. Larger firms may also receive greater benefit from selection of an auditor with industry experience.

7.1.3 Offering Underpricing

Hypothesis three predicted that auditor experience would be associated with lower underpricing of the offering. There was some support for this hypothesis, although the relationship between underpricing and most measures of auditor experience was not significant. The dichotomous measure based on sales at the three digit SIC level (SAEXP3) was statistically significant. In addition, when an indicator variable for merged firms was included, both the sales-based and client-based dichotomous measures at the three digit SIC level were significant. It was argued in section 3.2.1 that these dichotomous measures may best capture the perception of auditor experience. The results for these two dichotomous measures suggest that auditor experience is associated with lower underpricing.

7.1.4 Auditor Compensation

Hypothesis four predicted that auditor experience would be associated with increased auditor compensation. The results were generally consistent with this hypothesis, although not all experience measures were statistically significant.

A significant relationship between auditor experience and total IPO cash compensation was found for experience measures at the two-digit and three-digit SIC level. Evidence of a relationship between auditor experience and compensation was also found when the tests were performed using estimated auditor compensation,

rather than total IPO cash compensation. Consistent with the notion that dichotomous client-based measures best capture experience, this measure was significant in each compensation model.

Evidence of a premium in audit fees for auditor experience is an important finding. Palmrose [1986] hypothesized that auditor experience would be associated with higher audit fees, but did not find a significant relationship between experience and fees. More recent evidence has tended to suggest that auditor experience is associated with lower audit fees (Ettredge and Greenberg [1990]; Deis and Giroux [1992b]). The existence of a fee premium is a potential determinant of the demand for auditor experience.

There are several possible explanations for the existence of a fee premium in IPOs, but not other settings. First, previous studies have relied upon the use of one experience measure. These measures may not have been the most appropriate for capturing experience. Second, IPOs are a unique setting in which auditor experience may have greater value. Third, the nature of the size or variance of audit fees in the IPO setting may facilitate the detection of a relationship between audit fees and auditor experience.

7.2 Comparison to Previous Audit Quality Research

The results reported in Figure 7.1 generally support auditor industry experience as a dimension of audit quality. However, the pattern of results is not overwhelmingly conclusive as to the importance of auditor experience. To provide some perspective, these results are compared to the results of previous empirical

research on audit quality. Figure 7.2 summarizes the results of this research and previous audit quality research in IPO and non-IPO settings. Figure 7.3 provides a more detailed comparison of the results of this study to the results of previous audit quality research in IPO and non-IPO settings.

Dimension of Audit Quality	Current Study	Previous IPO Audit Quality Research	Previous non-IPO Audit Quality Research
Demand for Audit Quality	Supported	Supported	Supported
Determinants of Demand for Audit Quality	Weak Support	Mixed Support	Mixed Support
Economic Effects of Auditor Choice	Some support	Supported (1)	Not supported
Auditor Compensation	Supported	Supported (1)	Supported

(1) Results in current research suggest that relationship is less strong after controlling for offering exchange effects.

Figure 7.2
Comparison of Research Results to
Previous Audit Quality Research

Dimension of Quality	Current Study	Previous IPO Research	Other Audit Quality Research
Demand for Audit Quality	Experienced auditors demanded.	Big 6 auditors demanded. 78% of firm commitment offerings have Big 6 auditor (Balvers et al. [1988]).	Big 6 auditors demanded. Big 6 audit 81% of public traded companies (Danos & Eichenseher [1986]).
Determinants of Demand for Audit Quality	Demand for auditor experience related to IPO company membership in a specialized industry.	Auditor choice related to size, type of offering and investment banker reputation (Menon and Williams [1991]). Auditor choice not related to firm risk (Feltham et al. [1991]).	Big 6 concentration related to industry regulation and capital market activity (Eichenseher and Danos [1981]). Auditor changes weakly associated with agency costs (Francis and Wilson [1988]).
Economic Effects of Audit Quality	Weak evidence that underpricing is lower with experienced auditors.	Underpricing is lower with a Big 6 auditor (Balvers et al. [1988]; Beatty [1989]).	Little market reaction to change to a Big 6 auditor (Nichols and Smith [1983]). Market reaction to earnings not significantly different for companies audited by Big 6 auditors (Ettredge et al. [1988]).
Auditor Compensation	Experienced auditors receive a fee premium.	Big 6 receive higher fees (Beatty [1989]).	Big 6 receive a fee premium (Palmrose [1986]; Francis and Simon [1987]).

Figure 7.3
Detailed Comparison of Research Results to Previous Audit Quality Research

Figure 7.2 indicates that the results of the current study are consistent with most of the results of previous audit quality research. There are two main areas of difference. Previous IPO and non-IPO research has been able to explain a greater portion of the demand for audit quality than the current study. Also, previous IPO research has found stronger evidence of a relationship between offering underpricing and audit quality.

Comparison of the results of this study with previous research into the determinants of the demand for audit quality indicates more similarities than differences. Much of the explanatory power in previous models relates to the type of offering and reputation of the investment banker. Simunic and Stein [1987] and Menon and Williams [1991] have argued that these variables should be associated with a demand for increased auditor credibility. However, these two variables are not clearly linked to a theory of audit quality.

As in this study, previous research has not been successful in linking the demand for audit quality to specific theories. Feltham, Hughes and Simunic [1991] were unable to find a relationship between the demand for audit quality and firm risk in an IPO setting. Little relationship was found between the demand for audit quality and agency costs in a non-IPO setting (Francis and Wilson [1988]).

Previous research (Balvers, McDonald and Miller [1988]; Beatty [1989]) has found a significant relationship between auditor reputation and measures of auditor quality. However, the results reported in Table 5.2 suggest that the reduction in underpricing associated with use of a Big 6 auditor is less significant than reported in previous research. The results in Table 5.3 and Table 5.6 suggest that a

relationship may exist between dichotomous measures of experience and underpricing. The magnitudes of the relationships between dichotomous measures of auditor experience and underpricing are comparable to the relationship between underpricing and use of a Big 6 auditor reported in Table 5.2.

7.3 Other Results

In addition to the main research hypotheses, several other reported results are of research interest. These results include the correlation among the various measures of experience, the effect of the exchange of the offering on offering underpricing and compensation models, the effect of mergers on the reputational capital of the Big 6 firms, and the replication of studies of auditor selection, auditor compensation and offering underpricing.

7.3.1 Measurement of Auditor Experience

As discussed in section 3.2.1, auditor experience measures can be categorized along three dimensions: (1) sales-based or client-based measures, (2) the SIC code level used (two, three, or four digit), and (3) dichotomous or continuous measures. Absent a clear theory as to what constitutes industry experience at the firm level, any definition may have empirical validity. The tests in this study were performed using multiple experience measures that capture all three dimensions. Previous studies have generally tested only one experience measure.

As reported in Table 3.1, the correlation between the measures of experience varies substantially. Reported results in the empirical tests also vary substantially, dependent upon the experience measure used. Ultimately, researchers studying the

role of audit firm experience need to develop a theory of the demand for different types of experience. For example, the dichotomous measures may best be categorized as signals of audit quality. An argument based on signaling would appropriately use dichotomous experience measures. Prior to development of a theory of the demand for auditor experience, researchers should justify their choice of experience measures.

7.3.2 Exchange Effects

This study introduced the exchange of the offering as an explanatory variable to IPO research. Although research in finance has identified the exchange as an element of liquidity, and capital markets research has recognized differences between exchanges (Grant [1980]; Atiase [1987]), accounting research has not recognized differences within the NASDAQ market.

The exchange of the offering was statistically significant in models of offering underpricing and IPO compensation. The exchange of the offering is also correlated with the reputation of the auditor and investment banker. Controlling for the exchange of the offering reduced the reported coefficients for auditor reputation in the underpricing and compensation models. This result suggests that the relationship between audit quality and offering underpricing and auditor compensation is likely to be less significant than reported in previous research.

7.3.3 Effect of Mergers on Firm Reputational Capital

The mergers among the Big 8 accounting firms that occurred in late 1989 and early 1990 were an important change to the structure of the audit market. Because

these mergers are recent, little empirical evidence exists as to the impact these mergers have had on the audit market.

The results reported in Table 5.5 and 5.6 indicate that average underpricing is higher for offerings that involve the two Big 6 audit firms formed in these mergers. This provides preliminary evidence that the reputational capital of these firms was reduced as a result of these mergers. Additional research is needed to address the effect of these mergers on the audit market.

7.3.4 Replication of Previous Research

Previous research into the role of audit quality and auditor selection, offering underpricing and auditor compensation has generally examined each dimension of audit quality independently. In this study, all three dimensions of audit quality were examined. The results of these tests were largely consistent with the results of previous research. The replication of three dimensions of audit quality in one study is an important contribution. Because the dimensions of audit quality are related, it is desirable to consider each of the dimensions in the same setting.

Although the results of previous research were largely supported, some important findings were not replicated, or were changed due to the inclusion of other variables. As described in section 7.3.2, controlling for the exchange of the offering reduced the significance of the auditor reputation variable in models of offering underpricing and auditor selection. In addition, as shown in Table 5.2, the interaction between auditor and investment banker reputation was not significantly related to underpricing in this study. This interaction variable was significant in

Balvers et al. [1988]. No ready explanation exists for the differences in results, except that the tests were performed on different samples.

7.4 Limitations and Suggestions for Future Research

This study investigated whether auditor industry experience is a relevant aspect of audit quality. To address this issue, a context was chosen (IPOs) in which previous research has demonstrated the importance of audit quality. This research considered multiple dimensions of audit quality, and also considered multiple experience measures. Limitations of this research relate to the measurement of experience and other data constraints.

7.4.1 Measurement of Audit Firm Experience

Absent a theory of what constitutes auditor experience, this study considered multiple experience measures. However, as with most research, the research measures of experience are only proxies for the underlying construct of audit quality. Noise in the measure of the construct may impede the ability of the research to detect hypothesized relationships.

Future research may wish to directly investigate the process by which firms establish reputations for technical expertise in a given industry. Surveys of company officials and financial analysts is one possible approach to this issue.

7.4.2 Data Limitations

The data also impose constraints on the research. These constraints relate to both the time period studied and the data sources utilized. The time period studied was one in which the Big 8 audit firms were reduced to the Big 6 as the

result of mergers. These mergers may have introduced additional noise into the process by which firms establish their industry reputations.

Most of the time period under study was not a particularly active time for IPOs. This limited the size of the potential data set for testing hypotheses, especially for the subperiods before and after the mergers.

Research extensions both backward and forward in time may be helpful. A relationship between auditor industry experience and auditor selection and offering underpricing may be more likely to be found in the period before the mergers that resulted in the Big 6. Data sets used by previous researchers could be readily modified to conduct these tests. Research using current data as it becomes available may provide further evidence on the role of experience in the current market. The current market structure is most relevant for auditors, clients and investors in understanding the effects of auditor industry experience. Recent data will also be helpful in addressing whether audit firms' reputational capital changed as a result of merger activity among the largest audit firms.

LIST OF REFERENCES

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American Institute of Certified Public Accountants. AICPA Professional Standards. Commerce Clearing House, Chicago, Illinois (1989).

Antle, R. "The Auditor as an Economic Agent." Journal of Accounting Research (Autumn 1982): 503-527.

Atiase, R. "Market Implications of Predisclosure Information." Journal of Accounting Research (Spring 1987): 168-176.

Baker, H. and R. Edelman. "The Effects on Spread and Volume of Switching to the NASDAQ National Market System." Financial Analysts Journal (Jan-Feb 1992): 83-88.

Balvers, R., B. McDonald, and R. Miller. "Underpricing of New Issues and the Choice of Auditor as a Signal of Investment Banker Reputation." The Accounting Review (October 1988): 605-622.

Beatty, R. "Auditor Reputation and the Pricing of Initial Public Offerings." The Accounting Review (October 1989):. 693-709.

Beatty, R. and J. Ritter. "Investment Banking, Reputation, and the Underpricing of Initial Public Offerings." Journal of Financial Economics (1986): 213-232.

Belsley, D., E. Kuh and R. Welsch. Regression Diagnostics: Identifying Influential Data and Sources of Collinearity. John Wiley and Sons (1980).

Carpenter, C. and R. Strawser. "Displacement of Auditors When Clients Go Public." Journal of Accountancy (June 1971): 55-58.

Clarkson, P. and R. Thompson. "Empirical Estimates of Beta When Investors Face Estimation Risk." The Journal of Finance (June 1990): 431-453.

Copley, P. "The Determinants of Municipal Audit Fees: Some Additional Evidence." Research in Governmental and Nonprofit Accounting (1989): 3-23.

Copley, P. "The Association Between Municipal Disclosure Practices and Audit Quality." Journal of Accounting and Public Policy (Winter 1991): 245-266.

Cushing, B., and J. Loebbecke. "Comparison of Audit Methodologies of Large Accounting Firms." Studies in Accounting Research No.26 (1986). American Accounting Association, Sarasota, Florida.

Danos, P. and J. Eichenseher. "Audit Industry Dynamics: Factors Affecting Changes in Client-Industry Market Shares." Journal of Accounting Research (Autumn 1982): 604-616.

Danos, P. and J. Eichenseher. "Long-Term Trends Toward Seller Concentration in the U.S. Audit Market." The Accounting Review (October 1986): 633-650.

Datar, S., G. Feltham, and J. Hughes. "The Role of Audits and Audit Quality in Valuing New Issues." Journal of Accounting and Economics (March 1991): 375-399.

DeAngelo, L. "Auditor Size and Auditor Quality." Journal of Accounting and Economics (December 1981) pp. 183-199.

Deis, D., and G. Giroux. "Determinants of Audit Quality in the Public Sector." The Accounting Review (July 1992a): 462-479.

Deis, D. and G. Giroux. "Determinants of Audit Fees and Audit Hours Using a Direct Quality Measure." Louisiana State University working paper (1992b).

Edelman, R., and H. Baker. "Liquidity and Stock Exchange Listing." The Financial Review (May 1990): 231-249.

Eichenseher, J., and P. Danos. "The Analysis of Industry-Specific Auditor Concentration: Towards an Explanatory Model." The Accounting Review (July 1981): 479-492.

Eichenseher, J. and D. Shields. "The Correlates of CPA-Firm Change for Publicly-Held Corporations." Auditing: A Journal of Practice and Theory (Spring 1983): 23-37.

Ettredge, M., and R. Greenberg. "Determinants of Fee Cutting on Initial Audit Engagements." Journal of Accounting Research (Spring 1990): 198-210.

Ettredge, M., P. Shane, and D. Smith. "Audit Firm Size and the Association Between Reported Earnings and Security Returns." Auditing: A Journal of Practice and Theory (Spring 1988): 29-42.

Feltham, G., J. Hughes, and D. Simunic. "Empirical Assessment of the Impact of Auditor Quality on the Valuation of New Issues." Journal of Accounting and Economics (December 1991): 375-399.

Francis, J. "The Effect of Audit Firm Size on Audit Prices: A Study of the Australian Market." Journal of Accounting and Economics (August 1984): 133-151.

Francis, J., and D. Simon. "A Test of Audit Pricing in the Small-Client Segment of the U.S. Audit Market." The Accounting Review (January 1987): 145-157.

Francis, J. and D. Stokes. "Audit Prices, Product Differentiation, and Scale Economies: Further Evidence from the Australian Market." Journal of Accounting Research (Autumn 1986): 383-393.

Francis, J., and E. Wilson. "Auditor Changes: A Joint Test of Theories Relating to Agency Costs and Auditor Differentiation." The Accounting Review (October 1988): 663-682.

Freeman, R. "The Association Between Accounting Earnings and Security Returns for Large and Small Firms." Journal of Accounting and Economics (July 1987): 195-228.

Grant, E. "Market Implications of Differential Amounts of Interim Information." Journal of Accounting Research (Spring 1980): 255-268.

Hoel, P., S. Port, and C. Stone. Introduction to Statistical Theory. Houghton Mifflin Company, Boston, Massachusetts (1971).

Imhoff, E. "A Comparison of Analysts' Accounting Quality Judgments Among CPA Firms' Clients." Auditing: A Journal of Practice and Theory (Spring 1988): 182-191.

Klein, B., R. Crawford, and A. Alchian. "Vertical Integration Appropriable Rents and the Competitive Contracting Process." Journal of Law and Economics (1978) 21: 297-326.

Leland, H., and D. Pyle. "Informational Asymmetries, Financial Structure, and Financial Intermediation." The Journal of Finance (May 1977): 371-387.

Menon, K. and D. Williams, "Auditor Credibility and Initial Public Offerings," The Accounting Review (April 1991) pp. 313-332.

Nichols, D., and D. Smith. "Auditor Credibility and Auditor Changes." Journal of Accounting Research (Autumn 1893): 534-544.

Palmrose, Z., "Audit Fees and Auditor Size: Further Evidence," Journal of Accounting Research Spring (1986) pp. 97-110.

Palmrose, Z., "An Analysis of Auditor Litigation and Auditor Service Quality," The Accounting Review (January 1988) pp. 55-73.

Rhode, J., G. Whitsell, and R. Kelsey. "An Analysis of Client-Industry Concentrations for Large Public Accounting Firms." The Accounting Review (October 1974): 772-787.

Ritter, J. "The Long-Run Performance of Initial Public Offerings." The Journal of Finance (March 1991): 3-27.

Rock, K. "Why New Issues Are Underpriced" Journal of Financial Economics (January/February 1986): 187-212.

Rubin, M. " Municipal Audit Fee Determinants." The Accounting Review (April 1988): 248-261.

Shields, D. "Small CPA Firm Product Differentiation in the Small Business Market." Accounting, Organizations and Society (1984) 9: 61-90.

Simon, D. "The Audit Services Market: Additional Empirical Evidence." Auditing: A Journal of Practice and Theory (Fall 1985): 71-78.

Simunic, D. "The Pricing of Audit Services: Theory and Evidence." Journal of Accounting Research (Spring 1980): 161-190

Simunic, D. and M. Stein, Product Differentiation in Auditing: Auditor Choice in the Market for Unseasoned New Issues, The Canadian Certified General Accountants' Research Foundation, Vancouver, B.C. (1987).

Teets, W. "The Association between Stock Market Responses to Earnings Announcements and Regulation of Electric Utilities." Journal of Accounting Research (Autumn 1992): 274-285.

Titman, S. and B. Trueman. "Information Quality and the Valuation of New Issues," Journal of Accounting and Economics (June 1986) pp. 159-172.

Ward, D., R. Elder, and S. Kattelus. "Further Evidence on the Determinants of Municipal Audit Fees." Michigan State University working paper (1993).

Watts, R. and J. Zimmerman. Positive Accounting Theory. Prentice-Hall, Inc., Englewood Cliffs, NJ, 1990.

White, H. "A Heteroskedasticity-consistent Covariance Matrix Estimator and A Direct Test for Heteroskedasticity." Econometrica (1980) 48: 817-838.

Williams, D. "The Potential Determinants of Auditor Change." Journal of Business, Finance and Accounting (Summer 1988): 243-261.

APPENDICES

Description of Appendices Contents

The appendices contain the market share measures developed from the Compact Disclosure database that were used as a proxy for audit firm experience. Market share was measured using both number of clients and sales dollars audited. These measures were calculated for three-digit and two-digit SIC classifications. Market share for the years 1988-1989 was measured using the January, 1988 version of the database. This data is contained in Appendix A. Market share for the period 1990-1991 was measured using the January, 1990 version of the database. This data is contained in Appendix B.

Appendix A includes the period when there were eight large firms referred to as the Big 8. Appendix B includes the post-merger period in which the Big 8 were reduced to the Big 6. These audit firms are listed using initials in the appendices. The following are the audit firms included in each appendix, along with the initials used to refer to these firms.

Appendix A

AA	Arthur Andersen
AY	Arthur Young
CL	Coopers and Lybrand
DHS	Deloitte, Haskins and Sells
EW	Ernst and Whinney
PM	KPMG Peat Marwick
PW	Price Waterhouse
TR	Touche Ross

Appendix B

AA	Arthur Andersen
CL	Coopers and Lybrand
DT	Deloitte and Touche
EY	Ernst and Young
PM	KPMG Peat Marwick
PW	Price Waterhouse

APPENDIX A
BIG 8 MARKET SHARES
JANUARY, 1988

Appendix A.1
Client-Based Market Shares
Three-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
104	11.5	5.8	19.2	5.8	7.7	3.8	1.9	3.8	59.6
131	15.5	7.0	11.4	5.5	4.8	12.5	7.4	6.3	70.5
138	12.1	7.6	6.4	6.4	5.7	6.4	7.0	3.8	55.4
152	14.8	11.1	11.1	7.4	7.4	3.7	18.5	11.1	85.2
153	15.4	0.0	7.7	11.5	7.7	15.4	3.8	11.5	73.1
201	14.3	14.3	7.1	3.6	7.1	25.0	7.1	0.0	78.6
208	19.2	3.8	7.7	0.0	11.5	19.2	23.1	3.8	88.5
232	10.7	17.9	3.6	7.1	21.4	3.6	7.1	10.7	82.1
245	14.8	0.0	7.4	7.4	18.5	14.8	7.4	3.7	74.1
251	15.6	0.0	6.3	18.8	18.8	9.4	3.1	3.1	75.0
264	16.1	0.0	9.7	9.7	3.2	19.4	6.5	9.7	74.2
271	10.7	17.9	3.6	10.7	17.9	7.1	14.3	0.0	82.1
283	14.3	9.8	12.8	6.0	8.3	11.3	6.0	9.0	77.4
284	14.3	8.2	16.3	10.2	2.0	8.2	4.1	8.2	71.4
291	12.1	9.1	12.1	6.1	12.1	15.2	18.2	12.1	97.0
307	12.7	5.1	7.6	7.6	8.9	8.9	15.2	8.9	74.7
331	12.7	3.6	16.4	7.3	21.8	5.5	12.7	7.3	87.3
342	29.6	0.0	11.1	7.4	14.8	11.1	11.1	0.0	85.2
344	7.5	12.5	2.5	5.0	10.0	5.0	10.0	7.5	60.0
349	6.3	9.4	12.5	3.1	9.4	21.9	0.0	12.5	75.0
353	16.7	3.7	14.8	3.7	9.3	13.0	20.4	7.4	88.9
354	23.5	2.9	20.6	8.8	11.8	2.9	2.9	5.9	79.4
355	5.1	17.9	5.1	10.3	10.3	15.4	7.7	5.1	76.9
356	12.8	9.0	3.8	7.7	17.9	7.7	9.0	7.7	75.6
357	17.9	14.4	11.0	9.6	7.6	8.9	8.9	7.9	86.3
358	12.1	12.1	9.1	6.1	15.2	15.2	0.0	6.1	75.8
362	8.3	8.3	13.9	5.6	16.7	11.1	11.1	0.0	75.0
363	13.8	3.4	13.8	17.2	6.9	20.7	3.4	6.9	86.2
364	32.3	3.2	0.0	3.2	12.9	16.1	9.7	9.7	87.1
365	14.3	3.6	7.1	10.7	14.3	3.6	3.6	7.1	64.3
366	12.3	8.2	7.3	9.5	11.8	10.0	7.3	9.5	75.9
367	13.8	10.8	7.8	7.8	9.0	12.6	8.4	7.2	77.2
369	12.2	0.0	14.3	6.1	14.3	6.1	12.2	6.1	71.4
371	9.8	4.9	13.1	11.5	16.4	8.2	9.8	11.5	85.2
372	12.5	6.3	15.6	3.1	12.5	21.9	6.3	9.4	87.5
381	7.3	7.3	12.2	9.8	12.2	4.9	9.8	9.8	73.2
382	12.5	8.3	11.1	4.9	8.3	11.8	9.7	9.0	75.7
383	10.0	10.0	0.0	16.7	3.3	20.0	3.3	6.7	70.0
384	12.6	12.6	6.7	4.2	12.6	13.4	7.6	7.6	77.3
386	22.9	0.0	11.4	2.9	2.9	8.6	17.1	8.6	74.3
399	11.8	0.0	5.9	8.8	8.8	20.6	8.8	2.9	67.6
401	11.8	2.9	8.8	17.6	14.7	17.6	17.6	0.0	91.2

Appendix A.1
Client-Based Market Shares
Three-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
421	23.0	11.5	4.9	3.3	16.4	18.0	0.0	6.6	83.6
451	24.6	18.0	1.6	1.6	8.2	27.9	1.6	6.6	90.2
481	26.8	8.1	26.8	4.1	4.1	8.1	3.3	1.6	82.9
483	9.3	18.6	9.3	11.6	7.0	11.6	2.3	7.0	76.7
489	9.3	5.6	5.6	22.2	3.7	13.0	5.6	11.1	75.9
491	31.3	1.5	17.2	27.6	0.7	8.2	9.7	0.0	96.3
492	40.2	9.8	7.4	12.3	4.9	10.7	4.1	4.1	93.4
493	44.0	0.0	14.0	16.0	2.0	4.0	16.0	0.0	96.0
506	10.1	6.3	11.4	5.1	11.4	6.3	5.1	5.1	60.8
508	11.7	6.3	9.4	5.5	4.7	9.4	7.8	3.9	58.6
509	11.1	3.7	18.5	0.0	3.7	7.4	11.1	11.1	66.7
512	15.0	2.5	15.0	12.5	12.5	2.5	7.5	2.5	70.0
514	20.5	4.5	4.5	2.3	6.8	9.1	2.3	18.2	68.2
531	12.8	2.1	12.8	6.4	19.1	8.5	12.8	14.9	89.4
541	7.9	4.8	6.3	6.3	12.7	22.2	6.3	17.5	84.1
571	4.0	0.0	16.0	0.0	12.0	8.0	32.0	12.0	84.0
573	16.1	3.2	6.5	6.5	19.4	6.5	9.7	6.5	74.2
581	10.5	5.3	8.3	7.5	9.0	15.8	6.0	12.0	74.4
594	14.6	4.9	2.4	9.8	7.3	17.1	12.2	7.3	75.6
596	15.6	9.4	6.3	3.1	9.4	12.5	3.1	12.5	71.9
602	10.6	3.1	7.3	6.4	14.3	23.7	4.6	4.4	74.3
612	3.7	5.0	3.7	16.9	8.7	33.1	3.3	10.3	84.7
614	8.3	8.3	4.2	15.3	13.9	18.1	8.3	11.1	87.5
615	11.7	4.3	6.4	9.6	7.4	19.1	11.7	17.0	87.2
616	13.9	18.1	2.8	9.7	5.6	25.0	2.8	0.0	77.8
621	10.6	4.7	10.6	10.6	9.4	15.3	5.9	9.4	76.5
631	1.4	2.8	14.8	2.8	20.4	16.9	4.9	14.1	78.2
632	16.7	8.3	5.6	0.0	22.2	19.4	8.3	5.6	86.1
633	4.9	3.7	17.1	3.7	20.7	22.0	6.1	11.0	89.0
641	9.5	2.4	9.5	4.8	11.9	26.2	0.0	7.1	71.4
651	11.5	6.4	5.1	7.7	7.7	7.7	2.6	7.7	56.4
655	6.8	1.4	8.1	13.5	6.8	14.9	6.8	6.8	64.9
671	6.2	2.5	6.8	8.0	9.3	21.6	5.6	3.1	63.0
679	8.0	5.3	7.1	6.2	8.0	11.5	5.3	5.3	56.6
701	15.5	8.6	5.2	5.2	1.7	10.3	3.4	10.3	60.3
737	12.1	9.7	9.7	10.0	6.9	11.8	9.3	9.0	78.5
739	11.2	9.5	7.1	7.1	8.7	12.5	6.0	9.3	71.4
781	9.6	9.6	2.7	0.0	15.1	9.6	9.6	8.2	64.4
794	6.7	3.3	13.3	3.3	6.7	0.0	3.3	6.7	43.3
799	8.1	5.4	13.5	2.7	5.4	5.4	8.1	2.7	51.4
806	14.8	22.2	11.1	0.0	29.6	7.4	7.4	7.4	100.0
807	7.7	7.7	3.8	7.7	11.5	19.2	3.8	7.7	69.2

Appendix A.1
Client-Based Market Shares
Three-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
808	10.7	10.7	3.6	14.3	10.7	14.3	0.0	14.3	78.6
891	13.2	13.2	9.4	7.5	7.5	11.3	5.7	13.2	81.1
899	20.2	3.8	7.7	4.8	4.8	8.7	14.4	5.8	70.2
Avg.	13.8	6.9	9.3	7.7	10.6	12.7	7.9	7.5	76.4

Appendix A.2
Sales-Based Market Shares
Three-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
104	23.3	20.1	11.9	28.1	5.2	7.9	0.0	0.3	96.6
131	2.9	31.0	14.2	0.2	6.0	0.6	43.0	0.2	98.0
138	67.7	2.4	2.2	2.9	0.2	0.6	23.4	0.0	99.4
152	4.1	12.5	58.5	1.4	4.7	0.0	12.3	2.4	95.8
153	16.4	0.0	49.3	1.7	8.4	11.1	0.3	1.8	89.0
201	8.5	24.6	1.5	0.3	11.1	17.4	4.4	0.0	68.0
208	5.3	22.5	1.0	0.0	26.0	1.4	43.8	0.0	100.0
232	12.3	23.9	0.4	16.2	32.7	0.8	1.7	8.4	96.5
245	8.7	0.0	11.4	5.9	30.5	11.2	26.7	1.0	95.4
251	14.9	0.0	5.2	14.1	15.1	20.7	8.2	1.3	79.5
264	6.7	0.0	45.1	2.2	3.2	6.8	19.7	15.5	99.2
271	2.7	8.8	6.3	12.1	30.3	2.1	26.9	0.0	89.2
283	22.8	0.6	6.2	8.0	6.6	16.9	26.8	2.6	90.5
284	12.8	1.7	21.7	44.1	0.1	6.0	1.1	4.2	91.8
291	4.0	1.1	12.6	2.1	31.5	5.9	41.4	1.4	100.0
307	4.9	0.8	3.5	1.2	1.8	2.5	77.7	2.2	94.6
331	8.3	1.2	7.8	9.6	45.7	1.0	22.2	3.7	99.5
342	13.4	0.0	3.8	25.9	18.9	34.9	1.6	0.0	98.5
344	1.8	4.3	0.0	3.7	9.9	5.9	73.1	0.3	99.0
349	14.8	28.9	12.8	0.1	5.4	20.5	0.0	14.5	97.0
353	15.3	0.6	5.9	9.2	1.6	7.2	57.4	2.2	99.5
354	23.0	0.3	7.3	13.6	49.0	0.2	0.1	2.9	96.4
355	2.8	7.0	3.1	3.6	3.3	54.2	22.7	0.7	97.4
356	12.7	5.8	10.7	3.3	34.1	2.3	25.3	2.6	96.8
357	10.8	10.9	10.3	1.3	5.1	4.2	55.8	0.7	99.1
358	1.6	32.7	4.1	25.3	7.3	10.3	0.0	5.1	86.3
362	0.2	10.2	6.4	3.9	7.8	54.4	16.3	0.0	99.2
363	19.6	0.0	2.2	20.8	32.8	15.5	5.5	2.9	99.3
364	48.3	30.9	0.0	0.0	3.7	5.1	5.7	5.7	99.4
365	0.6	0.0	9.2	0.1	0.1	0.1	19.0	69.8	99.0
366	14.5	19.3	3.5	13.5	11.3	17.7	5.6	10.7	96.0
367	13.0	26.4	6.2	2.5	29.2	12.8	5.8	1.5	97.5
369	10.3	0.0	26.4	0.1	18.2	19.6	13.1	5.6	93.3
371	0.3	0.6	23.0	67.7	1.5	1.8	2.4	2.2	99.5
372	19.1	3.5	0.8	18.5	19.8	3.6	24.0	10.6	99.9
381	1.8	4.5	8.7	2.9	8.6	8.1	39.1	1.0	74.7
382	11.5	2.2	16.6	15.7	14.0	1.3	29.8	6.8	97.8
383	22.5	5.0	0.0	35.9	0.5	17.0	0.2	12.1	93.1
384	14.3	9.1	2.7	0.8	38.5	8.0	9.8	13.5	96.7
386	5.4	0.0	0.1	0.3	3.0	40.5	43.5	0.2	93.0
399	5.5	0.0	1.5	3.2	1.7	25.1	8.8	0.0	45.8
401	3.3	0.2	21.9	15.4	18.6	19.3	21.3	0.0	99.9

Appendix A.2
Sales-Based Market Shares
Three-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
421	31.4	5.9	3.7	9.2	21.6	22.3	0.0	1.1	95.1
451	38.9	27.3	0.0	0.1	13.1	10.9	1.2	0.9	92.5
481	22.6	4.9	65.3	0.4	0.1	0.9	2.1	3.4	99.7
483	2.6	43.0	38.6	2.0	1.8	4.7	0.2	5.4	98.3
489	7.5	1.2	1.7	34.2	10.7	7.9	29.0	4.6	96.8
491	34.2	1.2	14.0	39.9	0.0	2.7	7.4	0.0	99.4
492	34.7	7.6	5.2	17.0	2.4	16.5	7.6	8.1	99.0
493	43.5	0.0	15.2	17.2	3.7	1.8	18.5	0.0	99.9
506	5.3	48.9	5.5	0.4	2.8	5.8	10.9	1.6	81.2
508	6.2	2.1	12.4	1.8	6.2	6.4	57.6	1.7	94.4
509	95.3	0.1	2.0	0.0	0.0	0.2	0.7	0.5	98.9
512	6.8	0.0	12.9	64.4	8.4	0.6	5.3	0.1	98.5
514	17.7	2.3	3.7	4.1	3.5	12.9	2.5	49.0	95.6
531	11.8	7.4	6.2	0.4	7.7	11.5	16.2	38.1	99.4
541	4.4	1.1	17.6	7.4	16.9	27.0	9.2	12.7	96.3
571	5.6	0.0	10.3	0.0	17.2	0.6	18.6	7.2	59.6
573	6.4	0.0	11.1	0.8	8.9	15.4	45.8	1.3	89.8
581	19.1	16.9	2.6	10.1	8.0	9.2	2.7	25.0	93.5
594	32.1	4.2	1.1	5.4	3.0	6.4	12.2	27.0	91.4
596	31.1	0.7	3.2	0.0	11.4	4.6	1.5	6.9	59.4
602	7.4	2.7	6.1	3.8	22.4	35.1	17.0	2.6	97.0
612	2.5	6.6	0.9	14.6	3.0	44.4	8.9	15.6	96.5
614	0.8	3.8	0.0	43.5	13.3	4.7	9.4	24.2	99.8
615	13.8	7.7	33.3	6.6	4.6	8.7	5.9	17.8	98.4
616	22.0	11.1	0.1	12.5	22.7	12.9	0.6	0.0	81.9
621	22.7	11.2	23.9	26.2	1.1	6.8	0.4	2.0	94.1
631	0.1	1.6	13.2	0.7	27.3	41.3	2.5	10.8	97.5
632	2.4	6.8	14.1	0.0	42.6	30.8	0.8	1.2	98.6
633	15.0	3.7	19.9	3.0	11.8	12.8	15.9	16.6	98.7
641	32.3	0.0	27.3	17.2	1.4	6.8	0.0	12.9	98.0
651	1.2	0.9	0.0	0.6	0.1	2.9	0.2	71.0	77.0
655	7.0	1.9	0.8	9.6	6.5	37.5	7.0	20.0	90.4
671	10.0	3.5	2.2	3.5	13.8	36.9	26.5	0.2	96.6
679	21.9	2.3	13.5	4.5	8.8	15.4	4.6	17.0	87.9
701	33.1	1.4	1.1	7.8	0.2	1.0	0.3	30.6	75.5
737	6.0	4.9	44.8	9.9	2.9	8.3	8.6	12.8	98.2
739	21.7	5.7	30.2	0.9	8.4	17.5	7.4	5.4	97.3
781	25.2	5.3	0.1	0.0	19.8	1.1	29.1	1.9	82.4
794	20.6	5.7	7.9	1.9	7.4	0.0	2.1	6.6	52.3
799	21.0	0.9	19.2	1.5	3.1	4.0	44.0	0.3	94.0
806	22.6	5.3	21.0	0.0	33.3	16.1	0.1	1.7	100.0
807	3.8	6.1	34.8	7.9	34.4	3.8	0.0	2.2	92.9

Appendix A.2
Sales-Based Market Shares
Three-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
808	4.9	7.9	0.0	43.4	20.7	2.1	0.0	19.4	98.5
891	34.6	12.3	22.0	1.7	5.7	7.7	2.5	4.0	90.3
899	26.0	10.3	6.1	7.0	2.8	1.2	11.3	31.5	96.3
Avg.	15.5	7.6	11.7	10.1	12.3	11.8	15.2	8.5	92.7

Appendix A.3
Client-Based Market Shares
Two-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
10	11.9	4.5	17.9	9.0	9.0	3.0	3.0	6.0	64.2
13	15.0	7.4	9.8	6.1	5.1	11.0	6.4	5.4	66.2
15	20.0	6.2	9.2	7.7	7.7	10.8	9.2	9.2	80.0
17	9.4	9.4	0.0	3.1	12.5	15.6	0.0	9.4	59.4
20	10.8	8.9	10.1	3.8	8.9	13.3	13.9	5.1	74.7
22	17.1	7.9	3.9	6.6	21.1	7.9	7.9	3.9	76.3
23	14.1	8.5	4.2	4.2	12.7	5.6	4.2	9.9	63.4
24	23.1	1.9	5.8	9.6	15.4	9.6	5.8	3.8	75.0
25	13.8	3.4	5.2	8.6	19.0	6.9	6.9	3.4	67.2
26	18.2	2.6	14.3	10.4	3.9	14.3	10.4	6.5	80.5
27	9.8	7.5	6.8	9.8	9.8	9.0	10.5	5.3	68.4
28	13.7	7.4	11.3	8.1	10.2	10.9	7.7	6.7	76.1
29	14.6	7.3	12.2	7.3	12.2	9.8	19.5	9.8	92.7
30	10.9	5.5	8.2	9.1	9.1	10.0	13.6	9.1	75.5
31	17.2	0.0	6.9	6.9	6.9	10.3	10.3	13.8	72.4
32	13.2	14.7	10.3	4.4	10.3	2.9	11.8	5.9	73.5
33	13.2	5.5	15.4	7.7	17.6	6.6	9.9	5.5	81.3
34	13.4	7.3	10.4	4.3	12.2	10.4	9.1	7.3	74.4
35	16.2	11.5	10.3	8.2	10.3	10.3	8.6	7.5	82.9
36	14.3	7.5	8.0	8.6	11.4	10.5	7.7	8.0	75.9
37	12.9	8.1	12.1	8.1	16.1	12.9	8.1	8.9	87.1
38	12.8	9.7	8.6	5.8	9.2	11.5	9.2	8.9	75.7
39	10.3	2.3	9.2	8.0	12.6	17.2	5.7	3.4	69.0
40	11.8	2.9	8.8	17.6	14.7	17.6	17.6	0.0	91.2
42	22.7	12.1	4.5	3.0	15.2	18.2	1.5	6.1	83.3
44	20.0	4.0	8.0	8.0	20.0	24.0	8.0	4.0	96.0
45	23.9	16.4	3.0	3.0	7.5	28.4	1.5	7.5	91.0
48	19.1	9.5	18.2	10.5	4.5	10.0	4.1	4.5	80.5
49	34.9	4.6	11.5	18.4	2.9	11.2	8.6	2.0	94.2
50	10.6	6.7	10.0	4.6	7.9	8.2	7.9	6.7	62.6
51	13.9	4.6	11.3	6.0	12.6	5.3	5.3	9.9	68.9
52	14.3	7.1	3.6	10.7	10.7	17.9	14.3	10.7	89.3
53	10.9	3.1	12.5	10.9	14.1	7.8	14.1	12.5	85.9
54	6.6	3.9	6.6	5.3	13.2	18.4	6.6	14.5	75.0
56	6.7	0.0	8.3	1.7	6.7	18.3	10.0	25.0	76.7
57	10.3	1.7	12.1	3.4	17.2	6.9	19.0	8.6	79.3
58	10.5	5.3	8.3	7.5	9.0	15.8	6.0	11.3	73.7
59	18.5	5.6	4.0	5.6	4.8	19.4	6.5	8.9	73.4
60	10.3	3.1	7.4	6.3	14.1	24.0	4.5	4.5	74.1
61	7.5	7.3	4.2	14.4	8.8	26.9	5.8	9.8	84.6
62	8.1	3.6	9.0	9.0	8.1	16.2	8.1	9.0	71.2

Appendix A.3
Client-Based Market Shares
Two-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
63	5.6	4.3	16.3	3.4	24.0	24.0	7.3	13.3	98.3
64	9.5	2.4	9.5	4.8	11.9	26.2	0.0	7.1	71.4
65	8.3	3.3	6.1	10.0	7.2	11.1	4.4	7.2	57.8
67	6.5	4.1	6.8	7.5	9.2	16.4	5.1	4.1	59.9
70	15.3	6.8	5.1	6.8	0.0	10.2	5.1	10.2	59.3
72	9.4	6.3	3.1	6.3	3.1	9.4	6.3	15.6	59.4
73	12.2	8.9	7.9	8.7	7.7	11.9	8.3	8.6	74.2
78	11.1	7.8	2.2	1.1	13.3	10.0	10.0	7.8	63.3
79	6.4	3.8	11.5	5.1	5.1	2.6	7.7	5.1	47.4
80	10.6	10.6	6.1	9.1	14.4	13.6	3.8	9.8	78.0
89	17.0	7.0	7.6	6.4	6.4	11.1	11.7	8.2	75.4
Avg.	13.4	6.2	8.5	7.3	10.7	12.9	8.0	8.0	75.1

Appendix A.4
Sales-Based Market Shares
Two-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
10	12.3	3.8	19.3	40.8	7.4	1.5	13.6	1.0	99.7
13	11.3	27.9	12.9	0.5	5.0	0.6	40.9	0.2	99.2
15	20.6	5.6	45.3	1.3	5.6	6.7	5.2	1.7	92.0
17	3.4	10.5	0.0	32.6	11.0	12.3	0.0	11.2	80.9
20	12.1	12.2	9.6	2.2	12.8	14.8	23.2	6.2	93.2
22	15.1	23.9	1.8	9.3	20.0	18.1	6.8	0.6	95.5
23	16.0	14.4	1.1	18.0	20.0	7.0	1.8	6.9	85.3
24	71.6	0.0	1.3	1.6	14.7	2.3	4.4	0.3	96.2
25	18.6	3.4	3.4	6.8	21.1	16.0	10.4	1.8	81.5
26	28.7	1.3	27.1	9.8	4.2	6.6	16.1	5.3	99.0
27	15.7	12.1	4.7	11.0	25.9	3.4	16.2	3.0	92.0
28	15.2	0.9	11.3	26.4	6.5	14.0	13.8	2.1	90.3
29	6.6	1.6	17.6	2.9	12.1	7.5	49.6	2.0	100.0
30	3.6	4.9	12.0	3.3	4.4	4.3	62.4	1.3	96.2
31	7.4	0.0	10.3	1.0	8.8	4.4	35.0	3.7	70.6
32	28.3	19.8	15.7	1.7	12.7	1.2	11.8	2.1	93.3
33	8.3	2.3	20.7	11.8	34.0	1.0	17.3	2.7	98.2
34	6.2	4.1	18.4	5.5	14.1	11.1	28.8	11.0	99.1
35	11.9	9.1	6.7	4.6	7.2	22.1	34.6	1.4	97.7
36	15.4	16.1	4.5	8.5	16.4	17.1	6.5	13.6	98.1
37	2.7	2.5	11.0	20.2	53.7	1.8	5.8	2.2	99.9
38	7.7	2.2	4.9	4.3	9.5	25.3	38.0	3.3	95.3
39	4.4	8.1	8.4	4.2	10.2	23.1	12.5	0.2	71.1
40	3.3	0.2	21.9	15.4	18.6	19.3	21.3	0.0	99.9
42	37.5	5.3	3.3	8.2	19.3	20.8	0.3	1.0	95.6
44	33.0	0.6	1.1	12.1	36.9	6.7	7.5	2.1	99.9
45	38.8	27.1	0.1	0.1	13.0	11.1	1.2	1.1	92.5
48	21.6	7.2	63.8	1.4	0.4	1.3	3.1	0.7	99.5
49	38.3	3.4	10.8	28.6	1.6	6.6	7.4	3.0	99.6
50	46.4	14.0	5.5	2.5	5.0	4.6	11.9	3.2	93.2
51	7.3	33.6	4.8	11.8	16.1	4.7	4.0	14.9	97.2
52	31.9	2.3	1.1	16.0	15.0	16.5	5.3	11.4	99.6
53	11.0	6.9	7.0	3.5	7.0	10.5	18.5	34.7	99.1
54	4.4	1.1	17.7	7.3	16.8	27.0	9.2	12.7	96.2
56	10.3	0.0	8.3	1.2	7.1	39.6	6.9	18.5	91.9
57	3.5	0.0	46.7	0.3	6.8	6.0	23.5	1.8	88.7
58	19.1	17.0	2.6	10.2	8.0	9.2	2.7	24.7	93.5
59	36.7	1.5	1.5	2.6	2.4	28.3	5.8	11.9	90.6
60	7.3	2.6	6.0	3.7	22.6	35.1	16.9	2.6	96.8
61	3.9	5.7	4.7	25.2	8.0	22.7	8.4	18.8	97.6
62	22.0	10.9	23.5	25.5	1.1	6.9	2.0	2.1	94.0

Appendix A.4
Sales-Based Market Shares
Two-Digit SIC Level
January, 1988

SIC	AA	AY	CL	DHS	EW	PM	PW	TR	Total
63	8.4	3.0	16.8	1.9	19.5	25.1	10.1	13.4	98.2
64	32.3	0.0	27.3	17.2	1.4	6.8	0.0	12.9	98.0
65	2.3	1.0	1.8	2.6	1.6	20.6	2.2	50.4	82.6
67	12.5	9.0	3.7	4.4	16.3	43.3	4.5	1.2	95.1
70	42.9	0.3	1.4	10.1	0.0	1.3	0.4	39.6	96.0
72	16.5	17.1	5.3	0.3	0.4	9.5	5.1	26.4	80.7
73	12.1	2.9	23.4	3.7	3.4	8.1	8.2	5.4	67.2
78	42.5	3.3	0.1	2.4	12.7	0.7	21.3	5.7	88.7
79	20.2	1.1	17.8	2.1	3.3	3.6	40.9	1.1	90.2
80	18.1	12.1	14.9	8.3	26.5	11.4	0.7	6.4	98.3
89	26.6	10.4	7.1	6.7	2.9	1.7	10.8	29.8	95.9
Avg.	18.3	7.4	11.9	8.9	12.1	12.1	13.8	8.5	93.1

APPENDIX B
BIG 6 MARKET SHARES
JANUARY, 1990

Appendix B.1
Client-Based Market Shares
Three-Digit SIC Level
January, 1990

SIC	AA	CL	DT	EY	PM	PW	Total
104	8.5	23.4	12.8	8.5	6.4	0.0	59.6
131	16.7	12.4	11.0	11.0	15.2	7.1	73.3
138	14.7	11.9	8.3	12.8	11.0	3.7	62.4
201	14.8	11.1	11.1	18.5	25.9	7.4	88.9
232	15.4	0.0	23.1	30.8	7.7	7.7	84.6
264	14.8	11.1	14.8	7.4	14.8	7.4	70.4
271	16.0	4.0	16.0	28.0	12.0	12.0	88.0
283	17.9	17.1	10.3	13.7	16.2	6.0	81.2
284	11.1	17.8	8.9	8.9	17.8	4.4	68.9
291	13.3	10.0	16.7	23.3	13.3	20.0	96.7
307	12.7	7.0	14.1	14.1	11.3	14.1	73.2
331	14.0	14.0	16.0	28.0	8.0	12.0	92.0
344	6.3	0.0	18.8	21.9	9.4	12.5	68.8
349	6.9	17.2	13.8	20.7	13.8	0.0	72.4
353	17.4	10.9	13.0	8.7	15.2	23.9	89.1
354	22.6	19.4	12.9	19.4	3.2	3.2	80.6
355	7.9	10.5	15.8	18.4	13.2	7.9	73.7
356	15.9	5.8	14.5	23.2	13.0	8.7	81.2
357	16.0	10.5	16.8	23.8	12.1	9.4	88.7
358	7.4	11.1	3.7	40.7	22.2	0.0	85.2
362	10.0	6.7	10.0	23.3	13.3	13.3	76.7
363	14.8	14.8	14.8	14.8	25.9	3.7	88.9
364	32.0	0.0	12.0	12.0	16.0	8.0	80.0
366	14.8	7.1	21.9	18.4	12.2	6.6	81.1
367	14.7	10.7	10.7	25.3	14.0	8.0	83.3
369	11.3	11.3	9.4	17.0	11.3	5.7	66.0
371	13.5	17.3	26.9	23.1	3.8	7.7	92.3
372	20.7	13.8	17.2	10.3	24.1	3.4	89.7
381	7.7	20.5	20.5	15.4	0.0	5.1	69.2
382	13.7	9.7	17.7	16.1	12.9	9.7	79.8
383	11.5	0.0	23.1	11.5	19.2	3.8	69.2
384	10.9	7.6	16.0	22.7	16.8	7.6	81.5
386	18.5	11.1	14.8	7.4	11.1	14.8	77.8
394	6.9	3.4	17.2	17.2	13.8	6.9	65.5
399	10.3	6.9	20.7	10.3	24.1	3.4	75.9
401	12.5	9.4	15.6	15.6	21.9	12.5	87.5
421	21.7	4.3	4.3	41.3	23.9	0.0	95.7
451	26.1	2.2	8.7	30.4	23.9	2.2	93.5
481	19.2	29.8	6.7	16.3	7.7	3.8	83.7

Appendix B.1
Client-Based Market Shares
Three-Digit SIC Level
January, 1990

SIC	AA	CL	DT	EY	PM	PW	Total
483	10.8	10.8	16.2	27.0	13.5	0.0	78.4
489	11.1	6.7	28.9	13.3	11.1	4.4	75.6
491	33.3	16.7	29.7	1.4	7.2	8.7	97.1
492	41.8	5.5	20.0	12.7	10.0	4.5	94.5
493	45.5	10.9	16.4	3.6	3.6	18.2	98.2
506	8.2	8.2	13.1	18.0	13.1	9.8	70.5
508	9.2	10.1	12.8	5.5	17.4	7.3	62.4
509	7.4	11.1	22.2	7.4	11.1	7.4	66.7
512	12.8	12.8	17.9	17.9	2.6	15.4	79.5
514	16.3	2.3	18.6	11.6	16.3	2.3	67.4
531	7.9	10.5	26.3	26.3	10.5	13.2	94.7
541	12.7	7.3	23.6	16.4	23.6	5.5	89.1
571	4.0	12.0	16.0	16.0	4.0	24.0	76.0
573	14.3	14.3	17.9	32.1	3.6	7.1	89.3
581	7.3	7.3	24.5	15.5	15.5	3.6	73.6
594	17.6	2.9	20.6	11.8	17.6	8.8	79.4
596	19.2	7.7	11.5	19.2	7.7	7.7	73.1
602	9.8	7.8	12.5	15.1	26.5	5.0	76.8
612	1.6	2.4	26.8	14.4	36.0	3.2	84.4
614	11.1	3.7	18.5	37.0	11.1	3.7	85.2
615	14.1	4.7	20.3	10.9	15.6	14.1	79.7
616	13.1	3.3	14.8	19.7	27.9	3.3	82.0
621	9.1	11.7	22.1	16.9	13.0	3.9	76.6
631	2.6	14.9	16.7	18.4	21.9	5.3	79.8
632	9.7	6.5	6.5	29.0	22.6	9.7	83.9
633	6.3	17.7	11.4	27.8	25.3	5.1	93.7
641	11.4	8.6	11.4	14.3	22.9	0.0	68.6
651	10.0	5.0	21.7	10.0	10.0	5.0	61.7
655	3.3	10.0	23.3	13.3	11.7	5.0	66.7
671	9.0	9.0	14.0	10.0	21.0	7.5	70.5
679	5.3	6.0	12.0	9.8	8.3	6.0	47.4
701	15.9	0.0	15.9	6.8	15.9	2.3	56.8
737	12.1	10.1	16.2	17.0	10.9	9.7	76.1
739	11.3	8.0	12.5	16.7	14.0	4.8	67.3
781	10.6	1.5	7.6	24.2	13.6	7.6	65.2
799	13.5	13.5	8.1	10.8	5.4	8.1	59.5
806	18.5	11.1	3.7	51.9	7.4	7.4	100.0
809	4.0	16.0	12.0	28.0	4.0	8.0	72.0
891	14.6	12.5	18.8	22.9	10.4	6.3	85.4
Avg.	13.6	9.7	15.7	18.1	14.1	7.3	78.5

Appendix B.2
Sales-Based Market Shares
Three-Digit SIC Level
January, 1990

SIC	AA	CL	DT	EY	PM	PW	Total
104	36.3	20.6	21.7	7.9	11.7	0.0	98.3
131	16.0	9.8	0.1	21.0	0.4	52.6	99.9
138	60.0	25.0	1.1	1.0	0.3	12.5	99.9
201	32.6	2.6	20.6	25.7	13.5	3.1	98.1
232	34.8	0.0	10.1	48.5	1.3	2.7	97.4
264	6.9	44.2	17.5	2.8	7.0	21.0	99.4
271	3.6	8.0	12.3	38.0	2.5	34.5	98.8
283	29.2	14.8	7.7	7.3	23.1	17.0	99.1
284	10.2	23.2	44.9	1.2	19.0	1.2	99.7
291	4.3	12.0	3.3	18.3	6.1	56.1	100.0
307	9.1	4.0	3.3	4.4	3.5	69.2	93.5
331	7.4	7.9	11.9	40.2	2.5	29.9	99.8
344	7.9	0.0	6.0	8.1	7.0	70.1	99.0
349	11.3	14.6	23.0	27.2	20.2	0.0	96.4
353	48.6	4.0	6.0	0.8	4.6	35.9	99.8
354	21.7	6.3	12.5	57.7	0.2	0.5	99.0
355	3.2	4.9	4.4	8.4	48.0	29.2	98.0
356	12.0	16.8	5.9	24.9	7.4	31.3	98.3
357	4.5	10.4	2.1	20.3	4.7	57.4	99.4
358	2.8	7.0	6.0	50.4	18.7	0.0	84.9
362	0.1	3.7	5.4	21.5	55.5	13.2	99.5
363	12.1	1.4	11.4	46.2	17.2	10.1	98.3
364	50.0	0.0	6.2	33.7	4.4	4.9	99.3
366	9.1	6.0	27.7	33.3	18.7	4.2	99.0
367	10.7	8.2	3.0	59.9	13.0	4.6	99.4
369	20.1	3.6	6.4	19.8	24.4	23.6	97.9
371	0.4	33.3	60.3	2.9	0.3	2.7	99.9
372	20.4	0.6	39.7	16.8	2.5	19.9	100.0
381	3.2	28.4	20.9	10.1	0.0	12.8	75.4
382	11.6	16.2	23.2	12.4	1.6	33.1	98.1
383	31.3	0.0	51.5	4.9	10.4	0.1	98.2
384	12.2	5.2	14.4	39.5	17.9	7.2	96.5
386	2.4	0.1	0.3	1.1	48.3	47.5	99.9
394	0.7	3.5	3.5	26.9	36.4	26.5	97.5
399	5.5	1.0	28.7	2.4	53.9	8.4	99.8
401	3.7	21.8	16.0	21.2	26.5	10.8	100.0
421	42.9	2.3	2.2	35.2	16.5	0.0	99.2
451	46.8	0.0	1.0	39.8	10.4	1.3	99.3
481	19.0	69.1	0.6	7.9	0.3	2.6	99.5

Appendix B.2
Sales-Based Market Shares
Three-Digit SIC Level
January, 1990

SIC	AA	CL	DT	EY	PM	PW	Total
483	6.5	29.3	3.9	54.7	3.6	0.0	97.9
489	6.0	1.1	22.8	12.6	33.2	23.7	99.4
491	33.4	10.7	44.2	1.1	2.7	7.4	99.6
492	34.8	5.5	35.9	9.7	12.9	1.0	99.8
493	42.7	9.2	18.4	4.5	1.5	23.7	99.9
506	6.6	1.6	1.0	50.1	7.3	13.8	80.5
508	10.5	24.7	12.5	11.8	26.7	9.3	95.5
509	4.0	45.0	12.3	8.6	8.4	10.6	89.0
512	4.6	9.9	48.6	29.0	0.5	6.3	98.8
514	13.1	4.2	56.4	3.5	18.4	1.9	97.5
531	8.6	4.9	36.9	19.6	12.0	17.9	99.9
541	6.7	18.2	26.0	18.3	21.5	6.8	97.4
571	1.2	5.0	39.7	16.9	0.3	15.9	79.2
573	4.4	14.5	8.6	10.3	14.5	45.2	97.5
581	6.4	6.0	39.0	33.2	11.8	1.2	97.5
594	31.3	2.4	39.0	7.1	7.6	6.5	93.9
596	35.0	2.4	3.0	8.0	19.6	3.3	71.3
602	12.0	6.1	5.2	19.2	32.7	23.2	98.3
612	0.8	0.6	29.4	11.0	46.6	8.6	97.0
614	11.2	0.0	65.8	14.2	5.1	3.4	99.7
615	15.5	44.7	15.3	9.2	5.3	8.2	98.1
616	21.5	0.0	11.6	46.9	8.3	0.5	88.9
621	9.5	15.9	19.8	44.2	4.1	2.0	95.4
631	0.6	10.5	14.4	22.6	45.3	3.6	97.0
632	1.7	17.3	1.0	48.1	29.6	0.8	98.5
633	19.4	16.9	16.1	23.3	11.0	12.5	99.2
641	35.1	20.9	26.6	1.0	13.9	0.0	97.5
651	0.8	0.0	92.5	1.2	4.0	0.2	98.7
655	10.8	3.7	31.2	10.0	31.1	1.8	88.5
671	13.9	5.1	22.0	29.2	13.2	11.6	95.0
679	20.5	4.2	23.8	9.0	17.7	12.0	87.2
701	49.2	0.0	45.5	0.3	1.9	0.0	97.0
737	6.0	49.8	20.0	9.4	6.3	7.2	98.7
739	17.5	35.6	7.3	18.9	11.0	5.9	96.2
781	7.0	0.1	0.3	56.7	6.7	22.2	93.1
799	16.1	9.2	1.3	21.6	4.2	45.2	97.5
806	22.7	21.1	1.3	36.7	17.9	0.3	100.0
809	0.3	4.3	10.9	38.6	6.9	28.0	89.0
891	17.5	21.6	19.0	26.5	8.3	3.9	96.8
Avg.	15.8	11.8	18.9	21.1	14.0	14.8	96.4

Appendix B.3
Client-Based Market Shares
Two-Digit SIC Level
January, 1990

SIC	AA	CL	DT	EY	PM	PW	Total
10	10.6	22.7	16.7	9.1	4.5	1.5	65.2
13	16.0	12.2	10.0	11.6	13.8	6.0	69.6
15	20.3	8.5	11.9	13.6	11.9	6.8	72.9
17	16.1	3.2	16.1	12.9	16.1	3.2	67.7
20	7.7	9.2	14.1	16.9	16.2	14.8	78.9
22	15.6	4.7	15.6	29.7	9.4	3.1	78.1
23	11.3	0.0	19.7	19.7	11.3	4.2	66.2
24	27.3	6.8	6.8	15.9	11.4	6.8	75.0
25	18.8	6.3	8.3	27.1	6.3	4.2	70.8
26	18.8	13.0	17.4	7.2	13.0	10.1	79.7
27	12.9	8.9	13.9	17.8	12.9	8.9	75.2
28	14.0	16.3	12.0	15.5	17.1	8.1	82.9
29	18.4	7.9	13.2	23.7	13.2	21.1	97.4
30	13.1	9.1	15.2	14.1	12.1	12.1	75.8
31	21.4	7.1	21.4	7.1	10.7	10.7	78.6
32	13.3	8.3	13.3	26.7	6.7	13.3	81.7
33	13.8	13.8	14.9	25.3	10.3	9.2	87.4
34	11.4	10.7	15.0	21.4	9.3	8.6	76.4
35	16.0	10.1	14.8	22.3	13.0	9.5	85.6
36	15.1	8.2	14.9	19.7	13.6	6.9	78.5
37	16.4	12.9	19.8	22.4	12.9	5.2	89.7
38	12.4	9.2	17.9	17.6	13.3	8.4	78.7
39	9.9	7.4	17.3	16.0	18.5	4.9	74.1
40	11.1	8.3	13.9	13.9	22.2	13.9	83.3
42	19.6	5.9	3.9	39.2	23.5	2.0	94.1
45	25.9	3.7	13.0	27.8	22.2	1.9	94.4
48	15.4	20.2	14.4	17.6	10.6	3.2	81.4
49	35.4	10.6	22.0	9.7	10.3	8.9	96.9
50	10.6	8.8	14.1	12.0	12.7	8.8	66.9
51	12.9	9.4	16.5	16.5	6.5	7.9	69.8
53	7.7	9.6	30.8	19.2	9.6	13.5	90.4
54	11.5	6.6	21.3	16.4	21.3	4.9	82.0
56	12.1	10.3	25.9	8.6	17.2	12.1	86.2
57	8.8	14.0	19.3	24.6	5.3	14.0	86.0
58	7.2	7.2	24.3	15.3	15.3	3.6	73.0
59	19.8	5.7	16.0	11.3	16.0	7.5	76.4
60	9.4	7.7	12.7	15.0	26.9	4.8	76.5
61	6.2	3.0	23.6	17.3	28.9	5.1	84.1
62	6.5	10.3	21.5	14.0	14.0	4.7	71.0

Appendix B.3
Client-Based Market Shares
Two-Digit SIC Level
January, 1990

SIC	AA	CL	DT	EY	PM	PW	Total
63	4.5	14.5	12.8	23.1	24.4	6.2	85.5
64	11.4	8.6	11.4	17.1	22.9	0.0	71.4
65	7.0	7.7	20.3	11.9	11.9	5.6	64.3
67	7.4	8.0	12.9	10.3	15.8	7.2	61.6
70	14.3	0.0	16.3	6.1	14.3	2.0	53.1
72	10.0	3.3	20.0	10.0	13.3	3.3	60.0
73	11.9	8.8	14.1	16.1	12.6	7.8	71.3
78	9.4	1.2	12.9	21.2	12.9	8.2	65.9
79	10.0	12.9	11.4	11.4	2.9	7.1	55.7
80	12.4	8.3	14.9	24.0	11.6	5.0	76.0
89	16.0	9.3	16.0	18.7	10.7	9.3	80.0
Avg.	13.7	8.8	15.9	17.2	13.9	7.3	76.9

Appendix B.4
Sales-Based Market Shares
Two-Digit SIC Level
January, 1990

SIC	AA	CL	DT	EY	PM	PW	Total
10	22.2	25.3	8.2	16.8	2.1	25.1	99.7
13	21.0	11.6	0.2	18.7	0.4	48.0	99.9
15	24.2	35.8	3.2	13.4	7.3	8.3	92.3
17	33.7	0.4	24.9	21.3	14.9	0.1	95.2
20	13.2	5.0	15.1	27.0	15.5	23.5	99.3
22	21.4	3.1	15.1	41.6	7.2	3.8	92.1
23	29.8	0.0	13.1	32.5	11.2	2.4	89.0
24	75.0	1.3	0.8	13.8	1.9	4.1	96.8
25	25.0	2.7	5.8	31.1	10.5	9.3	84.3
26	30.1	23.8	16.4	4.9	6.9	16.8	98.9
27	16.1	5.4	11.2	40.3	5.0	18.2	96.1
28	14.6	19.3	27.1	7.1	21.7	9.7	99.6
29	5.6	11.6	3.2	19.1	5.9	54.6	100.0
30	7.4	8.2	5.6	11.0	6.4	58.0	96.7
31	6.4	8.2	5.4	5.5	6.6	36.1	68.2
32	21.2	8.7	21.5	32.3	3.7	11.5	98.9
33	7.5	27.2	10.6	29.8	3.0	21.6	99.8
34	7.1	14.1	17.9	19.2	11.3	29.4	99.1
35	15.4	6.5	4.3	15.1	25.0	32.8	99.1
36	13.7	5.5	14.7	39.2	19.2	6.5	99.0
37	3.2	14.0	30.5	31.4	1.0	5.4	85.5
38	5.9	6.2	8.4	8.3	30.9	37.0	96.8
39	4.9	2.4	18.6	15.5	43.4	13.7	98.5
40	3.0	17.9	13.1	17.5	22.6	25.8	100.0
42	42.2	2.3	2.2	34.7	17.4	0.4	99.2
45	46.6	0.1	1.4	39.5	10.4	1.3	99.3
48	17.9	64.8	1.7	10.0	1.7	3.3	99.4
49	37.1	8.8	35.0	4.1	5.0	9.8	99.7
50	12.6	9.4	10.1	34.7	11.7	11.2	89.7
51	9.1	6.5	41.4	26.9	7.0	4.4	95.3
53	8.1	4.7	37.3	17.9	11.0	20.5	99.5
54	6.7	18.2	26.0	18.3	21.5	6.8	97.4
56	21.2	7.5	19.6	10.9	30.9	5.4	95.5
57	2.0	37.2	15.1	9.0	7.8	22.0	93.0
58	6.4	6.0	39.0	33.2	11.8	1.2	97.5
59	44.2	6.2	15.0	3.6	21.4	2.6	93.1
60	11.7	6.0	5.2	19.0	33.4	22.8	98.1
61	7.5	5.9	39.7	13.7	24.5	6.3	97.6
62	9.4	15.9	20.0	43.5	4.1	2.3	95.2

Appendix B.4
Sales-Based Market Shares
Two-Digit SIC Level
January, 1990

SIC	AA	CL	DT	EY	PM	PW	Total
63	11.7	14.8	14.4	24.6	24.2	8.8	98.4
64	35.1	20.9	26.5	1.1	13.9	0.0	97.5
65	3.0	2.7	64.2	3.1	21.8	1.1	96.0
67	13.8	5.1	21.1	26.3	17.0	11.3	94.6
70	49.2	0.0	45.5	0.3	1.9	0.0	97.0
72	17.9	5.3	26.2	20.3	13.0	2.3	85.0
73	12.1	40.6	13.7	11.6	8.9	11.1	97.9
78	7.4	0.0	12.7	45.7	9.2	19.4	94.4
79	16.1	8.8	2.0	21.0	3.9	43.4	95.1
80	20.0	16.2	6.2	40.6	14.4	1.0	98.5
89	22.9	19.1	16.9	23.5	9.6	5.1	97.0
Avg.	18.4	11.9	17.1	21.0	12.8	14.5	95.7