AUDITOR AND UNDERWRITER INDUSTRY

SPECIALIZATION/DIFFERENTIATION: EVIDENCE FROM IPO

UNDERPRICING AND LONG-TERM PERFORMANCE

A Dissertation

by

KUN WANG

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2005

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ABSTRACT

Auditor and Underwriter Industry Specialization/Differentiation: Evidence from IPO

Underpricing and Long-term Performance. (August 2005)

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The dissertation examines IPO underpricing and long-term performance to assess the use of industry specialization as a differentiation strategy by audit firms and underwriters. Prior studies indicate that prestigious auditors or underwriters (e.g., Big 6 auditors) are associated with IPO underpricing. I extend existing literature by incorporating market share as a refined measure of auditor (underwriter) reputation. In particular, I define a differentiated auditor (underwriter) as the market leader that possesses significantly higher market share than their competitors in the client industry. I hypothesize that the impact of auditor (underwriter) reputation in the IPO setting depends on whether the audit firm (underwriter) has successfully differentiated itself from competitors within client industries. My results show that as audit firm (underwriter) industry market share increases without differentiation, the IPO underpricing increases. It appears that this group of auditors (underwriters) intentionally engages in high-risk IPOs in order to gain fee advantages. In contrast, differentiated auditors (underwriters) are related to lower IPO underpricing because their reputation

assist in reducing information asymmetry between issuers and investors. My study is important because it shows that the benefits previously thought to be attributable to a very large set of auditors and underwriters stems primary – and perhaps exclusively – from those dominate their respective industries. This project also provides a benefit to firms that are considering public offerings since they need to evaluate the cost and benefit of selecting industry-dominant auditors and underwriters.

TABLE OF CONTENTS

LIST OF TABLES

I. INTRODUCTION

One of the most heavily investigated areas of research in the IPO literature

involves the persistent underpricing of equity securities (e.g., Ibbotson 1975; Ritter

1984; Longhran and Ritter 2002).[1,2] In this context, the term "underpricing" is used to

describe the difference between the offering price and the market-clearing price at

issuance. Although a number of papers have attempted to identify factors that are

responsible for the underpricing phenomenon, relatively little attention has been paid to

the expertise of the auditors and underwriters that are appointed for the new issues. More

specifically, the literature to date has done nothing more than associates underpricing

with crude proxies for auditor and underwriter quality ("high" versus "low"). Although

some links do appear to exist (e.g., Balvers et al. 1988; Beatty 1989; Hogan 1997;

Willenborg 1999), the measures used in these studies are too broad (and in some cases

insufficient) to completely capture the nature of the observed relationships. The primary

purpose of this dissertation is to investigate these issues more thoroughly using recent

methodological improvements from the audit fee literature.

This study provides initial evidence on several questions relating to the IPO

underpricing and long-term performance. First, I investigate whether auditor industry

specialization is associated with underpricing and underwriting costs of new issues. A

This dissertation follows the style and format of *The Accounting Review*.

[1] For a review of the literature on the IPO market, see Ritter and Welch (2002).

[2] Underpricing translates directly into the initial return, defined as the return earned by an investor buying at the offering price and selling at the first-day closing price. These terms – underpricing and initial return – are used interchangeably in the literature.

common problem with extant underpricing studies is that they consistently define audit quality in terms of the Big 4/5/6 and non-Big 4/5/6 classification. While this scheme is consistent with a number of general theories of auditor selection (DeAngelo 1981; Simunic and Stein 1987), the definition is broad and fails to fully capture the dynamics of audit quality. In fact, Healy and Lys (1986) suggest that auditor size and audit quality are not necessarily related. They further emphasize that large audit firms can be differentiated through the specialized services that they can provide to clients (e.g., SEC reporting in their cases).

In support of Healy and Lys' propositions, Mayhew and Wilkins (2003) find that the impact of auditor quality on auditor compensation is subtler than what is documented in studies employing the simple Big 6 and non-Big 6 classification in the IPO setting. Audit firms with large market shares are able to develop more industry-specific knowledge and expertise, thereby enabling them to provide higher quality services than similar audit firms with smaller market shares. Specifically, Mayhew and Wilkins (2003) show that a fee premium exists only among "differentiated" auditors – that is, the subset of Big 6 audit firms that have a clear lead over their competitors in light of industry market share. The authors do not address the association between auditor industry specialization and IPO underpricing and underwriting costs. To the extent that specialized auditors do provide additional value-added service beyond what has been attributed previously to "Big 6 quality", I hypothesize that both underpricing and underwriting fees will be lower for issues audited by differentiated audit firms.

The present study also provides evidence on whether industry specialization among underwriters affects underpricing and underwriting costs. Prior studies establish that prestigious underwriters increase the net IPO proceeds received by an issuer (i.e., minimizing underpricing) either directly by certifying a higher firm value or indirectly by reducing the required underpricing for investor participation (Carter and Manaster 1990).[3] On the other hand, Ljungqvist and Wilhelm (2003) find that by spending time acquiring industry-specific knowledge, an industry specialist underwriter – much like an audit firm – is better equipped to price IPOs accurately. Implicit in their argument is the notion that industry specialization assists underwriters in achieving higher service quality. As a consequence, issues underwritten by industry specialist underwriters should have less underpricing. However, this relation has not yet been empirically tested in the academic literature. Moreover, the relationship between underwriting costs and underwriter industry specialization remains a completely open question. If the evidence documented by Mayhew and Wilkins (2003) regarding audit fees is analogized to underwriting costs, underwriting fees should be decreasing with the increase of underwriter market share due to economies of scale. But this pattern should reverse for underwriters that successfully differentiate themselves from their competitors in the industry. Both of these questions will be addressed in this dissertation.

Further, my study presents evidence on the relationship between auditors and underwriters in the context of industry specialization. Menon and Williams (1991)

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[3] Underwriter reputation is normally defined by the ranking of underwriters (i.e., top 18 or top 25). Similar to the classification of auditor reputation, there is speculation that this definition needs to be refined. Introducing additional metrics of underwriter quality, such as industry specialization, can provide new insights on the effects of underwriter quality (Chen and Ritter 2000).

demonstrate that underwriters exert considerable influence on an IPO firm's auditor-hiring decision. As industry specialization further differentiates audit quality across Big 4/5/6 firms, it is reasonable to expect that bundling industry specialized auditors and underwriters together would be an effective strategy in maximizing IPO proceeds. Balvers et al. (1988) document that the collective effect of bundling high reputation auditors and underwriters is positive (i.e., more underpricing). However, their reputation proxies are suboptimal, the concept of specialization and differentiation is not introduced at all, and a number of institutional changes have occurred (both with respect to audit firms and the IPO market) since the end of their sample period. The present study, by updating the time horizon and refining the relevant measures, attempts to more adequately assess the relationship between underpricing and the bundling of specialist auditors and underwriters.

Finally, I provide evidence on the association between auditor (underwriter) industry specialization and long-run IPO performance. Several studies (Jain and Kini 1994; Mikkleson et al. 1997) attempt to find firm characteristics that result in cross-sectional predictability of long-term IPO performance. Drawing on monitoring theory, I hypothesize that firms retaining industry specialized auditors and underwriters are, ceteris paribus, of higher quality than other firms and are also likely to have better monitoring mechanisms in place. Such monitoring should reduce agency costs and improve long-run performance of the offering firms.

My tests are based on a sample of 2,234 domestic IPOs brought to market between 1991 and 2001. Previous research confirms that the IPO market generates high

levels of competition for both auditors and underwriters. This high level of competition enables me to conduct a powerful test of the hypotheses. Following Hogan and Jeter (1999), and Mayhew and Wilkins (2003), I define auditor (underwriter) industry specialization in terms of the audit firm's (underwriter's) concentration levels in two-digit SIC codes based upon the industry proportion of the square root of assets (proceeds) audited (underwritten). Additionally, an auditor (underwriter) is defined as "differentiated" if it has the largest market share in any particular two-digit SIC code per IPO-year and its market share is at least ten percentage points higher than its closest competitors.

The empirical tests are run in three stages. First, an underpricing model using the entire sample of IPOs is used to replicate previous findings that general auditor reputation, as proxied by Big 4/5/6 and non-Big 4/5/6, suppresses IPO underpricing. Second, I constrain the tests to IPOs associated with Big 4/5/6 auditors, and use OLS to analyze the effects of auditor and underwriter industry specialization on underpricing, audit fees, and underwriting fees, as well as IPO long-term performance. Finally, to control for both the supply-side and the demand-side effects of auditor reputation, I use simultaneous equations to re-estimate the underpricing and audit fee models. The regression models employ control variables identified by recent IPO studies, modified by dynamics that are likely to influence the association among issuers, underwriters, and auditors.

As hypothesized, I find that IPO underpricing is reduced by 5 (6) percent if an auditor (underwriter) is identified as an industry differentiated specialist. This result is

important because it confirms that the auditing and underwriting market are quality differentiated regarding industry expertise. Companies can leverage on the quality of auditors and/or underwriters to reduce the underpricing. I also find that the impact of auditor and underwriter industry specialization (differentiation) on underwriter compensation is sensitive to the size of the IPO firms. Smaller IPOs tend to pay more fees to high reputation underwriters, but selecting a differentiated auditor may reduce the cost of these firms paid to underwriters. Further, the results indicate that industry specialists underwriters, rather than auditors, are more likely to be associated with improved long-term performance of IPOs.

My study makes significant contributions to the IPO literature because it is the first in either accounting or finance to address whether IPO underpricing and long-run performance are impacted by auditor and underwriter industry specialization. By providing substantial refinements in the definitions of audit and underwriter "quality" or "reputation", this study should remedy a number of the deficiencies that currently exist in the literature. This paper also has implications for auditing and underwriting practitioners by highlighting the potential benefits (higher fees and better IPO pricing) that stem from industry specialization. Finally, entrepreneurs considering public offerings should find this research of interest as they evaluate the costs and benefits associated with hiring industry specialists.

This paper will be structured as follows. First, an overview of the audit and underwriting functions in an IPO is given in Section II. Section III develops research questions and relevant hypotheses based upon extant auditing and finance literature. This

is followed by a description of the proposed research method in Section IV. Upon

completion of the study, empirical results will follow as well as a comment section.

II. THE IPO SETTING AND HYPOTHESES

IPO Underpricing

The underpricing of IPOs has been a topic of theoretical and empirical investigation for decades. Recently, this topic has enjoyed a resurgence of interest, motivated by the astonishingly high first-day returns on IPOs during the Internet bubble period of the late 90s. Based upon the extent of underpricing (15% to 65% in "hot issue" markets) documented in numerous empirical studies (e.g., Ibbotson 1975; Ritter 1984), Ritter and Welch (2002) contend that underpricing is a persistent feature of the IPO market and, while cyclical, may have increased in magnitude over time. Why do investment bankers underprice IPOs? Are there certain types of underwriters or certain characteristics of issues that are more (or less) likely to be associated with underpricing?

Explanations for the underpricing phenomenon frequently rely on the adverse selection consequences of information asymmetry. An agency-based model offered by Baron (1982) is built on the premise that the underwriter has significantly better information than the issuing firm concerning the demand for the issuer's securities. To induce the underwriter to put in the requisite effort to market shares, it is optimal to permit some underpricing, because the issuer cannot monitor the underwriter without incurring some costs. A follow-up study by Muscarella and Vetsuypens (1989), however, reports that when underwriters themselves go public, their shares are just as underpriced even though there is no monitoring problem.

An alternative relationship between uncertainty and underpricing is suggested by Beatty and Ritter (1986) and Rock (1986). In their models, two classes of investors are

assumed. Informed investors, on one hand, always bid for securities that are underpriced. On the other hand, relatively uninformed investors are aware of the possibility that they would tend to receive a greater portion of the overpriced issues than the informed investors would. Thus, in order to induce uninformed investors to participate in the IPO market, IPOs must be sufficiently underpriced to allow uninformed investors a reasonable return for the ex ante uncertainty and to enable them to cover the losses resulting from purchasing overpriced securities.

Bookbuilding models also agree with the view that informed investors are more privileged than uninformed investors in gathering information about IPOs. But underpricing is not interpreted as a form of compensation to uninformed investors to participate in market. Rather, issuers underprice to encourage informed investors to reveal their high personal demand for shares (e.g., in the road shows). Similarly, Lee et al. (1999) present evidence that informed investors request more, and preferentially receive more, IPO share allocations.

Theories of IPO underpricing based on information asymmetries have been met with partial acceptance by financial economists, as well as refutations arguing that these theories are unlikely to explain the recent average first-day returns of 65 percent earned in the Internet bubble period. There are also theories of underpricing that do not hinge on asymmetric information that is resolved on the first day of trading. Tinic (1988) argues that underpricing serves as a form of insurance against legal liability and the associated damages to the reputation of investment bankers. Ritter and Welch (2002) cast doubt on

his theory by questioning that leaving money on the table appears to be a cost-inefficient way of avoiding subsequent lawsuits.

Boehmer and Fishe (2001) advance another explanation for underpricing. They note that the high trading volume in the aftermarket is associated with greater underpricing of IPOs. Thus an underwriter that makes a market in a Nasdaq-listed IPO gains additional trading revenue. Unlike the lawsuit-avoidance explanation of underpricing, it remains unclear how the issuer benefits from the underpricing in this context based upon Booth and Smith (1986), unless the increased liquidity is persistent.

In sum, there are several possible explanations for the underpricing of IPOs. Although none of them taken alone has received overwhelming empirical support, the facts derived from these studies do suggest that (1) IPOs are significantly underpriced on average and (2) the more established an issuer and hence the less investor uncertainty about the firm's real value, the lower the underpricing. The purpose of this dissertation is to examine the extent to which auditor and underwriter industry specialization help to resolve investor uncertainties and as such, decrease underpricing of IPO firms.

Impact of Audit Quality on IPO Underpricing

Audit Quality – General

Practically speaking, the independent auditor's role in the IPO process includes responsibility for auditing the financial statements and providing advice, as well as general services involving the resolution of accounting issues, due diligence procedures, and the review of registration statements. The auditor is also responsible for issuing comfort letters to the underwriter. With respect to the comfort letter, some of the duties

include attestation regarding condensed financial information and other data. The duties also include negative assurance as to whether certain financial information outside of the purview of financial statements complies in form and in all material respects with the securities regulations.

In the accounting literature, there are four studies that document an association between the magnitudes of IPO underpricing and proxies for audit quality (e.g., Balvers et al. 1988; Beatty 1989; Hogan 1997; and Willenborg 1999). These associations are statistically significant and relatively robust but controversy surrounds their interpretation or meaning. One view suggests that a high quality auditor is demanded in an IPO setting to reduce information asymmetry between owners and investors (i.e., the reputation hypothesis), thereby reducing the cost to the initial purchasers of securities. The reputation hypothesis is normally tested by regressing underpricing on an indicator variable (i.e., Big4/5/6 vs. non-Big4/5/6) for auditor quality along with other control variables. The coefficient on auditor quality is then interpreted as the average increase or decrease in underpricing from choosing a higher quality auditor (Balvers et al. 1988; Beatty 1989). However, this approach does not take into account that auditor selection is influenced by cost differences across auditor types. If Big 4/5/6 auditors charge a risk premium that is sufficiently higher than the risk premium charged by non-Big 4/5/6 auditors, then the incremental cost of choosing a Big 4/5/6 auditor may outweigh the incremental benefit. The existence of both demand-side and supply-side effects of client-specific risk implies that auditor choice depends on a trade-off of costs and benefits and that the audit quality/risk relations may be nonlinear.

In an attempt to correct the problem from the supply-side effect of risk, Beatty (1989) uses a two-stage least squares approach to establish a reputation proxy by regressing compensation paid to the audit firms on measures of audit intensity (i.e., IPO proceeds, client sales, and client equity). The extent of underpricing is then regressed on the residuals from the compensation regression to provide evidence of the reputation hypothesis. Results using this residual proxy confirm that clients that pay a premium for their IPO audit are subject to less underpricing.

An alternative approach to control both demand-side and supply-side effects is demonstrated by Hogan (1997). Using self-selection analysis, she examines the trade-offs that an entrepreneur makes in an IPO between the incremental costs and benefits of selecting a Big 6 audit firm. Self-selection analysis provides a method of accounting for the cost/benefit trade-off and examining the effect of client-specific risk separately in each audit quality group. Evidence drawn from a sample of IPOs during the early 1990s suggests that the benefit of hiring a Big 6 auditor is a reduction in the extent of underpricing, consistent with Beatty (1989), while the cost of hiring a Big 6 auditor is higher auditor compensation. Hogan's overall findings are consistent with a differentiated market for audit services where owners select the level of audit quality – high or low – that minimizes the sum of underpricing and audit compensation costs.

On the other hand, Willenborg (1999) attempts to interpret the ability of high quality auditors to reduce underpricing from an insurance signaling perspective. Underlying his arguments is the assumption that auditors are perceived as providing financial statement users with a form of insurance; the prestigious audit firms have been

shown to provide increased coverage in the event of securities litigation (Wallace 1987).

In his empirical tests, Willenborg (1999) seeks to disentangle the information-based

demand for auditing from insurance-based demand by partitioning IPOs into start-ups

and established companies, per *SFAS No. 7*. For startups, he argues that the quality of the

audit should be of less interest because the financial statements of a startup contain little

meaningful accounting information. Alternatively, investors are more concerned with the

insurance coverage auditors provide for a startup IPO rather than the information quality

offered by auditors. Therefore, the insurance-based demand for auditing is likely to

dominate any information-based demand for IPO audits. The expected negative relation

between auditor reputation and underpricing, however, emerges in both the startups and

the larger portion of established companies. Willenborg interprets these results as

supporting both roles for auditing, though the evidence in support of an insurance

signaling role seems particularly strong.

Taken collectively, while it has been documented that large audit firms can

potentially reduce IPO underpricing, the underlying theories offer competing

predictions. One potential explanation for the inability of prior studies to differentiate

between the competing predictions stems from their failure to distinguish between the

service quality provided within Big 4/5/6 audit firms in an IPO context. Especially for

the reputation hypothesis, the classification of Big 4/5/6 and non-Big 4/5/6 appears to be

coarse, failing to adequately capture the dynamics of audit quality. Hogan's (1997) and

Willenborg's (1999) findings are indeed valuable, as they document that underpricing is

lower for issues audited by Big 6 firms. However, their studies leave the question

whether underpricing can be further mitigated by additional measures of audit quality unanswered. I first address this question by examining whether the ability of Big 4/5/6 to reduce IPO underpricing is attributable to a refined audit quality measure, industry specialization or differentiation of audit firms. If industry specialized/differentiated auditors are associated with a significant decrease in underpricing, this would lend additional support to the reputation hypothesis as industry specialization is widely acknowledged as an important determinant of auditor reputation. The next subsection relates prior studies of auditor industry specialization to this particular research question.

Auditor Industry Specialization

Claims by Big 6 audit firms of increased or increasing levels of industry specialization imply that firms perceive a net benefit to specialization (Hogan and Jeter 1999), whether the benefits come from increased market share, profits, audit quality, or audit fees. A large body of literature has examined the issue of auditor specialization in a variety of contexts. Mayhew and Wilkins (2003) take a novel approach to study the impact of auditor industry specialization on IPO audit fees. Traditionally, the evidence in this area has been mixed (Palmrose 1986; Ward et al. 1994; Craswell et al. 1995), mostly likely due to the underlying theories offering competing predictions. On one hand, audit firms acquire a reputation as industry specialists by developing industry-specific skills and expertise over and above normal auditor expertise. To the extent that Big 4/5/6 auditors invest in industry specialization, they require a return on this investment and, *ceteris paribus,* would be expected to charge higher fees compared to non-specialists for audits in these industries.

On the other hand, auditors develop industry specialization by increasing their clienteles. As a result, specialists could also achieve production economies and become more efficient, lower-cost producers of audits. Under these circumstances, the specialist audit firms would presumably earn a profit premium (due to their lower marginal costs). However, because only fees – not costs – are observable, empirical models could show that industry specialization results in lower fees.

Mayhew and Wilkins (2003) attempt to reconcile the previous discrepancies surrounding the relation between auditor industry specialization and auditing fees. Drawing on Porter's (1985) analysis of corporate strategy, auditor industry specialization is viewed as a *differentiation strategy* that provides auditors with a sustainable competitive advantage over non-specialist auditors. In particular, they extend existing theory by considering both the supply and the demand for industry specialization. In the supplier's view, the increased market share caused by industry specialization enables auditors to perform more cost effective audits, accruing benefits to both clients and auditors. From the demand side, an industry specialist audit firm provides a greater value proposition to its clients, as the audit is arguably a process and not simply a standardized report.

The empirical results of Mayhew and Wilkins (2003) reveal that as audit firm industry market share increases, the audit fee charged for a given IPO decreases. This finding is consistent with the existence of industry-based economies of scale. On the other hand, the results show that industry-leading audit firms earn a 28.79 percent average premium once they possess substantially higher market shares than their

industry competitors. Thus the ability of a given audit firm to differentiate its services from competing audit firms appears to be crucial in understanding the impact of industry market share on IPO audit fees. Put alternatively, it appears that audit quality only matters if the firm is truly dominant, not just the leading firm in its audit industry.

Indeed, additional evidence suggests that audit firm industry specialization may improve audit quality directly in focal industries. For example, Carcello et al. (1992) report a survey of Fortune 1,000 controllers who indicate that their auditors' industry knowledge/expertise is a primary attribute of overall perceived audit quality. In the spirit of Carcello et al., Kwon (1996) shows that audit firms with industry specialization can better assess the reasonableness of clients' discretion in applying accounting principles, thereby enhancing audit quality.

According to the reputation hypothesis, IPOs are underpriced because problems of information asymmetry and adverse selection are extremely severe for new issues. To the extent that industry specialization signals increased service quality, my primary expectation is that underpricing will be reduced through selecting an industry specialist auditor. In contrast, there is also anecdotal evidence showing that audit firms with a relatively high market share are willing to take on higher risk clients, with the hopes of either getting higher fees now or higher fees in the future. Under this situation, industry specialization might be observed as having association with highly underpriced issues.

Nevertheless, as an audit firm clearly establishes its dominant market position, it can earn fee premium simply due to its differentiated service quality (Mayhew and Wilkins 2003). It won't be necessary for differentiated audit firms to sacrifice their

reputation in order to boost profits. Consequently, IPO associated with differentiated

auditors are expected to have less underpricing as compared to those auditors by -

differentiated auditors. These notions lead to my first hypothesis:

H1a: IPOs audited by an industry specialized auditor is associated with IPO

underpricing.

H1b: IPOs audited by an industry differentiated auditor experience less

underpricing than IPOs audited by a non-industry differentiated auditor.

Underwriter Industry Specialization

It is widely agreed that the value of the auditors' services in an IPO is in some

ways contingent upon the extent to which the underwriter can reduce comparable

uncertainty (Hogan 1997). In contrast to the auditors' attestation to financial statements

for both potential investors and underwriters, an underwriter provides assurance to and

about the market for issuers. Specifically, the underwriter engages in two types of

activities in a public offering: a distribution activity and an underwriting activity. In

carrying out the distribution activity, underwriters act as a financial intermediary, aiding

the issuing firm in designing and timing the offering and in distributing the securities.

The underwriting function provides a guarantee to the issuer against the risk of

fluctuations in the price of the offered securities. As a result, underwriters play a more

vital role in the IPO process, particularly among start-up companies that do not have

much financial information.

A number of finance studies maintain that an investment bank's ability to perform its intermediary function relies on its reputation with investors and issuers (Beatty and Ritter 1986; Carter and Manaster 1990). The logic underlying these findings is the idea that prestigious underwriters put more reputation at stake with an offering and will try to avoid riskier issuers and the threat they pose to the reputation of underwriters. As a result, Booth and Chua (1996) report that issues underwritten by a prestigious bank attain a privileged status among investors, translating directly into higher IPO proceeds and lower underpricing.

One way that underwriters commonly use to improve their reputation and gain market share is to specialize in a particular industry. This is readily apparent from the manner in which firms characterize themselves on their WebPages. For example, JPMorgan's website at http://www.jpmorgan.com states that:

JPMorgan's investment bank is built on long-term relationships with its clients. Teams, specified by region and industry, provide in-depth market knowledge and experience and are dedicated to meet clients' critical financial needs. (JPMorgan 2005)

The JPMorgan website goes on to list 14 broad specializations: chemicals, consumer, diversified industries, financial institutions, financial and sponsor group, healthcare, mining & metals, oil & gas, power, paper, packaging & building products, real estate, technology, media & telecommunications, and transportation. The discussion of underwriter industry focus is also evident in Chen and Ritter (2000). They highlight that "by emphasizing industry expertise, the IPO underwriting business becomes one of differentiated products, reducing the number of viable competitors for any given deal."

Clearly, this statement is congruent with the underlying theory for auditor industry specialization/differentiation.

How do the advantages of developing industry specialization accrue to underwriters? First, an underwriter's ability to market an IPO depends on the quality of information it possesses about the issuer and investors. Information spillovers from one IPO to another help the underwriter improve its marketing skills, which should lead to increased pricing accuracy. Studies have documented a positive relation between reputations and offering price revisions in the primary market, a proxy for pricing ability (Benveniste et al. 2003; Ljungqvist and Wilhelm 2003). Better pricing skills acquired through specialization, in turn, will enable an underwriter to gain additional market share.

Second, in the case of follow-on equity offerings, James (1992) finds that a firm was more likely to stay with its IPO underwriter if the bank had spent time acquiring relationship-specific knowledge about the firm's operations and requirements. Similarly, Ljungqvist and Wilhelm (2003) show that a strong prior underwriting relationship was a significant determinant in a bank's ability to win further equity underwriting business from a company. Such a relationship is not likely to exist pre-IPO, but a bank can compensate by specializing in certain industries. This gives them a superior understanding of the characteristics necessary for a successful IPO from these industries.

With respect to the impact of underwriter quality on underpricing, there exist two schools of evidence in the finance literature. In the 1980s, a number of studies, represented by Carter and Manaster (1990) describe a negative relation between IPO

underpricing and IPO expert quality measure. They interpret this to imply a meaningful role of the underwriter in either signaling IPO risk or resolving uncertainty. On the other hand, Beatty and Welch (1996) find that higher quality underwriters (especially among large firms) and higher nominal issues underpriced more for a sample of 1992 to 1994. In particular, they employed a new measure of underwriter market share and controlled offering size in the model. But the reverse underwriter quality correlation remains robust regardless of variable definition. They conclude the relation between IPO underpricing and underwriter compensation has reversed due to differences in the economic environment. As a result, I don't predict any direction for the impact of the general underwriter industry specialization on IPO underpricing. However, for differentiated underwriters whose services stand out from their competitors in a specific industry, I still expect the differentiation will signal the highest service quality, thus leading to less underpricing for IPOs. Thus, my second hypothesis states:

H2a: IPOs underwritten by an industry specialist underwriter is associated with IPO underpricing.

H2b: IPOs underwritten by an industry differentiated underwriter experience less underpricing than IPOs underwritten by a non-industry differentiated underwriter.

Interaction of Auditor and Underwriter Industry Specialization

Underwriters have a preference for reputable auditors since they usually rely on audited financial statements in certifying the value of firm and determining whether to underwrite the offering (Balvers et al. 1988; Menon and Williams 1991). To the extent that auditor and underwriter industry specialization both offer a positive signal about IPO quality, it indicates the possibility that bundling industry specialist underwriters and auditors together will accumulate the most advantageous leverage in increasing IPO proceeds. Therefore, I expect IPO underpricing should be least prevalent when both specialists are in place.

On the contrary, Balvers et al. (1988) builds a model demonstrating that as both the investment banker's and auditor's reputation increase, their collective impact on underpricing is reduced. In other words, for a higher reputation investment banker the effect of a higher reputation auditor on underpricing is positive (i.e., the collective effect is less negative). However, they fail to offer convincing explanations for this phenomenon except for appealing to the evidence of diminishing returns on information acquisition. Moreover, Balvers et al. use Big 8/non-Big 8 dichotomies (top 25 in ratings) to proxy auditor's (underwriter's) reputations, raising the familiar problems that these measures are broad and inadequate quality instruments.

Coupling these competing arguments, I do not specify the direction for the relationship between auditor and underwriter specialization bundling and IPO underpricing. Therefore, H3 states:

H3: The bundling of industry specialist auditors and underwriters is associated with IPO underpricing.

Impact of Auditor (Underwriter) Industry Specialization on Underwriting Costs

The primary benefit underwriters derive from providing their services is the gross spread – the percentage of the offer price retained by the underwriter. The gross spread is typically divided into a management fee (20 percent), an underwriting fee (20 percent), and a selling concession (60 percent). Consistent with prior accounting literature (Menon and Williams 1991), my study focuses on the magnitude of underwriting fees.

Evidence abounds that the level of underwriting fees is positively related to underwriter prestige (Carter and Manaster 1990; Menon and Williams 1991). However, adding a high reputation auditor can potentially change the fee structure of underwriters. Using a sample of 1,105 IPOs during 1985 and 1986, Menon and Williams (1991) observe a 6.4 percent auditor switch during the two-year period prior to an IPO, with the majority of these switches representing IPO clients going to larger auditors. In addition, they find that the compensation demanded by the underwriter is adjusted downward for higher levels of credibility offered by the issuer's auditor. The reduced underwriting cost arguably stems from the responsibilities taken on by higher quality auditors in the IPO process; that is, the underwriter's risk is reduced. Put another way, a credible auditor can provide the underwriter with more assurance about the financial numbers

upon which the offering price is based and reduce the underwriter's own information search costs.

As both underwriters and clients typically prefer high quality auditors, industry specialist auditors should convey additional reputation advantages, leading to underwriters charging lower fees for clients audited by industry differentiated auditors (as more of the burden is placed on the audit firm). H4a formally tests this proposition:

H4a: The underwriting fee is lower for IPOs audited by an industry differentiated auditor than that for IPOs audited by a non-industry differentiated auditor.

As for the impact of underwriter industry specialization on underwriting fees, it is unlikely that the relation will be unidirectional (i.e., either increase or decrease). Rather, I expect that the situation will be akin to the findings of audit fees in Mayhew and Wilkins (2003). That is, when underwriters can increase their market share by specializing in one industry, but fail to be the clear industry leader, the underwriting fee will be lower due to economies of scale. However, an underwriter will be able to earn fee premiums if it can successfully differentiate its service among competitors and becomes a dominant industry leader. Thus, the next two hypotheses state:

H4b: Due to the existence of competition and economies of scale, the underwriting fee is lower for IPOs underwritten by an industry specialized underwriter than that for IPOs underwritten by a non-industry specialized

underwriter.

H4c: Underwriters that have significantly higher industry shares than their

competitors earn higher fees than other underwriters do.

IPO Long-term Performance

In recent years, the facet that has attracted the most interest from academics in

the realm of IPOs is the abnormally poor long-run returns. Underperformance has been

documented persistently in the U.S. and across many different countries, constituting a

direct challenge to the efficient markets hypothesis. The IPO underperformance

anomaly, to the extent that it actually exists, was explained initially as issuers exploiting

their informational advantage (Miller 1977). Conventional wisdom agrees that IPOs are

often timed when the firm has reached a peak in its operating performance. As a result,

insider selling around equity offerings suggests that issuers take advantage of

overpricing at the time of a given offering. Some of the overvaluation, in certain

situations, is due to earnings management by the issuer with those issuers that are most

aggressive producing the worst long-run performances. Other studies (e.g., Teoh et al.

1998) attempt to prove that biased earnings forecasts by analysts perpetuate investor

optimism, which deters the price correction that would eliminate subsequent

underperformance. More recently, behavioral theories (e.g., Heaton 2001) suggest that

investors appear to be unable to see through earnings management and analysts'

forecasts to correct consistent mispricing.

In this dissertation, I draw upon the monitoring theories of Easterbrook (1984) to correlate IPO long-run performance with auditor and underwriter industry specialization. In an IPO, there is generally limited information available to prospective investors at the time of the offering. Investors must rely heavily on the content of the entrepreneur/manager's self-disclosure in order to evaluate the performance and future prospects of the firm. In the absence of credible financial statements, market participants depend heavily on the specialized knowledge and monitoring abilities of underwriters and auditors.

The empirical support that Big 4/5/6 auditors are likely to signal more effective monitoring mechanisms (thereby leading to better firm performance) is evident in the auditing literature (Menon and Williams 1991; Jain and Kini 1999). Within finance research, Hansen and Torregrosa (1992) explicitly examine whether lead investment bankers of the underwriting syndicates provide monitoring of corporate managers and affairs for capital-raising companies. Their findings indicate that lead bank monitoring improves corporate performance and reduces agency costs, thereby raising the company's intrinsic value.

To the extent that industry specialization enhances underwriter and auditor quality, two additional factors support the notion that IPO long-term performance should be positively related to the presence of industry specialist underwriters and auditors. First, auditor industry specialists possess an informational advantage (relative to non-specialists) in their focus industries regarding a given IPO's prospects. This information advantage enables industry specialist auditors to screen out issues having poor prospects

of future operating performance. The apparent advantage in doing so is that audit firms gain access to more lucrative revenues, such as non-audit fees in the after-IPO market and, to a large extent, these revenues are contingent upon the issuers' continuing performance. Second, one important activity underwriters engage in the IPO process is price stabilization, including pre-IPO allocation policy, post-IPO purchases of shares by the lead underwriter, and the discouragement of selling. In part, the long-term performance of an IPO is a matter of the underwriter's ability to stabilize the aftermarket price. In this vein, industry specialized knowledge/expertise about the firm's operations and requirements enable an underwriter to perform price stabilization more successfully, increasing the long-term return of IPOs. The above discussions lead to my last hypothesis:

H5: IPOs with industry specialized auditors and underwriters have better long-term performance (1-year, 2-year, and 3-year) than issues having non-specialized auditors and underwriters.

Table 1 presents a summary of the hypotheses developed in this section.

III. SAMPLE AND METHODOLOGY

Data Selection and Variable Measurements

The sample used in the empirical test is drawn from the population of IPOs from 1991 to 2001. The data source for the variables is the Security Data Company (SDC) World Wide New Issues database. Consistent with previous IPO research, my initial sample of 4,481 observations excludes IPOs with an offer price below $5 per share, best-efforts offers, unit offers, closed-end mutual funds, as well as financial, insurance, and REIT offers. I further remove firms having missing SDC records for IPO accounting fees, underwriting fees, and all observations with missing data from COMPUSTAT and CRSP. The principal constraint for the sample is to get the variable of retained ownership of insiders. To compute auditor market share, I eliminate offerings occurring in the two-digit SIC industries with ten or fewer observations for auditing, consistent with Hogan and Jeter (1999) and offerings handled by non-Big 6 audit firms. Similarly, IPOs with less than five deals in the industry are deleted to derive the measure of underwriter market share. The final data contains 2,234 IPO issues for the underpricing (underwriting fee) model and 3,115 IPOs for the audit fee model. The combined sample of underpricing and audit fee models includes 1,996 observations. Table 2 offers a detailed description of the data selection.

Panel A of Table 3 summarizes various firm-specific characteristics related to the combined sample of IPOs. Due to the presence of a few offerings made by very large firms (e.g., ENEL SPA, Deutsch Telekom AG, and AT&T Wireless Group) median values are more representative of the sample as a whole and thus will be the focus of my

discussion. Median IPO issue proceeds are roughly 32.2 million, and median pre-IPO total assets for my sample are roughly 17.9 million. The median underpricing experienced by the sample IPOs is 9.5% percent. Figure 1 also illustrates the underpricing magnitudes of the IPO firms across my sample period.

Further, Panel B and C of Table 4 present general information related to the audit firm and underwriter specialization. To measure audit firm specialization based on total assets, I use the method employed by Hogan and Jeter (1999). In particular, each audit firm's market share is calculated, per year, as the sum of the square root of assets of all firms that it audited in a given two-digit SIC code divided by the sum of the square root of assets across all COMPUSTAT firms in the same two-digit SIC code. The following equation describes the measure:

$$MS_{ik} = \frac{\sum_{j=1}^{J_{ik}} \sqrt{A_{ijk}}}{\sum_{i=1}^{I_k} \sum_{j=1}^{J_{ik}} \sqrt{A_{ijk}}}$$

Where

i   = an index of audit firms

j   = an index of client firms

k   = an index of client industries

I_k = number of audit firms in industry k

J_{ik} = the number of clients served by audit firm i industry k.

The IPO literature has adopted the use of square root of the assets as a better measure of auditor industry concentration than the untransformed measure. For the sake

of completeness, however, I also calculate specialization measure based on volume – the number of firms audited in the same two-digit SIC code for that year. The measure of underwriter industry specialization is calculated in a similar approach. Specifically, the industry market share of each lead underwriter is defined as the percentage of the total IPO proceeds it underwrites in each two-digit SIC per year.

In particular, Panel B (C) of Table 3 presents median values for selected measures based on audit firm (underwriter) industry specialization. For this analysis I define an accounting firm (underwriter) as being a "specialist" if the industry market share measure is greater than 20 percent in the year of the IPO. However, it is important to note that Panel B (C) is presented purely for illustrative purposes. Unlike prior industry specialization research that uses a market share cutoff to define specialists, my multivariate model incorporates a continuous market share measure because the underlying theory suggests that the impact of market share on underpricing is ambiguous unless differentiation exists. Panel B illustrates that auditor industry specialists tend to be associated with large offerings made by large firms. The issues handled by specialists appear to be similar in risk to issues audited by non-specialists. Each is comparably leveraged and has comparable inventory and receivables as a percentage of total assets, but specialist-audited firms have lower returns variance after the issue. Similar conclusion can be drawn for firms characteristics related to IPOs underwritten by industry specialists underwriters. Finally, the information in Panel B (C) suggests that auditor (underwriter) specialists, on average, engage in more (less) underpriced IPOs

relative to non-specialists. I examine these relationships more fully in the multivariate analysis.

Finally, Panel D of Table 3 provides underpricing information relating to the quartiles of auditor and underwriter market share. It seems that both auditing firms and underwriters in the lowest market share quartiles are associated with underpriced IPOs. For audit firms, the level of underpricing does not vary whether their market shares fall in Q3 or Q4. In the case of underwriters, there is a clearly decline of underpricing if their market share goes from Q3 to Q4, suggesting the highest quartile market share is related to less undepricing. I also examine the median underpricing level for loss and profitable firms before IPO (not reported). The result does not show issuers having pre-IPO losses need to underprice more as compared to profitable IPOs. But a contingency table of the choice of auditor differentiation and firm type reveals that loss IPOs are more reluctant to select differentiated auditors.

Industry Specialization and IPO Statistics

In Table 4, I present audit firm (underwriter) specialization data and industry-specific IPO data. Panel A of Table 3 shows the distribution of offerings for all industries having more than 50 IPOs between 1991 and 2001. The highest volume IPO industry is two-digit SIC code 73 (Business Services), with 683 issues during the sample period. The second highest volume industry is two-digit SIC 36, comprising semiconductors, electronic components, communications equipment, and the like. Five industries- two digit SIC codes 35, 28, 38, 36, 73 – account for more than 5% of the total issues individually and over 60 percent of the total issues as a group. Because these are

the industries that are likely to have the greatest growth potential, I control for them explicitly in the empirical analysis.

Panel B (C) of Table 4 shows the distribution of audit (underwriter) specialists over time. For each year between 1991 and 2001 I used the COMPUSTAT tapes to determine the number of times each Big 4/5/6 firm had more than a 20 percent audit market share (again, based on percent square root of assets) in any two-digit SIC code. From the year of 1991 and 1997, Ernst & Young, and Arthur Anderson were specialists in more industries than any of the other firms and Coopers & Lybrand and Price Waterhouse had the smallest degree of specialization. I also find, consistent with Mayhew and Wilkins (2003), that the individual industries in which firms specialize remain relatively constant over time. Furthermore, the fact that the two firms (i.e., PriceWaterhouse and Coopers & Lybrand) with the least degree of industry specialization merged just after the end of 1997 suggests that industry specialization may have been a motivating factor in the merge. After the 1997 merge, PricewaterhouseCoopers, the combined firm has the largest degree of industry specialization (an average of approximately 42 industries per year).

Audit Firm (Underwriter) Differentiation

In table 5 I offer a breakdown of audit firm (underwriter) differentiation by industry. For the purpose of both this table and the multivariate tests, an audit firm is defined as "differentiated" if it has the highest market share in the industry (two-digit SIC) during the IPO year and if its market share is at least ten percentage points higher than the nearest competitor in that industry following Mayhew and Wilkins (2003).

Likely, a differentiated underwriter must be the industry leader and its market share must exceed that of it closest competitor by at least 10 percentage. An audit firm (underwriter) can be "differentiated" in any given year and does not have to meet the above criteria for all sample years in order to be classified as a differentiated auditor (underwriter) in any given year. Panel A (B) of Table 5 presents a breakdown of auditor (underwriter) differentiation by industries across the sample years. It appears that only a few audit firms (about 3 percent) in my IPO sample are classified as "differentiated" in every sample year. However, it is not the case that these audit firms enter into this classification at random. In some cases, the audit firm is the industry leader in every sample year, but does not always have a 10 percent lead over its nearest competitor.

Based upon my specification, 33 percent of the differentiated auditor IPO observations are associated with Ernst & Young and 22 percent are associated with Arthur Andersen. These findings are not surprising, given that these two firms are responsible for bring the most IPOs to market. What is interesting is that 76 percent of the differentiated Ernst & Young observations occur in IPOs involving Health Services. The greatest concentration of IPO for Andersen is in Electric, Gas, and Sanitary (8/33) and Amusement/Recreation Services (7/33). It is noteworthy that the new PricewaterhouseCoopers has been gaining market differentiation status (17 percent in total) as indicated by that almost half of its differentiated auditing cases occur in the years after the merge. Although the remaining firms are not differentiated frequently, they are concentrated on certain industries as well. For example, ten out of 21 issues for which Deloitte & Touche within these observations involved Apparel and Stores.

Similarly, seven out of the nine cases in which Cooper & Lybrand was the differentiated industry auditor involved with Communication industry before the merge. In sum, this analysis illustrate the IPO industries where differentiation tends to be mostly heavily concentrated – e.g. health care organizations and communication services – require a good amount of very specialized knowledge. My findings are comparable to what Mayhew and Wilkins (2003) documented except that my sample includes four more recent years (i.e., 1998-2001) and removes financial services industry.

Interaction of Audit Firms and Underwriters

Previous research demonstrates that underwriters exert considerable influences on the selection of auditors before a firm goes to public. To examine whether underwriters have preference for one specific auditor, Table 6 constructs a cross-tabulation of auditors and top 20 underwriters based upon their mean market share across all sample years. The significant Chisq statistic (p-value of 0.02) suggests that certain relationships exist between these top 20 underwriters and Big 6 auditors across the sample period. As the underwriting market has undergone enormous changes during the past decade, I also repeat the cross-tabulation for each year in my sample period (not reported). No significant results stand out from these yearly combinations.

IV. EMPIRICAL RESULTS AND ANALYSIS

IPO Underpricing Model

OLS for IPO Underpricing

H1a and H1b, H2a and H2b, and H3 assess the impact of industry specialization/differentiation of auditors, underwriters, and their interaction on IPO underpricing. I run multivariate regressions to formally examine these proposed associations. Using the entire sample, Equation (1a) reproduces the findings in prior studies that the general auditor reputation (i.e., Big 4/5/6 vs. non-Big 4/5/6) reduces IPO underpricing (Hogan 1997; Willengborg 1999). Next, I perform tests by restricting the sample to IPOs associated with Big 4/5/6 audit firms. Equation (1b), as an augmentation of equation (1a), allows investigation of the impact of auditor and underwriter industry differentiation as proxied by market share. I then append equation (1b) by adding variables reflecting the effects of auditor (underwriter) market share and interaction variables, as per equation (1c). The multivariate analysis controls for the factors associated with IPO underpricing identified by prior studies (Beatty 1989 etc.). The regression models are specified as follows:

$$UNDER = \alpha_0 + \alpha_1 RETAIN + \alpha_2\ 1/OFFER + \alpha_3\ PROC + \alpha_4 STDDEV$$
$$+ \alpha_5\ BIG4/5/6 + \alpha_{6\text{-}8}UNREP1(2,3) + \alpha_9 RELAYR + \varepsilon \qquad (1a)$$

$$UNDER = \alpha_0 + \alpha_1 RETAIN + \alpha_2\, 1/OFFER + \alpha_3\, PROC + \alpha_4 STDDEV$$

$$+ \alpha_5\, FOREIGN + \alpha_6\, HITECH + \alpha_7 AUDIFF + \alpha_8 UNDIFF$$

$$+ \alpha_9 RELAYR + \varepsilon \tag{1b}$$

$$UNDER = \alpha_0 + \alpha_1 RETAIN + \alpha_2 1/OFFER + \alpha_3 PROC + \alpha_4 STDDEV$$

$$+ \alpha_5 FOREIGN + \alpha_6 HITECH + \alpha_7 AUDSHR + \alpha_8 UNDSHR +$$

$$\alpha_9 AUDSHR*UNDSHR + \alpha_{10} AUDIFF + \alpha_{12} UNDIFF +$$

$$\alpha_{12}\, AUDIFF*UNDIFF + \alpha_{13} RELAYR + \varepsilon \tag{1c}$$

UNDER is the log of the sum of one and the first-day initial return. The log transformation mitigates distributional problems.[4] The initial return for an IPO is defined as the first day gross return to an investor who acquires a share and sells at the closing bid price on the first day of public trading. As a sensitivity check, I also examine the underpricing level within one week and one month intervals after the offering.

I include the percentage of ownership retained by pre-IPO shareholders (RETAIN) as a proxy for the quality of the issue. Research by Leland and Pyle (1977) suggests that the percent ownership retained by insiders signals private information possessed by owners/manager on the IPO's valuation and thus serves to reduce the information asymmetry between the investor and issuer. A negative coefficient would be consistent with higher quality issues incurring less underpricing.

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[4] These problems are the leptokurtosis exhibited by daily stock returns in general and the right-tailed skewness exhibited by IPO underpricing in particular.

The second control variable is the reciprocal of the offering price (1/OFFER) and serves as a control for the implicit insurance coverage provided by the audit firm (Willenborg 1999). The IPO issue proceeds (PROC) is another size control. STDDEV, defined as the standard deviation of the stock return one year after IPO, serves as a firm-specific risk proxy. If underpricing tends to be larger for greater levels of IPO risk, the coefficient for this variable should be positive. In addition, underwriters' reputation has been recognized as an important determinant of IPO underpricing (Beatty 1989; Willenborg 1999); therefore, I include three indicator variables to capture the impact of underwriter reputation in equation (1a). UNREP1 is a dichotomous variable which scored 1 if the underwriter has a market share of 10 percent or more rated by the Investment Dealer's Digest (IDD) per IPO year and 0 otherwise. UNREP2 (3) takes a value of 1 if the market share of the underwriter is between 5 percent and 10 percent (1 percent and 5 percent) based upon the ranking of IDD per IPO year and 0 otherwise. I expect the coefficients on these three reputation variables to be negative.

I also include variables aimed at capturing the relationships between IPO underpricing and industry characteristics (Beatty 1989). HITECH is equal to 1 if the underlying IPO is a high technology company. I define High Tech firms following Bushee et al. (2001) as firms that have one of the following SIC codes: SIC codes 2833-2836, 3612, 3612, 3621 to 3629, 3651, 3652, 3661 to 3669, 3671, 3672, 3674, 3695, 4812 to 4822, 4832 to 4899, and 7370 to 7379. I expect the coefficient on HITECH to be positive based upon the results of prior studies. In addition, I include a dichotomous variables, FOREIGN, to capture the potential effects of foreign IPOs on underpricing.

Finally, prior studies argue that aggregate numbers disguise the fact that the degree of underpricing of firms going public has varied over the years. For example, during the Internet bubble years, firms with no immediate prospect of becoming profitable commonly came to market. I model these effects by using a categorical variable (RELAYR) to control for time-specific factors occurring across the sample period as compared to year 1991.

The primary variables of interest for my study are AUDSHR, UNDSHR, AUDIFF, UNDIFF, as well as their interactions. I use AUDSHR, defined as the audit firm's percent square root of assets audited in a particular client's industry during the IPO year, to test H1a. Similarly, UNDSHR, defined as the underwriter's percent square root of proceeds in a particular client's industry during the IPO year, is used to test H2a. The regression coefficients on AUDSHR and UNDSHR are expected to be *negative* if industry specialization reflects higher service quality that can reduces underpricing. However, if industry specialized auditors and underwriters self select high underpriced IPOs in order to earn other economic benefits, these coefficients will be positively related to underpricing.

As discussed previously, the coefficients on AUDIFF and UNDIFF are used to test H1b and H2b. AUDIFF (UNDIFF) is set to 1 if the audit firm (underwriter) has the highest market share in the industry (two-digit SIC) during the IPO year and if its market share is at least ten percentage points higher than the nearest auditor (underwriter) competitor in that industry. Practically speaking, the coefficient on AUDIFF (UNDIFF) measures the additional reduction of underpricing relative to all non-differentiated

auditors that is attributable to the accounting firm's (underwriter's) positions being the clear market leader. I expect that IPO underpricing will be significantly lower when the auditing firm (underwriter) retains a dominant status in the industry. The coefficients on the interaction of AUDSHR (AUDIFF) and UNDSHR (UNDIFF) are used to test H3, representing the impact of bundling industry specialist auditors and underwriters on underpricing. But I make no directional predictions on the coefficients.

OLS Results

Table 7 presents the Pearson's correlation matrices. The high correlations between the independent variables indicate a potential multicollinearity problem. I attempt to assess the severity of the problems by computing variance inflation factors (VIF). The magnitudes of the VIF factors in Equation (1c) are less than three with the exception that the VIF for UNDSHR and the interaction of UNDSHR and AUDSHR is around seven. As an additional control, I remove the interaction variables from 1(c) and report the results separately (Column 1 in Panel B of Table 8).

The first column in Panel A of Table 8 reproduces the results documented in prior research regarding the negative association of underpricing and Big 6 auditors. My adjusted R^2 of 0.16 is much higher than the 7-9 percent reported in prior research (e.g., Balvers et al. 1988; Beatty 1989). The Big 6 indicator variable is significantly negative (p-value of 0.073), suggesting higher quality auditors are related to lower underpriced new issues. In addition, issues that are larger, less risky, with more retained ownership offer less underpricing to investors. Carter and Manaster (1990) describe a positive relation between IPO underpricing and their IPO expert quality measure. They interpret

this to imply a meaningful role of underwriters in signaling IPO risk. For my underwriter reputation proxies, only the coefficient of UNREP3 is significantly negative. The expected negative relation between IPO underpricing and underwriter quality is reversed for UNREP1 and UNREP2. Two factors may explain this result. First, my reputation proxies are different from those used in most prior studies, such as the Carter and Manaster's reputation scale developed in the early1990s. I believe my measures of underwriter reputation are more accurate and dynamic to capture the changing nature of underwriter market as it allows variations across years. Second, there is greater likelihood that a firm issuing highly underpriced IPOs provides premium revenues and causes a ripple effect throughout other investment banking activities, such as trading commission generated from flipping sales. As a result, high reputation underwriters are attracted to reap these benefits regardless of the deep underpricing.

Column two in Panel A of Table 8 offers results when only auditor and underwriter differentiation are included in the model (Equation 1b). Both the coefficients of AUDIFF and UNDIFF are negative as expected but insignificant. This finding suggests that failing to control industry specialization may pose potential threat to the model specification. My suspect is further confirmed by the results presented in Column three in which the market share of auditors and underwriters are included in the model (Equation 1c). After controlling for market share, results show that the coefficient on AUDIFF (UNDIFF) is negative and significant (t-statistic = 1.98 and 1.94 respectively), supporting H1b and H2b. This result suggests that differentiated audit firms (underwriters) are associated with lower underpricing relative to other audit firms

(underwriters). The equation is linear in logarithms, so the antilog of AUDIFF (UNDIFF)'s coefficient minus 1 represents the percentage effect of a differentiated auditor (underwriter) on underpricing. The -0.05 (-0.06) coefficient of AUDIFF (UNDIFF) translates into a 5 (6) percent reduce of underpricing for audit firms (underwriters) that successfully differentiate themselves from competitors. This decrease of underpricing reveals that differentiated audit firms (underwriters) supply services and/or value to their clients that audit firms (underwriters) with lesser market shares in the same industry cannot readily supply. If there were no differences in the services offered in terms of quality or value, there would be no differences in the magnitude of underpricing associated with differentiated audit firms or underwriters.

With respect to H1a and H2a, the coefficients on AUDSHR and UNDSHR are positive and significant. This result suggests that as industry market share (i.e., specialization) increases, audit firms (underwriters) with a relatively high market share are willing to take on higher risk clients, with the hopes of either getting higher fees immediately or higher fees in the future. This is also evident in the descriptive statistics that the standard deviation of one year after IPO stock return is larger for auditor industry specialists (Panel B of Table 4). In other words, a positive coefficient doesn't necessarily mean that audit (underwriting) quality is decreasing (i.e., underpricing is increasing) with market share. It could simply mean that some of the higher market share auditors (underwriters) have been willing to take on clients that, by their nature, are going to have more underpricing. Corresponding to my finding, Beatty and Welch

(1996) conclude that high-quality underwriters insure themselves (their) capital by underpricing relatively more.

For the interaction variables, both of them are positive but no interaction is significant. This result may be because IPOs associated with both industry differentiated auditors and underwriters only represent a very small portion of the entire sample (less than 2 percent).

Regarding the control variables, I find that firms operating in HITECH industry usually underprice more. IPOs with more retained ownership and larger in offering size experience less degree of underpricing. The coefficient of reciprocal of offering price (1/OFFER) is significantly negative. This relation runs opposite to that reported in earlier studies, not only because of environmental change (perhaps because of the Penny stock Reform Act), but also because I also use proceeds as another size control.

2SLS for Underpricing Model

Prior studies contend that underpricing and auditor choice are likely to be jointly determined (Balvers et al. 1988; Hogan 1997). As such, the results of separate OLS estimation models may suffer from serious biases (Copley and Douthett 2002). To control for the sequential nature of these auditor choice/going public decisions, I reestimate equation 1(c) using two-stage least squares. In the first stage, I use a bivariate probit model with auditor differentiation choice as the dependent variable to instrument AUDIFF. Specifically, I regress AUDIFF on all of the other explanatory variables in equation 1(c), and obtain the predicted value of this variable. Then I apply the predicted values of AUDIFF from the first stage regression as independent variable in the second

stage regression of underpricing. I specify the second-stage instrument for AUDIFF as equal to one if the predicted value with a probability greater than 0.5 by the first-stage probit.

As indicated by the second column in Panel B of Table 8, this 2SLS instrumental variable estimation generally confirms the OLS results. The two specialization variables are positively related to highly underpriced issues. The coefficients on differentiated auditors and underwriters are significantly negative. Findings based on OLS and 2SLS confirm that IPOs with differentiated auditors and/or underwriters experience lower level of underpricing.

I also try to reestimate the model with the dependent variable replaced by one week underpricing and one month underpricing. The median underpricing for one week and one month is 0.08 and 0.13 respectively. For the regression using one week underpricing, the interested variables loss significance with the exception of UNDSHR. In the case of one month underpricing, however, all the specialization and differentiation variables retain their signs, but turn to be insignificant

The underpricing regression is limited by the reduction in sample size imposed by RETAIN data requirements. In order to test the sensitivity of the results to this loss of observations, I rerun the regression, dropping RETAIN. The sample size increases from 2,234 to 2,917, and the R^2 increases from 21 percent to 31 percent. The interested variables have the same signs as in the previous model, but the F tests shows their significant levels are increased (p-values less than 0.005 for UNDSHR, AUDSHR, and UNDIFF, and p-value of 0.02 for AUDIFF). The results of this regression need to be

interpreted keeping in mind that RETAIN has been omitted and it may serve as a surrogate for the quality of the new issues.

Auditor Switch before IPO

According to Menon and Williams (1991), IPO firms tend to switch to more credible auditors prior to the offering. Descriptive analysis of my sample, not reported, demonstrates that only 2.8 percent of firms switched their auditors in the year preceding IPO, and four percent switched two years before the IPO. Among the 83 cases involving auditor switches the year before IPO, 19 firms had a non-Big4/5/6 auditor before the offering and changed to a Big4/5/6 when they went to public, and the rest 63 switches involve changes between Big4/5/6 auditors. When I include a dummy variable indicating auditor switch in the underpricing model, the coefficient is negative but insignificant. This result leads me to conjecture that it only matters to market that if the auditor switch is associated with change to industry specialists or differentiated auditors. Additional analysis reveals that 10 (21) out of the 19 (63) firms with non-Big4/5/6 (Big4/5/6) auditors before IPO selected a specialist auditor for the IPO. Moreover, five firms changed to a differentiated auditor for the IPO, a percentage relative high given that differentiated auditors only make up a very, very small minority of the overall population.

As further analysis, Panel C of Table 8 presents the regression results after including a dummy variable indicating whether the switch involves a specialist/differentiated auditor. I find the coefficient of this dummy variable is significantly negative at the 0.05 level. And the R^2 of the overall model is increased to

around 30 percent. The remaining variables in the model stay otherwise unchanged in terms of signs, but the significance of the interested variables tends to be higher than the main results. I interpret these results as additional support that the quality of auditors can be further differentiated among Big4/5/6 auditors. The benefits of reduced underpricing accrue exclusively to those IPOs that retain or switch to a differentiated auditor. The market doesn't respond to any auditor switches in case the change only relates to a general brand name without specialization and/or differentiation.

Additional Specification Check

Bradley et al. (2004) found that the average underpricing for whole and fractional priced IPOs were 25.5 and 8.1 percent. They interpret this finding as the offer price is contingent on the amount of the information the underwriter collects, which is a function of the bank's effort. Consistent with this notion, I include a variable indicating whether the offer price is a whole or fractional number. Adding this variable does not change the overall model fit in terms of R^2 and coefficients of interested variables. However, the coefficient of this indicator variable is significantly positive, confirming that IPOs priced as whole numbers underprice more (p-value of 0.02).

It is perceived that IPOs perform abnormally during the Internet Bubble period (i.e., extra underpricing), I rerun the model for bubble years (1999 and 2000) and normal years separately. Different pictures emerge from the two sets of results. In the normal period, the four interested variables are properly signed, but no single variable attains significance. And the R^2 is about 10 percent lower than the overall model, showing the model fit less well for the normal periods. In the case of bubble years, the model fit

increases slightly ($R^2 = 0.27$). Another noticeable difference is that the coefficient of AUDIFF turns to be significantly positive, indicating that even differentiated auditors may intentionally engage in highly underpriced issues to earn other economic benefits during this abnormal period. As an additional control for time-specific factors, I also run equation (1c) for each sample year to detect whether the coefficients of variables of interest remain consistent over time. The R^2s of these regressions range from 5 percent to 27 percent that occurs in year 1999. However, the regression results embody inconsistent features as those in the aggregated model. In most of the individual years, either the sign of the interested variables are reversed or the coefficients become insignificant. This finding suggests that short periods may not be able to detect the influences of industry specialization and differentiation on IPO underpricing.

Audit Fee Model

This study builds largely upon the theoretical framework presented in Mayhew and Wilkins (2003). As a robustness check, their propositions for auditor industry specialization/differentiation effects on auditing fees are replicated by the model specified in equation (2). Similar to other audit fee models, this regression model uses a set of variables to control for cross-sectional differences in factors that affect fees such as client size and audit complexity. These factors have been demonstrated to be good explanatory variables for the variation of audit fee levels across different samples, different time periods, and different countries.

$$ACCTFEE = \beta_0 + \beta_1 ASSETS + \beta_2\, PROC + \beta_3 INVREC + \beta_4 DEBT +$$

$$\beta_5 STDDEV + \beta_6 TOP5 + \beta_7 AUDSHR + \beta_8\, AUDIFF + \beta_9 RELAYR$$

$$+ \varepsilon \qquad\qquad\qquad\qquad\qquad (2)$$

where:

ACCTFEE =	log of the fees paid to the accounting firm associated with the IPO;
ASSETS =	log of firm total assets;
PROC =	log of IPO issue proceeds;
INVREC =	(inventory + accounts receivable) / assets;
DEBT =	total liability / total assets;
STDDEV =	standard deviation of stock returns one year after IPO;
TOP5 =	indicator variable equals to 1 if industry accounts for > 5 percent of total sample IPOs (two digit SIC of 28, 35, 36, 38, 48, or 73), and 0 otherwise;
RELAYR =	a categorical variable for year 1992 to 2001 as compared to year 1991;
AUDSHR =	% of two-digit SIC COMPUSTAT square root of assets audited for the year; and
AUDIFF =	1 if the market share spread between the IPO firm's audit firm and the next highest ranking audit firm in the IPO firm's two-digit industry is at least ten percentage points and 0 otherwise.
ε =	error term

The examination interval in Mayhew and Wilkin (2003) is between 1991 and 1997. Therefore, I first run this audit fee model using the same period as in their study and then expand the test to 1991-2001 to assess whether the results can be generalized to a more inclusive period. My result (2SLS in Table 9) reveals similar findings as those documented in Mayhew and Wilkins (2003). Offerings that are larger, riskier, and more complex result in higher audit fees. A fee premium exists when the IPOs are in the common industries (i.e., TOP5 industries). The coefficient on AUDSHR is negative and significant, suggesting that as industry specialization increases, audit firms pass along to their clients a significant portion of the benefits attributable to economies of scale. The coefficient on AUDIFF is positive and significant. This result supports that differentiated

audit firms earn a fee premium relative to other audit firms. Further, regression using the extended period reveals the same relationships as those generated in the shorter period.

Underwriting Fee Model

H4a, H4b, and H4c examine whether the underwriting cost is reduced when the issuer selects an industry specialist/differentiated auditor and/or underwriter. These propositions are tested by the following equation developed in preceding research (Menon and Williams 1991):

$$UNFEE = \gamma_0 + \gamma_1 STDDEV + \gamma_2 PROC + \gamma_3 1/OFFER + \gamma_4 RETAIN +$$
$$\gamma_5 UNDSHR + \gamma_6 UNDIFF + \gamma_7 AUDIFF + \gamma_8 RELAYR + \varepsilon \qquad (3)$$

The dependent variable (UNFEE) is computed as the underwriting fees as a percentage of the offering proceeds in the US market. Following prior studies (e.g., Booth and Smith 1986), I contend that underwriting fees increase with the riskiness of the client as proxied by the standard deviation of stock returns one-year after an IPO (STDDEV). Economies of scale for the underwriter dictate that the underwriting fee decreases with increases in the size of the offering. In order to control for this potential impact, the size of the issue (PROC) is included as an independent variable. This variable may also surrogate for the riskiness of the issue (Booth and Smith 1986), which should yield a similarly negative coefficient. PROC is computed as the natural log of proceeds. The reciprocal of offer price (1/OFFER) and retained ownership of insiders (RETAIN) are defined in the same approach as with the underpricing model.

UNDSHR, UNDIFF and AUDIFF are the variables of primary interest in the analysis. If the coefficient of AUDIFF is found to be negative, it indicates the fee advantage accrued to issuers due to the selection of industry-differentiated auditors. The coefficient of UNDSHR is also expected to be negative as it captures the effect of economies of scale. Finally, differentiated underwriters are expected to be able to earn fee premiums. If they do, the coefficient of UNDIFF should be positive.

Table 10 presents the results for the overall sample with respect to underwriter compensation, as well as results for IPOs in large and small size portfolios (i.e., above and below the median assets). The overall model has modest fit (adjusted R^2 = 0.31). And the coefficients on control variables are consistent with prior studies. Especially, the log of proceeds is negatively significant, reflecting economic of scale effect. The reciprocal of offer price (1/OFFER), as an additional control for offering risk, is positive and significant. As insiders retain more company stocks, the results suggest that underwriting fees is reduced but insignificantly. Also, the risk proxy (STDDEV) fails to be significant even its sign is positive.

Regarding the interested variables, the coefficients on UNDSHR is positive, and the coefficients on UNDIFF and AUDIFF are negative. But no one is significant. A likely explanation for the lack of significance of these variables is that underwriting compensation is determined differently for large and small IPOs. Consequently, I partition the sample into two size portfolios. For large (greater than median assets) IPOs, I found the underwriter market share is significantly negative (p-value less than 0.10), suggesting impacts of economy of scale. The coefficient on differentiated underwriter is

positive but insignificant. This finding shows that bi-directional trends of fees exist for specialized and differentiated underwriters, a phenomenon similar to what Mayhew and Wilkins (2003) found in auditing market. However, I do not find that the presence of differentiated auditors can reduce underwriting fees as the coefficient of AUDIFF remains slightly positive. It indicates the substitution role of auditors in large IPOs is not an important determinant of underwriter compensation.

An examination of the results in Column three of Table 10 reveals a different picture for small IPOs. First, the underwriter market share (UNDSHR) tends to be significantly positive, reflecting that underwriters will charge more as their reputations increase. Unlike those findings in large firms, the coefficient on UNDIFF is significantly negative. Combining these two results suggests that underwriters with general reputation are more concerned about the riskiness of small IPOs and require additional compensation for the engagements. The economic of scale effect on underwriting cost may only be shown in the very few cases where differentiated underwriters are involved. Further, the marginally negative coefficient of AUDIFF confirms that hiring a differentiated auditor may decrease the underwriting fee. But this finding is only valid among small IPOs. Presumably, auditors certify (or provide quality assurance for) small issues to their underwriters.

In sum, underwriting fee seems to reflect an economy of scale of IPO offering size; and riskier offerings have to pay more to their underwriters. Small and large IPOs perform oppositely regarding the impact of underwriter and audit quality on underwriting compensation. That is the reason why the overall results provide

inconclusive findings. In particular, the presence of a high-quality auditor may reduce compensation that has to be paid to the underwriters, especially among small firms. There is no evidence of high quality auditors can reduce underwriter compensation among large IPOs.

As an additional specification control for underwriter quality, I replace UNDSHR and UNDIFF by the three underwriter reputation variables based upon the ranking of IDD, and rerun the model for both large and small IPOs. In the case of small issues, UNREP1 (i.e., underwriters with 10 percent market share) is positively related to the dependent variable, reflecting the expected quality differences between the groups of companies underwritten by different underwriters. For large issues, no underwriter reputation variable appears to be related to underwriter compensation. Again, these evidence buttress that in my sample, reputation of underwriters plays a less critical role in influencing underwriter compensation among large IPOs.

Empirical Method for IPO Long-term Performance

In measuring long-run performance, one can focus either on raw (absolute) performance or performance relative to a benchmark (abnormal returns). Ritter and Welch (2002) show that investing in an equal-weighted portfolio of IPOs over a three-year horizon did not lose money in absolute terms, but an investment in the value-weighted market portfolio would have yielded about twice the return, resulting in a three-year market-adjusted return of −23.4 percent. Still, there is no consensus with respect to the proper measurement technique. Also, the sample used, both in terms of the

sample period and the sample selection criteria, is an important determinant in findings across studies.

I analyze IPO long-term performance for the time period beginning one year before the IPO to three years after the offering. Drawing on Mikkelson et al. (1997), my primary measure of operating performance is operating income before deducting depreciation, interest, taxes, and extraordinary items, divided by end-of-year assets. This scaling converts operating income into an operating return on assets and allows comparisons over time and across firms. IPOs typically lead to a substantial increase in assets, which potentially imparts a downward bias to measures of operating income scaled by assets. Thus, I also examine operating income scaled by sales. I expand the model of Jain and Kini (1994) to jointly test their association by estimating multiple regressions of the following form:

$$PERF = \phi_0 + \phi_1 MRETAIN + \phi_2 MUNDER + \phi_3 AUDSHR + \phi_4 UNDSHR +$$

$$\phi_5 AUDIFF + \phi_6 UNDIFF + \varepsilon \tag{4}$$

The dependent variable ($PERF_{it}$) is the raw operating performance measure. Regressions employing the change in performance measured from years 0, +1, +2, +3, and the average of years +1 to +3 relative to year -1 are also estimated. The regression model controls for two primary variables proved to impact IPO long-term returns in prior literature; MRETAIN and MUNDER. MRETAIN is a dummy variable that takes a value of 1 if managers retain more than the median ownership retention level for the

sample after the IPO and 0 otherwise. Similarly, MUNDER is a dummy variable that takes a value of 1 if underpricing exceeds the median underpricing level and 0 otherwise. The coefficients of AUDSHR, UNDSHR, AUDIFF, and UNDIFF are expected to be positive based on H5.

Descriptive statistics, not tabulated, indicates that the average of ROA in the year prior to the IPO year is –6.24 percent, and it spikes at 8.73 percent in the IPO year. After the offering, the operating performance start to fall as shown by the magnitudes of ROAs in years +1, +2, +3 are 3.77 percent, 0.67 percent, and –1.43 percent respectively. This trend is consistent with the pervasive literature that documents decreasing long-term performance of IPOs.

Table 11 presents four sets of regression results that show how the change and average operating performance of IPOs are associated with the market share and differentiation of the incumbent auditors and underwriters. In the three change regressions (i.e., +1, +2, and +3 to 0), the increases of underwriter market share are positively related to higher long-term operating performance, and two of them are significant (p-value of 0.01 and 0.06 respectively). This is consistent with the hypothesis that the presence of specialist underwriters offers additional monitoring mechanism of IPO performance. Another rationale for this result is that high quality underwriters are scrutinous about their clients to protect their reputation. As a result, only IPOs with relatively better performance are capable of attracting underwriters with larger market shares in order to provide a positive signal to the market. The auditor market share, however, are not found having significant and consistent association with IPO long-term

performance. This might be due to the longer tenure periods of the associated auditor that prevent them from foreseeing the operating performance of IPOs at the time of engagement. The results also indicate no apparent relationship of underwriter differentiation with long-run performance of IPOs. Finally, the coefficients of auditor differentiation are positive in all three equations, but in no case are significant. With respect to the results employing the average performance of +1, +2, +3 relative to −1, no significant results are detected for either the market share or differentiation variables. Note the adjust R^2 is very low (less than 0.001) in these regressions, reflecting the fact that there are many other factors, not identified in the model, impact the long-term performance of IPO firms. Regressions using the operating performance scaled by sales, not reported, reveal similar findings.

V. SUPPLEMENTAL ANALYSIS AND SENSITIVITY TESTS

Alternative Measures of Industry Specialists and Differentiation

I tried two specifications to broaden the differentiation definition for auditors and underwriters. Firstly I defined as AUDIFF (UNDIFF) any audit firm (underwriter) having a 15 (as opposed to 10) percentage point lead over its closest audit competitors. The findings with this alternative specification are virtually identical to the findings presented in Table 8. That is, specialists that dominate their industries are able to reduce IPO underpricing. I also decrease the required market share lead to 7.5 percentage points. My purpose in this analysis is to illustrate that a specialist audit firm (underwriter) must be the clear industry leader to have an incremental impact on underpricing, auditor and underwriter fees, and IPO long-term performance. With this specification, the coefficients for UNDSHR and UNDIFF are identical to those presented in Table 8. However, the coefficients for AUDSHR and AUDIFF remain negative and positive respectively, but become insignificant. This finding suggests that the line dividing differentiated auditors from non-differentiated auditors (underwriters) begins to blur below a 10 percent market share lead for audit firms.

Client Size, Industry Effects, and Audit Firm Effects

Willenborg (1999) shows that small deals such as Development Stage Enterprises (DSEs), are less concerned with the quality of auditors as the risk of company survival is prevailing. For my sample of US IPOs, I run separate analyses for small (below median assets) and large (above median assets) clients to assess the potential impact of client size on the results. As a reminder, the median assets of my

sample are 17.5 million. For small firms, the two variables related to underwriter effects (UNDSHR and UNDIFF) are appropriated signed and remains highly significant at 0.001. While the sign of AUDSHR and AUDIFF remain the same, their significance levels are reduced below the normal cutoff (p-value greater than 0.10). Thus, H2b are only supported in the small firm segment. One potential explanation for these results is that the role of underwriters are extremely vital for small firms as they more rely upon underwriters' service in consulting, certificating, as well as distributing of the new issues.

Among large firms, the only variable that stays the same as in the main results is auditor market share (AUDSHR). The coefficients of UNDIFF and AUDIFF remain negative but insignificant, suggesting weak effects of differentiation in the large IPO segment. This result may be related to the fact that larger IPOs are less subjective to the information asymmetry problem as smaller IPOs do. As a result, distinction between the role of specialized and differentiated auditors/underwriters becomes clouded, leading to insignificant results.

Table 4 shows that the health services industry (SIC code 80) accounts for approximately 30 percent of the differentiated observations. To ensure that AUDIFF and UNDIFF are not simply capturing underpricing attributable to a particular industry in which a number of nonstandard IPO issues likely exists, I included an additional indicator variable (HEALTH) defining firms in this industry. The coefficient for HEALTH is slightly positive (0.002) and insignificant (t-statistic = 0.09). The coefficients for AUDSHR, UNDSHR, AUDIFF, and UNDIFF remain significant.

As an additional control for industry effects, I estimated a fixed-effect model using indicator variables for each industry that makes up more than 10 percent of the observations. The reason I did not use all industries is that most of them have only 4 to 15 observations. Regarding the results, the coefficients of SIC codes 13 and 28 are insignificantly negative. All other coefficients of industry dummies are positive and six of them are significant (SIC codes 35, 36, 38, 50, 58, and 73). The main results of the interested variables are not changed with the exception that auditor differentiation (AUDIFF) becomes insignificant. It seems the effect of differentiated auditors is reduced after controlling for industry factor.

Lastly, to ensure that no single audit firm was responsible for the results of my study, I ran six additional regressions removing one auditor each time. Generally, I found the main results were sensitive to the including or excluding of individual firms. The only exclusion of audit firm that did not change the results is Deloitte & Touch. For other auditors, either the variables for underwriter (Arthur Anderson and KPMG) or auditors (Coopers, Ernst & Young, and Pricewaterhouse) become insignificant without changing signs.

VI. CONCLUSION AND LIMITATIONS

This paper adds to the body of evidence that indicates that the supply of auditing services in not homogeneous by addressing the association of auditor industry specialization/ differentiation and IPO underpricing and long-term performance. Despite uniform certification requirements and generally accepted auditing standards, it appears that users of audited financial statements perceive auditors as having different levels of credibility and make economic decisions on this basis. My findings do suggest that differentiated auditors are associated with less IPO underpricing due to their highest service quality. This result should be of great interest of a number of parties taking part in the IPO market, including IPO firms, auditors/underwriters, and regulators as well.

My study also reveals similar evidence on the impact of differentiated underwriters on IPO underpricing. That is, underpricing can be reduced if firms select industry-differentiated underwriters when going to public. Further analysis indicates as the market share of underwriters increase, the long-term operating performance of the IPOs they are engaged tend to be superior to those of underwriters with less market share. I interpret this result as underwriters are more protective of their earned reputation when they have larger market shares.

As with most empirical studies, the dissertation is subject to several limitations. First, I did not pursue the restrictions to the demand for industry specialization. For example, there may be other ways that audit firms can differentiate themselves and industry specialization may not be the most important differentiation mechanism for a given client. Small clients may prefer personalized relationships with an audit firm

having a small client base, rather than with a firm that offers general industry

specialization. In other cases, the threat of leaking proprietary information to competitors

may induce a client to avoid an auditor who audits its competitors. Second, there are

alternative measurements of auditor industry specialization based on extant literature,

and this dissertation is not exhaustive in exploring all these different proxies. Finally, the

explanatory power of the long-term performance is very low indicating that the

introduction of a better-specified model is the next step development of this part of the

dissertation.

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FIGURE 1
Underpricing Trend Over the Period of 1991 to 2001
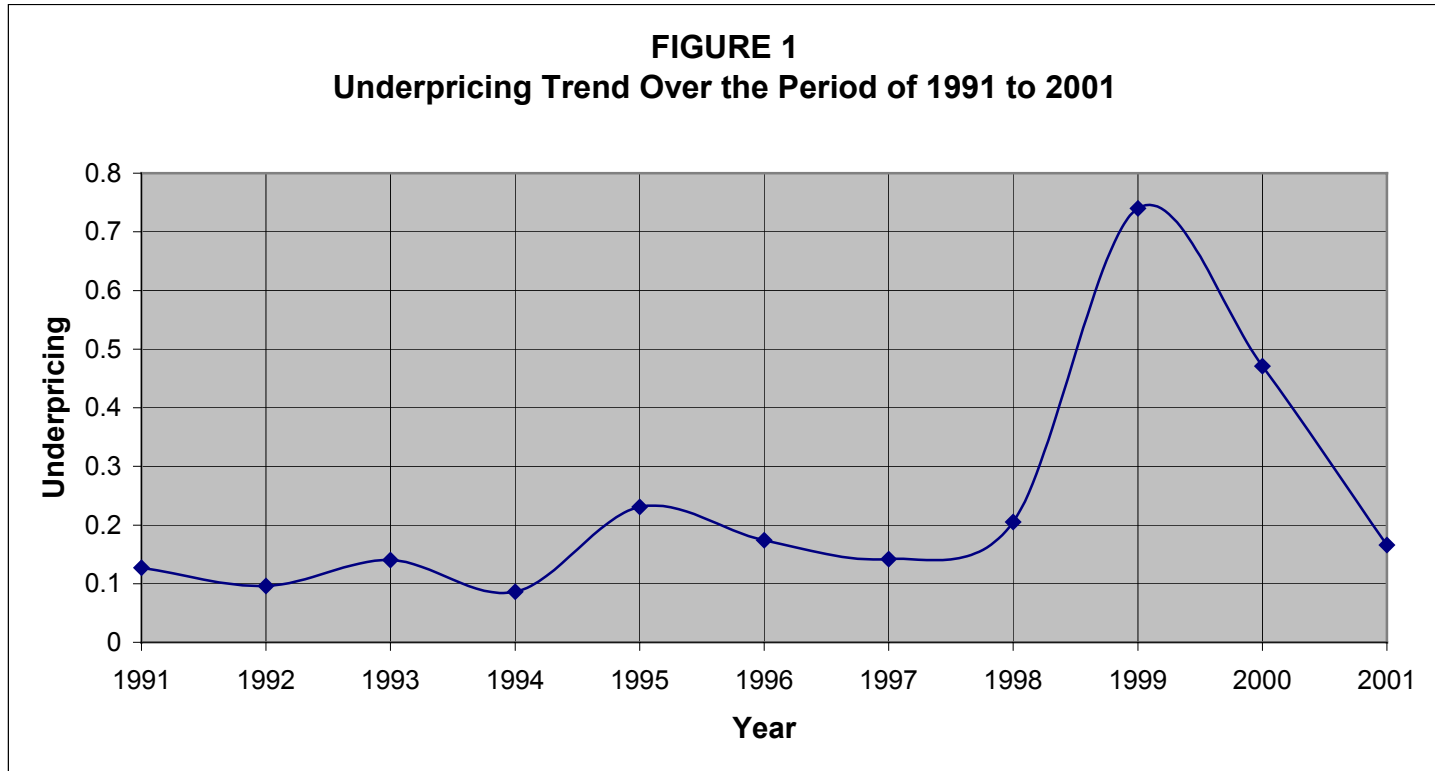
TABLE 1

Summary of Hypotheses

Dependent variables	Auditor market share	Auditor differentiation	Underwriter market share	Underwriter differentiation	Interaction of auditor and underwriter market share	Interaction of auditor and underwriter differentiation
			Independent variables			
IPO underpricing	H1a (-)	H1b (-)	H2a (-)	H2b (-)	H3 ?	H3 ?
IPO underwriting fee	H4a (-)	H4a (-)	H4b (-)	H4c (+)		
IPO long-term performance	H5a (+)	H5a (+)	H5a (+)	H5a (+)		

TABLE 2

Sample Selection over the Period 1991 to 2001

Beginning sample of all IPOs from SDC	5,995
Remove unit offerings, and IPOs in finance, insurance, and real estates industries (SIC code between 6000-7000).	1,514
Remove IPOs with offering price less than $5.	112
Remove IPOs in industries having less than 5 IPOs in each year	510
Remove IPOs with Non-Big4/5/6 auditors	436
Removing IPOs with missing data due to:	
standard deviation of stock returns in CRSP	18
!) underpricing, underwriting fee, and retained ownership	1,171
Final Sample for underpricing and underwriting fee model	2,234
2) pre-IPO assets in Compustat	290
Final Sample for audit fee model	3,115
Total combined sample	1,996

TABLE 3

Summary Statistics for 1,966 IPOs (1991-2001) Audited by Big 6 Audit Firms

Panel A: Financial and Market Share Measures

	Median	Standard Deviation
IPO Underpricing	0.095	0.442
Accounting Fees	175,000.000	186,599.130
Underwriting Fees ($ millions)	0.500	0.590
IPO Proceeds ($ millions)	32.200	62.025
IPO Firm Assets ($ Millions)	17.988	310.772
Retained Ownership of Insiders	0.004	0.032
(Inventory + Accounts Receivable)/Assets	0.387	0.251
Debt (Liability/Assets)	0.685	0.698
Post-IPO 1-Year Standard Deviation of Returns	0.046	0.021
Foreign IPOs	0.000	0.204
Loss IPOs	0.000	0.466
Share of Two-digit SIC Audit Market (% square root assets)	0.172	0.068
Share of Two-digit SIC Audit Market (% volume)	0.180	0.059
Share of Two-digit SIC Underwriter Market (% square root proceeds)	0.063	0.112
Auditor differentiation	0.000	0.156
Underwriter differentiation	0.000	0.148

Panel B: Comparison of Characteristics of IPOs Audited by Specialist versus Nonspecialists

	Specialists (n=746)	Nonspecialists (n=1,220)
Median IPO Underpricing	0.300	0.185*
Median Accounting Fees	250,230.960	211,126.70*
Median Underwriting Fees ($ millions)	0.720	0.590*
Median IPO Proceeds ($ millions)	54.361	40.071*
Median IPO Firm Assets ($ Millions)	83.195	64.909*
Median Retained Ownership of Insiders	0.270	0.292*
Median (Inventory + Accounts Receivable)/Assets	0.381	0.399
Median Debt (Liability/Assets)	0.752	0.784
Median Post-IPO 1-Year Standard Deviation of Returns	0.055	0.048*
Median Share of Two-digit SIC Underwriter Market (% square root proceeds)	0.088	0.078*

Panel C: Comparison of Characteristics of IPOs Underwritten by Specialist versus Nonspecialists

	Specialists (n=177)	Nonspecialists (n=1,789)
Median IPO Underpricing	0.174	0.234*
Median Accounting Fees	272,937.850	221,317.42*
Median Underwriting Fees ($ millions)	1.156	0.585*
Median IPO Proceeds ($ millions)	104.327	39.377*
Median IPO Firm Assets ($ Millions)	327.515	45.423*
Median Retained Ownership of Insiders	0.280	0.284
Median (Inventory + Accounts Receivable)/Assets	0.347	0.399*
Median Debt (Liability/Assets)	0.805	0.769*
Median Post-IPO 1-Year Standard Deviation of Returns	0.038	0.051*
Median Share of Two-digit SIC Audit Market (% square root assets)	0.192	0.183

TABLE 3 (continued)

Panel D: Underpricing and Quartile Market Share

	Median Underpricing			
	Quartile 1	**Quartile 2**	**Quartile 3**	**Quartile 4**
Auditor market share	0.08	0.089	0.107	0.107
Underwriter market share	0.062	0.09	0.125	0.112
Auditor and underwriter market share	0.055	0.095	0.134	0.111

* Indicates value for Specialists is significantly different (p<=0.05) from value for Nonspecialists using a Wilcoxon Sign Rank Test

a In Panel B (C), an auditor (underwriter) is defined as a "specialists" if it audited (underwrote) 20 percent or more of the two-digit square root assets (proceeds) in the IPO year.

TABLE 4

Industry IPO Data and Audit Firm (Underwriter) Specialization Data

Panel A: Industries Having >= 50 IPOs between 1991 and 2001

Two Digit SIC Code	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
28 - Chemicals and Allied Products	3	21	20	16	23	32	19	7	5	20	4	170
35 - Industrial and Commercial Machinery	1	13	28	19	26	19	16	6	4	6		138
36 - Electronic/Other Electrical Equipment	1	27	42	27	34	27	19	8	21	26	2	234
38 - Measuring/Analyzing Equipment	3	27	21	12	22	52	23	4		13	4	181
48 - Communications		6	15	9	11	15	7	5	22	14		104
50 - Wholesales	1	6	9	9	8	13	10	2				58
58 – Eating and Drinking Places	3	10	10	7	8	10		2				50
59 - Miscellaneous Retails		11	8	4	4	9	9	6	9	2		62
73 - Business Services	4	35	47	44	84	156	73	44	141	50	5	683
80 - Health Services	5	18	11	11	14	16	12	3			1	91
87 - Engineering/Accounting Services	1	3	9	4	5	14	15					51
Total	22	177	220	162	239	363	203	7	7	6		1,406
All Other Industries	0	49	123	64	26	62	44	102	205	137	16	828
Total Sample IPOs	22	226	343	226	265	425	247	109	212	143	16	2,234

Panel B: Number of Compustat Two-Digit Industries (not restricted to IPO firms) in which Audit Firms Has >=20% of Square Root of Assets Market Share

Audit Firms	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
Arthur Anderson	24	22	22	20	21	24	27	27	26	26	21	260
Coopers & Lybrand	6	7	6	10	11	11	6					57
Ernest & Young	34	35	33	35	34	33	33	34	33	37	33	374
Deloitte & Touche	18	19	17	18	13	16	16	15	17	19	19	187
KPMG Peat Marwick	22	22	24	23	21	21	20	19	14	17	16	219
Price Waterhouse	10	12	10	9	9	11	13	40	39	42	42	237

Table 4 (continued)

Panel C: Number of Compustat Two-Digit Industries (restricted to IPO firms) in which Lead Underwriters Has >=20% of Square Root of Proceeds Market Share

Underwriters	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
BT-Alex-Brown	1	1	1	1				3	1		1	9
CS-First Boston				2		1				1		4
Donaldson Lufkin & Jenrette		2	1	1	1	2	2	2	1			12
First Boston Corp	2	1										3
Goldman Sachs	5	3	4	4	2	3	4	3	2	2		32
Merrill Lynch	3	1	2		2		2	1		1		12
Montgomery		1	1			1	1					4
Mabon Securities Corp		3	1	2	2	6	1					15
Paine-W								4	1			5
Salomon-Smith		2		1	6	2		2				13
Total of Top 10 Underwriters	11	14	10	11	13	15	14	12	4	4	1	109
Others	0	4	7	7	1	1	1	1	1	0	0	23
Total	11	18	17	18	14	16	15	13	5	4	1	132

TABLE 5

Auditor and Underwriter Differentiation among IPOs Occurring between 1991 and 2001

Panel A: Auditor Differentiation

Auditor	Industry	SIC	# IPOs	Mean Auditor Market Share[a]	MarketShare of the Closest Competitor
Arthur Anderson	Construction Special Trade Contractors	17	2	0.473	0.216
	Lumber and Woods Products	24	5	0.528	0.172
	Motor Freight Transportation	42	1	0.321	0.217
	Electric/Gas and Sanitary Services	49	8	0.367	0.244
	Auto Dealers and Gas Stations	55	2	0.329	0.213
	Hotels/Other lodging Places	70	3	0.405	0.217
	Personal Services	72	1	0.328	0.215
	Amusement/Recreation Services	79	7	0.467	0.204
	Engineering, Accounting and related	87	4	0.302	0.18
Coopers & Lybrand	Tobacco Products	21	1	0.896	0.074
	Communications	48	7	0.332	0.196
	Personal Services	72	1	0.379	0.244
Ernst & Young	Mining and Quarrying	14	2	0.487	0.286
	Textile Mill Products	22	5	0.436	0.207
	Motor Freight Transportation	42	1	0.423	0.274
	Transportation Services	47	1	0.418	0.255
	Motion Pictures	78	3	0.375	0.245
	Health Services	80	39	0.385	0.23
Deloitte & Touche	Transportation Equipment	37	1	0.307	0.195
	General Merchandise Stores	53	6	0.323	0.165
	Food Stores	54	4	0.402	0.207
	Apparel and Accessory Stores	56	10	0.343	0.197
KPMG Peat Marwick	Auto Dealers and Gas Stations	55	1	0.360	0.187
	Printing, Publishing and Allied Industries	83	2	0.357	0.221
Price Waterhouse	Agricultural Production Crops	1	2	0.389	0.255
	Food and Kindred Products	20	2	0.379	0.22
	Electric/Gas and Sanitary Services	28	4	0.353	0.179
	Fabricated Metal Products	34	1	0.381	0.213
	Industrial and Commercial Machinery	35	1	0.343	0.189
	Measuring/Analyzing and Controlling	38	6	0.369	0.249
	Personal Services	72	1	0.475	0.193
	Educational Services	82	3	0.451	0.171
	Engineering, Accounting and related	87	6	0.323	0.221

[a]"Differentiated" auditors are audit firms having both the highest two-digit SIC market share (defined in terms of percent square root of assets) and a market share of at least 10 percentage over the closest audit competitor in the year of the IPO

[b] Mean auditor market share is calculated as the simple mean of the auditor's two-digit SIC market share (based on Compustat) across all represented IPO years. For example, Ernst & Young was the differentiated auditor in 39 Health Services IPOs between 1991 and 2001. The mean auditing market share 0.385 reported above is the average Ernst & Young market share across all sample years, weighted by the proportion of its total IPOs occurring in each sample year. Ernst & Young's simple average underwriting market share across sample period is 0.387.

TABLE 5 (continued)

Panel B: Underwriter Differentiation

Underwriter	Industry	SIC	# IPOs	Mean Underwriter Market Share[a]	MarketShare of the Closest Competitor
Alex-Brown	Motor Freight Transportation	42	8	0.655	0.143
	Transportation Equipment	37	1	0.624	0.156
	Home Furniture/Equipment Stores	57	3	0.547	0.239
CS-First Boston	Oil and Gas Extraction	13	2	0.513	0.162
	Measuring/Analyzing and Controlling	38	3	0.374	0.153
	Electric/Gas and Sanitary Services	49	1	0.646	0.143
	Eating and Drinking Places	58	2	0.484	0.17
	Educational Services	82	4	0.819	0.181
DLJ	Food and Kindred Products	20	1	0.471	0.261
	Rubber and Miscellaneous	30	1	0.521	0.141
	Food Stores	54	1	0.450	0.216
	Home Furniture/Equipment Stores	57	2	0.657	0.26
	Eating and Drinking Places	58	1	0.681	0.096
	Miscellaneous Retail	59	1	0.637	0.237
	Amusement/Recreation Services	79	2	0.727	0.16
Goldman Sachs	Oil and Gas Extraction	13	4	0.596	0.123
	Food and Kindred Products	20	2	0.577	0.237
	Printing/Publishing and Allied Industries	27	1	0.508	0.166
	Industrial and Commercial Machinery	35	4	0.436	0.195
	Communications	48	30	0.508	0.142
	Electric/Gas and Sanitary Services	49	5	0.713	0.179
	Building Materials/Garden Supply	52	1	0.687	0.101
	General Merchandise Stores	53	2	0.554	0.188
Lehman Brothers	Oil and Gas Extraction	13	3	0.839	0.077
	Industrial and Commercial Machinery	35	3	0.312	0.095
	Electric/Gas and Sanitary Services	49	3	0.610	0.158
Merrill Lynch	Communications	48	10	0.505	0.184
	Wholesales	50	1	0.489	0.127
	Apparel and Accessory Stores	56	1	0.508	0.136
	Miscellaneous Retail	59	2	0.423	0.179
	Motion Pictures	78	1	0.593	0.206
	Health Services	80	2	0.508	0.105
Morgan Stanley	Textile Mill Products	22	1	0.734	0.106
	Paper and Allied Products	26	2	0.538	0.235
	Electronics	36	6	0.634	0.115
	Transportation Equipment	37	2	0.721	0.087
Morgan Stanley	Textile Mill Products	22	2	0.602	0.157
Dean Witter & Co	Printing/Publishing and Allied Industries	27	2	0.758	0.107
	Transportation Equipment	37	3	0.457	0.139
	Transportation Services	47	1	0.678	0.235
Salomon Brothers	Oil and Gas Extraction	13	1	0.485	0.224
	Communications	48	2	0.502	0.161
	Hotels/Other lodging Places	70	2	0.549	0.227
	Amusement/Recreation Services	79	2	0.645	0.231

[c] "Differentiated" underwriters are investment bankers having both the highest two-digit SIC market share (defined in terms of percent of square root of assets) and a market share of at least 10 percentage over the closest underwriter competitor in the year of the IPO.

[d] Mean underwriter market share is calculated as the simple mean of the underwriter's two-digit SIC market share (based on SDC) across all represented IPO years. For example, GS was the differentiated underwriter in 30 communication IPOs between 1991 and 2001. The mean underwriter market share 0.508 reported above is the average Merrill underwriting market share across all sample years, weighted by the proportion of its total IPOs occurring in each sample year. GS's simple average underwriting market share across sample period is 0.443.

TABLE 6

Frequency Table of Big 6 Auditors and Top 20 Underwriters

Underwriters	Arthur Anderson	Coopers & Lybrand	Ernst & Young	Deloitte & Touche	KPMG Peat Marwick	Price Waterhouse	Total	Percentage
			Auditors					
Goldman, Sachs	49	25	69	35	41	69	288	12.25%
Merrill Lynch	46	16	44	34	33	29	202	8.59%
DLJ	43	14	48	14	29	34	182	7.74%
Morgan Stanley	24	21	42	20	24	21	152	6.47%
Lehman Brothers	32	19	43	19	25	32	170	7.23%
CS-First Boston	33	8	33	24	19	34	151	6.42%
MSDW	15	4	29	13	13	29	103	4.38%
Alex-Brown	40	28	49	21	16	16	170	7.23%
BEAR	21	13	22	11	16	18	101	4.30%
Hambrecht	32	19	33	18	22	25	149	6.34%
Montgomery	30	16	29	17	21	22	135	5.74%
Robertson Stephen	15	17	36	17	17	18	120	5.10%
Salomon Brothers	18	5	8	11	12	10	64	2.72%
Smith Barney	19	7	17	7	11	11	72	3.06%
Salomon-Smith	11	1	8	8	7	12	47	2.00%
J. P. Morgan	5	5	12	3	3	7	35	1.49%
Prudential Securities	11	7	17	6	11	10	62	2.64%
FBC	12	7	9	4	6	5	43	1.83%
PaineWebber	14	8	14	9	8	4	57	2.42%
Boston-Brothers	10	0	11	4	5	18	48	2.04%
Total	480	240	573	295	339	424	2351	100.00%
Percentage	20.42%	10.21%	24.37%	12.55%	14.42%	18.03%	100.00%	

TABLE 7

Pearson's Correlation of Variables in the Regression Models

Panel A: Underpricing (Underwriting fee) Model

Variables	UNDER	UnFee	1/Offer	PROC	RETAIN	STDDEV	AUDSHR	UNDSHR	AUDIFF	UNDIFF	HITECH	FOREIGN	RELAYR
UNDER	1.00												
UNFEE	0.187*	1.000											
1/OFFER	(0.279)*	(0.489)*	1.000										
PROC	.153*	0.947*	(0.426)*	1.000									
RETAIN	(0.032)	0.017	(0.010)	0.023	1.000								
STDDEV	0.306*	0.045*	0.141*	0.009	(0.036)	1.000							
AUDSHR	0.105*	0.111*	(0.075)*	0.010*	(0.260)	0.120*	1.000						
UNDSHR	0.021	0.263*	(0.276)*	0.246*	(0.200)	(0.188)*	0.084*	1.000					
AUDIFF	(0.017)	0.006	(0.102)*	0.002	(0.006)	(0.061)*	0.495*	0.134*	1.000				
UNDIFF	(0.031)	0.110*	(0.015)	0.104*	0.000	(0.109)*	0.041	0.659*	0.094*	1.000			
HITECH	.199*	0.064*	(0.018)	0.047*	(0.009)	0.357*	(0.016)	(0.263)*	(0.124)*	(0.105)*	1.000		
FOREIGN	(0.050)*	0.015	(0.016)	0.059*	(0.093)*	(0.045)*	(0.017)	0.001	(0.033)	0.016	0.042	1.000	
RELAYR	0.304*	0.273*	(0.101)	0.210*	(0.054)*	0.556*	(0.162)*	(0.081)*	(0.035)	(0.048)*	.255*	0.015	1.000

Variable Definitions:

UNDER = log of the sum of one and the market adjusted first-day initial return;

UNFEE = underwriting fee as a percentage of IPO issue proceeds;

1/OFFER = the reciprocal of the offer price;

PROC = log of IPO issue proceeds;

RETAIN = the percentage of ownership retained by pre-IPO shareholders;

STDDEV = standard deviation of stock returns one year after IPO;

AUDSHR = % of two-digit SIC COMPUSTAT square root of assets audited for the year;

UNDSHR = % of two-digit SIC Security Data Company (SDC) square root of proceeds underwritten for the year;

AUDIFF = indicator variable equals to 1 if the market share spread between the IPO firm's audit firm and the next highest ranking audit firm in the IPO firm's two-digit industry is at least ten percentage points, and 0 otherwise;

UNDIFF = indicator variable equals to 1 if the market share spread between the IPO firm's underwriter and the next highest ranking underwriter in the IPO firm's two-digit industry is at least ten percentage points, and 0 otherwise;

HITECH = indicator variable if the IPO is in the High Tech industry, and 0 otherwise;

FOREIGN = indicator variable equals to 1 if the IPO is a foreign company, and 0 otherwise; and

RELAYR = a categorical variable for year 1992 to 2001 as compared to year 1991.

TABLE 7 (continued)

Panel B: Audit Fee Model

Variable	ACCTFEE	ASSETS	PROC	INVREC	DEBT	STDDEV	TOP5	AUDSHR	AUDIFF	RELAYR
ACCTFEE	1.000									
ASSETS	0.289*	1.000								
PROC	0.413*	0.647*	1.000							
INVREC	0.093*	(0.011)	(0.081)*	1.000						
DEBT	0.018	(.138)*	(0.018)	(0.014)	1.000					
STDDEV	0.123	0.371	(0.113)	(0.179)*	0.018	1.000				
TOP5	(0.006)	(0.059)*	0.002	(0.045)*	(0.034)*	0.353*	1.000			
AUDSHR	0.117*	0.069*	0.082*	(0.058)*	(0.011)	0.094*	(0.061)*	1.000		
AUDIFF	0.093	0.107*	0.079*	(0.022)	(0.007)	0.110*	0.525*	0.527*	1.000	
RELAYR	0.410*	(0.003)	0.092*	(0.243)*	(0.017)	0.551*	0.156*	(0.018)	(0.009)	1.000

Viable definitions:

ACCTFEE = log of the fees paid to the accounting firm associated with the IPO;

ASSETS = log of firm total assets;

PROC = log of IPO issue proceeds:

INVREC = (inventory + accounts receivable) / assets;

DEBT = total assets/total liabilities;

STDDEV = standard deviation of stock returns one year after IPO;

TOP5 = indicator variable equals to 1 if industry accounts for > 5 percent of total sample IPOs (two digit SIC of 28, 35, 36, 38, 48, or 73), and 0 otherwise;

AUDSHR = % of two-digit SIC COMPUSTAT square root of assets audited for the year;

AUDIFF = indicator variable equals to 1 if the market share spread between the IPO firm's audit firm and the next highest ranking audit firm in the IPO firm's two-digit industry is at least ten percentage points, and 0 otherwise; and

RELAYR = a categorical variable for year 1992 to 2001 as compared to year 1991.

* Indicates significance at the 5 percent level based on a two-tailed test.

TABLE 8

Regression Results of the Underpricing Model (p-values in parentheses)

Panel A: OLS Regression of Underpricing on Auditor and Underwriter Industry Specialization/Differentiation, and Control Variables for All IPOs

Variables[a]	Expected Sign	Model 1a (replication)	Model 1b (with auditor and underwriter differentiation only)	Model 1c (with auditor and underwriter interaction)
Intercept	?	0.285 (1.89**)	0.362 (2.39**)	0.415 (2.65*)
RETAIN	+	-0.063 (1.94**)	0.059 (1.64***)	-0.052 (1.48)
1/OFFER	?	-1.856 (9.89*)	-2.200 (11.70*)	-2.184 (11.69)
PROC	-	-0.004 (0.49)	-0.009 (1.10)	-0.014 (1.67***)
STDDEV	+	2.858 (10.42*)	2.260 (7.35*)	2.229 (7.27*)
FOREIGN	?		-0.065 (3.04*)	-0.066 (3.06*)
HITECH	+		0.040 (4.41*)	0.046 (4.81*)
UNREP1	-	0.061 (2.85*)		
UNREP2	-	0.034 (2.47*)		
UNREP3	-	-0.017 (1.78***)		
BIG6	-	-0.026 (2.04**)		
UNDSHR	?			0.135 (1.23)
AUDSHR	?			0.141 (1.57)
UNDIFF	-		-0.012 (0.68)	-0.060 (1.98**)
AUDIFF	-		-0.014 (0.73)	-0.050 (1.94***)
*UNSHR*AUDSHR*	?			0.058 (0.1)
*UNDIFF*AUDIFF*	?			0.008 (0.14)
RELAYR	?		0.008 (3.99)	0.007 (3.99)
Adjusted R^2		0.16	0.21	0.21

TABLE 8 (continued)

Panel B: Comparison of OLS and 2SLS Regression of Underpricing on Auditor and Underwriter Industry Specialization/Differentiation without Interaction

Variables[a]	Expected Sign	Model 2 (OLS for Firms with Big 4/5/6 auditors)	Model 3 (2SLS for Firms with Big 4/5/6 auditors)
Intercept	**?**	0.413 (2.64*)	0.415 (2.64*)
RETAIN	+	-0.052 (1.50*)	-0.052 (1.47*)
1/OFFER	?	-2.182 (11.69*)	-2.119 (11.70*)
PROC	-	-0.014 (1.67***)	-0.015 (1.68***)
STDDEV	+	2.230 (7.28*)	2.223 (7.26*)
FOREIGN	?	-0.066 (3.06*)	-0.066 (3.06*)
HITECH	+	0.046(4.82*)	0.045 (4.80*)
UNDSHR	?	0.146 (2.10**)	0.145 (2.08**)
AUDSHR	?	0.147 (2.18**)	0.153 (2.25**)
UNDIFF	-	-0.059 (2.02**)	-0.059 (2.02**)
AUDIFF	-	-0.050 (1.99**)	-0.057 (2.21**)
RELAYR	?	0.008 (4.02*)	0.008 (4.02*)
Adjusted R^2		0.21	0.21

TABLE 8 (continued)

Panel C: OLS Regression of Underpricing on Auditor and Underwriter Industry Specialization/Differentiation, and Auditor Switch for All IPOs

Variables[a]	Expected Sign	Regression without Retained Ownership	Regression with Retained Ownership
Intercept	?	0.837 (7.43*)	0.461 (2.59*)
RETAIN	+	-0.057 (2.29**)	-0.059 (2.36**)
1/OFFER	?	-3.106 (19.54*)	-2.389 (12.02*)
PROC	-	-0.039 (6.57*)	-0.017 (1.73**)
STDDEV	+	3.417 (14.19*)	2.475 (8.95*)
FOREIGN	?	-0.056 (3.32*)	-0.061 (2.58*)
HITECH	+	0.055 (6.00*)	0.051 (5,12*)
UNDSHR	?	0.190 (2.95*)	0.156 (2.00**)
AUDSHR	?	0.214 (3.12*)	0.166 (2.11**)
UNDIFF	-	-0.080 (2.93*)	-0.066 (1.73***)
AUDIFF	-	-0.061 (2.12**)	-0.050 (1.46)
RELAYR	?	0.010 (5.20*)	0.010 (3.98*)
AUDSWITCH	-	-0.080 (2.93**)	-0.077 (1.83***)
Adjusted R^2		0.30	0.23

*, **, *** indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively, based on a one- or two-tailed test as appropriate.

[a] Panel A of Table 7 describes variables except for:

BIG 6 = indicator variables equals to 1 if the audit firm is a Big4/5/6 auditor, and 0 otherwise;

UNREP1 = indicator variable equals to 1 if the underwriter has a market share of 10 percent or more rated by the investment Dealer's Digest (IDD) per IPO year, and 0 otherwise;

UNREP2 (3) = indicator variable equals to 1 if the underwriter's market share is between 5 (1) percent and of 10 (5) percent or more rated by the investment Dealer's Digest (IDD) per IPO year, and 0 otherwise;

* = indicates multiplication; and

AUDSWITCH = indicator variables equals to 1 if the IPO firm switch to a industry specialist or differentiated auditor the year before IPO, and 0 otherwise.

TABLE 9

Regression of Audit Fee on Auditor Industry Specialization/Differentiation, and Control Variables for All IPOs (p-values in parentheses)

Variables[a]	Expected sign	OLS	2SLS
Intercept	?	7.167 (19.03*)	7.163 (19.03*)
ASSETS	+	0.039 (3.03*)	0.038 (3.01*)
PROCEEDS	+	0.253 (10.85*)	0.254 (10.90*)
INVREC	+	0.172 (3.13*)	0.169 (3.09*)
DEBT	+	0.032 (1.97**)	0.031 (1.92***)
STDDEV	+	1.918 (2.21**)	1.987 (**)
TOP5			
AUDSHR	-	-0.372 (1.56)	-0.435 (1.81***)
AUDIFF	+	0.289 (2.72*)	0.36 (3.21*)
RELAYR	?	0.086 (11.67*)	0.086 (11.62*)
Adjusted R^2		0.25	0.25

*, **, *** indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively, based on a one- or two- tailed test as appropriate.

[a]Panel B of Table 7 describes variables.

TABLE 10

Regression of Underwriting Fee on Auditor and Underwriter Industry Specialization/Differentiation, and Control Variables for All IPOs (p-values in parentheses)

Variables[a]	Expected sign	Overall sample	Large IPOs	Small IPOs
Intercept	?	3.119 (15.15*)	3.555 (17.44*)	2.581 (5.97*)
STDDEV	+	0.408 (1.30)	0.778 (2.16**)	0.096 (0.18)
PROC	-	-0.103 (9.10*)	-0.121 (11.00*)	-0.078 (3.22*)
1/OFFER	+	2.548 (10.96*)	1.035 (3.57*)	3.429 (8.75*)
RETAIN	+	-0.017 (0.58)	-0.031 (1.37)	0.097 (1.14)
UNDSHR	+	-0.001 (0.01)	-0.136 (1.65***)	0.348 (1.43***)
UNDIFF	+	-0.017 (0.40)	0.023 (0.60)	-0.172 (1.43)
AUDIFF	-	-0.010 (0.30)	0.017 (0.55)	-0.092 (1.21)
RELAYR	?	-0.007 (2.33*)	-0.004 (1.38)	-0.009 (1.90***)
Adjusted R^2		0.31	0.29	0.29

*, **, *** indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively, based
      on a one- or two-tailed test as appropriate.
[a]Panel A of Table 7 describes variables.

TABLE 11

Regression of IPO Long-term Performance (Return on Assets) on Auditor and Underwriter Industry Specialization/Differentiation, and Control Variables for All IPOs (p-values in parentheses)

Variables[a]	Expected Sign	Operating performance (ROA) measured from 0 to +1	Operating performance (ROA) measured from 0 to +2	Operating performance (ROA) measured from 0 to +3	Average Operating performance (ROA) of +1, +2, +3 relative
Intercept	?	-0.044 (3.67*)	-0.069 (3.22*)	-0.129 (4.67*)	0.055 (1.03)
MUNDER	?	0.007 (1.070	0.012 (1.01)	-0.006 (0.36)	-0.075 (2.50*)
MRETAIN	?	-0.008 (1.24)	-0.005 (0.43)	0.019 (1.24)	-0.088 (2.94*)
UNDSHR	+	0.133 (2.58*)	0.116 (1.26)	0.218 (1.83***)	-0.146 (0.64)
AUDSHR	+	-0.020 (0.34)	-0.042 (040)	0.055 (0.41)	0.097 (0.38)
UNDIFF	+	-0.024 (0.87)	0.014 (0.29)	-0.008 (0.12)	0.085 (0.70)
AUDIFF	+	0.009 (0.35)	0.023 (0.50)	0.018 (0.31)	0.003 (0.03)
Adjusted R^2		0.005	0.0002	0.0002	0.007

*, **, *** indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively, based on a one- or two-tailed test as appropriate.

[a]Panel A of Table 7 describes variables except for:

MUNDER = indicator variable equals to 1 if the underpricing is greater than the median underwriting, and 0 otherwise;

MRETAIN = indicator variable equals to 1 if the retained ownership is greater than the median value, and 0 otherwise.

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EDUCATION

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RESEARCH EXPERIENCE

- Dissertation: "Auditor and underwriter industry specialization/differentiation: Evidence from IPO underpricing and long-term performance".
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PUBLICATIONS AND WORKING PAPERS

Wilkins, M., Hogan, C., & Wang, K. 2005. An investigation of underpricing of Hong Kong, Singapore, and US IPOs. Working paper

Wang, K. 2004, Smith, M. The impact of accounting standards on the valuation of multinational enterprises. Working paper.

Wang, K. 1995. Management of state-owned assets. *Journal of Hebei Auditing*, China.

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SCHOLARLY PRESENTATIONS

A reexamination of the association between auditor choice, retained ownership, and earnings disclosure for IPOs. 2004. Presented at AAA Southwest Regional Meeting.

Does culture impact auditors' materiality judgment, evidence from China and the US? 2004. Presented at AAA Southwest Regional Meeting.

TEACHING EXPERIENCE

- Instructor, Survey of Managerial & Cost Accounting. Texas A&M University, 2004.
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