Trends in the market for audit services: BIG-4 "Cherry Picking" or Non BIG-4 Market Power?[*]

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ABSTRACT

We analyze changes in audit fees and market shares of the BIG-4 audit firms (KPMG, PWC, D&T, E&Y) as compared with those of NB-4 (Non-Big 4) auditors in the period 2000-2011. Both relative fees and relative market shares (compared across BIG-4 and NB-4) auditors changed radically over this period due to the enactment of the Sarbanes-Oxley Act (SOX). In addition, one of the major audit firms, Arthur-Andersen (AA) was driven out of business. We exploit variations in the effects of these two events across industries and across size deciles to examine changes in pricing strategies and market shares of BIG-4 and NB-4 auditors. In particular we examine whether the market changes have been driven primarily by the BIG-4 deterring clients through pricing strategies (which we characterize as 'cherry picking') or through more effective competition by NB-4 auditors (which we characterize as NB-4 market power). Our empirical results suggest that both these factors have played a significant role in the realignment of the market for audit services across BIG-4 and NB-4 auditors following the enactment of SOX and the collapse of AA.

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I.   INTRODUCTION

Following the enactment of the Sarbanes-Oxley act in 2002 (hereafter SOX) and the demise of Arthur-Andersen (hereafter AA), audit fees have risen sharply and the market share for the BIG-4 auditors (KPMG, PWC, D&T and E&Y) has fallen dramatically.[1] Two possible competing explanations have been advanced for this change in industry fee and market share structure: (i) BIG-4 have chosen to follow a strategy of taking on fewer but higher margin clients (which we refer to as "cherry picking") or (ii) SOX has improved the competitive position of non-BIG-4 (hereafter, NB-4) allowing them to increase their market share (which we refer to as an increase in NB-4 market power).[2] While these two effects have been discussed individually, our paper studies them jointly by examining the relationship between differences in pricing across BIG-4 and NB-4 auditors (usually referred to as the BIG-4 premium) and market share changes. Specifically, we examine differences in the relationship between the BIG-4 premium and market share changes across the period 2003-2011 across industry codes and size deciles to whether BIG-4 market share losses can be explained purely by BIG-4 pricing decisions or whether NB-4 empowerment has also played a role in the erosion of BIG-4 market share.

The critical economic property that influences demand and supply patterns for public audits is the unobservability of audit quality by users of financial statements. This property leads to theoretical prediction that auditor reputation (and wealth) will be used by the market as a proxy for audit quality (Dye (1989), Alles and Datar (1994), Mayhew (2001), Sarath and Bar-Yosef (2005)). As a consequence, reputable auditors will be able to charge a "premium" relative to less reputable auditors. Based on the general agreement that big audit firms are the most reputable, Palmrose (1986) tested and empirically documented an audit fee "premium" charged by (then) BIG-8 auditors. Implicit in this finding is an assumption that in equilibrium, big

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[1] Papers that have documented fee increases following the enactment of SOX include (Asthana and Balsam, 2004; Griffin and Lont, 2007). BIG-4 market share losses have also been noted in earlier literature though we could not find a systematic reference documenting the effects that are categorized in Table 1 of this paper.

[2] Evidence for this proposition, at least with regard to second-tier auditors, is provided in (Cassels et. al. 2011). Our evidence suggests that this phenomenon is more widespread and applies to smaller audit firms as well.

auditors supply greater value (real or perceived) to their clients and recapture a portion of this value through higher fees. [3]

A second theoretical feature associated with the BIG-4 premium is their greater exposure to litigation because of their "deep pockets" (Dye (1989)). This greater exposure to audit failure serves as an implicit warranty of higher audit quality acts as an observable proxy for auditor reputation (Dye (1989), Alles and Datar (1994)). The interaction between "deep pockets" and reputation may be one economic explanation for the large market share of BIG-4 auditors (Sarath and Bar-Yosef, (2005)). However, this greater litigation risk has to be recovered through higher fees and constitutes part of the BIG-4 premium. Summarizing, the overall economic consequences of the interrelated factors of greater reputation and deeper pockets leads to two components in the BIG-4 premium – (i) a (partial) recapture of market value to the client-firm associated with higher auditor reputation and (ii) a (partial) recovery of greater litigation risk that is the observable proxy for auditor reputation.

Before proceeding with the development of our arguments, a simple decision model of auditor choice is useful for framing our empirical tests. We view client firms as collecting quotes from both BIG-4 and NB-4 auditors. The firms then weigh the benefits that will accrue from choosing a more reputable (i.e. BIG-4) against the extra fees they will have to pay. If the perceived value of a BIG-4 audit reduces while quoting strategy stays constant, firms are more likely to switch to an NB-4 auditor. This is equivalent to a (downward) shift in the demand curve (Figure 3a). Conversely, if the perceived value of a BIG-4 audit goes up, the demand curve will shift up *ceteris paribus.* Similarly, if the perceived benefit stays constant while BIG-4 firms increase fees relative to NB-4 (i.e. increase the premium), the market share of the BIG-4 will go down but the clients who remain with the BIG-4 will pay higher fees. This is equivalent to a shift in the supply curve of services offered by the BIG-4. [4]

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[3] There is a considerable stream of empirical literature attempting to document the market value generated by BIG-4 auditors. For example, Beatty (1989) associated BIG-8 auditors with reduced underpricing for their clients at the time of Initial Public offerings. Teoh and Wong (1993) found the earnings response coefficient (ERC) is higher for firms audited by BIG-4. Pittman and Fortin (2004) and Mansi et al. (2004) suggested that debt financing costs are lower for firms audited by BIG-4. Khurana and Raman (2004) showed that the ex-ante cost of equity capital is lower for firms audited by BIG-4 than for companies audited by non BIG-4 audit firms.

[4] There is of course the possibility that firms may decide to go private because of increases in audit fees. This does not pose significant empirical difficulties for our study for two reasons. First, the decision to go or not go public is influenced by many other more weighty factors than audit fees so the market of publicly traded firms is more or less inelastic in audit fees. Second, it

Drawing on this simple decision model, the focus of our empirical analysis is in examining whether supply side strategies by the BIG-4 (i.e., the decision to charge a higher premium) can explain the shifts in market share or whether demand shifts (the greater propensity of client-firms to choose NB-4 auditors) have also played a significant role in market share changes. These effects cannot be separated by studying the market as a whole; however, by studying the effects across individual industries where each industry exhibits a different relationship between premium and market share changes, we find evidence inconsistent with pure supply side effects. Specifically, if market share changes are primarily being driven by the large premia being charged by the BIG-4 (that is, by cherry picking), we would expect to see a positive relationship between the size of the premium and loss in market share. However, we find that there is a negative relationship between the industry ranking by BIG-4 premium and industry ranking by loss of market share. This negative association is suggestive of a demand side shift as well as a supply side shift (see Figure 3c).

In order to get more evidence of demand side shifts, we analyze the relationship between the BIG-4 premium and the propensity to switch to an NB-4 auditor at the level of an individual firm. We use a logit model based on Landsman et. al., (2009). At a firm level, we find that firms that are charged a larger BIG-4 premium are more likely to switch to an NB-4 auditor in the following year. This finding is consistent with BIG-4 firms being forced to include a greater risk component in the premium they charge over the NB-4. As firms cannot recover this extra cost through the market benefits from choosing a BIG-4 auditor, they decide to switch to an NB-4 auditor. However, the logit model also shows that firms are more likely to switch to NB-4 auditors over the period 2003-2011 in industries where the NB-4 had a larger market share *prior to 2002*. This is additional evidence that NB-4 market power has played a role in attracting clients -- industries where the NB-4 were more competitive pre-SOX and AA demise are also the ones where they are more likely to capture clients in the post-SOX era.

We also examine both our tests for demand shifts on a size decile-by-decile basis. As is to be expected, there is very little switching to NB-4 auditors in the highest deciles. However both our main empirical findings hold up in the lowest eight size deciles. The logit model is consistent on a decile by decile basis while the negative association between industry ranking by

is likely that firms that weigh these fees heavily are small firms that would disproportionately choose NB-4 auditors if they were present in the market and this would only strengthen our results.

premium and industry ranking by BIG-4 market share erosion also holds when the rankings are computed over the lower eight size deciles.

There is a considerable literature examining the determinants of audit fees (Ashbaugh et.al. 2003; Blankley et.al. 2012; Choi et.al. 2010; Francis 1984; Kealey et.al. 2007; Maher et.al. 1992; Palmrose et.al. 1986). In addition, there are several papers analyzing changes in the levels of audit fees post-SOX (Ghosh et.al. 2009; Griffin et.al. 2007; Huang et. al. 2009). There is also analysis in the prior literature about the types of firms that switched from BIG-4 to NB-4 auditors after the enactment of SOX (Landsman, Rountree, Wilson 2009). Our analysis adds to these prior papers in three ways. First, we focus on the BIG-4 *premium* rather than fees as theory suggest that the premium rather than the level of fees determines client-firm choice of auditors. Second we exploit potential heterogeneity in the effects of SOX (and the demise of AA) across industries by correlating the premium (and changes in the premium) with changes in market shares across industries. Last, we analyze the effects of the BIG-4 premium and NB-4 market share on the probability of an individual firm switching from a BIG-4 to an NB-4 auditor adding to earlier research on client-firm behavior.

We use the pricing model from Blankley et.al. (2012) and combine it with the industry fee effects analysis in Ashbaugh (2003). First, we estimate a BIG-4/5 premium separately for the periods 2001-2002 and the periods 2003-2012. These estimates show that the BIG-4 premium increased significantly across these periods. We then estimate an industry BIG-4 premium across the same sample of industries selected by Ashbaugh et al (2003)[5] and rank industries based on (i) the BIG-4 premium coefficient estimated over the period 2003-2011 (termed as Industry Premium Ranking) and (ii) change in BIG-4 premium across the two periods. We next compute three different values based on fee and market share changes across the years 2001 and 2011 (i) % Market share change; (ii) % Fee share change; (iii) their ratio and then rank industries based on these values. Last we create three industry rankings based on AA's presence in that industry in 2001: (i) % AA market share; (ii) % AA fee share; and (iii) AA switch share defined as (% AA clients switching to NB-4 in 2002)/(% of other BIG-4 clients switching to NB-4). We then study the association between these different industry rankings. Our main findings are that

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[5] The sample we use from Audit analytics has relatively few firms from 2000 so the model is primarily evaluated in 2001 and 2002. Ashbaugh et. al. do not list their industry dummies so we mainly compare our regression coefficients.

market share rankings are inversely correlated with premium rankings whereas AA rankings have a less significant association, but mainly positive relationship with the premium rankings. [6]

The second test uses a Logit switching model to examine the effect of (firm-specific) residuals estimated in the audit fee model on the propensity to switch to an NB-4 auditor. The idea here is that if the reason for switching to an NB-4 auditor is due to supply side effects, that is due to an increase in the BIG-4 premium, we should expect to see firms which are being charged a high premium (in the year before the change) switching more often to NB-4 auditors. On the other hand, if the client-firms are deciding to switch to NB-4 auditors because they do not see much perceived value in staying with BIG-4 auditors, the firms that stay with the BIG-4 would be the ones that see high perceived value and pay higher (residual fees). In other words, the coefficient on the residual fee in a switching model provides evidence on whether the market share loss of the BIG-4 is due to cherry picking (client firms deterred due to high fees) or due to NB-4 market power (only firms that see high benefits and are willing to pay high premia) remaining with the BIG-4.

Our results show a negative association between the BIG-4 industry market share rankings and industry premium rankings. In other words, the industries in which the BIG-4 have lost the greatest share are also the ones where they charge the lowest average premium. This suggests that market share losses are influenced by the relative attractiveness of NB-4 auditors (demand side effects). That is, rather than being driven away by the size of the BIG-4 premium, the firms in these industries find NB-4 auditors more attractive and switch to them even though the BIG-4 are willing to charge a lower premium. The industry fee premium shows an unclear association with AA's 2001 market strength in the industry.[7] However the AA switch ranking displays a significant positive association suggesting that AA clients may have perceived lower benefits in going to a BIG-4 auditor and switched more readily in high premium industries.

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[6] The audit market displays a very high level of market-share concentration with the BIG-4 suggesting that the audit industry constitutes a "natural oligopoly" in the sense of Vives (1999). However, The standard models of Oligopolistic competition, either Bertrand or Cournot (Vives, 1999), do not fit the audit industry very well. In the face of regulatory and product complexities, it is difficult to make clear theoretical predictions as to what would happen to market shares and prices if one of the players in the oligopoly (i.e., AA) is forced to exit.

[7] We conjecture this is due two opposite effects. AA's market strength in a particular industry appears to be negatively correlated (though insignificantly) with the changes in NB-4 market share post-SOX.

Landsman e. al., (2009) examines whether the Enron crisis diminished the reputation value of BIG-4 auditors leading to a greater propensity to switch to NB-4 auditors in the Post-Enron period. We use a similar switching model in the post-SOX period. Since our primary goal is to establish the link between the level of the premium and switching behavior, we control for the "mismatch" variable constructed in Landsman et al. Intuitively, a firm may be mismatched with a BIG-4 auditor because their firm characteristics have changed (making a prior choice of a BIG-4 auditor suboptimal) or due to the fact that they have a special idiosyncratic value for BIG-4 auditors vis-à-vis NB-4 auditors. If the former, we expect to see a positive coefficient on the mismatch variable; if the latter, we expect to see that the coefficient is zero. Our findings are that the mismatch coefficient is insignificant in the period 2003-2011 suggesting that switching was being driven by the firm-specific market benefits of a BIG-4 audit rather than change in market characteristics. After controlling for mismatch, our switching model shows a significant negative association between the fee residual and the propensity to switch to NB-4 auditors over the whole sample 2000-2011 but a positive association over the years 2004-2011 suggesting that overall, both risk effects and NB-4 market power changes have had an impact on shaping the market for audit services. In addition, there is a significant a positive association between NB-4 market share *in 2001* and the probability of switching in the period *2003-2011*,[8] that is, client-firm's switched more often to NB-4 auditors in industries where NB-4 were historically stronger. Taken together, these findings suggest that firms switched to NB-4 auditors in the period 2003-2011 due to the increased attractiveness of NB-4 auditors as well as shifting due to risk-based increases in audit fees.

While we do not directly depend on them, the studies by Maher et al. (1982) and Menon and Williams (2001) had a significant impact on our methodology. Maher et. al. report declining audit fees from 1977 to 1981 because the profession dropped many of its restrictions against competition. Menon and Williams find that audit fees increased in the 1980s but stayed flat in the 1990s. There is a significant increase in 1988 because The Auditing Standards Board issued the "expectation gap" standards. Menon and Williams (2001) also mentioned that BIG-8 mergers had a short-run, instead of a long run, effect on fees. Our focus is on similar economic

phenomena in the period 2000-2011. In these years, we find a significant jump in fees due to the enactment of SOX. As in Menon and Williams (2001) we have a reduction in the number of large audit firms (due to the exit of AA rather than mergers). The effect of SOX is so significant that descriptive statistics establish the trend. So our focus is on trying to establish an AA effect above and beyond the changes in audit fees resulting from SOX. To do this we use cross-sectional variations in the fee premium across industries to show that these variations are inversely linked to the market share captured by NB-4 auditors. This association suggests that the exit of AA did indeed allow the BIG-4 to price more aggressively relative to NB-4 firms but that this premium was lower in industries where NB-4 firms became more competitive.

II.   RELATED LITERATURE

We review prior literature on the BIG-4 premium and the effects of SOX and AA's bankruptcy, both direct and indirect, on the post-SOX market share held by the BIG-4. The audit fee is the product of unit price and the quantity of audit services demanded by the management of the audited company. Cross-sectional differences in fees can represent either the effect of quantity differences or price differences (Simunic, 1980). However Rosen (1974) argues that audit services may be differentiated. Differentiated products are not observed directly but rather are revealed indirectly through differences in prices (Simunic, 1980). Other possible reasons for a big auditor premium are monopoly power, economies of scale, reputation or deep pockets (Simunic, 1980; Danos and Eichenseher, 1986; Dye, 1993).

The issue of "deep pockets" has been analyzed in several theoretical studies (Dye 1993, Bar-Yosef and Sarath 2005) as an important factor in determining the structure of the audit market. In the event of an audit failure, litigation may prove a more effective remedy for firms with big auditors. Palmrose (1994) found that the litigiousness of the environment for accountants increased over the study period. Simunic and Stein (1996) suggest that BIG-4 audit firms will have higher quality audits than NB-4 because they may suffer greater losses from

investor lawsuits in the event of audit failure. For both these reasons, we expect that BIG-4 firms would charge a premium to compensate them for the extra litigation risk and that client-firms would be willing to pay this premium because of the perceived higher quality of audits conducted by BIG-4 firms.

Empirical tests of the BIG-4 auditor premium include Palmrose (1986) and Beatty (1989) Palmrose found that the BIG-8 audit firms charge higher audit fees and explained it as arising from their monopoly powers. Beatty however argued that reputation led to better pricing of IPO's audited by the BIG-8. Francis (1984) also found that the BIG-8 charged higher audit fees than non big eight firms while Blokdijk et al. (2006) found that NB-4 audit firms are less efficient in their work than BIG-4 firms, which reflect low audit quality. Shockley and Holt (1983) provide evidence that auditors whose client firms represent the highest market value are perceived providing higher quality audits by those in the banking industry. However, Dopuch and Simunic (1980) and DeAngelo (1981) find the quality of audit services is very difficult to measure. More recently, Koenig (2008) found that investors feel more comfortable if a BIG-4 firm was providing the audit. Danos and Eichenseher (1986) found that clients choose auditors for good economic reasons, based on both the (perceived) quality of auditor services and the audit fee as well as client specific factors. For example, they assume a link between audit firm market share and comparative advantages for larger clients (Dopuch and Simunic, 1980, Danos and Eichenseher, 1986). A 2008 GAO (Government Accountability Office) report suggests auditees don't want to be audited by NB4 audits firms because of the recognized difference in reputation.

In summary, both the theory literature suggest that big auditors have (or are perceived to have) an advantage that should be reflected as a pricing premium. Whether perceived or real, there is a long-stream of literature on audit fee determinants that include a component for the BIG-4 premium. We rely on this long precedent in assuming that a BIG-4 premium is present in audit fees and is determined primarily by the belief that BIG-4 auditors generate market value for their clients. We us one of the latest published papers in this stream of literature, Blakeney et al, (2012) to estimate both an overall BIG-4 premium and an industry-by-industry BIG-4 premium. Our goal is not to study the BIG-4 premium *per se,* but to see how this premium is related to changes in market share across BIG-4 and NB-4 auditors.

We emphasize the effect of SOX in increasing audit fees has been amply documented (Asthana and Balsam, 2004; Griffin and Lont, 2007; Huang, 2009); also, the possibility that SOX has increased NB-4 competitiveness has been studied indirectly in Cassel et. al. (2011). This paper finds a post-Andersen improvement in the perceived financial reporting credibility of clients of Second-Tier (NB4) auditing firms relative to clients of BIG-4 auditing firms. Also they find that pre-Andersen, BIG-4 clients had a lower ex ante cost of equity of capital than these firms had after Arthur Andersen collapsed suggesting that some of the BIG-4 reputation for audit quality had eroded.

Our sample takes this analysis up to 2011 and shows that while there has been some downward pressure in the last two years, most of the increases have persisted. Our focus is not so much on how SOX increased audit fees but rather the relative effects on BIG-4 and NB-4 auditors. We are interested in seeing how the BIG-4 auditor premium was affected after controlling for SOX. The effect on market competition between BIG-4 and NB-4 firms is treated indirectly We draw on the evidence in Cassel et. al. (2011) to reinforce the popular sentiment that SOX has strengthened NB4 auditors relative to BIG-4 auditors. More specifically, we look at changes in fees, market share and pricing power (defined as the ratio of fees over market share) for NB4 auditors. Our goal is not to study these effects directly but to use them indirectly to rank industries based on the SOX-effect. This ranking process appears unrelated to earlier studies.

Simunic (1980) argues that if the BIG-8 firms collude to increase prices in the "large" auditee segment, their NB-8 competitors would seek to expand market share and price consistent with their own cost conditions, rather than to maintain the cartel price. Danos and Eichenseher (1986) indicated a more generalized movement to the BIG-8 across all client firms from 1973 to 1980. They argue that the observed auditor changes in U.S. audit market in the recent past reflect a long-term adjustment to a fairly stable equilibrium distribution of clients across large and small audit firms. In addition to these factors, Danos and Eichenseher (1986) mentioned that switching in auditors is linked with the supply and demand in the audit market. Krishnamurthy et al. (2006) found that firms which are former audit clients of Andersen and then switch to other BIG-4 audit firms have higher returns suggesting these were either intrinsically better quality firms (and signaled this by staying with a BIG-4 auditor).

III.   A Model of Demand and Supply for Audit Services

We combine a consumer choice model with a litigation driven model to arrive at demand and supply curves for audit services in a competitive market. Recall that these curves are written in terms of proportion of market share held at a particular premium by a BIG-4 auditor. The demand curve is based on a client-side trade-off of the extra fee charged and the extra value generated by the BIG-4 auditor relative to the NB-4 auditor. The supply curve is based on the need of the BIG-4 auditor to charge enough to compensate for the risk of the firm relative to the NB-4 auditor. Therefore, our models are formulated in terms of the differences in fees, extra market value and financial risk across BIG-4 and NB-4 auditors.[9]

A. The Audit Demand Curve

A client firm has certain observable characteristics, X, and an unobservable private value for a BIG-4 audit denoted by the random variable $\tilde{\varepsilon}$. The client-firm will choose the BIG-4 auditor provided that the premium π charged by the Big-4 auditor is less than the additional value provided by the Big-4 auditor, that is if $\pi \leq V(X) + \varepsilon$ where $V(X)$ denotes the value of a BIG-4 audit based on the observable characteristics. Let $F(\circ)$ denote the cumulative distribution function of $\tilde{\varepsilon}$.[10] Then the probability of a client-firm with characteristics X having a big auditor is:

$$\text{Prob}\{\pi - V(X) \leq \circ\} = 1 - F(\pi - V(X)) \tag{1}$$

Assuming that the empirically observed market share is close to this true probability,[11] the market share of the BIG-4 auditor across clients of characteristics X at a premium π is given by the right-hand-side of (1). The aggregate market share is given by averaging across all client-firms.

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[9] Such a profit function can also be written in terms of fees but this simply introduces additional terms related to audit cost. Intuitively, we assume that the NB-4 sets a certain fee structure based on audit costs and "normal profit" whereas the BIG-4 auditor charges an "excess Big-4 premium" that recaptures some of the market benefits obtained by going to such an auditor.

[10] Making the private value conditional on X does not lead to any qualitative differences in the analysis.

[11] This is a law of large numbers argument. If there are many firms with observed characteristics X, then the empirically observed market share of BIG-4 auditors will approximate the true underlying probability for each value of X.

Given this formulation, we consider changes in the demand curve resulting from shifts in the distribution function $F(\cdot)$. In particular, consider a change to a new distribution function $F_{new}(\cdot)$ where:

$$F(\cdot) \text{ first-degree stochastically dominates } F_{new}(\cdot). \tag{2}$$

In other words, consider a reduction (in a distributional sense) of the private value for BIG-4 audits. By the definition of first-degree stochastic dominance, $F_{new}(\pi - V(X)) \geq F(\pi - V(X))$ for every π and X showing from (Figure II Panel A) that the market-share for the BIG-4 auditor falls for every client characteristic and every choice of premium. Therefore, the market share shifts downward in the premium as illustrated in Figure II.

B. The Audit Supply Curve

The focus of our analysis is to examine whether the changes in audit market shares result from a downward shift in the demand curve as described in the previous paragraph or due to a deliberate policy by BIG-4 firms to limit services to risky clients. In order to capture this tension, we introduce the *excess* expected litigation cost for a firm of characteristics X to a BIG-4 auditor which is denoted by $L(X)$. The BIG-4 auditor will accept a client-firm of characteristics X provided that the excess fee offsets the excess litigation risk, that is if $\pi \geq L(X)$. The advent of SOX is supposed to have increased the financial risk of certain client firms so as to make them unattractive for the BIG-4 audit firms. In order to capture this notion, we consider a new expected litigation risk function denoted by $L_{new}(X)$ where $L_{new}(X) > L(X)$ for every client-firm characteristics X. Under such circumstances, the supply curve will shift downwards after the enactment of SOX as described in Figure II Panel B.

IV. HYPOTHESES DEVELOPMENT

We outline again the basic economic factors that motivate our study. The audit market involves a complex fee and quality structure where audit quality is credence good. For this reason, BIG-5/4 auditors are able to set up a quasi-oligopoly and charge a higher fee than NB4 auditors. Firms are willing to pay this premium as they recover the costs through a better price in

the stock market (i.e. have a lower cost of capital). Despite the premium charged, large audit firms also held a preponderant share of the market for audit services, generally increasing their market share over a long period prior to 2000. However, this process was interrupted by two major events in 2002 – the collapse of AA and the enactment of SOX. Our hypotheses pertain to changes in market and fee structure after these two events.

SOX greatly increased the regulatory scrutiny both of auditors and of client-firms. The end result was a sharp increase in audit fees documented in several earlier studies including (Ghosh and Pawlewicz (2009)). However, the effect on the BIG-4 premium has not been analyzed. One consequence of SOX, as suggested by several earlier studies, is that BIG-4 firms faced greater liability exposure post-SOX and increased fees in order to compensate for this extra risk. Such behavior would result in an increase in the BIG-4 premium. In contrast, other papers such as Cassels et. al. (2011) argue that NB-4 (particularly second-tier auditors) compete more effectively with BIG-4 auditors post-SOX. In this case, the BIG-4 auditor premium should decline as a result of competitive pressures. In addition, earlier studies (Landsman et al; 2002) have argued that the collapse of AA led to (short-term) capacity constraints for BIG-4 firms. Such constraints would typically increase the oligopoly rents of the surviving auditors.

Our results show that there was a significant increase both in fees and the BIG-4 premium. Because the total market for audit services is (almost) inelastic with regard to audit fees and increase in the BIG-4 premium should result in a reduction in market share for big auditors. However such a market share reduction could be further enhanced if the competitive position of NB-4 auditors has been strengthened due to SOX. The main focus of our analysis is to try and see if we can find evidence for stronger market competition from NB-4 auditors post-SOX through a careful analysis of the relationship between premium increases and changes in market share.

Summing up, the starting point of our analysis is to see if the premium was affected by the enactment of SOX and the demise of AA. Such changes are implied by earlier literature documenting significant changes in audit fees post-SOX but have not been formally documented in prior literature. After establishing this benchmark, we proceed to our main analysis which analyzes the relationship between premium changes and the changes in BIG-4 market share.

Our firsthypothesis (stated in null form) is:

H1: *BIG-4 premium in audit fees relative to NB-4 firms did not change after the collapse of AA.*

The hypothesis is decisively rejected and shows that there was a significant increase in the premium charged by the BIG-4. As a consequence, it may be expected that the market share held by the BIG-4 would decline. An examination of the data shows that there have been dramatic shifts in market share from BIG-4 to NB4 post-SOX. These effects are so strong that we do not test market-wide for such reductions. Instead, we examine them on an industry-by-industry basis As has been documented conclusively in prior literature (see for example Ashbaugh and Skaife) the audit fee is sensitive to industry factors. It seems likely that the premium will also vary across industries. Again, we state this as a formal Hypothesis mainly because it does not seem to be documented in earlier studies. This gives us Hypothesis 2 (in null form):

H2: *The fee premium charged by the BIG-4 post-SOX (and after the collapse of AA) will be the same across industries (after controlling for industry influence on audit fees).*

The first two hypotheses merely confirm that the effects documented in earlier literature on audit fees also hold for the BIG-4 premium. We can now proceed to our main theme of comparing the relationship between premia changes and market share changes, we need to establish results analogous to H1 and H2 for market share changes. The third hypothesis is based explore whether the effects of SOX (and the collapse of AA) had differential effects across industries. In other words, industries where the influence of NB-4 auditors increased the most should see lowest BIG-4 premium. Note that there is a clear alternative possibility here – that NB-4 market share increased because BIG-4 increased their fees (and profitability) by giving up less attractive clients. Under this second scenario, the increase in the BIG-4 premium will be highest in industries where market share decreases the most, or equivalently, where NB-4 share increases the most. In other words, what we are hypothesizing here is a SOX effect (of increasing NB-4 auditor competitiveness) as opposed to a pricing power argument where BIG-4 firms deter clients by raising fees. This leads to our third hypothesis (one-sided null)

H3: *The fee premium charged by the BIG-4 post-SOX will be higher in industries where their market share declined more (i.e., fee premium will be negatively correlated with BIG-4 market share change in the industry).*

The fourth hypothesis is connected with the joint effects of the collapse of AA and SOX. The premise is that the larger AA's market share in that industry in 2001, the greater will be the increase in pricing power for the surviving BIG-4 firms. In addition, the lower the shift in competitive advantage to NB-4 auditors, the less the pricing power for BIG-4. This leads to our fourth hypothesis (in null form):

H4: *The fee premium charged by the BIG-4 post-SOX in any industry will bear the same relationship to the SOX effect (as in H3) irrespective of AA's market share in that industry prior to 2001.*

The last two hypotheses are associated with the probability of switching from a BIG-4 firm to an NB-4 firm in the period 2003-2011. If cherry picking is the main significant factor driving the switch to NB-4 auditors, we expect that firms that are being charged a high premium by the BIG-4 (in the prior year) are more likely to switch to NB-4 auditors. In null form, this reduces to:

H5: *The fee premium charged by the BIG-4 will decrease the probability of switching to an NB-4 auditor.*

As we conjecture that NB-4 market power has also had a significant influence in reshaping the audit market, our last hypothesis in null form is:

H6: *The industry strength of NB-4 auditors prior to SOX has no effect on the switching behavior post-SOX.*

We now describe our methodology and statistical tests to try and reject the null hypotheses H1-H6.

V. SAMPLE, METHODOLOGY AND RESULTS

A. Sample and Descriptive Statistics

To form the sample, we collected data from audit analytics covering the period from 2001 to 2012. This resulted in a total of 150,908 observations. If a client has two or more auditors in a sample year (but did not change auditors), we sum the audit fees for the specific year. Therefore we have a single fee observation for each client-firm for each year. If a client-firm switched auditors, we delete these observations eliminating 6,701 observations from the sample. Next, we merge with Compustat to collect financial data. 55,723 observations were deleted because the financial data was not available. In addition, 26,703 observations did not have information about business segments and were deleted. We use the industry analysis methodology of (Ashbaugh, 2003) and eliminate the financial services industry (SIC 6000-6999) losing 10,040 observations in this process. In the final step, we exclude firm years with missing Compustat data in the auditor switch model and as a consequence, 6,714 observations were deleted. Our final sample for the audit fee model consisted of 51,732 observations. 8,636 firm year observations are before 2002, while 43,096 firm year observations are after 2002. In addition, for the switching model, we delete 1,629 observations before 2011, because of missing data regarding auditor switches. Then we delete 6,330 firm year observations before 2003, because we focus on the influence of fee premium after 2002. Our final sample for switching model is 37,060.[12]

Table 1 Panel A shows the number of firms audited by BIG-5 and NB-5 audit firms from 1999 to 2010. From this table, it is obvious that the market share of NB-4/5 firms increased significantly post-SOX and AA. (See also Figure 2). Table 1 Panel B represents the distribution of our sample firms across the industry classifications and shows that our sample's industry composition is closely aligned to the industry composition in the COMPUSTAT Database. Table 1 panel D shows the change of auditors in our database over the period 2000-2011. Every industry shows a shift to NB4 auditors and some of these changes are significant (using a chi-squared test).

The time series of industry changes is given in Table V. The pattern is so strong that statistical tests are not necessary. Each industry shows a steady increase in the share of NB4 auditors stabilizing in 2008 but it changes differently by industries. In some industries, such as Mining and Construction, Transportation, Utilities, the ratio changes a little; on the other hand, in Agriculture, Services, Computers, the ratio changes more than 10 times. Table V Panel B

---

[12] If the firm was a foreign filer or failed to issue a SOX 404 Internal Control report, we define going concern, material weakness and modified opinion 0, so we did not lost observations in this process.

describes the ratio of audit fees by NB5/4 audit firms divided by total fees from 2000 to 2011 in different industries. While this also shows the same time-trend, what is striking is that the share of revenues does not exceed 13% in any industry showing the enormous pricing advantage held by the BIG-4.

B. Methodology

Our methodology involves two different approaches. First, we construct an audit fee model and establish the increase in the BIG-4 premium in the period 2003-2011 relative to 2000-2002. Second, we show that increase in pricing power differed across industries. Then we try and correlate this industry-specific premia with changes in market share. Specifically, compare the industry premium rankings with the shift to NB-4 auditors and to AA's share in the industry prior to their collapse.

B. 1 Audit Fee Model

One of our primary goals is to get an estimate of the fee premium charged by the BIG-4 on an industry-by-industry basis. To isolate the BIG-4 fee premium, it is necessary to estimate what the fee "would be" based on firm and industry characteristics had the firm been audited by a small auditor. Models that tie audit fees with firm characteristics have been extensively developed starting with Simunic (1980). Most of the models in the following years have used variations of Simunic's model. In particular, the models are log-linear in audit fees and firms' assets. Other variables such as account receivables are used to control for risk. Many recent models extend and improve on Simunic's original model. We use the following model from (Blakeney et.al. 2012) as it provides a convenient reference point for our subsequent industry based analysis:

$$
\begin{aligned}
LAF_{i,t} = {} & \alpha_0 + \alpha_1 LTA_{i,t} + \alpha_2 CR_{i,t} + \alpha_3 CA\_TA_{i,t} + \alpha_4 ARINV_{i,t} + \alpha_5 ROA_{i,t} + \alpha_6 LOSS \\
& + \alpha_7 FOREIGN + \alpha_8 MERGER + \alpha_9 BUSY_{i,t} + \alpha_{10} LEV_{i,t} + \alpha_{11} INTANG_{i,t} \\
& + \alpha_{12} SEG + \alpha_{13} OPINION_{i,t} + \alpha_{14} MATWEAK_{i,t-(t-1)} + \alpha_{15} INDCON + \varepsilon_{i,t} \qquad (3)
\end{aligned}
$$

Where:
LAF   = logarithm of audit fees;
LTA   =logarithm of end of year total assets (Data6);
CR   = current assets (Data4) divided by current liabilities (Data5);

CA_TA	=current assets divided by total assets;
ARINV	= sum of accounts receivable (Data2) and inventory (Data3) divided by total ssets;
ROA	= earnings before interest and taxes (Data 178) divided by total assets;
LOSS	=1 if firm incurred a loss (Data 172), 0 otherwise;
FOREIGN	=1 if firm has any foreign operations (Data64), 0 otherwise;
MERGER	=1 if the firm reported the impact of a merger or acquisition on net income (Data 360), 0 otherwise;
BUSY	= 1 if a company's fiscal year is December 31st, 0 otherwise;
LEV	= long-term debt (Data9) divided by total assets;
INTANG	= ratio of intangible assets to total assets;
SEG	= logarithm of number of business segments;
OPINION	=1 if the auditor issues a going concern audit opinion, 0 otherwise;
MATWEAK	=1 if the client receives a material weakness opinion in the current year, 0 otherwise; and
INDCON	= industry fixed effects;[13]

[TABLE III]

We take the natural log of audit fees.[14] If a firm is audited by Arthur Andersen, Deloitte & Touche, Ernst & Young, KPMG, or PricewaterhouseCoopers (or just the last 4 after AA's collapse), the BIG-5 Dummy equals 1 and 0 otherwise; The control variables are consistent with prior research.(Simunic 1980; Palmrose 1986; Francis et al. 2005; Hay et al. 2006). The audit effort measures are assets (LTA); the presence of mergers (MERGER) or foreign operations (FOREIGN); the number of business segments (SEG); and the auditors issue a going concern opinion (OPINION).Further, Audit risk measures are CR; CA_TA; ARINV; ROA; LOSS; and INTANG. Financial leverage (LEV) captures long-term financial structure of the client. We also include industry dummies following Ashbaugh et al. (2003), since our analysis is based on industry premium. To control for internal control quality, we also use a variable as the company has material weakness in the current year (Ettredge et al.,2006; Doyle et al., 2007). Finally, we include a variable if the company's fiscal year end is December 31st.

---

[13] Industry membership follows Ashbaugh et al.(2003) and is determined by SIC code as follows: agriculture(0100-0999), mining and construction (1000-1999, excluding 1300-1399), food (2000-2111), textiles and printing/publishing (2200-2799), chemicals (2800-2824; 2840-2899), pharmaceuticals (2830-2836), extractive (1300-1399; 2900-2999), durable manufactures (3000-3999, excluding 3570-3579 and 3670-3679), transportation (4000-4899), retail (5000-5999), services (7000-8999, excluding 7370-7379), computers (3570-3579; 3670-3679; 7370-7379), and utilities (4900-4999).

[14] An alternative to transforming the fee variables by their natural log is to scale the fee variables by total assets. (Ashbaugh et.al. 2003) We do not use this transformation because our focus is the magnitude of fees instead of the relative cost of audit-related services to the client.

B. 2 BIG-4 Auditing Firms' Fee Premium

There are many strong theoretical reasons for associating higher fees with higher quality audits or with greater litigation risk (Datar, Feltham, and Hughes (1991); Dye (1993)). Empirical identification of this premium involves a much harder task. Heuristically, for each firm audited by a BIG-4 auditor, we have to identify what the fee would have been had the firm selected an NB4 auditor and then measure the difference. A straightforward estimate is obtained by using a BIG-4 dummy in the period 2003-2012. A comparison with a similar BIG-5 dummy over the years 2000-2002 suggests that the BIG-4 "premium" increased significantly post-SOX rejecting null Hypothesis 1.

[TABLE III]

B. 3 Industry Effects

Audit fees vary significantly across industries. Different patterns of production, raw materials and intangible assets change the nature of the external auditor's verification process. Less clear are arguments as to how auditor specialization in industry affects fees. Both Palmrose (1986) and Menon and Williams (2001) find no association is observed between audit fees and industry specialization. () argue that auditors didn't obtain any price premium from industry specialization. Other scholars suggest that fee differences across BIG-4 and NB-4 as well as fee differences within the BIG-4 should vary across industries. Danos and Eichenseher (1986) said that market share differentials are maintained in the public utility, oil and gas, and railroad industries from 1950 to 1980 due to client regulation. They found a significant positive correlation between industry-specific auditor concentration levels and the percentage of industry members listed on the American and New York Stock Exchanges. Previous researches also pointed out the possibility that large audit firms have comparative advantages in highly regulated industries. (Danos and Eichenseher, 1986). Craswell et al. (1995) found that BIG-6 auditors could charge a higher price than non specialist BIG-6 auditors. They attribute this effect to the fact that industry specialists make investments in order to achieve their industry specific expertise.

Based on these earlier results, we expect to see significant differences across industries in terms of the BIG-4 incremental premium and in terms of the effects of SOX. To test this, we run the same regression as (1) with industry coefficients.

$$
\begin{aligned}
LAF_{i,t} = {} & \alpha_0 + \alpha_1 LTA_{i,t} + \alpha_2 CR_{i,t} + \alpha_3 CA\_TA_{i,t} + \alpha_4 ARINV_{i,t} + \alpha_5 ROA_{i,t} + \alpha_6 LOSS \\
& + \alpha_7 FOREIGN + \alpha_8 MERGER + \alpha_9 BUSY_{i,t} + \alpha_{10} LEV_{i,t} + \alpha_{11} INTANG_{i,t} \\
& + \alpha_{12} SEG + \alpha_{13} OPINION_{i,t} + \alpha_{14} MATWEAK_{i,t-(t-1)} + \alpha_{15} BIG4 * INDCON + \varepsilon_{i,t} \quad (4)
\end{aligned}
$$

The results are tabulated in Table IV and show that the coefficients varied significantly across industries, that is, the BIG-4 premium was industry dependent. The F-test after Table IV rejects the equality of the industry coefficients rejecting null hypothesis 2.

[TABLE IV]

We now turn to the industry-specific effects of SOX and AA's market share. As far as AA's market share is concerned, it is simply a question of tabulating their share (either in terms of firms audited or in terms of revenues). The situation with SOX is more complicated. Non-BIG-4 auditors increased both their market share and their fee share in every industry. In addition, there is evidence (Huang et. al. 2010) that the BIG-4 let some clients go post-SOX. So it is conceivable that market share growth may not represent an increase in desirability of non-BIG-4 auditors. For this reason, we rank industries based on three different measures of changes (i) Growth in NB-4 market share from 2000-2011; (ii) Growth in NB-4 revenue share from 2000-2011; (iii) Growth in pricing power for NB-4 auditors measured as the ratio of revenue share to market share from 2000 to 2011. We then use the non-parametric Spearman rank correlation test to see if the ranking of industries based on the BIG-4 price premia obtained through the two-stage regression process are significantly correlated with the industry rankings determined through market and revenue share analysis. The results are presented in Table VI panel B and reject (the null hypotheses) H-3 and H-4.

C. **Audit Switch Model**

We follow the auditor switch model from (Landsman et.al. 2009)

$$SWITCH_{i,t} = \alpha_0 + \alpha_1 ABAFEE_{i,t-1} + \alpha_2 * TestVar + \alpha_3 GROWTH_{i,t-1} + \alpha_4 ABSDACC_{i,t-1} + \alpha_5 ARINV_{i,t-1}$$

$$+ \alpha_6 GC_{i,t-1} + \alpha_7 MODOP_{i,t-1} + \alpha_8 TENURE_{i,t-1} + \alpha_9 ROA_{i,t-1} + \alpha_{10} LOSS_{i,t-1}$$

$$+ \alpha_{11} LEVERAGE_{i,t-1} + \alpha_{12} CASH_{i,t-1} + \alpha_{13} BIG4 * MISMATCH_{i,t-1} + \alpha_{14} EXPERT_{i,t-1}$$

$$+ \alpha_{15} SIZE_{i,t-1} + \alpha_{16} MERGER_{i,t-1} + \varepsilon_{i,t} \tag{5}$$

TestVar

1. *NB4MarketShare*

2. *AAMarketShare, ABAFEE * AAMarketShare*

3. *AAFeeShare, ABAFEE * AAFeeShare*

Where,

SWITCH	=0 if the company switch from Big-4 auditors to a NB-4 auditors from 2003-2012;
ABAFEE	=the unscaled residual from the audit fee model one year before, Equation (1) above.
NB4 MarketShare	= NB-4 market share (%) in that industry in 2001;
AA MarketShare	=AA market share (%) in that industry in 2001;
ABAFEE*AAMarketShare	=the multiplication of ABAFEE and AA MarketShare;
AA FeeShare	=AA fee share (%) in that industry in 2001;
ABAFEE*AAFeeShare	=the multiplication of ABAFEE and AA FeeShare;
GROWTH	=total asset (Data 6) less beginning total assets, divided by beginning total assets;
ABSDACC	=absolute value of discretionary total accruals;
ARINV	=sum of accounts receivable (Data2) and inventory (Data3) divided by total assets;
GC	=1 if the audit opinion is a going concern, and 0 otherwise;
MODOP	=1 if the audit opinion is modified for anything other than a going concern, and 0 otherwise;
TENURE	=number of years audited by the incumbent auditor;
ROA	= return on assets, defined as net income before extraordinary items (Data 18) divided by average total assets (Data6);
LOSS	= 1 if ROA<0, and 0 otherwise;
LEVERAGE	= ratio of debt (Data9+Data34) to total assets (Data6);
CASH	= cash (Data1) divided by total assets (Data6);
BIG-4*MISMATCH	= BIG-4 Dummy times Mismatch Dummy. Mismatch equals to 1, if the company is mismatched with the incumbent auditor, following the methodology in Shu (2000), and 0 otherwise;
EXPERT	=1 if the incumbent auditor has most clients in a particular industry and state than any other auditor, and 0 otherwise;
SIZE	= natural logarithm of market value of equity (Data25 * Data199);

To control for audit risk, we include GROWTH, ABSDACC, INVREC, GC, MODOP, and TENURE (Stice, 1991; DeFond and Subramanyam, 1998). We include other variables to

control for client-specific aspects of the audit engagement related to audit risk, like INVREC, GC and MODOP and TENURE (Dopuch et al.,1987; Krishnan,1994; Krishnan and Krishnan, 1997; Johnstone and Bedard, 2004, Stice, 1991). To control for financial risk, we include ROA, LOS, CASH, and LEVERAGE. GAO (2006) repost suggest that audit firms are more sensitive to client risk after Arthur Andersen went collapse, so we expect that BIG-4 auditors will be more sensitive to the client risk characteristics. Then we expect that risky clients are more likely to switch to NB4 clients in the post SOX period. To test the prediction that the downward auditor switching are more sensitive to client misalignment, we include MISMATCH as a proxy for misalignment(Shu, 2000; Landsman, 2009). Finally, we include industry fixed effects, EXPERT, SIZE and MERGER as additional control variables. (Hogan and Jeter, 1999; DeAngelo, 1981), because companies are more likely to switch auditors after a merger or acquisition if the newly companies have original different auditors.

[TABLE V]

D.   Results

The sequence of results is as follows. First, we establish that the BIG-4 market share reduced significantly over the period 2003-2011. The descriptive statistics are compelling (Tables I and II) and a the null hypothesis that the market share of the BIG-5/4 did not change from 2000-2011 is rejected using a chi-squared test both at individual industry levels and in the aggregate (Table I Panel D). Next we show through regression analysis that the BIG-5/4 premium increased significantly from the period 2000-2001 to the period 2002-2011 (Table IV; using an F-test and the seemingly unrelated regressions model). These two results confirm prior research and create the starting point for our own analysis.

We next test to see if there is variation in the industry fee premium. Table IV shows that the variation in the industry-specific premium is considerable and includes both positive and negative coefficients. The null hypothesis that all the industry BIG-4 premia are equal is decisively rejected (rejected at the 0.001 level by an F-test). Together, these tables reject (null) Hypotheses H1-H2 and set the stage for our main tests provided in H3 and H4.

The results documented in Tables I – III show that the cross-sectional variation both in market share losses and BIG-4 premia are considerable across industries. Our fundamental

economic premise is that the enactment of SOX and the demise of AA affected both the demand and supply curves for audit services as a function of the BIG-4 premia. In particular, we wish to study how strongly changes in the demand curve have affected market structure. If the primary force for change has been cherry picking by the BIG-4, we would expect to see a positive association between the level of premium and changes in market share. If however, demand curve shifts have also been influential, we would expect to see more negative correlations between the industry premium and industry market share declines (Figures 3 A,B,C). Table IV shows the significant relationship is negative (using a non-parametric Spearman test) showing that though the premium has gone up overall, it is more the consequence of shifts in demand rather than shifts in supply.

Analogously, if the demise of AA disrupted the supply curve more than the demand curve, we would expect to see higher premia in industry where AA had a larger market share. In contrast, if NB-4 auditors where better able to compete in industries where AA initially had a greater market share (because the remaining BIG-4 were weaker), we would expect to see a negative association. The results are significantly negative using a non-parametric Spearman test (Table IV). The finding suggests that the premium is higher in industries where AA had a relatively smaller footprint reinforcing the inference that demand side effects have been more significant than supply side effects.

Table V documents the tests on switching behavior by BIG-4 clients to NB-4 auditors during the years 2003-2011. There are several results in this table. First, we show that the audit fee residual from the model used to generate Table III has a positive coefficient in the switch model. The inference is that firms with larger residual were more likely to switch to NB-4 auditors. This is consistent with an assumption that customers were dissuaded by the use of large audit fees from selecting BIG-4 auditors. Under that scenario, we would expect firms that were being charged higher fees to be more likely to switch to NB-4 auditors.

In this table, it is also shown that industries in which the NB-4 had higher market share in *2001* (the last variable in Table 5 termed as NB4-2001-market share) also had a higher probability of switching in the period *2003-2011*. Again, the inference is that switching is driven by the competitive abilities of NB-4 auditors rather than cherry picking by BIG-4 auditors. The last result in this table concerns the mismatch variable. This variable is determined based on

optimal cut-off score (based on certain firm characteristics; see Appendix) that creates the least misclassification of auditor selection. In other words, the optimal cutoff score is chosen in such a way that a specification that all firms below the cutoff should choose an NB-4 auditor whereas firms above the cutoff should choose BIG-4 produces the smallest number of errors. Firm below the cutoff that choose BIG-4 or firms that are above the cutoff but choose NB-4 are classified as mismatched firms. The empirical question is whether such mismatched firms are more likely to switch. Our results show that mismatched firms are less likely to switch. Again, this is consistent with a demand side explanation. Firms below the cutoff (respectively, above the cutoff) that are mismatched are ones that perceive high (respectively, low) values from BIG-4 auditors. For this reason, such firms are less likely (or no more likely) to switch than other firms.

Our results show that although the BIG-4 premium has risen significantly, the relative competitive position of NB-4 auditors has strengthened with regard to a significant proportion of the market. To augment this finding, we run the switching model separately on each decile (Table V panel B). The results are consistent with the overall findings across the lowest eight deciles. In the largest deciles, there is almost no switching from BIG-4 to NB-4 auditors. This result confirms the common-sense conclusion that the competitiveness of NB-4 auditors has been the dominant feature for about 80% of the market whereas the largest firms are contributing to the significant increase in the BIG-4 premium even after employing the standard controls for size used in prior literature.

D. 1   Sensitivity Tests

A variable whose VIF values are greater than 10 may merit further investigation. Non-tabulated results show that VIF for equation (7) is 1.37, and 3.24 in equation (8). Therefore, it is not a concern.   Then Breusch-Pagan and White test for heteroskedasticity were positive. However, using heteroskedasticity- robust standard errors did not change the ranking of the Industries based on the BIG-4 incremental premium. We used several different statistical (such as the Ramsey RESET test) to test the robustness of our results to potential omitted variables. We did not find any significant changes in the ranking of the industries by BIG-4 pricing power although there were some occasions when industries changed places with the ones immediately above or below. These changes had no effects that would lead us to reassess our conclusions. We also checked for alternatives to the Ashbaugh et. al. pricing model. The increase in the BIG-4

price premium from the 2000-2002 periods to the 2003-2011 periods was robust across these specification changes. Another test is done to exclude the firm quarters after the firms switched between 2003-2011, because we suppose they will never switch again. Our results still hold. Then we did another test to only include the client audited by BIG-4 in 2002 and we look at the switch behavior after 2003. Based on year by year analysis, our results still hold.

D. 2   Second Tier Auditors

We examine whether the shift to NB-4 is concentrated in Second Tier auditors (REFERENCE). No tabulate results show that second tier auditors fee percentage and market share percentage are only a very small portion of the shift away from the BIG-4.

D. 3   Switching Noise

Another test is done to exclude the firm quarters after the firms switched between 2003-2011, because we suppose they will never switch again. Our results still hold. Then we did another test to only include the client audited by BIG-4 in 2002 and we look at the switch behavior after 2003. Based on year by year analysis, no tabulate results show that our results still hold.

VI.   CONCLUSION

The market for auditing services is highly concentrated with the big audit firms. In 2002, one of these auditors, Arthur Andersen, went out of business. In addition, a comprehensive set of new regulations concerning auditing (SOX) went into effect. Subsequently, in the period 2003-2012, there were significant increases in audit fees (both for BIG-4 and NB-4) auditors as well as significant decreases in market share for BIG-4. Prior literature has advanced two possible explanations for these shifts in market structure: (i) a deliberate attempt by BIG-4 auditors to concentrate on (fewer) more profitable clients (characterized in our paper as "cherry picking"); and (ii) that better regulation and enforcement post-SOX has increased confidence in the reports of NB-4 auditors (characterized as "NB-4 market power"). By examining cross-industry correlation across reductions in market share and the size of the BIG-4 premium, as well as the relationship between audit fees and switching behavior, we are able to provide some new insights on these two effects.

An increase in NB-4 market power should typically lead to a *decrease* in the BIG-4 premium (the excess oligopoly or other rents) extracted by BIG-4 auditors. We first document that BIG-4 rents *increased* across the period 2003-2012. This finding suggest that the combined effects of the demise of AA and the increased requirements of SOX enhanced the pricing edge for BIG-4 auditors, suggesting that cherry-picking may have been the more significant driving force in reshaping the market. However, if cherry picking were the dominant influence, we would expect to see that the more selective the BIG-4 became, the higher would be the premium. In contrast, if the increased NB-4 market power played a significant role, then the BIG-4 would lose market share even if they reduced the premium they charged over NB-4 auditors. An industry-by industry analysis shows that BIG-4 industry premium and market share losses are inversely related (higher premium associated with smaller market share losses) showing that increased NB-4 market power has also been a significant influence on the market for audit services.

We also analyze whether higher *residual* fees (after controlling for firm characteristics), affect the probability of switching to an NB-4 auditor. We find that firms with high residual fees are more likely to switch, *ceteris paribus,* to NB-4 auditors. These results are stable when analyzed across individual size deciles. Our interpretation of this finding is that switching behavior is as much demand-driven as supply-driven. If the BIG-4 were increasing fees so as to concentrate on fewer more valuable clients, we would expect to see clients switching away because of high fees, that is, that higher residual fees would lead to a greater probability of switch. In contrast, if only firms that see high value in BIG-4 auditors relative to NB-4 auditors remain with the BIG-4, there will be a negative association between residual fees and switching behavior. Our results based on firm level analysis confirm that the higher fees they charge, the more likely they will switch, however the industry level analysis shows more demand curve shifting for BIG-4 because clients benefit more from BIG-4 than from NB-4.

Lastly, we examine if the results of the switching model hold up in different size deciles. As may be expected, we find that the switching model is stable across the lowest eight size deciles but fails in the highest size deciles. This leads us to conclude that demand side changes have been significant in the majority of the market (80%) whereas supply side effects may be more influential in the highest deciles resulting in an overall increase in the BIG-4 premium.

SOX has changed many other aspects of corporate structure including governance. Although we control for many firm-specific features connected to audit fees, we do not study the role of governance or management incentives on the decision to retain a BIG-4 auditor. Managers (and/or the board) may see value in hiring a BIG-4 auditor even if the extra premium is not recovered through the equities market. One of the challenges for the future is to examine whether agency conflicts may lead to the retention of BIG-4 auditors even if such retention does not benefit shareholders.

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Figure I

Trends in BIG-5/4Market Share Ratio and Fee Ratio

The figure plots BIG-5/4 Market Share Ratio and BIG-5/4 Fee Ratio. BIG-5/4 Market Share Ratio is the number of firms audited by BIG-5/4divided by the total number of firms in the audit market. BIG-5/4 Fee ratio is audit fee from BIG-5/4's clients divided by the total audit fees in the audit market from 2000 to 2011.

Panel A: Big-5/4 Audit Fee Ratio and Market Share Ratio
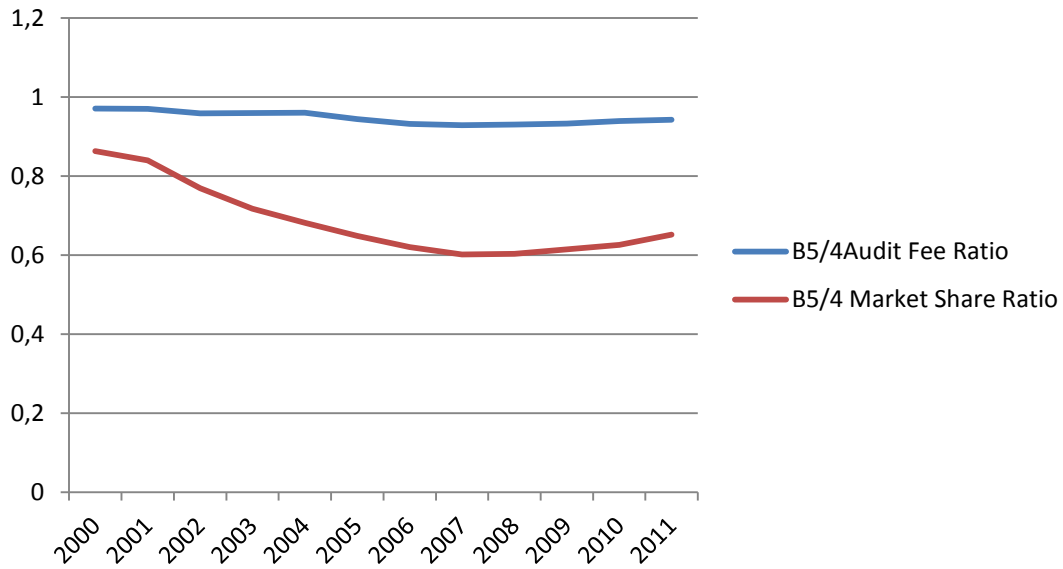
Panel B: NB-5/4 Audit Fee Ratio and Market Share Ratio
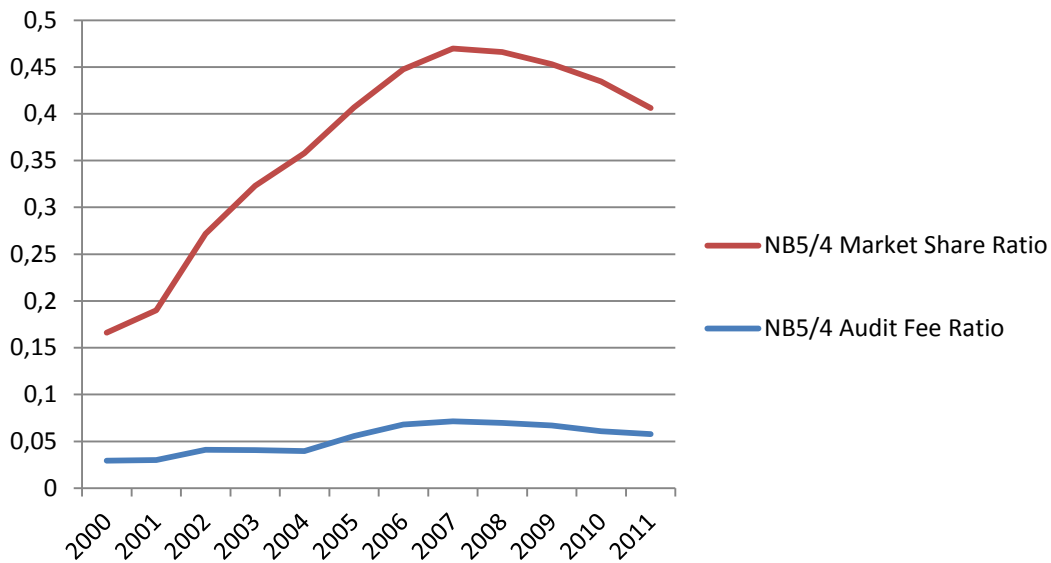
Figure II

Economic Equilibrium for fee premium and market-share for BIG-4 firms

This figure shows the effects of demand and supply curve shifts in the BIG-4 premium. The first panel shows the effects of the demand curve shifting down. The second panel shows the effects of the supply curve shifting up while the demand stays constant. The third panel shows that the pattern we observe is consistent with both curves shifting, that is, the changes in market share and premium being inversely correlated (compare Prem 1 Prem 2).

Panel A: Only Demand Curve for BIG-4 Shifts down   *Panel B: Only Supply Curve for BIG-4 Shifts up*
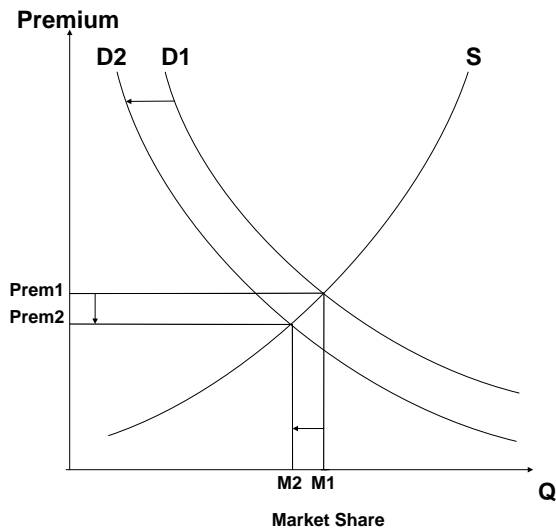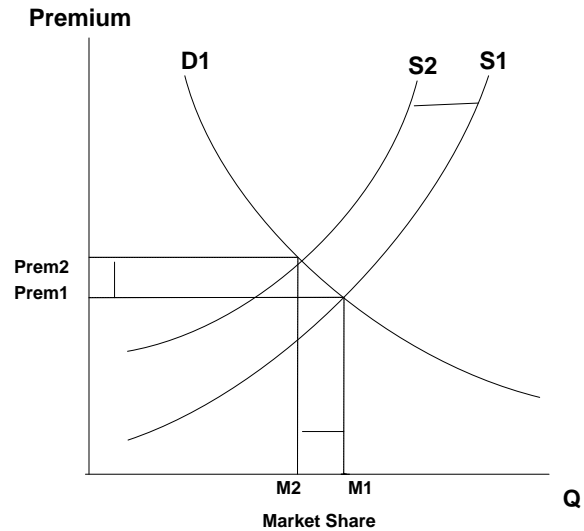
Panel C: Supply Curve shifts down and Demand Curve Shifts down
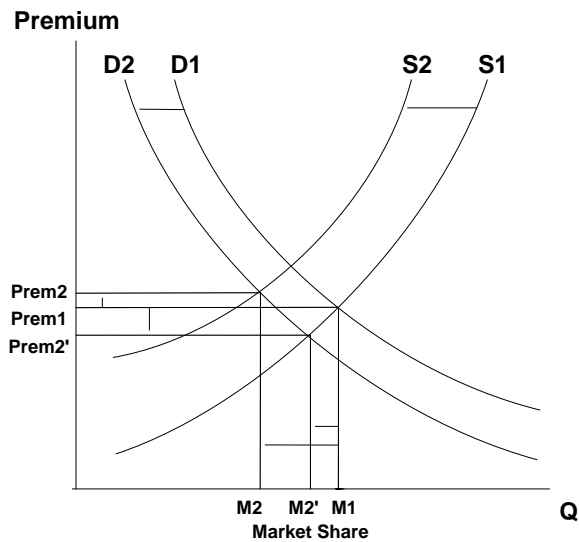
Table I

Sample Composition and Attrition

	Audit Fee Model	Switch Model
Firms year Observations from Audit Analytics	150,908	
Less:	(6,701)	
one firm one year has more than one audit fee observation in a fiscal year		
No audit fees	(55,723)	
No Business Segment	(26,703)	
No SIC code	(10,040)	
Final firm year observations	51,732	
Missing Compustat data		(6,714)
Final firm year observations		45,018
Firm year observations in 2001		(1,628)
Firm year observations after 2001		43,390
Firm year observations before 2003	(8,636)	(6,330)
Final firm year observations after 2002	43,096	37,060

TABLE II

SOX Effect in Industries

Panel A&B describes the market shares (the ratio of the NB-5/4 market share divided by the total market share) and fee shares (the ratio of fee share divided by the total audit fee) by each industry from the 2000 to 20011(in percentage %), which we define as SOX effect. Panel C&D shows the market share and fee share for second tier audit firms (in percentage %). Panel E&F shows the whole market audit fees and number of clients for BIG-5/4.

Panel A: Specific Industry Audit Fees Shares for NB-5/4 (2000-2011)

Year	Agriculture	Mining and Construction	Food	Textiles and printing/ publish	Chemical	Pharmacutical	Extract	Durable Manufactures	Transportation	Utility	Retail	Service	Computer	Total
2000	0.00%	6.37%	1.73%	5.93%	1.04%	3.03%	1.01%	2.65%	2.82%	0.89%	4.60%	3.28%	3.28%	0.00%
2001	1.45%	1.48%	2.13%	5.04%	2.74%	3.71%	1.73%	2.92%	2.34%	0.82%	3.48%	4.37%	2.36%	1.45%
2002	1.27%	3.90%	1.78%	4.31%	2.19%	5.39%	9.02%	3.89%	4.81%	0.52%	5.83%	4.79%	3.39%	1.27%
2003	2.21%	3.32%	2.33%	4.05%	1.86%	7.41%	9.71%	3.77%	2.44%	0.92%	5.91%	5.86%	3.76%	2.21%
2004	1.57%	6.39%	2.05%	3.90%	1.55%	9.28%	3.55%	3.58%	1.75%	1.32%	7.04%	4.31%	4.89%	1.57%
2005	1.20%	5.87%	1.68%	3.35%	3.48%	11.33%	4.83%	5.49%	3.51%	3.16%	6.41%	7.08%	6.94%	1.20%
2006	3.25%	6.13%	3.32%	4.34%	4.05%	9.75%	7.51%	6.87%	3.99%	3.70%	8.07%	9.68%	8.98%	3.25%
2007	4.18%	7.55%	3.95%	4.94%	5.14%	9.84%	9.04%	6.82%	4.23%	3.53%	9.20%	10.38%	8.77%	4.18%
2008	11.95%	7.18%	5.19%	4.28%	4.24%	9.47%	7.14%	6.82%	3.89%	3.82%	9.37%	10.46%	8.99%	11.95%
2009	10.57%	8.47%	5.02%	5.43%	3.67%	8.92%	7.33%	6.56%	3.99%	3.48%	7.75%	9.59%	8.57%	10.57%
2010	7.33%	8.34%	4.58%	5.24%	3.53%	8.44%	5.95%	6.05%	3.94%	2.88%	7.32%	8.88%	7.30%	7.33%
2011	6.52%	7.03%	4.58%	6.11%	3.62%	5.84%	6.29%	5.52%	3.80%	2.88%	8.10%	7.99%	7.14%	6.52%

TABLE II-Continued

Panel B: Specific Industry Number of Firms Shares for NB-5/4 (2000-2011)

Year	Agriculture	Mining and Construction	Food	Textiles and printng/publish	Chemicals	Pharmacutical	Extractive	Durable manufactures	Trans Portation	Utility	Retail	Service	Computer
2000	0.00%	25.93%	25.81%	15.58%	13.21%	13.53%	12.64%	12.86%	6.45%	6.74%	15.67%	15.38%	12.98%
2001	7.69%	17.78%	22.95%	14.17%	20.51%	16.80%	22.88%	16.50%	9.49%	8.47%	13.50%	19.01%	11.83%
2002	23.81%	30.93%	24.44%	14.38%	24.79%	23.73%	34.50%	24.09%	14.07%	9.18%	18.09%	26.91%	21.06%
2003	28.57%	40.31%	30.00%	17.65%	28.06%	28.53%	43.90%	30.01%	17.87%	11.26%	21.58%	30.96%	25.52%
2004	28.57%	46.58%	31.31%	19.89%	31.03%	32.37%	46.64%	33.82%	20.40%	14.35%	24.01%	33.80%	30.35%
2005	19.05%	49.39%	33.03%	20.00%	33.33%	35.11%	47.39%	37.26%	22.53%	16.88%	27.49%	38.63%	35.33%
2006	31.82%	45.30%	34.86%	22.16%	36.54%	36.78%	50.92%	40.94%	25.25%	18.26%	31.45%	39.83%	39.31%
2007	42.86%	50.54%	39.09%	26.92%	41.18%	38.19%	50.92%	43.62%	26.56%	19.51%	33.12%	41.99%	39.17%
2008	57.14%	50.84%	43.27%	26.54%	43.26%	38.21%	46.79%	45.98%	23.50%	21.23%	32.77%	40.05%	38.12%
2009	48.00%	51.46%	40.38%	27.16%	41.18%	41.87%	43.90%	44.89%	25.43%	19.05%	29.87%	40.09%	35.78%
2010	46.15%	53.00%	44.76%	25.32%	38.28%	41.79%	42.26%	43.63%	24.71%	17.48%	27.64%	39.35%	34.64%
2011	50.00%	49.38%	40.22%	25.53%	36.84%	38.07%	39.66%	40.62%	19.87%	14.21%	25.61%	36.34%	34.65%

TABLE II-Continued

Panel C: Audit Fee Percentage audited by Second Tier Auditors (2000-2011)

Year	Agriculture	Ming and Construction	Food	Textile	Chemicals	Pharma	Extractive	Durable	Transportation	Utility	Retail	Services	Computer
2000	0.00%	3.97%	1.12%	4.15%	0.68%	1.75%	0.61%	1.65%	1.31%	0.58%	2.55%	1.51%	1.80%
2001	0.00%	0.50%	1.70%	3.61%	0.47%	2.25%	0.52%	1.64%	1.61%	0.52%	2.09%	1.97%	1.18%
2002	0.12%	0.54%	1.07%	2.96%	0.20%	2.18%	0.53%	2.06%	2.95%	0.28%	3.27%	1.73%	1.44%
2003	0.18%	0.61%	0.98%	2.81%	0.15%	3.39%	0.93%	1.71%	1.70%	0.45%	3.69%	2.46%	1.68%
2004	0.00%	4.21%	0.80%	3.05%	0.15%	4.66%	1.64%	2.04%	0.94%	0.97%	4.77%	2.24%	2.50%
2005	0.00%	3.46%	0.50%	1.85%	1.46%	6.04%	2.25%	2.86%	2.00%	2.53%	4.36%	3.26%	3.97%
2006	0.00%	3.02%	1.06%	2.82%	2.11%	5.72%	4.53%	3.56%	2.35%	2.80%	5.41%	4.20%	5.15%
2007	0.00%	3.73%	1.53%	3.38%	2.21%	5.28%	4.65%	3.94%	2.26%	2.60%	5.68%	6.16%	5.32%
2008	3.90%	3.52%	2.50%	2.95%	0.54%	4.79%	3.99%	3.82%	2.00%	2.59%	5.87%	6.58%	4.65%
2009	3.66%	4.71%	2.12%	3.94%	0.66%	4.60%	3.93%	3.59%	2.08%	2.24%	5.07%	5.55%	4.47%
2010	2.64%	2.79%	1.17%	2.73%	0.53%	2.33%	2.44%	2.65%	1.53%	1.62%	3.29%	2.89%	2.64%
2011	2.59%	2.27%	1.48%	2.53%	0.44%	1.24%	2.96%	2.53%	1.56%	1.84%	2.42%	2.18%	2.29%

TABLE II-Continued

Panel D: Percentage of firms audited by Second Tier Auditors (2000-2011)

Year	Agriculture	Ming and Construction	Food	Textile	Chemicals	Pharma	Extractive	Durable	Transportation	Utility	Retail	Services	Computer
2000	0.00%	7.41%	12.90%	6.49%	5.66%	6.47%	6.90%	6.90%	0.81%	4.49%	6.72%	5.49%	5.34%
2001	0.00%	2.22%	14.75%	5.51%	3.85%	6.97%	5.93%	6.80%	3.80%	5.08%	6.11%	6.34%	4.93%
2002	4.76%	3.09%	8.89%	4.38%	2.48%	8.54%	5.85%	8.00%	4.07%	2.90%	6.72%	6.23%	5.45%
2003	4.76%	2.33%	8.00%	4.71%	2.16%	9.60%	6.34%	9.27%	4.08%	3.90%	7.91%	6.63%	6.94%
2004	0.00%	4.11%	7.07%	4.97%	1.38%	9.42%	8.52%	10.05%	4.82%	4.78%	8.39%	7.28%	8.96%
2005	0.00%	4.27%	5.50%	4.74%	4.00%	8.89%	8.84%	10.30%	6.08%	5.19%	9.74%	9.71%	9.98%
2006	0.00%	3.87%	5.50%	6.70%	5.13%	9.50%	9.89%	10.82%	6.19%	5.02%	10.90%	10.27%	11.56%
2007	0.00%	4.35%	5.45%	9.89%	3.92%	9.28%	9.89%	12.04%	6.25%	5.37%	10.11%	12.19%	11.29%
2008	9.52%	4.47%	6.73%	8.64%	2.84%	9.20%	10.19%	12.55%	5.74%	5.19%	11.08%	13.51%	11.14%
2009	8.00%	6.43%	5.77%	10.49%	3.68%	10.05%	10.98%	11.62%	6.29%	4.29%	9.37%	12.59%	10.68%
2010	7.69%	4.00%	4.76%	7.14%	3.13%	6.52%	6.79%	9.02%	4.07%	2.91%	7.04%	7.52%	7.32%
2011	7.69%	4.32%	5.43%	7.80%	2.63%	5.68%	7.76%	9.95%	3.97%	3.68%	5.39%	6.76%	7.20%

TABLE II-continued

Panel E: Total audit fee table for different industries for BIG5/4 (2000-2011)

Year	Agriculture	Ming and Construction	Food	Textile	Chemicals	Pharma	Extractive	Durable	Transportation	Utility	Retail	Services	Computer
2000	4,489,000	5,188,605	28,327,147	54,613,767	47,706,490	50,986,620	62,971,233	212,759,956	69,591,055	65,182,115	42,363,690	71,214,547	91,294,671
2001	6,702,886	17,409,901	51,452,004	75,037,095	84,948,778	85,736,615	73,334,586	373,367,310	100,081,944	100,671,491	122,118,431	99,199,385	220,853,774
2002	16,913,267	34,790,136	84,343,876	128,509,167	167,016,826	158,158,338	130,926,946	601,865,909	316,294,284	232,688,674	153,453,638	156,993,580	324,913,352
2003	12,756,418	50,638,380	104,252,681	165,976,071	218,493,450	183,253,263	168,401,567	879,445,839	401,179,144	278,025,180	195,153,909	201,769,517	445,018,135
2004	25,848,954	89,677,840	136,287,636	257,105,978	335,034,201	288,781,052	323,778,231	1,465,735,851	612,845,372	458,146,783	292,745,671	442,490,111	708,472,222
2005	29,610,815	112,457,738	213,534,169	309,972,073	358,046,941	351,000,205	384,162,849	1,719,456,092	699,531,230	456,478,147	477,291,134	547,245,077	938,138,942
2006	35,739,218	149,428,569	208,214,695	373,395,466	433,066,440	406,700,952	466,039,877	1,911,116,134	801,449,741	432,282,058	525,736,552	537,949,499	1,118,682,426
2007	35,476,170	194,513,936	195,201,801	321,442,092	323,749,042	420,651,011	461,086,800	1,919,911,262	763,443,678	419,210,122	516,171,058	498,597,970	1,189,518,764
2008	23,423,780	215,011,703	184,604,418	319,143,421	309,970,135	407,295,929	478,802,955	1,866,496,865	745,589,887	444,419,391	481,841,667	483,627,160	1,212,841,814
2009	27,163,039	191,866,525	189,240,229	280,417,687	280,668,018	382,224,344	441,332,908	1,746,561,025	672,681,041	414,015,391	476,429,842	455,208,889	1,069,287,024
2010	35,436,198	184,598,898	182,619,072	274,253,269	272,122,081	413,761,995	470,462,088	1,675,586,959	647,124,436	396,891,117	474,163,015	449,171,519	1,094,718,111
2011	34,279,904	183,974,237	171,394,021	247,289,024	252,725,227	408,773,028	460,768,178	1,681,624,963	637,196,806	395,481,490	438,406,263	432,335,465	1,063,084,238

Panel F: The number of firms in the audit market by different industries for BIG5/4 (2000-2011)

Year	Agriculture	Ming and Construction	Food	Textile	Chemicals	Pharma	Extractive	Durable	Transportation	Utility	Retail	Services	Computer
2000	6	20	23	65	46	147	76	366	116	83	113	154	228
2001	12	37	47	109	62	203	91	602	143	108	269	230	447
2002	16	67	68	137	91	241	112	712	232	188	317	258	536
2003	15	77	70	140	100	268	115	702	262	205	327	281	569
2004	15	78	68	145	100	280	119	724	281	197	326	282	560
2005	17	83	73	152	100	292	131	719	306	192	335	278	551
2006	15	99	71	151	99	306	134	688	302	179	327	287	562
2007	12	91	67	133	90	293	134	623	282	165	311	257	528
2008	9	88	59	119	80	262	141	551	280	167	279	253	500
2009	13	83	62	118	80	243	138	555	261	170	277	257	499
2010	14	94	58	115	79	241	153	544	259	170	288	242	500
2011	13	82	55	105	72	218	140	519	242	163	276	226	445

Table III
Determinants of Fee Premium Metrics(2000-2011)

This table shows the results of audit fee model in different samples. Sample A is from 2000 to 2012. We get the similar results as Blankley et.al. (2012). We add BIG-4*Industry in Sample B, we would like to show that after SOX, BIG-4 auditors charge a premium over some industries, while charge a lower premium over some industries. We add Big-4 dummy in Sample C&D. We would like to show that after SOX, Big-4 auditors charge a higher premium. Our results prove the hypothesis. ***, **, *, . Indicate statistical significance at 0.1%, 1%, 5% and 10% level, respectively.

	Full Sample		Sub Sample	
Dependent Variable	2000-2011	2003-2011	2000-2002	2003-2011
	(A)	(B)	(C)	(D)
Intercept	9.57***	9.58***	9.51***	9.60***
	(418.27)	(533.47)	(186.91)	(410.67)
lta	0.48***	0.45***	0.43***	0.45***
	(271.29)	(216.18)	(93.36)	(209.87)
BIG-5/4			0.07**	0.40***
			(2.76)	(39.56)
cr	0.00***	0.00***	-0.01***	0.00***
	(-15.23)	(-14.22)	(-11.81)	(-13.97)
ca_ta	0.61***	0.64***	0.19***	0.54***
	(31.85)	(33.07)	(4.41)	(27.02)
ARINV	-0.05**	0.02	0.39***	0.07** (3.10)
	(-2.30)	(0.8)	(7.89)	
ROA	0.00***	0.00***	0.00***	0.00***
	(-6.97)	(-6.57)	(-5.84)	(-6.84)
loss	0.20***	0.22***	0.26***	0.23***
	(23.95)	(25.43)	(15.27)	(26.34)
foreign	0.23***	0.20***	0.20***	0.20***
	(28.24)	(23.05)	(11.34)	(23.38)
merger	-0.03**	0.00	-0.01	0.00
	(-2.45)	(-0.4)	(-0.55)	(-0.02)
busy	0.08***	0.09***	0.12***	0.08***
	(10.65)	(11.1)	(7.07)	(10.47)
lev	0.01***	0.01***	0.00*	0.01***
	(10.89)	(10.66)	(-1.71)	(10.71)
intang	0.66***	0.69***	0.40***	0.61***
	(30.98)	(32.62)	(8.04)	(27.89)
seg	0.15***	0.15***	0.12***	0.16***
	(24.72)	(24.42)	(10.41)	(25.70)
GOING_CONCERN	0.11***	0.08**	0.25***	0.07**
	(4.33)	(3.02)	(4.49)	(2.92)
material_weakness	0.12***	0.08***	1.00***	0.09***
	(4.82)	(3.35)	(3.49)	(3.65)
BIG-4*agriculture		0.26***		
		(3.75)		
BIG-4*miningandconstruction		0.11***		
		(4.02)		
BIG-4*food		0.33***		
		(10.13)		
BIG-4*textile		0.36***		
		(15.26)		

Table III-Continued

	(A)	(B)	(C)	(D)
BIG-4*chemicals		0.59***		
		(20.7)		
BIG-4*pharma		0.32***		
		(17.96)		
BIG-4*extractive		0.33***		
		(13.36)		
BIG-4*durable		0.46***		
		(34.6)		
BIG-4*transportation		0.21***		
		(11.17)		
BIG-4*utilities		0.05**		
		(2.24)		
BIG-4*retail		0.20***		
		(11.47)		
BIG-4*services		0.40***		
		(22.93)		
BIG-4*computer		0.43***		
		(30.65)		
INDUSTRY	YES	NO	YES	YES
N	51732	43096	8636	43096
R-Square	0.7525	0.7854	0.7264	0.7881

Table IV

Spearman Rank Order Test

The Spearman rank test is used in this table to indicate the relationship between the Fee premium, SOX effect, Arthur Andersen bankruptcy effect. Market Share Rank is based on the difference of Market Share in 2001 and 2011 for NB-5/4. Fee Share Rank is based on the difference of Fee Share in 2001 and 2011 for NB-5/4. SOX Rank measures the difference in pricing power in NB-5/4, which is defined on the difference of Audit Fee divided by Market Share in 2001 and with the same ratio in 2011. Fee Premium Rank is based on the coefficient of BIG-4*Industry dummy of audit fee premium model (2003-2011). Arthur Andersen Market Share Rank is based on Arthur Andersen's market share in 2001. Arthur Andersen Fee Share Rank is based on Arthur Andersen's audit fee share in 2001. AA Switch Share is based on the ratio of the number of prior AA clients switching to NB-4 divided by the number of prior AA clients switching to other BIG-4 audit firms in 2003. Panel B shows the results of Spearman rank test. ***, **, *, . indicate statistical significance at 0.1%, 1% , 5% and 10% level, respectively.

Panel A: Rank Table

Industry	Rank						
	SOX	Market Share	Fee Share	Fee Premium (Fee Premium Model)	AA Switch Share	AA Market Share	AA Fee Share
Agriculture	11	1	2	9	12	1	1
Chemicals	8	9	13	1	8	10	12
Computers	6	4	3	3	2	11	11
Durable manufactures	9	3	7	2	3	9	9
Extractive	2	8	5	7	6	2	6
Food	5	7	8	6	1	13	13
Mining and Construction	3	2	1	12	7	6	7
Pharmaceuticals	12	5	9	8	5	12	10
Retail	4	10	4	11	9	7	8
Services	7	6	6	4	4	5	3
Textiles and Printing/Publishing	13	11	12	5	11	8	5
Transportation	10	12	11	10	10	4	4
Utilities	1	13	10	13	13	3	2

Table IV - Continued

Panel B: Spearman Rank-Order Correlation

Correlation between Two Ranks	Fee Premium I						Fee Premium II		Fee Premium III		Arthur Andersen Market Share			Arthur Andersen Fee Share			
	With Agriculture*			Without Agriculture**			With Agriculture				With Agriculture		Without Agriculture	With Agriculture		Without Agriculture	
	rs	Sig.	8At	rs	Sig.	8At	rs	Si.	rs	Sig.	rs	Sig.		rs	Sig.	rs	Sig.
Market Share***	-0.786	***	-0.2	-0.755	***	-0.4	-0.016		0.214	*	-0.115		-0.420	***	0.121		-0.077	
Fee Share	-0.626	***	-0.3	-0.588	***	-0.3	-0.192	*	-0.264	*	0.258	*	0.091		-0.027		0.147	
Arthur Andersen Switch Share	-0.231	*		-0.434	***		-0.231	*	0.011		-0.654	***	-0.573	***	-0.70	***	-0.622	**
Arthur Andersen Switch Share1	(-0.071)			(-0.322)	**		-0.071		0.621	***	-0.05		0.210	*	-0.181		0.042	
Arthur Andersen Market Share	-0.126			0.035			-0.126		0.313	**					0.890	***	0.860	***
Arthur Andersen Fee Share	-0.159			0.007			-0.159		0.242	*	0.890	***	0.860	***				

Fee Premium I   =   Ranking based on the median of the Industry residual in Table III Column D ;
Fee Premium II =   Ranking based on the change in the coefficient of BIG-4*INDUSTRY before 2002 and after 2002 in equation(2);
Fee Premium III = Ranking based on the magnitude of the coefficient of BIG-4*INDUSTRY after 2002 in equation(2);
Market Share   =   Ranking based on the increase in NB-4 market share between 2001 and 2011;
Fee Share   =   Ranking based on the increase in NB-4 fee share between 2001 and 2001;
Arthur Andersen Switch Share = Ranking based on prior AA clients in the industry switching to NB-4 as a proportion of AA clients in the industry in 2003
Arthur Andersen Switch Share1 = Ranking based on prior AA switching to NB-4 clients as a proportion of total clients switching from BIG-4 to NB-4 in 2003
Arthur Andersen Market Share = Arthur Anderson's market share in 2001;
Arthur Andersen Fee Share   = Arthur Anderson's fee share in 2001;
8At=The first eight asset deciles. Both of the coefficient of market share, fee share change of NB4 with Fee premium of B4 with or without agriculture are significant at 0.05 level.
*means including agriculture industry.
**Excluding the agriculture industry because it consisted of only seven firms,
***Share is a ratio of the number with NB-4 firms divided by divided by total number of firms in the database.

TABLE V

Auditor Switch Model

This table shows the results of auditor choice model over the years 2000-2011 (we omit 2000 because the model uses lagged fees). Panel A Sample A covers the period 2001 to 2011 whereas   Samples C & D shows the clients switching behavior across 2003-2011. Sample B considers the period 2001-2002 to examine whetehr switching behavior changed after SOX. ABAFEE is the residual from Table III Column A in the year *before* the switch. The Mismatch variable is based on Landsman et.al. (2012). As we only consider BIG-4, we use Mismatch*BIG5/4 in our regressions (i.e., to see if mismatched clients with the BIG-5/4 were more likely to switch to NB-5/4). Our sample exhibits properties similar to that study (see Appendix). Our results show that clients are *more* likely to switch if they are paying a *higher* premium (in the post-SOX period) and *more* likely to switch in the years *2003-2011* in industries where NB-4 had a large market share *in 2001*. Panel B shows the audit switch behavior broken out for 10 assets deciles. The results show that 2001 market share increases the probability of switching in the low size deciles (***, **, *, indicate statistical significance at 0.1%, 1% , 5% and 10% level, respectively.)

Panel A: Audit Switching Model

	Full Sample	Sub Sample		
	2000-2011	2001-2002	2003-2011	
	(A)	(B)	(C)	(D)
Intercept	2.49***	0.92***	2.43***	2.14***
	(>100)	(23.52)	(>100)	(>100)
ABAFEE	-0.02	-0.34***	0.14***	0.14***
	(2.18)	(55.05)	(63.53)	(56.65)
NB4 Market Share in 2001	0.01***	0.01	0.02***	0.02***
	(21.72)	(0.47)	(31.77)	(37.98)
AA Market Share in 2001	0.00	2.49***	-0.62**	
	(0.00)	(14.99)	(6.91)	
ABAFEE*AAMARKET	0.07**	-0.12	0.16***	
	(3.82)	(1.42)	(18.83)	
AA Fee Share in 2001				-0.17
				(1.55)
ABAFEE*AAFEE				0.17***
				(22.15)
growth	0.00	0.00	0.00***	0.00***
	(12.51)	(0.76)	(10.47)	(9.16)
absdacc	0.00***	0.00***	0.00***	0.00***
	(48.13)	(11.71)	(62.85)	(59.60)
ARINV	-0.44***	0.99***	-0.63***	-0.56***
	(54.87)	(32.71)	(95.02)	(71.95)
GOING_CONCERN	-0.34***	0.06	-0.28***	-0.25***
	(34.69)	(0.14)	(19.80)	(15.37)
modop	-1.04***	11.2	-0.92***	-0.91***
	(97.12)	6	(73.02)	(71.88)
		(0.00)		
tenure	0.37***	0.89***	0.42***	0.42***
	(>100)	(802.24)	(>100)	(>100)

Panel A-Continued

	(A)	(B)	(C)	(D)
ROA	0.00	0.00	0.00	0.00
	(0.00)	(0.01)	(0.07)	(0.12)
loss	0.05**	-0.04	0.02	0.03
	(4.46)	(0.23)	(0.52)	(1.23)
leverage	0.01***	0.07***	0.01***	0.01***
	(14.97)	(11.49)	(10.28)	(9.55)
cash	0.32***	0.62***	0.30***	0.33***
	(43.48)	(19.94)	(32.65)	(36.89)
Mismatch*Big-5/4	-2.14***	-2.89***	-2.25***	-2.20***
	(>100)	(989.11)	(>100)	(>100)
expert	-0.17***	-0.05***	-0.18***	-0.18***
	(>100)	(16.53)	(>100)	(>100)
size	0.08***	0.31***	0.03***	0.04***
	(139.48)	(260.70)	(16.29)	(29.11)
merger	0.19***	0.42***	0.12**	0.16***
	(26.86)	(14.25)	(8.69)	(16.25)
N	415892	77642	338250	324747
Pseudo R square	0.263	0.397	0.284	0.284

Panel B: Auditor Switch Model by 10 Asset Deciles

	Switch Model 2003-2011									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Intercept	6.20***	4.22***	4.08***	2.28***	0.92***	1.74***	2.79***	1.73***	6.62***	21.49
	(>100)	(440.90)	(359.08)	(116.61)	(17.82)	(36.75)	(>100)	(8.31)	(13.19)	(1.23)
ABAFEE	-0.09**	0.05	0.13***	0.26***	0.16***	0.09*	0.74***	0.36***	1.93***	-0.78
	(3.95)	(1.13)	(11.65)	(46.89)	(14.96)	(2.80)	(>100)	(17.30)	(20.21)	(0.08)
NB4 Market Share	-0.01*	-0.01	0.05***	0.02**	0.02**	0.03***	0.00***	0.01	-0.25***	-0.65**
	(3.42)	(1.45)	(69.85)	(5.50)	(9.36)	(10.66)	(>100)	(0.72)	(11.01)	(5.06)
growth	0.21***	0.00	0.15***	0.04	0.08**	0.03	0.00***	0.03	3.73***	0.00
	(15.88)	(0.00)	(12.77)	(2.40)	(5.36)	(1.25)	(83.12)	(0.73)	(15.24)	(0.00)
absdacc	0.00***	0.00**	0.00	0.00***	0.00	0.00***	0.00***	0.00	0.00	0.00
	(39.23)	(8.11)	(0.86)	(36.47)	(0.33)	(12.01)	(>100)	(1.13)	(0.73)	(0.27)
ARINV	-0.82***	0.53**	-0.70***	-0.47**	-0.22	-0.55***	-1.48***	0.70	-7.45***	30.41
	(14.66)	(8.72)	(16.69)	(8.92)	(1.61)	(7.07)	(>100)	(1.54)	(13.77)	(1.11)
GOING_CONCERN	-0.99***	-0.89***	-1.73***	1.08**	-1.58***	12.56	33.79	7.79	10.94	3.72
	(57.43)	(45.03)	(104.16)	(4.23)	(26.39)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)
modop	10.15	0.34	-1.52***	0.41	-1.33***	-0.67**	-0.09***	-3.23***	12.09	0.44
	(0.00)	(0.68)	(22.06)	(1.28)	(44.26)	(6.51)	(170.65)	(132.55)	(0.00)	(0.00)
tenure	0.14***	0.42***	0.39***	0.43***	0.45***	0.45***	0.38***	0.50***	0.35***	1.55***
	(80.77)	(812.40)	(>100)	(>100)	(>100)	(>100)	(>100)	(258.98)	(11.52)	(7.41)
ROA	0.00	0.01	0.02**	-0.18**	-0.08	-0.06	-0.01***	0.12	-0.06	0.65
	(0.01)	(1.23)	(3.71)	(4.55)	(0.60)	(0.14)	(26.63)	(0.11)	(0.01)	(0.00)
loss	0.02	0.40***	0.34***	0.09	-0.05	-0.39***	-0.65***	-0.24	-1.52***	-5.78
	(0.03)	(25.82)	(28.79)	(1.79)	(0.42)	(20.80)	(>100)	(1.51)	(7.86)	(0.98)
leverage	0.00	0.00	0.20**	0.06	0.51***	0.17	0.05***	0.43	6.44**	0.68
	(0.24)	(0.10)	(3.75)	(0.34)	(11.31)	(0.95)	(>100)	(1.07)	(5.69)	(0.00)
cash	-0.01	1.19***	0.28**	0.71***	1.58***	0.56***	1.47***	2.38***	16.15**	58.85
	(0.00)	(73.17)	(4.01)	(24.20)	(92.14)	(9.02)	(>100)	(12.51)	(5.57)	(0.96)
Mismatch*BIG-4	-4.04***	-4.95***	-5.03***	-3.38***	-0.47***	-0.15	0.30***	-0.58**	16.15	2.35
	(>100)	(>100)	(>100)	(832.71)	(48.41)	(2.17)	(>100)	(6.33)	(0.01)	(0.07)
expert	-0.13***	-0.10***	0.03***	-0.10***	-0.28***	-0.20***	-0.18***	-0.14***	0.17	-0.02
	(62.55)	(60.38)	(8.04)	(60.43)	(621.63)	(232.09)	(>100)	(23.16)	(1.38)	(0.00)
size	-0.37***	-0.17***	-0.14***	0.16***	-0.02	-0.13**	-0.14***	0.04	0.39**	-1.23
	(191.47)	(39.19)	(20.98)	(23.97)	(0.22)	(8.51)	(>100)	(0.21)	(4.60)	(0.44)
merger	-0.28*	-0.05	0.01	0.31***	0.09	0.36***	0.44***	-0.85***	-2.49***	5.89
	(2.72)	(0.15)	(0.00)	(9.62)	(0.97)	(11.86)	(>100)	(25.58)	(18.81)	(0.15)
N	30390	33718	34646	33865	33650	35162	35236	35621	35200	30762
Pseudo R square	0.451	0.450	0.365	0.302	0.209	0.181	0.091	0.260	0.344	0.963

APPENDIX

ESTIMATION OF CLIENT MISALIGNMENT

We follow the methodology in Shu (2000) to indicate the probability a firm is misaligned with its current auditor. Specifically, we estimate the following model separately for each year in the sample period, using all available observations from Compustat:

$$BigN_t = \alpha + \alpha_1 Size_t + \alpha_2 Acquisition_t + \alpha_3 ExFinance_t + \alpha_4 \Pr ofitability_t$$
$$+ \alpha_5 MktBk + \varepsilon_t \qquad (A1)$$

Where

BigN=1 if the company had a Big N auditor, and 0 otherwise1[15];

TABLE A1
Estimation of Client Misalignment

Panel A: Coefficient Estimate Summary Statistics from Annual Estimations of the Client Misalignment Model

Variable	Mean	Standard Error	P-Value
Intercept	-2.18	0.0270	<.0001
Size	0.58	0.005	<.0001
Acquisition	-0.03	0.11	0.77
ExFinance	-0.02	0.02	0.19
Profitability	-0.00007	0.0007	0.92
MktBk	-0.00006	0.00004	0.15

Panel B: Estimated Cut-Off Probabilites

Year	N	Estimated Cut-Off Probability
2000	4,717	0.64
2001	6,495	0.63
2002	8,069	0.63
2003	8,517	0.64
2004	8,434	0.64
2005	8,329	0.64
2006	8,164	0.64
2007	7,824	0.73
2008	7,350	0.74
2009	7,199	0.72
2010	7,049	0.73
2011	6,335	0.73

The coefficient estimates from this regression are utilized to estimate the probability of having a Big N auditor in a certain year. The point at which the Big N and non-Big N auditor distributions cross is an

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[15] Shu (2000) defines the dependent variable to include all "large "auditors, defined as Big N auditors and any auditor identified by an individual auditor code on Compustat, Because our analysis is to find the probability that if the client is misaligned with a Big N auditor. So we follow Landsman et.al (2009), utilize the Big N auditor as the dependent variable.

estimate of the optimal cut-off level. If the probability of having a Big N auditor falls below the cut-off point, the client is expected to have a Non-Big N auditor. So if the client has a Big N auditor, then we define MISMATCH equals to 1. We choose different cut-off levels until we get the best cut-off level which will minimize the MISMATCH. Our results before 2005 is different from Shu (2000) and Landsman (2009), we think the difference comes from the limitation about the data.