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THE BIG FOUR AUDIT FEE PREMIUM AFTER SARBANES-OXLEY ACT

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ABSTRACT

Many prior studies have examined whether large auditing firms charge higher fees, which is known as the audit fee premium. The amount of fee premium varies significantly from different studies, ranging from 0% to 63%. Large fee premium can be a temporary effect caused by audit market change, such as mergers. Or it can be long-term effect that signals the lack of competition in the audit market and the dominant power of large auditors. Most recent studies have focused on how Sarbanes-Oxley Act affects the fee premium. They find an increasing audit fee premium immediately after the Sarbanes-Oxley Act (SOX). In a study, Ebrahim (2010) conclude that the fee premium gradually declines as he observe the decline of fee premium in 2005 and 2006. However, his sample period ends 2006; and hence his results show only the short-term effect of the SOX. The long-term effect might not be the same as the short-term effect. To address the sample period limitation, this study extends the sample period to 2014 and finds the opposite results to Ebrahim's study. Three models, OLS regression, Heckman two-stage self-selection and semi-parametric matching models, are used to estimate the premium. The results of all three models suggest the overall premium from 2000 to 2014 of 29.4%. The results of OLS regression and the semi-parametric matching model suggest that the fee premium does not decline, but continues to increase, after 2006. The results indicate the unequal power between large and small auditors should raise the market's attention and encourage more investigations on the causes.

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Chapter 1: Introduction

Financial statements are the most important documents for corporations. They reflect companies' performance and provide investors information for investment decisions. To ensure the accurate representation of companies' performance, all public corporations are required to have external auditors examine their financial statements. The auditors are responsible for financial statements' compliance with accounting standards such as Generally Accepted Accounting Principles (GAAP) in the U.S. Unlike internal auditors, external auditors of companies are accountants who work for independent accounting firms, not related to the companies. Independent auditors add credibility, reliability and accuracy to companies' financial statements. Many corporations are in favor of large audit firms because of their industry expertise and reputation. Large audit firms have more resources and experience and are more capable of handling complex cases. As a result, large audit firms are considered more reliable than small audit firms. However, large audit firms tend to charge higher audit fees than small audit firms, which is known as the audit fee premium.

Many prior studies such as Clatworthy, Makepeace and Peel (2009), Ireland and Lennox (2002) and McMeeking, Peasnell and Pope (2007) examine audit fee premiums in both U.S. and non-U.S. countries. The majority of previous studies show the existence of the big audit firm fee premium in both U.S. and non-U.S. countries. The audit fee premium ranges from 0% to 63%. The sizes of the audit premium vary significantly partly due to difference in samples and partly due to different premium calculation methods. Among U.S. studies, Pong and Whittington (1994) use an Ordinary Least Square (OLS) regression model and find a 24% fee premium. However, Ireland and Lennox (2002) argue that the

OLS regression model does not consider selection bias in that auditors are not randomly assigned to auditees. They adopt Heckman's (1979) two-stage correction model to adjust for selection bias and find a 53.4% fee premium after the adjustment. Clatworthy, Makepeace and Peel (2009) apply an alternative model: Propensity Score Matching Model to adjust for selection bias and find a 40% fee premium.

In 2002, the Sarbanes-Oxley Act (SOX) was enacted in response to the collapse of Enron and WorldCom which employed Arthur Anderson, one of the big accounting firms, as their auditors. The SOX has significantly impacted the audit market. It has established new standards and procedures for external audit and internal control of corporations. Under section 404 of SOX, management officers are responsible for internal control and financial reporting. Moreover, external audit firms are required to evaluate and supervise their corporate clients' internal control procedures. Ebrahim (2010) argues that to conform to SOX, audit firms need to spend more time and resources on the audit procedures, resulting in higher audit fees. A few prior studies examine the impact of SOX on audit fees by comparing the fees before and after SOX. Using a sample from 2000-2001 and 2003-2004, Huang, Liu, Raghunanda and Rama (2007) find a substantial increase in audit fees after SOX and a more significant fee premium for small public corporate clients. In a follow up study, the authors add a sample from 2006 and find a 24% discount of the initial audit fees in 2001 and a 16% premium of the initial audit fees in 2006 for the Big Four clients. Their findings suggest that the Big Four raises the initial audit fees compared to non-big four firms and become more conservative with accepting new customers.

Although the prior studies find an increase in big audit firm fee premium after SOX, these studies use the sample periods that are immediately after the enactment of the act.

The most recent data include the 2006 information, only four years after the enactment (Huang, Liu, Raghunanda and Rama, 2009). The limited sample period does not provide the information about long-term impacts of SOX on audit market. The Big Four fee premium may remain constant several years after the SOX. The sudden increase of the fee premium can be interpreted as a failure to adapt to SOX. Public corporate clients are willing to pay higher fees to the Big Four audit firms that have more resources and expertise to help conform to the new regulations. However, after Non-big Four audit firms become more familiar with the SOX standards and better incorporate the regulations into audit procedures, the Big Four audit firms should gradually lose this advantage over Non-big Four firms. The Big Four fee premium might gradually decrease overtime and eventually stay at certain level.

This thesis contributes to the audit market study by examining the long-term effects of SOX on the Big Four audit fee premium. Specifically, the sample period of this study spans over 15 years from 2000 to 2014, which includes 12 years after the SOX was enacted. The results of a long sample period should provide public companies with a better understanding of audit market pricing and the alternative choices they may have. Three models are used to test the existence of fee premium and estimate the amount of fee premium. The OLS regression is the most widely used model in accounting studies of audit fee premiums. Variables that capture the size, risk and complexity of the clients are included in the regression model to estimate the fee premium. The two-stage Heckman self-selection model and semi-parametric matching model are used to address systematic difference between Big Four and non-Big Four clients and clients' selection bias. The results from OLS regression model and matching model show that fee premium continues

to increase in the long run. This finding does not support Ebrahim's conclusion that audit fee premium gradually decline over time. Even after non-Big Four auditors adapt to the SOX changes, the audit fee premium continues to increase. These findings suggest that the Big Four accounting firms have the dominant power and significant advantage over non-big four firms not only in short-run but in long-run. In other words, the Big Four firms have the power to charge the higher price and maintain the market shares and profits long after SOX was implemented. Based on the matching model, the overall premium from 2000 to 2014 is 29.4%. These findings raise the audit market's attention. More investigations on the causes are needed to examine whether the audit market is lack of competition. Furthermore, clients should evaluate whether the incremental benefits from a Big Four auditor justify the fee premium.

The reminder of the paper is organized as follows. Section 2 summaries the results from previous studies. Section 3 outlines the model specifications and explains the variables and data in this study. Section 4 reports the results of three models: OLS regression model, Heckman two stage self-selection model and matching model. Section 5 conclude the paper and offer suggestions for future studies.

Chapter 2: Literature Review

From 1984 to 2002, big international audit firms continuously merged, resulting in the decrease in the number of the big audit firms from eight to five. Prior to 1984, there were eight big audit firms: Arthur Andersen, Arthur Young, Coopers & Lybrand, Ernst & Whinney, Deloitte Haskins & Sells, Peat Marwick Mitchell, Price Waterhouse, and Touche Ross. In 1986, Peat Marwick Mitchell successfully merged with KMG and formed KPMG. Two years later, Ernst & Whinney and Arthur Young merged to form Ernst &Young (E&Y). In the same year, Deloitte Haskins & Sells merged with Touche Ross to form Deloitte & Touche. In 1998, the merger between Coopers & Lybrand and Price Waterhouse resulted in PricewaterhouseCoopers (PwC) and signaled the beginning of Big Five audit firms era: KPMG, PwC, E&Y, Deloitte and Arthur Andersen. However, the Big Five audit firms era did not last for too long. In 2001, the Enron scandal, one of the largest frauds in the history, was revealed to the public. As Enron's auditor, Arthur Andersen collapsed in 2002 due to obstruction of justice, impaired reputation and huge amount of fines. The demise of Arthur Andersen signals the beginning of Big Four audit firms era.

Many prior studies such as Francis and Simon (1987), Chaney, Jeter and Shivakumar (2004) and McMeeking, Peasnell and Pope (2007) examine the changes of the audit market concentration and the audit pricing after mergers or other events that significantly impact the audit market. The majority of previous studies show an existence of the fee premium charged by big audit firms. However, the sizes of the audit premium vary significantly between studies. The differing results can be partially explained by the variety of data and methodology: sample country and market segment, research methods for audit premium calculation and sample period.

This chapter reviews previous studies of audit premium. Section 2.1 discusses the big audit firm fee premium among different countries. Section 2.2 analyzes the research methods and audit premium calculation. Section 2.3 presents the results of audit fee premium in different time periods. Section 2.4 examines the relation between audit fee premiums and the Sarbanes-Oxley Act.

2.1. Audit Premium among Different Countries

This section presents the findings of prior studies that examine audit fee premiums among different countries. This section also discusses the relation between audit fee premium and market segment. DeFond, Francis and Wong (2000) examine 348 publicly listed companies in Hong Kong in 1992. They find a 63% Big Six premium, suggesting that big accounting firms charge 63% higher auditing fees than Non-big Six firms. Their finding of the existence of an audit premium is consistent with the finding of Lee (1996) who examines the audit premium in Hong Kong in 1990. However, the two studies find different magnitudes of the premium. Lee finds a 50% fee premium in 1990, which is 13% less than the premium found by DeFond, Francis and Wong.

In Australia, the Big Four premium is also found. Hamilton, Li and Stoke (2008) study the audit fees for more than 1,200 public Australian companies in both 2000 and 2003. They divide the sample into two groups by firm size. They find a 32% fee premium for small clients and only 17% fee premium for large clients in 2000. They also find an increase in the audit fee premium from 2000 to 2003. The premium for small clients grows to 49% and the premium for large clients doubles in 2003. Compared to the audit premium in Hong Kong, the audit premium in Australia is smaller, 17-32% vs. 50-63%.

In U.K., the results of fee premium studies are mixed. Chaney, Jeter and

Shivakumar (2004) conclude no evidence of the fee premium for private firms in U.K. That is, the big auditors charge similar fee to the small auditors. On the other hand, Ireland and Lennox (2002) discover a significant amount of fee premium for U.K. public firms. They find that large audit firms have a 53.4% fee premium. Furthermore, they conclude that 34.2% of the fee premium is result from selectivity bias. In other words, public clients favor big auditors and are willing to pay higher fees. Ireland and Lennox also suggest the fee premium is explained by higher audit quality of big auditors. It is worth noting that these two researches use different types of U.K. firms as their samples. Different types of firms may require distinct audit services and pay different fees to audit firms. Public clients tend to favor big audit firms because of the industry specialization. Private clients may not have sufficient fund as large public clients to support high cost of external audit. Chaney, Jeter and Shivakumar point out that private UK corporate clients choose audit firms base on cost and efficiency.

The difference in the big audit firm fee premium does not only exist between public corporate clients and private corporate clients. Among the public corporate clients, large and small clients show different results of fee premium. McMeeking, Pope and Peasnel (2006) use the data based on U.K. public companies from 1985 to 2002. Using a sensitive test, they find that big audit firm premium is more significant for small size clients than large size clients. Large size clients usually implement better internal control while small size clients can be more risky and difficult to audit. Risk avoidance can explain why audit firms tend to charge higher fee for small size clients. The finding of the difference in the fee premium between large and small companies is also consistent with the finding of Hamilton, Li and Stoke (2008) for Hong Kong firms.

In the U.S., Francis and Simon (1987) examine 220 small public U.S. companies and find the existence of a fee premium. Big Eight auditors charged higher fees than non-Big Eight auditors. Huang, Raghunandan and Rama (2009) study the audit pricing in the initial audit engagement in 2006. They focus on the client changing auditors from one auditor group to the other. They find that new Big Four clients pay a 19% premium for switching from non-Big Four auditors in 2006. Both studies in the U.S. show that the Big Four audit firms generally charge a higher fee than Non-big Four audit firms.

Overall, the audit markets in different countries show the existence of fee premium but the size of the premium varies. Many studies try to analyze the different characteristics of countries and market segments in order to interpret the different findings of the fee premium. For example, Choi, Kim, Liu and Simunic (2008) study audit fees in 15 countries and test the relationship between audit fees and macroeconomic level variables. They suggest that the audit fee premium increases as the strictness of a country's legal environment increases. If a country has more detailed and well-enacted auditing regulations, the country is more likely to have higher fee premium.

2.2. Research Method and Audit Premium Calculation

Varying audit fees of prior studies might be due to different audit premium calculation and research methods. This section summarizes the models that are widely used for audit fee calculation and outlines the methods that are used to adjust selectivity bias in audit research. Selectivity bias rises because clients self-select auditors rather than being randomly assigned to auditors.

Most of the audit research of audit fee premium uses a regression model to examine the relation between audit fees and related variables. Simunic (1980) is the first

study that develops an audit fee model and discusses the factors that may influence audit fee. The identified variables include loss exposure (such as the total assets of a company and number of consolidated subsidiaries), the assessed loss sharing ratio (defined as net income to total assets), auditor production function, auditor identity, and other independent variables such as salaries paid to internal auditors. Later studies expand Simunic's model and modify some variables based on the specific circumstances such as different audit markets and time periods.

Selection bias in premium calculation might result in significant differences in the sizes of audit premium. Heckman (1979) argues that researchers need to consider selection bias that results from using a not randomly selected sample. He suggests the selection bias can be seen as the problem of an omitted variable. Heckman proposes a two-stage correction model to eliminate the selection bias error. He argues that corporate clients are not randomly assigned with audit firms; they intentionally choose audit firms. As a result, the selection bias needs to be taken into consideration. To apply Heckman's two stage self-selection model in the audit research, the first stage is to estimate the probability of choosing the selected sample. The second stage is to correct the selection bias by incorporating the estimated probability as an additional variable.

Ireland and Lennox (2002) adopt the Heckman Model and apply it to 1,326 public U.K. firms. They demonstrate a 53.4% fee premium with Heckman's correction and a 19.2% fee premium without adjustments for selection bias. Pong and Whittington (1994) do not address selection bias while reporting a 24% percent of fee premium in the U.K. The fee premium reported by Pong and Whittington is similar to that of Ireland and Lennox without the adjustment. However, after applying the Heckman's correction model, the

results of fee premium vary significantly between these two studies. As a result, the fee premium can be highly underestimated if researchers fail to consider selection bias (Ireland & Lennox, 2002).

Clatworthy, Makepeace and Peel (2009) also recognize the selection bias in their study. They also address the weakness of the Heckman's model. The Heckman's model is largely impacted by extreme observations and auditees' characteristics. Furthermore, the model has the collinearity issue between the selection variable and other variables in the regression model. Lack of robustness and the essence of counterfactual also limit the accuracy of the model. As a result, Clatworthy, Makepeace and Peel (2009) suggest using the propensity score and portfolio matching methods to adjust selection bias. Clatworthy, Makepeace and Peel argue that Heckman's model is highly sensitive to changes in sample and model specification. The propensity score matching model (PSM) is originally introduced by Rosenbaum and Rubin (1983). PSM is designed to estimate the effect of a treatment and consider the probability of receiving the treatment. Similar to Heckman's model, the first step of PSM is to estimate the probability of being selected as the sample, which is called the propensity score. Then researchers need to create balanced treatment groups matching on the propensity score. In Clatworthy, Makepeace and Peel's study, the Big Four clients are matched to Non-big Four clients based on the estimation of the probability of using a Big Four auditor. Then the audit fees of matched sub-sample are compared with the audit fees of Non-big Four sample to evaluate the fee premium. By using propensity score matching method, Clatworthy, Makepeace and Peel also find the existence of fee premium. However, the fee premium is 13% less than the result from Ireland and Lennox (2002).

2.3. Time Period and Audit Premium

Applying different research methods to calculate audit premium or selecting samples from different countries can result in different conclusions on audit premium. Moreover, prior studies show that the audit premium changes during different time periods. This section summarizes the studies that examine the audit fee premium during different time periods. These studies suggest that significant events, such as mergers between large audit firms, can significantly impact the fee premium.

Simunic (1980) and Francis and Simon (1987) are early studies of audit pricing and market structure in the U.S. Simunic develops an audit fees model and use small public companies as the benchmark to indicate a competitive market. As he points out, the market control of the big auditors increases as the size of the clients increases. As a result, the audit market of large public clients is more concentrated and there is more competition in the audit market of small public clients. Examining 397 U.S. public corporations in 1977, he finds that the Big Eight firms charge lower audit fees than Non-big Eight firms. Simunic concludes that the audit premium does not exist both in large and small public companies. Whether the market is concentrated or competitive, large auditors do not have the privilege to charge higher fees. On the other hand, Francis and Simon (1987) examine 220 small public U.S. companies and provide the evidence of the Big Eight fee premium. Although the Big Eight auditors charge higher audit fees than their alternative competitors, Francis and Simon also find the existence of the market competition among the auditors of small clients. They find a discount of initial audit engagement and an increased fee for continuing audit engagements. The discount of initial audit engagement indicates that the big accounting firms decrease the price to attract new customers and actively compete with

other firms. As a result, they conclude the existence of Big Eight audit fee premium does not impede the competition in the audit market.

Many later studies adopt Simunic's audit fees model and extend the sample to a more recent time period. McMeeking, Peasnell and Pope (2007) study the audit fee change from 1985 to 2002 in the U.K. market and find that audit fee changes significantly after mergers of audit firms. Before various mergers between the Big Eight audit firms, large corporate clients were charged the highest audit fee premium. The authors also find after the mergers between Peat Marwick Mitchell and KMG, and Ernst & Whinney and Arthur Young, the audit fee premium increases for mid-size clients while it decreases for large and small size clients. During the Big Five audit firm period, fee premium becomes higher for small clients while lower for large clients. The authors also point out that the fee premium rises for mid-size clients while it falls for other clients after the collapse of Arthur Andersen. Since the audit fee premium rises for different sizes of clients in different mergers, the authors believe the increase in fee premium is due to industry expertise instead of market dominance.

The results indicate that mergers and collapses of large audit firms can significantly impact the audit market and fee premium. Moreover, different mergers can have distinct impact on the audit premium. The influence on fee premium by large incidents should not be generalized and needs to be examined. In the 21st century, the most significant event that influenced the audit market was the demise of Arthur Andersen, followed by the introduction of the Sarbanes-Oxley Act. Arthur Andersen's collapse breaks the existing balance of the audit market and restructures the market share between large audit firms. The Sarbanes-Oxley Act not only establishes the new standards for the U.S. audit market

but also impacts all corporations in the U.S. The next section discusses how the Sarbanes-Oxley Act affects the audit fee premium.

2.4. The Sarbanes-Oxley Act and Audit Premium

The Sarbanes-Oxley Act (SOX) is a federal law passed after large accounting fraud scandals including Enron and Worldcom. SOX establishes new standards and procedures for external audit and internal control of corporations. Under section 404 of SOX, management officers are responsible for internal control and financial reporting. As a result, when management officers review the financial statements and internal control documents, they are required to ensure the accurate representation of the company's actual performance. If management officers fail to take these responsibilities and sign on the financial documents, they share the liability with accountants for providing wrongful and misleading information to investors. Moreover, external audit firms are required to evaluate and supervise their corporate clients' internal control procedures.

As Ebrahim (2010) argues, to conform to SOX, audit firms need to spend more time and resources on the audit procedures, resulting in higher audit fees. Audit firms need to be fully knowledgeable of SOX and train auditors to modify auditing procedures in order to comply with the new rules. The SOX requires auditors to spend longer time to review company's financial documents. Auditors need to collaborate more with clients' accounting departments to understand clients' internal control process. Auditors need to suggest necessary changes to strengthen clients' internal control procedures. All the trainings, additional procedures, and increased auditing hours will raise the audit fees that ultimately are charged to corporate clients.

A few prior studies compare the audit fees before and after SOX. Huang, Liu,

Raghunanda and Rama (2007) study the Big Four audit firm's public U.S. clients. Their sample period includes 2000, 2001, 2003 and 2004, which are the two years right before SOX and two years immediately after SOX. They find a substantial increase in audit fee after SOX and a more significant fee premium for small public corporate clients. They find that the mean of audit fee increases from $0.83 million in 2001 to $1.38 million in 2003. Moreover, they find a negative and more significant coefficient of the variable, auditors' power, for small clients in their regression model. They interpret that the Big Four audit firms purposely charge higher fee for small clients. Because small clients tend to have weaker internal control procedures and are more risky than large clients, the Big Four auditors need to spend more time to perform extensive substantive testing to control the clients' audit risk at an acceptable level.

Feldman (2006) studies 1,071 public U.S. companies from 2000 to 2002. He finds the results are consistent with Huang, Liu, Raghunanda and Rama (2007). He finds that the average audit fee increases over 32% in 2002. However, these studies only contains the sample before 2004. As a result, their conclusions are based of the audit fees changes immediately after the introduction of the SOX. In a separate study, Huang, Liu, Raghunanda and Rama (2009) extend the sample period of their previous study by including the data in 2006. They find a 24% discount of the initial audit fees in 2001 and a 16% premium of the initial audit fees in 2006 for the Big Four clients. The findings suggest that the Big Four raise the initial audit fees and become more conservative with accepting new customers.

A majority of the studies state the existence and even an increase in big audit firm fee premium. However, these studies use the sample periods that are immediately after the

SOX. The relatively recent data is based on 2006 information (Huang, Liu, Raghunanda and Rama). Limited sample period weakens the implication of the studies. The fee premium may remain constant several years after the SOX. The sudden rise of the fee premium can be interpreted as not adapting to SOX. Public corporate clients are willing to pay higher fees to the Big Four audit firms that have more resources and expertise to help conform to the new regulations. However, the non-Big Four audit firms will gradually become more familiar with the SOX standards and better embrace the regulations into audit procedures. Once that happens, the Big Four audit firms will not be able to keep increasing the audit fees. The Big Four fee premium may not increase over time. As a result, studies with more recent data are necessary to analyze the long-term effect of SOX on the Big Four audit premium.

This thesis will examine the long-term effect of SOX on the fee premium among public U.S. firms by applying the Simunic's 1980 audit fee model adjusted for selectivity bias. The hypothesis is that the Big Four audit premium immediately increases after the Sarbanes-Oxley Act then drops and stabilizes over time among the U.S. public corporate clients. As non-Big Four accounting firms gradually become familiar with the SOX regulations and expertise in compliance, there will be less Big Four dominance and more competition in the audit market. Big Four clients will eventually change to non-Big Four auditors if they continuously pay increasing fee premium to Big Four auditors. Some clients will stay with the Big Four auditors due to large auditors' brand name, industrial expertise and other reason. The study expects to find a natural rate of the Big Four audit fee premium when the audit fees premium is stabilized.

Chapter 3 Data and Methodology

My sample selection procedure follows that of Huang, Liu, Raghunandan and Rama (2009). The sample consists of all non-financial U.S. firms from 2000 to 2014 with fiscal year-end December 31, audit fee and auditor name available and firm size greater than $5 million total assets. Financial institutions are excluded from the sample because the composition of their financial statements is different from other companies' financial statements. The Sarbanes-Oxley Act was enacted in the middle of a year. Huang, Liu, Raghunandan and Rama (2009) suggest that comparisons are difficult between firms with fiscal year-end in the month before and after the implementation of the law. These two types of firms do not adopt the law in the same year. For that reason, firms with fiscal year-end other than December 31 are excluded from the sample. Each observation needs to have all crucial variables including audit fees, auditor names, and total assets. Small size firms are very likely to miss the crucial variables to estimate the fee model. As a result, firms with total assets less than $5 million are excluded from the sample. Foreign firms are excluded because some of the SOX regulations are not applicable to foreign firms. The final sample consists of 49079 firm-years.

Three models are used to estimate the fee differences between Big Four auditors and Non-Big Four auditors and test the existence of fee premium. All the auditors are divided into two groups: the Big Four and Non-Big Four. Big Four auditors include KPMG, PwC, E&Y, and Deloitte. Since Arthur Anderson was the top five accounting firms before its demise, Arthur Anderson is also referred as Big Four to ensure consistency and avoid confusion. All other accounting firms are categorized as Non-Big Four auditors.

3.1 Model Specification

Three models are used to estimate the audit fee premium. The models include (a) OLS regression model, (b) Heckman model, and (c) propensity score matching model.

(a) OLS Regression Model

Simunic (1980) first develop an audit fee model. He suggests three categories of variables that impact the audit fee. The three categories include auditee characteristics, risk measures and auditor function. Ordinary least square regression is used to examine the existence and magnitude of audit fee premium. This study includes the variables that are proved to be significant in previous studies (e.g., Clatworthy, Makepeace and Peel,2009 and Chaney, Jeter, and Shivakumar, 2004). The OLS regression for audit fee is specified as:

$$LNFEE = \alpha + \beta_1 BIG4 + \beta_2 LNASSET + \beta_3 LOSS + \beta_4 SQSUB + \beta_5 FOREIGN + \beta_6 CURRENT + \beta_7 DEBT + \beta_8 ROI + \varepsilon \quad (1)$$

where:

LNFEE = Natural log of audit fee;

BIG4 = A dummy variable taking a value of 1 if the firm is audited by a Big Four accounting firm, 0 otherwise;

LNASSET = Natural log of end of year total assets;

LOSS = A dummy variable taking a value of 1 if the firm incurred a loss in the previous year, 0 otherwise;

SQSUB = Square root of the number of subsidiaries;

FOREIGN= Percentage of total assets that are foreign based;

CURRENT = Current asset divided by total assets;

DEBT = Long-term debt divided by total assets; and

ROI = Return on investment which equals net income before tax divided by total assets.

The model is estimated for each year. To test the hypothesis that the audit fee premium is the same over time, I first test whether β_1 is significantly different from zero for each year. Then, I calculate changes in β_1 over different periods and test whether the changes are significantly different from zero. In short, the hypotheses are as follow:

H1.1: $\beta_1 \neq \emptyset$

H1.2: $\Delta\beta_1 = 0$

(b) Two Stage Heckman Self-selection Model

As Chaney, Jeter, and Shivakumar (2004) point out, the OLS regression model assumes that auditors are randomly assigned to clients. They question the validity of the assumption and argue that clients self-select auditors. In other words, the characteristics of the clients may largely affect clients' auditor choices. Clients may favor the Big Four auditors over the Non-Big Four auditors or vice versa due to their characteristics. Selection bias arises if Big Four clients and Non-Big Four clients are systematically different. As a result, correction models are adopted to adjust for selection bias. The Heckman's two-stage self-selection model is applied for adjustment. As the name implies, the Heckman's two-stage model consists of two stages. The first stage is to estimate the probability of corporations to select a big four audit firm. The probit regression model is used to compute the inverse Mills ratios, λ_{BIG4} and $\lambda_{NON.}$ The probit regression model is as follow:

$$BIG4 = \alpha_1 + \alpha_2 LNASSET + \alpha_3 ROI + \alpha_4 LOSS + \alpha_5 SQSUB + \alpha_6 FOREIGN + \alpha_7 CURRENT + \alpha_8 DEBT + \varepsilon \quad (2)$$

where:

BIG4 = A dummy variable taking a value of 1 if the firm is audited by a Big Four accounting firm, 0 otherwise;

LNASSET = Natural log of end of year total assets;

ROI = Return on investment which equals net income before tax divided by total assets;

LOSS = 1 if the firm incurred a loss in the previous year, 0 otherwise;

SQSUB = Square root of the number of subsidiaries;

FOREIGN= Percentage of total assets that are foreign based;

CURRENT = Current asset divided by total assets; and

DEBT = Long-term debt divided by total assets.

The model is run for two sets of firms: (1) firms using Big Four, and (2) firms not using Big Four. From the two regressions, two sets of α for the Big Four auditees and non-big four auditees is obtained. Then, the two sets of α is used to calculate the inverse Mills ratios, λ_{BIG4} and $\lambda_{NON.}$ λ_{BIG4} and λ_{NON} represent the possibility of an auditee choosing a Big Four or a Non-Big Four auditor, which is included in the stage two as additional variables. The inverse Mills ratio is calculated as:

$$\lambda = \frac{\phi(\sum_{n=1}^{n} \alpha_n Z_n)}{\Phi(\sum_{n=1}^{n} \alpha_n Z_n)}$$

where ϕ is the normal density function and Φ is the normal distribution function.

The second step is to estimate the audit fee premium after adjusting for the selection bias. The estimated models are as follow:

$$LNFEE_{BIG4} = \alpha_1 + \beta_1 \lambda_{BIG4} + \beta_2 LNASSET + \beta_3 LOSS + \beta_4 SQSUB + \beta_5 FOREIGN + \beta_6 CURRENT + \beta_7 DEBT + \beta_8 ROI + \varepsilon \quad (3)$$

$$LNFEE_{NON} = \delta_1 + \gamma_1 \lambda_{NON.} + \gamma_2 LNASSET + \gamma_3 LOSS + \gamma_4 SQSUB + \gamma_5 FOREIGN + \gamma_6 CURRENT + \gamma_7 DEBT + \gamma_8 ROI + \varepsilon \quad (4)$$

where:

λ_{BIG4}= The possibility of choosing a Big Four auditor; and

$\lambda_{NON.}$ = The possibility of choosing a non-Big Four auditor.

The other variables are the same as in equation (2).

β and γ values are estimated for the Big Four auditees and non-Big Four auditees. The variables for non-big four auditees are applied to the Big Four audit fee model to estimate the audit fee they would have paid if they chose a Big Four auditor. The procedure will be repeated for big four auditees. The different between the estimated audit fee and the actual audit fee is the audit fee premium. The difference indicates a significant audit fee premium. The change in the difference between the estimated audit fee and the actual audit fee represents either increase or decrease in audit fee premium. To test the hypothesis that the audit fee premium stabilizes over time, I test the following:

H2.1: Estimated FEE_{BIG4}- Actual $FEE_{BIG4} \neq \emptyset$

H2.2: Δ(Estimated $FEE_{BIG4} -$ Actual FEE_{BIG4}) = 0

(c) Semi-parametric Matching Model

Clatworthy, Makepeace and Peel (2009) show that the selection term λ of the Heckman's correction model is largely affected by extreme observations. The extreme observations can be the Big Four auditees with large size and complexity. No non-big four auditees can share the similar characteristics with these Big Four auditees. For that reason, Clatworthy, Makepeace and Peel conclude that the Heckman model is too sensitive to auditees' characteristics and lack of robustness and adequate counterfactuals. They propose the matching method in their study.

In this study, I use the semi-parametric matching model. The first step for the matching model is to match non-big four auditees with Big Four auditees based on key attributes. Total assets will be used as key variables for the matching model. The variable, total assets, is selected corresponding to an important factor that affects the audit fees and choices of auditors: auditee size. Then the full sample will be sorted and divided into groups based on total assets (40 groups). After that, each Big Four auditee is matched with a non-Big Four auditee with the similar characteristic. It is rare to find an exact matching. So the closest match is chosen in most of the cases to ensure similar size.

More public companies are expected to choose the Big Four auditors. As a result, one non-big four auditee may be repeated several times in the sample to match with several Big Four auditees. For the matching, the number of observations of the sub-sample of the Big Four auditees is the same as the number of observations of the sub-sample of non-big four auditees. Moreover, the mean of variables in two sub-samples should be more similar to each other compared with the sample before matching (Clatworthy, Makepeace and Peel, 2009).

The second step is to estimate the audit fee premium after the matching process. The two sub-samples are pooled to the same regression equation:

$$LNFEE = \alpha + \beta_1 BIG4 + \beta_2 LNASSET + \beta_3 LOSS + \beta_4 SQSUB + \beta_5 FOREIGN + \beta_6 CURRENT + \beta_7 DEBT + \beta_8 ROI + \varepsilon \quad (5)$$

where the variables are the same as in Equation (1).

The data analysis is the same as in the OLS regression model. The key coefficient indicator is β_1. If $\beta_1$is significantly different from zero for each year, then the evidence shows the existence of audit fee premium and the amount of premium for each year. The

changes of β_1 is test for significant level. The changes of β_1 from year to year indicate an increase or decrease in audit fee premium. In short, the hypotheses are as follow:

H3.1: $\beta_1 \neq \emptyset$

H3.2: $\Delta\beta_1 = 0$

It is worth noting that Clatworthy, Makepeace and Peel (2009) point out a potential bias of the matching model. The matching process assumes that unobservable auditee characteristics are unimportant. If the unobservable characteristics determine the audit fees and choices of auditors, then the semi-parametric model can be biased. They argue that the matching method is an appropriate method because it addresses the robustness of the Big Four premium. Furthermore, the determinants of auditor choices and the effect of unobservable characteristics still need further researches. So the matching method is still considered as a better method for current study of audit fee premium.

3.2 Data

As Clatworthy, Makepeace and Peel (2009) and Chaney, Jeter, and Shivakumar (2004) suggest, auditee size, complexity and risks impact both audit fees and the choice of auditors. In this study, the natural log of total asset (LNASSET) is used to measure the auditee size. Corporations that have larger size pay much higher audit fees. Two variables are included to capture auditee complexity: the square root of subsidiaries (SQSUB) and the percentage of total assets that are foreign based (FOREIGN). If companies have more subsidiaries and foreign asset, the complexity of the business should increase accordingly. Complex and large size companies require larger audit engagement team and more audit effort. Auditors need to spend more time to collect sufficient evidence, conduct test of

controls and substantive procedures in order to issue an opinion. The whole audit process is more time-consuming and thus increases the audit fees.

The third group of variables is designed to measure the risks of the companies. These variables include Return on investment (ROI), debt to asset ratio (DEBT), current asset ratio (CURRENT) and loss (LOSS). ROI is expected to be negatively related to the audit fees. ROI is the ratio of net income before tax to total assets. High ROI indicate high profitability and operational efficiency, which are expected to have fewer risks, reducing the audit fees. CURRENT, DEBT and LOSS are expected to be positively correlated to audit fees. CURRENT in this model is the percentage current asset of total assets. Current assets are crucial to meet debt obligations and financial needs. In auditing, current assets such as accounts receivables, inventory and cash are always considered as high risk accounts and require substantive testing. In the study, LOSS is a dummy variable to indicate whether the companies incur loss or not. Companies reporting a net loss are exposed to higher operation risk and pressure. DEBT concerns the percentage of long-term debt in terms of total assets. Companies which carry a larger percentage of debt, are exposed to higher burden of paying interest and meeting debt covenants, resulting in higher possibilities of financial distress. This can add more risks to the company. If a company is more risky, auditors should spend more effort and time reviewing the company's financial condition in order to gather sufficient evidences to support their audit opinions, resulting in higher audit fees. All data are obtained from Compustat.

3.3 Descriptive Statistics

The descriptive statistics of audit fees and market share of big accounting firms are

shown in Figure 1. Figure 1 shows the percentage (left scale) of Big four and non-Big Four clients from 2000 to 2014 and the amount of audit fees they pay (right scale) for each year. In 2000, 90% of public companies were Big Four clients. The difference of audit fees charged by the Big Four accounting firms and non-Big Four accounting firms was at its minimum level in 2000 since the 21st century. After the demise of Arthur Anderson and the enact of the Sarbanes-Oxley Act in 2002, the market share of the top four accounting firms dropped substantially to 84% in 2003. The Big Four encountered the lowest market control of public clients in 2007. In 2007, 70% of the public companies chose the Big Four and the rest 30% used non-big four as their auditors. After 2007, the Big Four slightly captured more clients. However, they are only able to increase their market share to 78%.

Consistent with previous researches, the audit fees charged by accounting firms increased immediately after the Sarbanes-Oxley Act. The increased fees can be explained by the new requirements and additional responsibilities of the auditors. The auditors need to conduct more procedures such as internal control evaluations and closely cooperate with the audit committees, in accordance with the new regulations. Both the Big Four and non-Big Four accounting firms increased their audit fees significantly after 2002. In 2003, the big Four increased fees by 178% and the non-Big Four charge 138% more fees than the previous year. After 2004, the non-Big Four auditors either increased their fees more than or almost equivalent to the fee increases of the Big Four auditors. Although the proportional increases of fees were not substantially different between the Big Four and non-Big Four auditors, Big Four gradually charged much higher fees due to the original large basis of audit fees. In 2000, the Big Four auditors charged about four times more fees than the non-Big Four auditors. And the fee difference increased to 8.3 times in 2004 and

stabilize around seven times after 2004. Due to the increasing differences in total audit fees charged by the Big Four and non-Big Four accounting firms, the Big Four have continued to lose their clients while the non-big four have been able to attract more customers. Since 2006, the Big Four tried to stabilize their audit fees and even slightly decreased their fees to prevent losing more clients and to regain the market control. Despite the effort, the Big Four were no longer able to reach the same market control level as they had before 2002.

Table 1 presents descriptive statistics of firm characteristics and variables used in the models. Consistent with the findings of prior studies (such as Clatworthy, Makepeace and Peel,2009 and Huang, Liu, Raghunanda and Rama, 2007), the Big Four clients pay a significantly higher audit fees after the Sarbanes Oxley Act. On average, the Big Four clients pay more than $2 million while the non-big four clients pay about $335,000 fees. The differences in the audit fees are largely supported by the auditees' size difference. The big four clients are significantly larger in terms of total assets, sales and net income. The non-big four clients on average have $272 million total assets. The Big Four clients have about $6 billion total assets, which are more than twenty times larger than the non-big four clients. From year to year, the size differences between the Big Four clients and non-Big Four clients varies. The Big Four clients are 39 times larger than the non-Big Four clients in term of the total assets in 2005. In 2014, the size difference is at the minimum level where the Big Four only have 14 times more assets than the non-Big Four clients. The Big Four clients generate more than $4 billion sales annually, which is also about 20 times more than the non-big four clients. The sale volume difference between the Big Four clients and non-Big Four clients varies between 11 times in 2014 and 34 times in 2006. Furthermore, the Big Four clients report $251 million net incomes on average, which is

about fifty-six times more than the net income reported by the non-big four clients. The net incomes difference between Big Four clients and non-Big Four clients varies significantly from year to year. In 2002, the Big Four clients on average incurred about $26 million net losses while the non-Big Four clients generate about $3 million net incomes on average. In contrast, the Big Four clients generate about $354 million incomes in 2006, which is more than 3200 times more than the incomes of non-Big Four clients.

Besides the size difference, the Big Four clients also carry more debt (DEBT), show less probability to incur losses (LOSS), report larger amount of net incomes, own more subsidiaries (SQSUB) and have higher return on investment (ROI). On average, the Big Four clients borrow 7% more long-term debt to total assets than the non-big four clients. The debt level difference varies between 1% and 10% from year to year. More than half of the non-big four clients report losses while about 37% of Big Four clients incur loss on average. For all the years from 2000 to 2014, more non-Big Four clients incur losses. In 2001, only 3% more non-Big Four clients claim losses while 28% more non-Big Four clients report losses in 2014. On the other hand, the non-big four clients have higher rate of current assets to total assets (CURRENT), sales to total assets (SALEAT), and more foreign assets to total asset (FOREIGN). On average, the non-Big Four clients have 8% more CURRENT assets than the Big Four clients. The percentage difference in Current vary between 3% in 2000 and 10% in 2006. For all the years, the non-Big Four clients have about 14% more SALEAT on average than Big Four clients, varying from 8% to 30%. It is important to note that Compustat only have FOREIGN and SQSUB data available after 2007. So these two variables are not included in the three models to estimate the audit fee premium. Overall, the descriptive statistics shows a mixed result of the risk and complexity

characteristic of the Big-Four and non-big four clients. The Big Four clients are not necessary riskier or more complex than the non-big four clients[1].

[1] The median and mean of each variable are significantly different, suggesting the sample is skewed. Wilcoxon signed-rank test are implemented to test the median of each variable between Big Four and non-Big Four clients. As is shown in table 1, the median of each variable is statistically different between Big Four and non-Big Four clients.

Chapter 4 Empirical Results

This study focuses on the existence and change of the Big Four audit fee premium among the publicly traded U.S. companies from 2000 to 2014. The hypotheses are that (a) the audit fee premium exists and (b) the fee premium declines over time. Three models are used for the hypothesis testing: (a) the ordinary least square (OLS) regression model, (b) the Two Stage Heckman self-selection model and (c) the semi-parametric matching model. This chapter discusses the results of the three models.

4.1 Results from OLS Regression Model

The most widely adopted model in audit fee research is an OLS regression model. The OLS regression model relates audit fees to a dummy variable of whether firms use Big Four as their auditor (Big4), while controlling for firm characteristics. The slope of Big4 dummy variable (β_1) indicates the premium or discount of Big Four audit fees. Positive $\beta_1$indicates an audit fee premium of Big Four while negative $\beta_1$implies that the Big Four auditors offer discounts compared with non-Big Four competitors.

Table 2 presents the results of the first model. For all observations, the audit fee premium is proven to exist. The Big4 coefficient (0.09) indicates a 9.39% audit fee premium on average from 2000 to 2014.[1] From year to year, the slope coefficient of Big4 is significantly positive for all years except 2000 and 2001. The coefficient ranges from the lowest of 0.07 in 2002 to the highest of 0.43 in 2008. This indicates the premium between 7.18% and 53.65% over the period of 2000 to 2014. The coefficients for both 2000 and

[1]The natural log of the audit fee is used in the regression model. The audit fee is the anti-natural log of the slope coefficient β_1 and the audit fee premium is the difference in audit fee between Big 4 and non-Big 4. For example, the overall coefficient in model 1 is 0.09; therefore the audit fee for Big4 is $e^{0.08}$ or 1.0939, while the audit fee for non-Big4 is $e^{0.00}$ or 1. The audit fee premium is calculated as follow: 1.0939 – 1 = 0.939 = 9.39%.

2001 are insignificant. The findings of premium from 2002-2014 support the first hypothesis that a significant audit fee difference exists between Big Four and non-Big Four clients. That is, Big Four auditors charge significantly higher fees than their non-Big Four counterparts. These findings are consistent with the findings of prior studies such as Francis and Simon (1987) and Ebrahim (2010) for samples of U.S. firms.[2]

In term of changes of audit fee premium, the fee premium has changed substantially from year to year. In 2000, the Big Four accounting firms offered a 4.63% audit fee discount (β_1 = -0.05), and then charged a slightly higher premium (5.15% and 7.18%) in 2001 and 2002. The premium rose significantly after the Sarbanes-Oxley Act was implemented in 2002. The premium increased to the highest of 53.65% in 2008, and then declined slightly after that. Although the premium fluctuated after 2008, the Big Four auditors have continued to charge 35% higher fees than the non-Big Four auditors. These findings do not support the second hypothesis that the audit fee premium declines over time due to efficiency of auditors. The results indicate that the SOX Act clearly has raised the audit fee premium to a high level above 35%. Although a slight premium decline is observed after 2008, there is still no convincing sign of fee premium decline in long run.

These findings of overall fee increase are consistent with the findings of Francis and Simon (1987) and Ebrahim (2010) who present a sharp increase of fee premium in 2004. However, these findings are not consistent with the conclusion of Ebrahim. Ebrahim finds that the fee decreases in 2005 and 2006; so he concludes that the fee premium starts to decline after both clients and auditors have developed necessary procedures to comply with SOX act and adapt to the changes. Because his sample period ends 2006, it is difficult

[2] Francis and Simon (1987) examine a sample of 220 small public U.S. companies and conclude the existence of audit fee premium. Ebrahim (2010) studies public U.S. companies with 32,253 observations from 2000 to 2006. He find that the audit fee premium range from 6.72% in 2000 to 23.99% in 2004.

to generalize his findings after 2006. The results of this study show that the premium does not decline after 2006; it increases and stabilizes after that.

Most of the other variables in the regression are statistically significantly for each year. The sign of the coefficient of each variable is consistent with the predictions. ROI is negatively correlated to audit fees while all other variables such as LNASSET, LOSS, CURRENT, and DEBT are positively related to audit fees. A positive coefficient of Inasset indicates a positive correlation between total assets and the audit fee. Companies that incur more loss, have more current assets and carry more debt pay higher audit fees. While a negative coefficient for ROI implies that firms with higher profitability pay less audit fees.

It is also important to note that the OLS regression model in this study has an overall adjusted R^2 of 71%. This suggests that the model explain 71% of the variation in the audit fees. From year to year, the adjusted R^2 ranges from the lowest of 65% in 2000 to the highest of 79% in 2011. Francis and Simon (1987) report a 61% adjusted R^2 for their overall sample with the range of 57% and 63%. The adjusted R^2 in this study is higher than adjusted R^2 reported by Francis and Simon (1987). Two earlier studies conducted by Huang, Liu, Raghunandan and Rama (2007), and Clatworthy, Makepeace and Peel (2009) report a 78% adjusted R^2. Compared with their result, a 71% of adjusted R^2 is slightly lower but still comparable. A possible explanation for the slightly lower adjusted R^2 in this study is the inclusion of fewer control variables. The number of subsidiaries and foreign assets are excluded from the model in this study because the data are missing especially in years before 2007. The number of subsidiaries and foreign assets are used to capture the complexity of auditees' characteristics. As a result, the regression models in this study are limited to estimating the impact of complexity of clients on the audit fee premium.

However, since this study focuses on the long-term effect of the SOX act and the changes in audit fee premium for a long time period. The limitation of two missing variables should not affect the conclusion of this study especially the changes in audit fee premium. If the bias exists, it should appear in the audit fee premium every year. The change of audit fee premium should minimize the bias[3].

The findings of the changes of audit fee premium in an extensive time period provide a broader view of the U.S. audit market. The implications of the results support the dominant power of the Big Four auditors. The audit fee premium reflects the market power of the Big Four. The Big Four has the power to charge a higher fee to the clients. Since the Sarbanes-Oxley act, the Big 4 has charged significantly more audit fees than the non-big 4 competitors and has maintained a high fee premium of above 35% ever since. As the Big Four continuously increases their fee premium, it is expected that they will lose some of the market share to the non-big four competitors. However, the evidence suggests otherwise; Big Four auditors can still maintain a market control of 70% public clients, showing a dominant power. It has been more than 10 years after the SOX act. Both auditors and clients has well adapted to the compliance and regulations. The Big Four auditors are still more favorable. Clearly, there are other factors such as reputation that affect clients' evaluation of Big Four auditors,and the other factors empower the Big Four to charge higher premium while maintaining almost all of their clients.

As discussed in Chapter 3, the OLS regression ignores the impact of self-selection

[3] To address this potential bias of the result, an OLS regression model includes number of subsidiaries and foreign assets are tested only with the sample period after 2007. Although the data of these two variables are available for years after 2007, the availability of the data is still limited. A large amount of missing data causes the number of observations used the regression model dropped significantly to less than 150 for each year. The results find that the fee premium is still significantly different from zero. As a result, adding number of subsidiaries and foreign assets to the OLS regression model also support the existence of fee premium.

of auditors. The client preference over Big Four auditors may explain part of the audit fee premium. As a result, two stage Heckman Self-selection model is implemented and the results are discussed in section 4.2.

4.2 Results Adjusted with Two Stage Heckman Self-selection Model

The results from the OLS regression model reject the second hypothesis that the audit fee premium decreases and stabilizes in the long run after the Sarbanes-Oxley Act was enacted. The results show the increasing audit fee difference between Big Four and non-Big four clients. However, the descriptive statistics in chapter 3 raise the caution of the OLS regression model. Size, complexity and risk distinctions suggest a systematic difference between Big Four and non-Big Four clients. Specifically, the Big Four clients are significantly larger in terms of total assets, sales and net income. The two client groups also show difference in risk and complexity characteristics. The Big Four clients carry more debt, are less likely to incur losses, own more subsidiaries and report higher return on investment. On the other hand, non-Big Four clients have higher percentage of current assets, sales, and foreign assets to total asset. Such difference in company characteristics largely impacts the choice of auditors. As discussed in Chapter 3, it is possible that larger or more complex or riskier clients favor Big Four auditors because of industry expertise and sufficient resources. The OLS regression model might fail to address this concern and the result could be biased.

The two-stage Heckman self-selection model is used to address the client's self-selection bias of the auditors. This model adds an additional step to estimate the probability of a client to choose a Big Four auditor. The probability is incorporated as an

additional variable in the second step to estimate a predicted audit fee a client need to pay based on its characteristics. The difference between an actual fee the client paid and the predicted fee indicates the existence and amount of audit fee premium.

The initial probit model is modified to ensure the variables in the model significantly impact the likelihood of choosing Big Four auditors. DEBT and ROI are dropped from the initial probit model and sales in terms of total assets (SALEAT) is added in the model. The *p*-values of DEBT and ROI in the probit model are above 0.4. This suggests that the two variables do not significantly impact the selection of auditors. To avoid collinearity issue results from the shared variables in both probit and regression model, sales is added to the probit model as an additional variable. In predicting the auditor's choice, all of the variables are significant in every year of the sample except LOSS in certain years.

The regression results of the Heckman model for non-Big Four client group are reported in Panel A of Table 3 and the results for Big Four client group are reported in Panel B of Table 3. All the variables are significant in every year except DEBT. The coefficients of the Mills ratio ($\beta_1 \; and \; \gamma_1$) are significantly different from zero. This indicates that the auditor choice has a large impact on the audit fees.

Panel C of Table 3 reports the audit fee difference between the predicted value and the actual fee paid. The positive fee difference indicates that auditees paid more than they would have paid if they chose the other type of auditors. For Big Four clients, a positive fee difference shows that they paid more to Big Four auditors than they would have to pay if they choose non-Big Four auditors. In other words, Big Four clients pay a fee premium. On the other hand, a positive fee difference for non-Big Four clients implies a fee discount.

Non-Big Four clients are predicted to pay less fees if they would have switched to Big Four auditors. The results in Table 4 show that, for both client groups, a large positive fee difference is observed in all years. For Big Four clients, the audit fee differences range from $138,892 in 2000 to $556,184 in 2004. The audit fee differences for non-Big Four clients range from $22,061 in 2000 to $83,583 in 2006. The results suggest both client groups can pay less audit fees if they switch to the alternative auditor group.

Because this study finds positive fee differences for both Big Four and non-Big Four auditees, the existence of an audit fee premium is not consistent in two client groups. For the Big Four client group, an audit fee premium is found, ranging from 16.9% in 2014 to 36.0% in 2003. The premium reaches to its peak in 2003, which is immediately after the Sarbanes-Oxley Act, and gradually decreases over time. For the non-Big Four client group, the Big Four fee discount is reported, ranging from 8.6% in 2014 to 36% in 2003. The fee discount observed among the non-Big Four sub-sample might suggest Big Four auditor efficiency. The Big Four auditors have more integrated resources and industry expertise to quickly adapt to the new regulations after the Sarbanes-Oxley Act. They can complete audit procedure for clients more efficiently than non-Big Four competitors, thus reducing the audit fee. The hypothesis of the existence of audit fee premium is rejected based on the results in Table 3. However, for both client groups, the audit fee difference as a percentage of the predicted fees has decreased over time. This indicates the fee gap between two types of auditors reduces over time.

There are three limitations of the Heckman model. The first limitation is the incorrect classification of auditor choice. The probit model predicts the possibility of choosing a Big Four auditor and reporting in the mills ratio. This study uses 50% as the

cut-off criteria to assess the correctness of auditor choice classification. If the Mills ratio is larger than 50%, the client will use a Big Four auditor. Based on the 50% cut-off, the probit model classifies less than 20% of the auditor choice accurately. The inaccuracy is obvious especially when compared with classification accuracy of 68.5% reported by Chaney, Jeter, and Shivakumar (2004). The inaccuracy of the probit model in this study may cause biased results of audit premium. The inaccurate prediction of auditor choice can be caused by several reasons. One reason is the design of the probit model. The variables used in the model may not be sufficient enough to predict selection of auditors. Future studies many add more variables to the probit model to improve the accuracy of auditor choice prediction. Another reason of the inaccuracy prediction may be clients' preference. Auditor choices may not simply based on clients' characteristics. Clients may have strong self-preferences or bias that cannot be quantified by the probit model.

The second limitation is the collinearity between the selection variables and other variables in the regression model. The probit model and the regression model share the same three variables: LNASSET, CURRENT and LOSS. The Mills ratio captures the effect of these variables on auditor choice. Yet these three variables are used again in the regression equation to determine audit fee. Although the two equations are not exactly the same, collinearity can cause problems of the final fee premium results.

The third limitation of this model is the lack of adequate counterfactuals. For extreme large auditees, they no longer face the choice between a Big Four auditor and a non-Big Four auditor. They automatically use a Big Four auditor. For these Big Four auditees, there are no non-Big Four counter auditees in the market can share the similar characteristics with them. The lack of counterfactuals also decreases the accuracy of the

results from the Hackman model.

Because of the mixed results in the Heckman model and the limitations of the model, a matching model is adopted in the next section. The matching model does not require a probit model and eliminates the lack of counterfactuals and collinearity issues. The matching model results are discussed in the following section.

4.3 Results Adjusted with Semi-parametric Matching Model

Similar to the Heckman model, semi-parametric matching model can also be used to mitigate the systematic differences between Big Four and non-Big Four clients. In the sample, the number of Big Four clients is about three times the number of non-Big Four clients. The number of Big Four observations might dominate the results of OLS Regression and Heckman models. The matching model makes the number of observations for both Big Four and non-Big Four clients equal. As discussed in Chapter 3, Big Four and non-Big Four samples are matched based on total assets (LNASSET). After matching, the same regression as in Section 4.1 is run. Like the OLS regression model, the slope of Big4 dummy variable (β_1) indicates the premium or discount of Big 4 audit fees.

Panel A of Table 3 presents the results of the model based on LNASSET matching. The number of observations increases to 73,984. For all years except 2001, the slope of Big4 (β_1) is significantly different from zero. The Big4 coefficient (0.22) indicates a 24.66% audit fee premium on average from 2000 to 2014. From year to year, the slope coefficient of Big4 is significantly positive for all years except 2000 and 2001. The coefficient ranges from the lowest of 0.05 in 2003 to the highest of 0.87 in 2007. This indicates the premium between 5.11% and 139.82% over the period of 2000 to 2014. These findings suggest a 15.27% higher fee premium than the result from the OLS regression

model. The overall adjusted R^2 of model based on asset matching is 73%, ranging from 70% in 2000 to 86% in 2014. There is no clear pattern of the fee premium changes with the largest sudden decrease of about 70% premium in 2009 and largest sudden increase of about 100% premium in 2007.The extreme changes of the fee premium over the period of time raise some concern of the matching procedure.

As a robustness check, two alternative matching procedures are used: ROI matching and two variables matching. Overall, the results of both matching models are similar to the results of size matching model. The results based on ROI matching are presented in Panel B of Table 3. The number of observations is 74,094. The regression results suggest a 24.61% ($\beta_1 = 0.22$) overall premium, with the range of 6.3% ($\beta_1 = 0.06$) in 2003 and 82.21% ($\beta_1 = 0.6$) in 2011. Panel C of Table 3 reports the regression results based on both LNASSET and ROI matching. The number of observations is 31,802, lower than the number of observations of the other two matching models due to more restriction of the matching criteria. The Big Four coefficient ($\beta_1 = 0.26$) indicates a 29.45%, varying from 0.31% in 2000 to 51.36% in 2008. As the two variables matching produces the closest matched pairs, a trend of premium changes is observed. The trend of fee premium changes is consistent with the OLS regression model. The premium increases about 20% immediately after the Sarbanes-Oxley Act and continues to increase until it reaches its peak at 51.36% in 2008. The matching model based on LNASSET and ROI better mitigates the systematic difference between Big Four and non-Big Four clients. The results from the matching model suggest a 29.45% fee premium, which is about 20% higher than the OLS regression model. The findings from the two-variable matching model also reject the second hypothesis that the fee premium declines over time.

The matching model results and the OLS regression results are consistent with the prior findings reported by Clatworthy, Makepeace, and Peel (2009). Clatworthy, Makepeace, and Peel find a Big Four premium of 31.3%, ranging from 26.7% to 36.2% with the matching model. This result is similar to the finding of fee premium (31%) found in the OLS regression model. In this study, from year to year the OLS regression model and the semi-parametric matching model indicate similar amounts of fee premiums for each year and the change of the fee premium shows the same patterns for both models. The overall fee premium from the matching model is 20% higher than OLS regression model. The difference is driven by the higher fee premium observed in certain years. The fee premiums are higher in 2008 (51.36%) and 2013 (50.05%) than other years. The matching model only includes comparable pairs of Big Four and non-Big Four clients. Each pair of clients has higher impact on the overall audit fee premium. As a result, the overall fee premium can be largely impacted by the years with high fee premium such as 51.36% fee premium in 2008.

The matching process addresses the limitation of lack of counterfactuals issues in the Heckman model. It only includes Big Four and non-Big Four clients with comparable firm characteristics in the final sample. However, excluding too many companies due to a closest match restriction may be a limitation of the matching model. In some cases, non-Big Four clients are paired 70 times with different Big Four clients due to the restriction to find the closest match. A majority of non-Big Four clients are excluded in the final observations for the regression model because their characteristics are different from Big Four clients.

Compared with the OLS regression and the Heckman model, the semi-parametric

matching model better addresses the systematic difference between client groups and show fewer limitations of the model itself. The results from the semi-parametric model support the first hypothesis: the audit fee premium exists, while reject the second hypothesis: the fee premium decreases over time. An overall audit fee premium of 29.45% should raise the attention of the market, especially the auditees' attention. The study focuses on the existence and change of the fee premium but does not examine the reason of the fee premium. The Big Four fee premium can be caused by industry expertise, valuable service, brand differentiation, client preference or market dominance. Future research is needed to analyze the factors that contribute to the fee premium to determine if Big Four market control impedes competition. There is no doubt that auditees need to be aware of the premium. Auditees need to weigh the benefits and costs of using a Big Four auditor based on the company's strategy. A 22.75% audit fee saving can be allocated to other projects to create more value for the auditees. [4]

[4] Assume a Big Four client currently pay 129% of audit fees, the client would have paid 100% of fee if choosing a non-Big Four auditor. The fee savings will be (129%-100%)/129%=22.75%

Chapter 5 Conclusion

This study examines the audit market pricing by testing whether large accounting firms charge significantly higher auditing fee to public U.S. clients. The higher audit fee is known as audit fee premium. Specifically, the study focuses on the long-term effect of Sarbanes-Oxley Act (SOX) on audit fee and the changes of fee premium from 2000 to 2014. Sarbanes-Oxley Act aimed to improve audit quality and protect investors from possible frauds. Compliance with the SOX requires auditors to conduct more thorough procedures, spend more time and resources to gather sufficient evidences for auditors' opinion. Consistent with prior studies in the U.S. market such as Huang, Liu, Raghunandan and Rama 2007; Ebrahim 2010, this study finds a positive amount of audit fee premium for all the years. The fee premium has increased significantly immediately after SOX as the Big Four auditors had the advantage of resources and expertise to adjust regulations under SOX. By examining a sample of U.S. public firms from 2000 to 2006, Ebrahim (2010) concludes that the Big Four advantage gradually phase out. This study extends the sample period to 2014 and finds an opposite conclusion: the fee premium has not declined but been increasing over the years after 2006.

This study also analyzes the effect of different audit research models on the fee premium results. Many prior studies of audit fee premium in the U.S. market fail to address the selection bias and systematic difference between the Big Four and non-Big Four clients.[5] Three models are used in the study, including the OLS regression, the Heckman two-stage model and the semi-parametric matching model. The results from both the OLS

[5] Huang, Liu, Raghunandan and Rama (2007) and Ebrahim (2010) only use the OLS regression model to estimate the fee premium. While many UK studies such as McMeeking, Peasnell and Pope (2007) and Chaney, Jeter and Shivakumar (2004) point out the importance of using Heckman model or matching model to address the selection bias.

regression model and the semi-parametric matching model conclude an increasing trend of audit fee premium. The Heckman two-stage self-selection model fails to provide reasonable estimates due to three limitations: collinearity, inaccurate prediction of auditors' choice and lack of similar counterparts. The semi-parametric matching model provides a more reliable estimate of the premium; the model adjusts the systematic difference between Big Four and non-Big Four clients. Based on the semi-parametric model, the average fee premium from 2000 to 2014 is 29.45%, ranging from 0.31% in 2000 to 51.36% in 2008.

This study contributes to the U.S. audit market by examining the long-term effect of Sarbanes-Oxley Act on the audit market. Without an extensive sample period, one may believe that the fee premium gradually decreases as observed in 2005 and 2006 by Ebrahim(2010). However, the decline in premium in 2005 and 2006 is just short-term change. This study finds that the fee premium continues to increase as high as 29.45% in the long run. The 29.45% premium should raise the market's attention. Although SOX was enacted in 2002, it has significantly affected the audit market ever since. The accumulation of client base and experience with SOX compliance immediately after SOX help Big Four auditors to develop advantage over their smaller competitors. The increasing fee premium may suggest clients' preference over large auditors or the dominant market power of the Big Four. Big Four's industry expertise, valuable resources and brand name can all contribute to the fee premium. Whether the fee premium indicates a lack of competition in the audit market needs further research. This paper assists public clients with selection of auditors. Clients should recognize the fee difference and evaluate whether benefits of using Big Four overweigh the fee premium.

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Figure 1 Market Share and Audit Fees

This figure shows market share in percentage (left axis) of the Big Four and non-big four accounting sample firms and average audit fees in dollar amount (right axis) charged by auditors from 2000 to 2014. The sample consist of 47,952 non-financial U.S. public firms with fiscal year-end December 31, audit fee and auditor name available and total assets greater than $5 million.

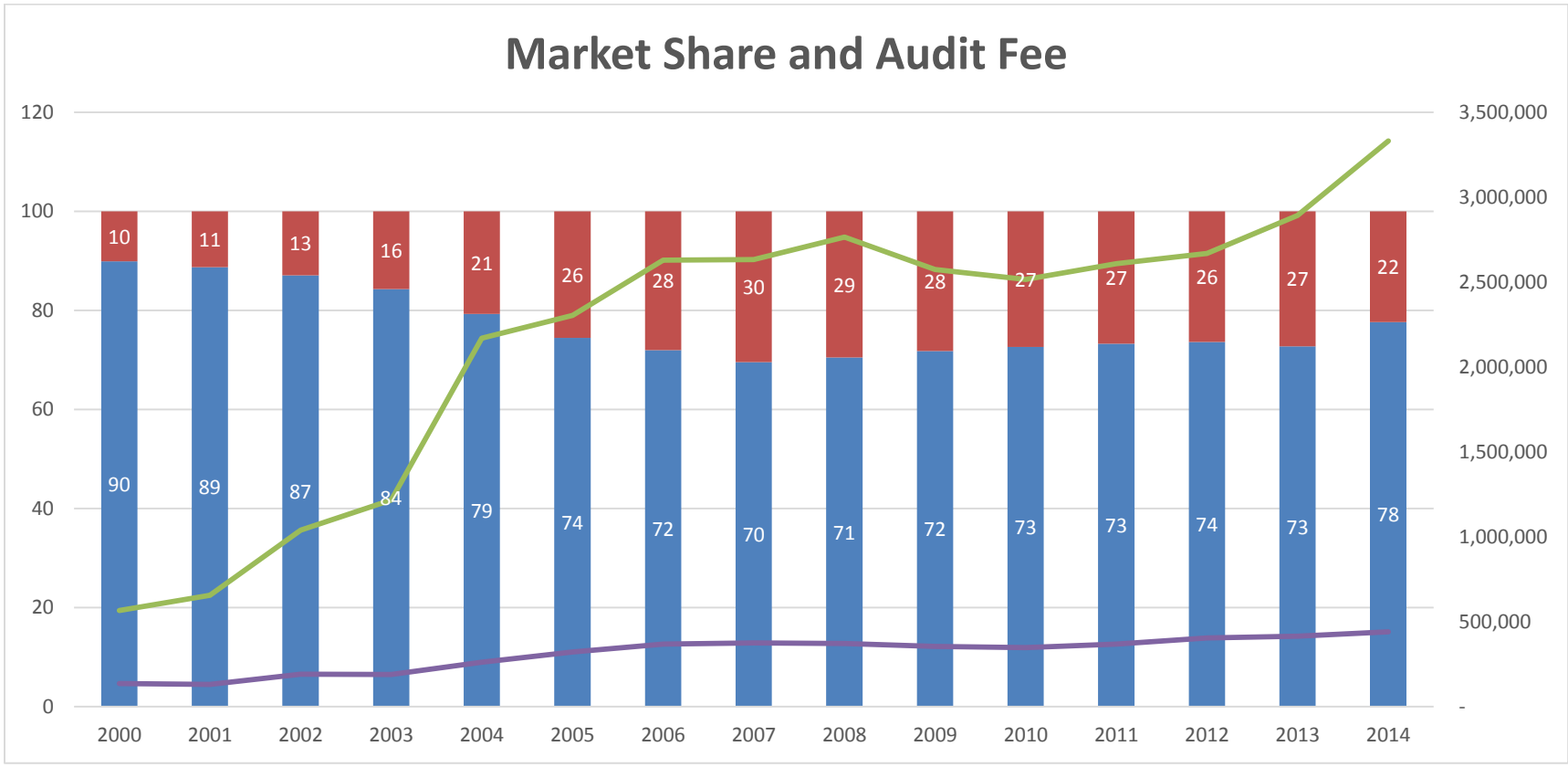

Table 1 Descriptive Statistics

This table reports the descriptive statistics of the sample by year and by the type of auditors. The sample consist of 47,952 non-financial U.S. public firms with fiscal year-end December 31, audit fee and auditor name available and total assets greater than $5 million. Panel A includes audit fees, total assets (AT), debt to total assets (DEBT), sales (Sales) and net incomes (NI) data of both Big Four and non-big four clients. Panel B includes sales to total assets (Sales/AT), current assets to total assets (Current), possibility of loss (Loss), foreign sales to total sales (Foreign), number of subsidiaries (No. Segment) and net incomes to total assets of both Big Four and non-big four clients. All variables are obtained from Compustat. [a], [b], [c] indicate the significant difference between Big 4 and Non-Big 4 at 1%, 5% and 10% level.

Table 1 – cont.

Panel A

YEAR		Audit Fee		AT		Debt		Sales		NI	
		Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4
All	Mean	334,816	2,086,155[a]	272	5,952[a]	15%	22%[a]	203	4,047[a]	4.45	250.50[a]
	Medium	171,000	836,702[a]	44	672[a]	3%	17%[a]	36	501[a]	(0.62)	13[a]
	N	11,280	37,799	11,280	37,799	11,256	37,687	11,234	37,763	11,233	37,760
2000	Mean	136,694	565,716[a]	114	2,611[a]	17%	20%	131	1,841[a]	(1.61)	79.61[a]
	Medium	85,614	201,991[a]	26	230[a]	7%	12%[b]	25	170[a]	(0.30)	1.16[a]
	N	295	2,624	295	2,624	295	2,618	295	2,624	295	2,624
2001	Mean	130,446	656,592[a]	98	2,987[a]	19%	20%	117	2,083[a]	(1.28)	25.60[e]
	Medium	82,000	225,000[a]	23	237[a]	8%	12%[a]	24	189[a]	(0.59)	(1.21)
	N	323	2,550	323	2,550	323	2,543	322	2,550	322	2,550
2002	Mean	191,785	1,039,187[a]	213	3,703[a]	20%	22%[e]	195	2,369[a]	2.62	-25.75[e]
	Medium	85,400	311,925[a]	23	365[a]	8%	16%[a]	22	283[a]	(0.96)	1.07[a]
	N	460	3,108	460	3,108	459	3,102	457	3,104	457	3,104
2003	Mean	189,545	1,217,248[a]	188	4,013[a]	18%	22%	171	2,636[a]	37.23	151.38
	Medium	98,075	403,020[a]	21	413[a]	7%	16%[a]	23	328[a]	(0.81)	6.36[a]
	N	587	3,157	587	3,157	587	3,151	585	3,148	585	3,148
2004	Mean	261,127	2,170,905[a]	175	4,678[a]	15%	21%[a]	154	3,280[a]	(0.83)	210.27[a]
	Medium	122,750	850,828[a]	27	535[a]	4%	16%[a]	24	417[a]	(0.80)	13.73[a]
	N	776	2,974	776	2,974	776	2,967	772	2,971	772	2,971
2005	Mean	321,366	2,304,412[a]	131	5,119[a]	15%	21%[a]	119	3,644[a]	(0.09)	274.35[a]
	Medium	158,500	957,000[a]	34	631[a]	3%	16%[a]	31	506[a]	(0.63)	19.76[a]
	N	946	2,755	946	2,755	945	2,749	941	2,752	941	2,752
2006	Mean	368,490	2,629,730[a]	154	5,721[a]	14%	22%[a]	121	4,066[a]	0.11	353.95[a]
	Medium	182,103	1,102,980[a]	41	726[a]	2%	16%[a]	33	564[a]	(0.48)	26.17[a]
	N	1,034	2,657	1,034	2,657	1,034	2,646	1,030	2,654	1,029	2,654

YEAR		Audit Fee		AT		Debt		Sales		NI	
		Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4
2007	Mean	374,613	2,633,704[a]	252	6,367[a]	14%	22%[a]	143	4,479[a]	(1.22)	372.09[a]
	Medium	206,500	1,199,500[a]	49	822[a]	2%	16%[a]	34	630[a]	(0.52)	24.76[a]
	N	1,081	2,470	1,081	2,470	1,079	2,463	1,071	2,466	1,071	2,464
2008	Mean	372,447	2,766,168[a]	289	6,815[a]	14%	24%[a]	190	5,194[a]	(1.02)	210.71[a]
	Medium	216,649	1,261,600[a]	53	913[a]	2%	19%[a]	48	770[a]	(0.81)	13.84[a]
	N	992	2,371	992	2,371	989	2,362	992	2,371	992	2,370
2009	Mean	355,362	2,574,025[a]	237	7,181[a]	13%	23%[a]	163	4,402[a]	2.21	320.89[a]
	Medium	209,000	1,164,900[a]	54	977[a]	1%	17%[a]	51	654[a]	(0.88)	16.25[a]
	N	927	2,363	927	2,363	922	2,353	926	2,363	926	2,363
2010	Mean	347,284	2,516,675[a]	261	7,667[a]	14%	21%[a]	191	5,013[a]	11.49	390.78[a]
	Medium	203,056	1,150,000[a]	59	1,089[a]	1%	17%[a]	49	723[a]	0.32	31.69[a]
	N	885	2,349	885	2,349	883	2,342	882	2,346	882	2,346
2011	Mean	368,475	2,609,228[a]	318	8,212[a]	13%	22%[a]	233	5,723[a]	9.99	422.16[a]
	Medium	213,975	1,195,650[a]	64	1,172[a]	1%	18%[a]	52	826[a]	0.22	34.80[a]
	N	851	2,333	851	2,333	849	2,323	848	2,333	848	2,333
2012	Mean	404,917	2,668,490[a]	426	8,664[a]	14%	23%[a]	266	5,853[a]	5.09	360.57[a]
	Medium	211,050	1,260,430[a]	57	1,242[a]	2%	19%[a]	43	845[a]	(1.08)	28.93[a]
	N	848	2,367	848	2,367	845	2,358	847	2,364	847	2,364
2013	Mean	414,549	2,893,398[a]	480	9,245[a]	18%	24%[c]	379	6,096[a]	3.10	402.09[a]
	Medium	211,985	1,375,000[a]	61	1,405[a]	4%	20%[a]	39	913[a]	(1.64)	27.80[a]
	N	878	2,343	878	2,343	875	2,336	871	2,340	871	2,340
2014	Mean	440,820	3,331,097[a]	789	10,819[a]	18%	26%[b]	622	6,901[a]	8.02	435.36[a]
	Medium	198,000	1,657,590[a]	59	2,221[a]	4%	24%[a]	38	1,421[a]	(1.31)	66.48[a]
	N	397	1,378	397	1,378	395	1,374	395	1,377	395	1,377

Table 1 – cont.

Panel B

YEAR		SaleAT		Current		ROI		Loss		Foreign		No_Segment	
		Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4
All	Mean	102%	88%[a]	53%	45%[a]	-19%	-6%[a]	54%	37%[a]	75%	53%[a]	4	5[a]
	Median	81%	70%[a]	54%	42%[a]	-2%	3%[a]	100%	0%[a]	46%	40%[a]	4	5[a]
	N	11,234	37,763	11,127	37,032	11,233	37,760	11,280	37,799	2,655	10,269	178	1,962
2000	Mean	119%	96%[b]	53%	50%	-18%	-14%	53%	46%	.	.	.	.
	Median	105%	78%[a]	55%	49%[c]	-2%	1%[a]	100%	0%[b]	.	.	.	.
	N	295	2624	286	2558	295	2624	295	2624	-	-	-	-
2001	Mean	130%	100%[a]	53%	48%[c]	-23%	-23%	55%	52%	.	.	.	.
	Median	109%	79%[a]	56%	47%[a]	-3%	-1%	100%	100%	.	.	.	.
	N	322	2550	317	2488	322	2550	323	2550	-	-	-	-
2002	Mean	120%	93%[a]	49%	45%[c]	-18%	-11%	59%	47%[a]	.	.	.	.
	Median	96%	75%[a]	51%	43%[a]	-5%	1%[a]	100%	0%[a]	.	.	.	.
	N	457	3104	454	3031	457	3104	460	3108	-	-	-	-
2003	Mean	120%	91%[a]	53%	46%[a]	-16%	-4%[a]	59%	39%[a]	.	.	.	.
	Median	94%	74%[a]	54%	44%[a]	-3%	2%[a]	100%	0%[a]	.	.	.	.
	N	585	3148	579	3081	585	3148	587	3157	-	-	-	-
2004	Mean	110%	90%[a]	54%	46%[a]	-19%	-3%[a]	56%	32%[a]	.	.	.	.
	Median	87%	72%[a]	56%	44%[a]	-3%	3%[a]	100%	0%[a]	.	.	.	.
	N	772	2971	760	2913	772	2971	776	2974	-	-	-	-
2005	Mean	106%	90%[a]	55%	46%[a]	-17%	-3%[a]	55%	30%[a]	.	.	.	.
	Median	84%	71%[b]	56%	43%[a]	-2%	4%[a]	100%	0%[a]	.	.	.	.
	N	941	2752	934	2698	941	2752	946	2755	-	-	-	-
2006	Mean	101%	89%[b]	56%	46%[a]	-16%	-1%[a]	53%	29%[a]	.	.	.	.
	Median	80%	71%[b]	57%	43%[a]	-1%	4%[a]	100%	0%[a]	.	.	.	.
	N	1030	2654	1021	2607	1029	2654	1034	2657	-	-	-	-

YEAR		SaleAT		Current		ROI		Loss		Foreign		No_Segment	
		Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4
2007	Mean	95%	84%[b]	54%	45%[a]	-21%	-3%[a]	53%	32%[a]	60%	48%[c]	3	5[a]
	Median	76%	67%[c]	55%	41%[a]	-1%	3%[a]	100%	0%[a]	44%	37%[c]	3	5[a]
	N	1071	2466	1069	2424	1071	2464	1081	2470	300	1221	16	202
2008	Mean	107%	94%[b]	51%	43%[a]	-24%	-9%[b]	54%	41%[a]	76%	57%[a]	3	5[a]
	Median	87%	75%[a]	53%	39%[a]	-2%	2%[a]	100%	0%[a]	53%	44%[a]	3	5[a]
	N	992	2371	981	2329	992	2370	992	2371	355	1272	17	232
2009	Mean	100%	81%[a]	52%	43%[a]	-16%	-4%[a]	55%	37%[a]	73%	52%[c]	4	5[b]
	Median	80%	65%[a]	54%	39%[a]	-2%	2%[a]	100%	0%[a]	45%	40%[a]	4	5[a]
	N	926	2363	916	2325	926	2363	927	2363	415	1392	26	265
2010	Mean	99%	82%[a]	53%	43%[a]	-15%	-1%[a]	48%	30%[a]	100%	54%[e]	4	5
	Median	77%	66%[a]	57%	40%[a]	1%	3%[a]	0%	0%[a]	48%	41%[a]	4	5[a]
	N	882	2346	873	2313	882	2346	885	2349	386	1421	28	270
2011	Mean	96%	86%[c]	52%	43%[a]	-14%	-2%[a]	48%	29%[a]	86%	57%[e]	5	6[d]
	Median	76%	67%[c]	55%	40%[a]	0%	3%[a]	0%	0%[a]	47%	43%[c]	4	5[b]
	N	848	2333	839	2297	848	2333	851	2333	368	1405	28	269
2012	Mean	93%	84%[d]	50%	43%[a]	-22%	-5%[a]	56%	34%[a]	71%	56%[e]	5	6[e]
	Median	70%	64%	52%	39%[a]	-3%	3%[a]	100%	0%[a]	46%	40%[c]	5	5
	N	847	2364	838	2323	847	2364	848	2367	353	1413	25	288
2013	Mean	88%	79%[d]	50%	43%[a]	-21%	-5%[a]	59%	36%[a]	59%	52%[e]	5	5[d]
	Median	63%	61%	51%	40%[a]	-3%	3%[a]	100%	0%[a]	42%	38%	4	5
	N	871	2340	868	2298	871	2340	878	2343	344	1382	27	275
2014	Mean	88%	80%[e]	48%	38%[a]	-24%	-2%[a]	57%	29%[a]	58%	48%[e]	5	5[e]
	Median	61%	60%	46%	34%[a]	-3%	3%[a]	100%	0%[a]	41%	36%	5	5
	N	395	1377	392	1347	395	1377	397	1378	134	763	11	161

Table 2 OLS Regression Model Result

This table reports the OLS regression model results of the sample by year. The sample consists of 47,952 non-financial U.S. public firms with fiscal year-end December 31, audit fee and auditor name available and total assets greater than $5 million. The model is as follow:

$$LNFEE = \alpha + \beta_1 BIG4 + \beta_2 LNASSET + \beta_3 LOSS + \beta_4 SQSUB + \beta_5 FOREIGN + \beta_6 CURRENT + \beta_7 DEBT + \beta_8 ROI + \varepsilon$$

where:

$LNFEE$ = Natural log of audit fee;
BIG4 = A dummy variable taking a value of 1 if the firm is audited by a Big Four accounting firm, 0 otherwise;
LNASSET = Natural log of end of year total assets;
LOSS = A dummy variable taking a value of 1 if the firm incurred a loss in the previous year, 0 otherwise;
SQSUB = Square root of the number of subsidiaries;
FOREIGN= Percentage of total assets that are foreign based;
CURRENT = Current asset divided by total assets;
DEBT = Long-term debt divided by total assets; and
ROI = Return on investment which equals net income before tax divided by total assets.

All variables are obtained from Compustat. [a], [b], [c] indicate the significance level at 1%, 5% and 10% level.

Table 2-cont.

Year	Type	Intercept	BIG4	LNASSET	LOSS	CURRENT	DEBT	ROI	N	Adj R^2	*F* value	*p*-value	Fee Premium
Total	Slope	9.27	0.09	0.57	0.13	0.90	0.08	-0.06	47952	0.7120	19760.9	<.0001	9.39%
	t-statistics	539.57[a]	9.38[a]	265.94[a]	16.35[a]	59.59[a]	6.54[a]	-10.24[a]				.	
2000	Slope	9.55	-0.05	0.48	0.00	0.28	0.03	-0.28	2838	0.6501	879.39	<.0001	-4.63%
	t-statistics	145.75[a]	-1.08	61.38[a]	0.13	5.05[a]	0.65	-9.25[a]	.			.	
2001	Slope	9.48	0.05	0.49	0.13	0.32	-0.11	-0.11	2797	0.7014	1095.44	<.0001	5.15%
	t-statistics	162.04[a]	1.25	68.35[a]	5.12[a]	6.18[a]	-3.01[a]	-7.45[a]	.			.	
2002	Slope	9.08	0.07	0.54	0.15	0.78	0.09	-0.18	3474	0.7064	1393.89	<.0001	7.18%
	t-statistics	156.77[a]	1.79[c]	77.02[a]	5.49[a]	14.44[a]	2.08[b]	-5.78[a]	.			.	
2003	Slope	9.02	0.11	0.55	0.21	0.92	0.19	-0.08	3645	0.7161	1533.1	<.0001	11.18%
	t-statistics	157.01[a]	2.93[a]	76.85[a]	7.91[a]	17.58[a]	4.50[a]	-2.85[a]	.			.	
2004	Slope	9.10	0.34	0.58	0.09	1.00	0.09	-0.25	3661	0.7148	1530.02	<.0001	39.81%
	t-statistics	140.91[a]	8.88[a]	69.95[a]	2.76[a]	17.24[a]	1.58	-6.26[a]	.			.	
2005	Slope	9.35	0.26	0.57	0.14	0.91	0.13	-0.16	3619	0.7180	1536.16	<.0001	29.42%
	t-statistics	148.91[a]	7.44[a]	68.81[a]	4.23[a]	16.24[a]	2.38	-3.99[a]	.			.	
2006	Slope	9.51	0.30	0.56	0.22	0.81	0.04	0.03	3611	0.7267	1600.43	<.0001	35.40%
	t-statistics	152.11[a]	9.09[a]	68.66[a]	7.31[a]	15.03[a]	0.87	2.22	.			.	
2007	Slope	9.55	0.41	0.54	0.20	0.81	0.12	-0.07	3468	0.7399	1644.36	<.0001	50.43%
	t-statistics	156.32[a]	12.67[a]	66.02[a]	6.96[a]	15.76[a]	2.65[a]	-3.21[a]	.			.	
2008	Slope	9.46	0.43	0.54	0.23	0.94	0.13	-0.07	3297	0.7642	1781.78	<.0001	53.65%
	t-statistics	164.02[a]	13.77[a]	70.86[a]	8.89[a]	18.62[a]	3.00[a]	-4.46[a]	.			.	
2009	Slope	9.56	0.36	0.53	0.14	0.89	0.14	-0.06	3225	0.7821	1929.13	<.0001	43.73%
	t-statistics	171.61[a]	12.20[a]	74.12[a]	5.72[a]	18.26[a]	3.06[a]	-2.68[a]	.			.	
2010	Slope	9.58	0.40	0.52	0.15	0.86	0.18	-0.04	3173	0.7833	1911.42	<.0001	49.12%
	t-statistics	170.55[a]	13.40[a]	71.88[a]	5.71[a]	18.09[a]	4.41[a]	-2.14[b]	.			.	
2011	Slope	9.52	0.38	0.52	0.07	0.97	0.18	-0.14	3122	0.7931	1995.1	<.0001	46.21%
	t-statistics	173.18[a]	12.85[a]	74.08[a]	2.60[a]	20.41[a]	3.76[a]	-3.81[a]	.			.	
2012	Slope	9.52	0.31	0.53	0.04	0.93	0.18	-0.16	3146	0.7784	1842.67	<.0001	36.26%
	t-statistics	163.84[a]	9.76[a]	71.88[a]	1.32	18.66[a]	3.58[a]	-5.53[a]	.			.	

2013	Slope	9.54	0.44	0.53	0.11	0.89	0.05	-0.09	3146	0.7803	1862.73	<.0001	55.78%
	t-statistics	161.42[a]	13.85[a]	69.48[a]	3.81[a]	18.22[a]	1.50	-2.74[a]	.			.	
2014	Slope	9.20	0.33	0.57	0.13	1.15	0.01	-0.03	1730	0.7794	1019.37	<.0001	39.71%
	t-statistics	107.31[a]	6.90[a]	52.49[a]	3.13[a]	16.19[a]	0.17	-0.67	.			.	

Table 3 Heckman Two-stage Self-selection Model Regression Result

This table reports the Heckman two-stage self-selection model results of the sample by year. The sample consist of 47952 non-financial U.S. public firms with fiscal year-end December 31, audit fee and auditor name available and total assets greater than $5 million. The probit regression model is as follow:

$$BIG4 = \alpha_1 + \alpha_2 LNASSET + \alpha_3 ROI + \alpha_4 LOSS + \alpha_5 SQSUB + \alpha_6 FOREIGN + \alpha_7 CURRENT + \alpha_8 DEBT + \varepsilon$$

where:
BIG4 = A dummy variable taking a value of 1 if the firm is audited by a Big Four accounting firm, 0 otherwise;
LNASSET = Natural log of end of year total assets;
ROI = Return on investment which equals net income before tax divided by total assets;
LOSS = 1 if the firm incurred a loss in the previous year, 0 otherwise;
SQSUB = Square root of the number of subsidiaries;
FOREIGN= Percentage of total assets that are foreign based;
CURRENT = Current asset divided by total assets; and
DEBT = Long-term debt divided by total assets.
The inverse Mills ratio is calculated as: $\lambda = \frac{\phi(\sum_{n=1}^{n} \alpha_n Z_n)}{\Phi(\sum_{n=1}^{n} \alpha_n Z_n)}$
where ϕ is the normal density function and Φ is the normal distribution function.
The fee premiums are estimated as follow:

$$LNFEE_{BIG4} = \alpha_1 + \beta_1 \lambda_{BIG4} + \beta_2 LNASSET + \beta_3 LOSS + \beta_4 SQSUB + \beta_5 FOREIGN + \beta_6 CURRENT + \beta_7 DEBT + \beta_8 ROI + \varepsilon$$

$$LNFEE_{NON} = \delta_1 + \gamma_1 \lambda_{NON.} + \gamma_2 LNASSET + \gamma_3 LOSS + \gamma_4 SQSUB + \gamma_5 FOREIGN + \gamma_6 CURRENT + \gamma_7 DEBT + \gamma_8 ROI + \varepsilon$$

where:
λ_{BIG4}= The possibility of choosing a Big Four auditor; and
$\lambda_{NON.}$ = The possibility of choosing a non-Big Four auditor.
The other variables are the same as in the probit model.
All variables are obtained from Compustat. a, b, c indicate the significance level at 1%, 5% and 10% level.

Table 3-cont.

Panel A- non-Big Four Client Regression Result

Year	Type	Constant	Mills Ratio	Inasset	Loss	Current	Debt	Roi	N	Adj R^2	F Value	p
2000	Slope	7.91	1.41	0.68	0.35	0.64	-0.19	-0.23	286	47.02%	43.15	<.0001
	t-statistics	14.54[a]	3.42[a]	8.79[a]	3.48[a]	3.50[a]	-1.63	-2.60[a]			.	.
2001	Slope	7.48	1.36	0.73	0.59	0.80	-0.03	-0.09	316	49.80%	53.07	<.0001
	t-statistics	13.22[a]	3.54[a]	8.88[a]	5.80[a]	4.91[a]	-0.43	-1.59			.	.
2002	Slope	7.31	1.33	0.77	0.32	1.10	0.01	-0.16	450	51.07%	79.11	<.0001
	t-statistics	19.55[a]	5.81[a]	14.60[a]	4.28[a]	6.95[a]	0.10	-2.89[a]			.	.
2003	Slope	7.40	1.14	0.79	0.28	0.95	0.08	-0.09	577	49.44%	94.89	<.0001
	t-statistics	22.90[a]	7.10[a]	16.58[a]	4.72[a]	7.32[a]	1.17	-2.12[b]			.	.
2004	Slope	7.51	0.75	0.84	0.23	1.05	-0.04	-0.18	758	54.60%	152.74	<.0001
	t-statistics	20.68[a]	5.16[a]	16.06[a]	3.86[a]	8.39[a]	-0.44	-4.20[a]			.	.
2005	Slope	7.46	0.74	0.86	0.35	0.95	0.02	-0.09	928	50.93%	161.38	<.0001
	t-statistics	16.69[a]	4.49[a]	13.84[a]	6.04[a]	6.99[a]	0.22	-1.46			.	.
2006	Slope	7.09	0.94	0.91	0.41	0.87	0.03	-0.04	1017	47.14%	152	<.0001
	t-statistics	11.83[a]	4.54[a]	11.22[a]	6.64a	5.69a	0.33	-1.64			.	.
2007	Slope	7.34	0.77	0.84	0.48	0.88	0.25	-0.07	1057	45.02%	145.11	<.0001
	t-statistics	13.70[a]	4.59[a]	11.94[a]	7.23[a]	6.36[a]	2.94[a]	-2.41[b]			.	.
2008	Slope	8.50	0.36	0.65	0.46	0.91	0.27	-0.04	978	46.62%	143.21	<.0001
	t-statistics	14.83[a]	1.93	9.03[a]	6.47[a]	5.94[a]	3.29[a]	-2.42[b]			.	.
2009	Slope	7.75	0.69	0.77	0.31	0.98	0.10	-0.12	910	53.69%	176.67	<.0001
	t-statistics	14.93[a]	3.97[a]	11.55[a]	5.61[a]	7.11[a]	1.28	-3.25[a]			.	.
2010	Slope	7.87	0.62	0.74	0.33	0.97	0.20	-0.07	870	55.14%	179.05	<.0001
	t-statistics	16.24[a]	4.12[a]	11.99[a]	5.61[a]	7.15[a]	3.40[a]	-2.27[b]			.	.

2011	Slope	8.41	0.40	0.67	0.19	0.97	0.35	-0.12	835	61.39%	221.99	<.0001
	t-statistics	16.42[a]	2.48[b]	10.55[a]	3.19[a]	6.57[a]	3.91[a]	-2.59[a]			.	.
2012	Slope	8.06	0.57	0.70	0.21	1.16	0.37	-0.12	834	58.53%	196.93	<.0001
	t-statistics	15.38[a]	3.18[a]	11.14[a]	3.52[a]	6.90[a]	3.71[a]	-3.29[a]			.	.
2013	Slope	7.84	0.65	0.74	0.19	1.12	0.02	-0.04	858	61.31%	227.38	<.0001
	t-statistics	16.70[a]	4.22[a]	13.39[a]	3.27[a]	7.28[a]	0.59	-0.91			.	.
2014	Slope	7.49	0.72	0.79	0.20	1.28	-0.36	-0.10	388	62.25%	107.36	<.0001
	t-statistics	11.96[a]	3.57[a]	10.76[a]	2.43[b]	5.42[a]	-4.53[a]	-1.68			.	.

Table 3– cont.

Panel B-Big Four Client Regression Result

Year	Type	Constant	Mills Ratio	Inasset	Loss	Current	Debt	Roi	N	Adj R^2	F Value	p
2000	Slope	8.20	1.68	0.63	0.11	0.63	0.11	-0.23	2552	65.47%	807.14	<.0001
	t-statistics	64.33[a]	11.89[a]	43.34[a]	3.48[a]	9.75[a]	1.88	-7.46[a]			.	.
2001	Slope	8.23	1.66	0.64	0.25	0.60	-0.13	-0.08	2481	70.29%	978.85	<.0001
	t-statistics	72.50[a]	13.89[a]	49.44[a]	8.78[a]	10.22[a]	-3.47[a]	-5.16[a]			.	.
2002	Slope	7.43	1.87	0.72	0.19	1.37	0.21	-0.13	3024	70.48%	1204	<.0001
	t-statistics	62.85[a]	16.59[a]	56.37[a]	6.69[a]	20.71[a]	3.97[a]	-3.70[a]			.	.
2003	Slope	7.65	1.33	0.71	0.22	1.44	0.32	-0.02	3068	69.81%	1183.06	<.0001
	t-statistics	67.05[a]	14.14[a]	56.46[a]	7.50[a]	22.70[a]	6.20[a]	-0.46			.	.
2004	Slope	9.13	0.16	0.61	0.03	1.21	0.17	-0.37	2903	62.79%	817.19	<.0001
	t-statistics	63.63[a]	1.57	39.48[a]	0.82	15.83[a]	2.49[b]	-4.74[a]			.	.
2005	Slope	9.10	0.29	0.61	0.06	1.21	0.23	-0.17	2691	64.17%	804.04	<.0001
	t-statistics	60.68[a]	3.16[a]	38.27[a]	1.51	16.30[a]	3.53[a]	-3.03[a]			.	.
2006	Slope	8.97	0.41	0.64	0.16	1.23	0.08	0.06	2594	66.47%	857.71	<.0001
	t-statistics	57.80[a]	4.66[a]	38.51[a]	4.59[a]	17.63[a]	1.51	3.98[a]			.	.
2007	Slope	8.99	0.48	0.63	0.17	1.24	0.13	-0.03	2411	67.15%	821.9	<.0001
	t-statistics	56.61[a]	5.67[a]	38.00[a]	4.58[a]	18.61[a]	2.46[b]	-0.54			.	.
2008	Slope	8.99	0.46	0.63	0.17	1.28	0.11	-0.16	2319	70.07%	905.27	<.0001
	t-statistics	56.72[a]	5.34[a]	39.00[a]	4.95[a]	19.04[a]	2.20[c]	-3.42[a]			.	.
2009	Slope	8.97	0.50	0.62	0.15	1.26	0.20	0.03	2315	71.44%	965.85	<.0001
	t-statistics	61.13[a]	6.17[a]	40.94[a]	5.03[a]	19.70[a]	3.82[a]	0.95			.	.
2010	Slope	8.88	0.59	0.63	0.17	1.22	0.16	-0.01	2303	70.67%	925.38	<.0001
	t-statistics	61.29[a]	7.60[a]	41.99[a]	5.37[a]	19.12[a]	2.85[a]	-0.67			.	.

2011	Slope	8.93	0.54	0.62	0.10	1.31	0.18	-0.11	2287	71.19%	942.59	<.0001
	t-statistics	60.02[a]	6.60[a]	41.23[a]	2.73[b]	20.31[a]	3.32[a]	-1.98			.	.
2012	Slope	8.95	0.47	0.62	0.03	1.28	0.18	-0.12	2312	70.59%	925.51	<.0001
	t-statistics	53.54[a]	5.00[a]	37.45[a]	0.81	17.65[a]	3.08[a]	-2.55[b]			.	.
2013	Slope	8.77	0.63	0.63	0.13	1.34	0.20	-0.11	2288	68.22%	819.29	<.0001
	t-statistics	50.98[a]	6.65[a]	37.71[a]	3.89[a]	18.37[a]	3.26[a]	-2.05[c]			.	.
2014	Slope	8.22	0.67	0.67	0.13	1.81	0.54	0.11	1342	70.41%	532.81	<.0001
	t-statistics	38.50[a]	5.15[a]	32.07[a]	2.56[b]	18.98[a]	6.83[a]	1.11[c]			.	.

Table 3– cont.

Panel C-Fee Difference Result

YEAR	N		Predicted Fees		Average Fee Difference		Fee Difference %		Median Fee Difference		t-statistics	
	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4	Nbig 4	Big 4
2000	286	2552	113,258	406,310	24,329	138,893	21.5%	34.2%	-3,151	1,790	2.37[b]	5.49[a]
2001	316	2481	108,573	492,265	22,061	145,818	20.3%	29.6%	970	1,266	2.09[b]	6.57[a]
2002	450	3024	141,853	745,100	51,042	267,873	36.0%	36.0%	2,125	2,349	2.51[b]	5.12[a]
2003	577	3068	159,418	912,034	30,621	282,334	19.2%	31.0%	-1,063	5,670	2.76[a]	8.33[a]
2004	758	2903	223,463	1,561,855	37,211	556,185	16.7%	35.6%	-534	41,181	2.31[b]	9.24[a]
2005	928	2691	256,477	1,717,595	64,865	528,265	25.3%	30.8%	1,469	35,477	5.95[a]	8.64[a]
2006	1017	2594	283,860	2,038,504	83,583	539,003	29.4%	26.4%	2,193	38,384	6.53[a]	8.80[a]
2007	1057	2411	302,741	2,113,809	65,755	470,262	21.7%	22.2%	11,488	37,214	2.75[a]	8.43[a]
2008	978	2319	296,540	2,213,714	71,361	478,764	24.1%	21.6%	14,041	34,187	5.21[a]	8.04[a]
2009	910	2315	293,737	2,082,367	56,987	435,363	19.4%	20.9%	8,227	38,932	5.10[a]	7.87[a]
2010	870	2303	284,587	2,051,976	56,398	398,815	19.8%	19.4%	4,695	26,093	4.48[a]	8.02[a]
2011	835	2287	310,642	2,129,955	52,455	416,045	16.9%	19.5%	2,893	34,833	4.33[a]	8.01[a]
2012	834	2312	324,720	2,206,322	66,882	418,338	20.6%	19.0%	1,761	40,028	3.28[a]	7.94[a]
2013	858	2288	341,787	2,410,994	59,674	436,278	17.5%	18.1%	2,909	41,420	3.06[a]	8.09[a]
2014	388	1342	376,205	2,782,832	32,533	471,502	8.6%	16.9%	4,442	48,226	1.38	6.62[a]

Table 4 Semi-parametric Matching Model Result

This table reports the Semi-parametric matching model results of the sample by year. The sample originally consists of 47,952 non-financial U.S. public firms with fiscal year-end December 31, audit fee and auditor name available and total assets greater than $5 million. The model is as follow:

$$LNFEE = \alpha + \beta_1 BIG4 + \beta_2 LNASSET + \beta_3 LOSS + \beta_4 SQSUB + \beta_5 FOREIGN + \beta_6 CURRENT + \beta_7 DEBT + \beta_8 ROI + \varepsilon$$

where:

$LNFEE$ = Natural log of audit fee;
BIG4 = A dummy variable taking a value of 1 if the firm is audited by a Big Four accounting firm, 0 otherwise;
LNASSET = Natural log of end of year total assets;
LOSS = A dummy variable taking a value of 1 if the firm incurred a loss in the previous year, 0 otherwise;
SQSUB = Square root of the number of subsidiaries;
FOREIGN= Percentage of total assets that are foreign based;
CURRENT = Current asset divided by total assets;
DEBT = Long-term debt divided by total assets; and
ROI = Return on investment which equals net income before tax divided by total assets.

All variables are obtained from Compustat. [a], [b], [c] indicate the significance level at 1%, 5% and 10% level.

Table 4 cont.

Panel A- Matching based on total assets

Year	Type	Constant	Big4	Inasset	Loss	Current	Debt	Roi	N	Adj R^2	F Value	p	Fee Premium
Total	Slope	9.37	0.22	0.56	0.18	0.67	-0.14	-0.13	73984	72.71%	32854.1	<.0001	24.66%
	t-statistics	744.25[a]	31.87[a]	321.20[a]	27.63[a]	58.12[a]	-15.27[a]	-19.24[a]					
2000	Slope	9.34	-0.05	0.50	0.04	0.41	0.10	-0.42	5176	70.02%	2015.12	<.0001	-4.65%
	t-statistics	230.46[a]	-2.40[b]	85.89[a]	2.11[b]	11.10[a]	5.76[a]	-18.70[a]	.		.	.	
2001	Slope	9.38	-0.01	0.49	0.18	0.63	-0.05	-0.10	5031	71.82%	2138.11	<.0001	-0.60%
	t-statistics	274.94[a]	-0.30	91.66[a]	9.95[a]	18.03[a]	-1.58	-7.71[a]	.		.	.	
2002	Slope	8.91	0.14	0.54	0.25	0.80	0.40	-0.25	6055	73.88%	2855.18	<.0001	14.66%
	t-statistics	228.69[a]	6.39[a]	100.13[a]	11.33[a]	20.72[a]	10.12[a]	-10.94[a]	.		.	.	
2003	Slope	8.85	0.05	0.59	0.25	0.97	-0.06	-0.20	6067	77.59%	3501.33	<.0001	5.11%
	t-statistics	249.78[a]	2.32[b]	113.51[a]	12.37[a]	27.07[a]	-1.91[c]	-8.44[a]	.		.	.	
2004	Slope	9.36	0.18	0.60	-0.23	0.81	0.09	-0.72	5802	78.50%	3531.49	<.0001	20.09%
	t-statistics	225.16[a]	8.12[a]	102.73[a]	-10.05[a]	20.95[a]	2.00[b]	-19.46[a]	.		.	.	
2005	Slope	9.32	0.27	0.58	0.39	0.65	0.20	-0.10	5446	74.35%	2631.56	<.0001	31.42%
	t-statistics	218.10[a]	10.61[a]	88.54[a]	15.09[a]	15.28[a]	4.17[a]	-2.89[a]	.		.	.	
2006	Slope	9.96	0.28	0.53	0.29	0.42	-0.24	0.00	5185	71.72%	2191.84	<.0001	32.54%
	t-statistics	215.46[a]	10.65[a]	79.96[a]	11.98[a]	9.78[a]	-5.58[a]	0.08[a]	.		.	.	
2007	Slope	9.79	0.87	0.44	0.30	0.55	0.27	-0.21	4881	72.36%	2129.74	<.0001	139.82%
	t-statistics	184.80[a]	33.73[a]	63.34[a]	10.65[a]	12.57[a]	6.01[a]	-5.67[a]	.		.	.	
2008	Slope	9.79	0.65	0.47	0.15	0.88	-0.12	-0.39	4690	71.81%	1992.22	<.0001	91.40%
	t-statistics	190.21[a]	24.64[a]	66.72[a]	5.45[a]	19.77[a]	-2.64[a]	-9.22[a]	.		.	.	
2009	Slope	9.65	0.17	0.54	-0.18	1.14	0.44	-0.15	4559	77.51%	2619.43	<.0001	18.44%
	t-statistics	203.06[a]	6.42[a]	77.73[a]	-7.63[a]	27.20[a]	10.37[a]	-4.84[a]	.		.	.	

2010	Slope	10.00	0.55	0.47	0.06	0.36	0.23	-0.07		4594	76.54%	2498.85	<.0001	74.09%
	t-statistics	200.56[a]	20.48[a]	63.41[a]	2.40[b]	8.59[a]	5.21[a]	-2.93[a]	.			.	.	
2011	Slope	9.69	0.52	0.47	0.08	0.77	0.72	-0.24		4562	81.12%	3267.31	<.0001	68.86%
	t-statistics	234.51[a]	23.30[a]	80.75[a]	3.30[a]	21.22[a]	18.97[a]	-6.43[a]	.			.	.	
2012	Slope	9.75	0.38	0.51	0.06	0.53	0.27	-0.23		4620	78.67%	2839.93	<.0001	46.81%
	t-statistics	194.70[a]	16.59[a]	82.50[a]	2.46[b]	13.84[a]	5.66[a]	-11.82[a]	.			.	.	
2013	Slope	9.40	0.36	0.55	0.27	0.73	0.21	-0.21		4631	79.26%	2949.48	<.0001	43.66%
	t-statistics	201.30[a]	14.61[a]	90.22[a]	11.27[a]	15.94[a]	5.00[a]	-5.51[a]	.			.	.	
2014	Slope	9.30	0.40	0.59	0.13	0.87	-0.78	-0.13		2685	86.33%	2825.62	<.0001	49.09%
	t-statistics	154.79[a]	12.25[a]	71.52[a]	3.90[a]	17.16[a]	-23.39[a]	-2.21[b]	.			.	.	

Table 4 – cont.

Panel B-Matching based on return on investments

Year	Type	Constant	Big4	Inasset	Loss	Current	Debt	Roi	N	Adj R^2	F Value	p	Fee Premium
Total	Slope	9.39	0.22	0.56	0.15	0.65	0.08	-0.10	74094	74.43%	35947.1	<.0001	24.61%
	t-statistics	775.23[a]	31.58[a]	319.18[a]	23.29[a]	58.78[a]	7.81[a]	-16.42[a]				.	
2000	Slope	9.49	0.07	0.47	-0.02	0.32	0.12	-0.33	5102	70.06%	1990.02	<.0001	6.94%
	t-statistics	266.75[a]	3.27[a]	82.25[a]	-1.12	9.00[a]	2.99[a]	-16.30[a]	.		.	.	
2001	Slope	9.47	0.17	0.47	0.04	0.44	-0.07	-0.11	5031	73.72%	2352.59	<.0001	18.92%
	t-statistics	279.31[a]	8.22[a]	82.47[a]	2.07[c]	13.74[a]	-3.30[a]	-10.34[a]	.		.	.	
2002	Slope	9.40	0.06	0.50	0.21	0.51	0.05	-0.27	6051	74.76%	2988.41	<.0001	6.30%
	t-statistics	263.39[a]	2.93[a]	96.82[a]	11.04[a]	14.51[a]	1.99	-12.24[a]	.		.	.	
2003	Slope	9.31	0.25	0.52	0.12	0.52	0.21	-0.20	6189	72.49%	2719.13	<.0001	28.72%
	t-statistics	218.88[a]	10.86[a]	82.77[a]	5.76[a]	13.20[a]	7.23[a]	-7.64[a]	.		.	.	
2004	Slope	9.65	0.42	0.53	-0.03	0.58	-0.18	-0.26	5726	77.35%	3259.98	<.0001	52.30%
	t-statistics	219.95[a]	17.43[a]	84.07[a]	-1.14	14.73[a]	-3.90[a]	-7.28[a]	.		.	.	
2005	Slope	9.84	0.36	0.51	0.09	0.44	0.11	-0.04	5437	72.85%	2431.94	<.0001	43.68%
	t-statistics	217.53[a]	13.17[a]	72.75[a]	3.59[a]	11.07[a]	2.22[c]	-1.11	.		.	.	
2006	Slope	9.58	0.39	0.57	0.16	0.46	-0.23	0.10	5241	73.56%	2430.99	<.0001	47.74%
	t-statistics	176.28[a]	14.56[a]	77.35[a]	6.66[a]	10.30[a]	-5.88[a]	7.57[a]	.		.	.	
2007	Slope	9.76	0.43	0.52	0.27	0.43	0.31	-0.32	4814	74.73%	2372.76	<.0001	54.05%
	t-statistics	217.31[a]	16.71[a]	76.07[a]	10.50[a]	10.36[a]	9.98[a]	-9.86[a]	.		.	.	
2008	Slope	9.16	0.30	0.57	-0.01	1.38	0.35	-0.55	4689	80.43%	3211.88	<.0001	35.34%
	t-statistics	220.86[a]	13.16[a]	90.80[a]	-0.62	38.84[a]	8.34[a]	-20.32[a]	.		.	.	
2009	Slope	9.65	0.28	0.53	0.22	0.74	0.30	-0.01	4636	82.03%	3528.28	<.0001	32.86%
	t-statistics	262.10[a]	13.59[a]	98.88[a]	11.92[a]	23.20[a]	10.26[a]	-0.57	.		.	.	

2010	Slope	9.74	0.43	0.50	0.20	0.57	0.19	-0.08		4599	78.35%	2774.33	<.0001	54.47%
	t-statistics	189.31[a]	17.04[a]	73.69[a]	8.83[a]	12.20[a]	4.02[a]	-4.57[a]	.			.	.	
2011	Slope	9.76	0.60	0.48	0.22	0.63	0.14	0.41		4562	81.43%	3333.28	<.0001	82.21%
	t-statistics	225.47[a]	22.64[a]	73.78[a]	8.79[a]	15.48[a]	3.19[a]	10.84[a]	.			.	.	
2012	Slope	9.45	0.37	0.56	0.21	0.67	-0.25	-0.42		4675	82.89%	3774.25	<.0001	44.41%
	t-statistics	242.72[a]	16.43[a]	102.68[a]	9.82[a]	19.18[a]	-6.42[a]	-16.42[a]	.			.	.	
2013	Slope	9.92	0.60	0.48	0.00	0.56	0.10	0.01		4627	78.97%	2896.19	<.0001	81.92%
	t-statistics	223.38[a]	24.92[a]	75.52[a]	0.02	15.31[a]	4.02[a]	0.23	.			.	.	
2014	Slope	9.05	0.14	0.59	0.06	1.35	0.55	-0.30		2715	83.52%	2292.59	<.0001	15.17%
	t-statistics	156.01[a]	4.56[a]	71.97[a]	2.24[c]	26.37[a]	12.67[a]	-7.74[a]	.			.	.	

Table 4 – cont.

Panel C-Matching based on total assets and return on investments

Year	Type	Constant	Big4	Inasset	Loss	Current	Debt	Roi	N	Adj R^2	F Value	p	Fee Premium
Total	Slope	9.48	0.26	0.56	0.21	0.66	-0.12	-0.08	31802	73.21%	14482.6	<.0001	29.45%
	t-statistics	469.01[a]	24.30[a]	196.56[a]	20.70[a]	38.67[a]	-10.07[a]	-12.78[a]					
2000	Slope	9.58	0.00	0.49	0.12	0.11	-0.35	-0.34	1021	64.45%	309.16	<.0001	0.31%
	t-statistics	100.45[a]	0.06	32.82[a]	2.35[c]	1.28	-4.29[a]	-6.19[a]	.		.	.	
2001	Slope	9.44	0.08	0.48	0.37	0.21	-0.08	-0.08	1169	72.49%	514.01	<.0001	8.72%
	t-statistics	125.91[a]	1.99[c]	40.79[a]	9.56[a]	3.00[a]	-2.34[b]	-5.38[a]	.		.	.	
2002	Slope	9.11	0.05	0.53	0.14	0.70	0.30	-0.29	1741	74.93%	867.89	<.0001	5.02%
	t-statistics	129.80[a]	1.26	53.99[a]	3.49[a]	10.56[a]	4.54[a]	-8.50[a]	.		.	.	
2003	Slope	9.45	0.22	0.51	0.20	0.48	0.06	-0.16	2287	73.19%	1041.23	<.0001	24.81%
	t-statistics	148.32[a]	6.14[a]	53.80[a]	5.80[a]	8.28[a]	1.65	-5.64[a]	.		.	.	
2004	Slope	9.24	0.31	0.58	0.13	0.83	0.00	-0.22	2630	74.42%	1275.56	<.0001	35.99%
	t-statistics	132.81[a]	8.17[a]	56.44[a]	3.82[a]	13.73[a]	-0.02	-10.71[a]	.		.	.	
2005	Slope	9.49	0.28	0.56	0.19	0.65	0.10	-0.14	2739	71.59%	1151.04	<.0001	32.11%
	t-statistics	130.26[a]	7.45[a]	54.17[a]	5.03[a]	10.46[a]	1.57	-4.50[a]	.		.	.	
2006	Slope	9.60	0.29	0.56	0.22	0.66	0.00	0.03	3034	73.11%	1375.44	<.0001	33.95%
	t-statistics	141.32[a]	8.36[a]	58.36[a]	6.61[a]	11.52[a]	-0.01	2.03[c]	.		.	.	
2007	Slope	9.64	0.38	0.54	0.26	0.61	0.11	-0.03	2733	73.01%	1232.48	<.0001	46.79%
	t-statistics	136.78[a]	10.65[a]	53.11[a]	7.63[a]	10.94[a]	3.47[a]	-2.82[a]	.		.	.	
2008	Slope	9.52	0.41	0.53	0.28	0.82	0.31	-0.05	2467	75.87%	1293.09	<.0001	51.36%
	t-statistics	139.65[a]	11.68[a]	55.62[a]	8.84[a]	14.48[a]	5.54[a]	-3.47[a]	.		.	.	
2009	Slope	9.66	0.37	0.53	0.19	0.74	-0.07	-0.02	2358	78.22%	1411.44	<.0001	45.30%
	t-statistics	150.22[a]	10.94[a]	58.33[a]	6.12[a]	13.68[a]	-1.61	-0.84	.		.	.	

2010	Slope	9.72	0.32	0.52	0.19	0.69	0.19	-0.07	2319	80.13%	1559.2	<.0001	37.92%
	t-statistics	153.22[a]	10.16[a]	59.58[a]	6.24[a]	13.60[a]	7.72[a]	-2.89[a]	.		.	.	
2011	Slope	9.54	0.40	0.52	0.16	0.88	0.22	-0.05	2180	81.03%	1552.15	<.0001	48.84%
	t-statistics	138.62[a]	11.94[a]	55.47[a]	4.50[a]	16.17[a]	4.58[a]	-1.31	.		.	.	
2012	Slope	9.67	0.32	0.52	0.07	0.78	0.22	-0.15	2193	78.55%	1338.76	<.0001	38.18%
	t-statistics	137.74[a]	9.22[a]	54.71[a]	2.00[a]	14.17[a]	4.09[a]	-6.62[a]	.		.	.	
2013	Slope	9.60	0.41	0.52	0.09	0.86	0.14	-0.11	2150	79.38%	1379.7	<.0001	50.05%
	t-statistics	132.69[a]	11.40[a]	54.64[a]	2.58[a]	15.18[a]	4.77[a]	-3.77[a]	.		.	.	
2014	Slope	9.34	0.36	0.59	0.37	0.66	-0.76	-0.04	764	86.29%	801.46	<.0001	42.90%
	t-statistics	70.10[a]	5.21[a]	32.86[a]	5.29[a]	6.38[a]	-20.88[a]	-0.68	.		.	.	

Academic Vita

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