Is the Auditing Industry Becoming a Tighter or Looser Oligopoly?

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Abstract

The market concentration of Big N auditors increased steadily during the last half of the 20th century, such that by the mid-1990s, the public accounting industry had become a tight oligopoly. After the dot-com bubble and the SOX regulation, however, we find a significant reversal in two trends that affect Big N's market concentration. First, unlike before the mid-1990s when companies were more likely to upgrade from a non–Big N to a Big N auditor, downgrades now exceed upgrades. Second, unlike the 1980s and 1990s when three out four new issuers of public equity had a Big N auditor, recent new issuers are more likely to have a smaller than a Big N auditor. These two trends, combined with the shift in the client population toward new issuers, indicate that the audit industry is deconsolidating. Our results point to increased selectivity by Big N auditors and a growing divergence in the characteristics of markets addressed by Big N and non–Big N auditors.

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1. Introduction

The number of major players in auditing (the Big N firms) fell from eight to four by 2002, their market shares increased steadily from 1975 to 1998 in almost all categories of public companies (Shu 2000, p. 179), and these four players controlled over 98% of the audit revenues from large public companies in 2002 [Government Accountability Office (GAO) 2008].[1] This increased market concentration of Big N auditors alarmed regulators (Dwyer 2003; Cox 2005; Nocera 2005; Cunningham 2006) and has been the subject of academic research (e.g., DeFond and Lennox 2011; Gerakos and Syverson 2015; Ferguson, Pinnuck, and Skinner 2016). We contribute to the literature by showing a reversal of the trend of consolidation in the audit industry at the outset of the 21st century and examine potential reasons for this phenomenon. In addition we document a growing auditor–client self-selection in the auditing market and a divergence between the characteristics of market segments addressed by Big N and non–Big N auditors (Sutton 1991).

We find two significant trend reversals that could affect the audit industry's competitive structure. First, for the first time since 1975, when data became available to examine the market concentration in the U.S. auditing market, a newly listed company is more likely to have a non–Big N than a Big N auditor (see Figure 1). Contrast it to the mid-1990s when approximately 80% of new public issuers selected a Big N as an auditor. Second, while the initial client-auditor relationship remains sticky over time (e.g., DeAngelo 1981a), especially for whether a company has a Big N or non–Big N auditor, the number of companies downgrading from a Big N to a non–Big N auditor now exceeds the number of companies upgrading their auditor (see Figure 2). As newer cohorts of listed companies replace legacy cohorts in the set of public companies (see Figure 3), the auditor–client selection decisions of recent cohorts, not legacy cohorts, determines the

[1] Ernst & Young, KPMG, Deloitte & Touche, PwC, Arthur Andersen, and their predecessors are the Big N firms.

evolving competitive structure in the audit market. (For example, more than 80% of the companies observed after 2010 are listed after 1990.) The overall effect of these developments is that the numerical market share of Big N auditors, which increased steadily to 82% by the end of the 20th century, declined to 61% by the end of 2010, the lowest ever to the extent measurable by auditor data available in Compustat (see Figure 4). These trends indicate that the audit industry is evolving toward a looser oligopoly, a trend that contrasts with what has been documented or generally considered in prior literature.

[Insert Figures 1, 2, 3, and 4 near here]

Without taking into account the stylized facts presented in the aforesaid paragraph, one might expect that the trend of Big N's increasing market concentration in the last quarter of the 20th century (Shu 2000) would continue into future. This is because the survivorship, economies of scale, and insurance capabilities of suppliers along with the stickiness of the client-auditor relationship, remain the prerequisites for extracting rents in the assurance industry (Arnett and Danos 1979; Wallace 1980; Danos and Eichenseher 1982). All of these factors are reliable predictors of further tightness in an already tight oligopoly (Klepper and Simons 2000). For example, in the U.S., only one new large player in the automobile industry and no new large player in the tire industry has emerged since 1950.

So what could cause the reversal in the trends in competitive structure at the onset of the 21st century? Potential factors including changes in client characteristics (demand shifts), audit firms' cost structure and opportunity set (supply shifts), and regulatory shocks (Brown and Knechel 2016). We next systematically examine each of these factors.

Demand shifts could occur because of changes in the properties of new public companies. Industry membership of new issuers veers toward knowledge-based industries, such as

pharmaceuticals, electronics, and business services (Ritter and Welch 2002; Srivastava 2014a). Each new cohort of listed firms has lower likelihood of survivorship (Govindarajan and Srivastava 2016) and has less verifiable assets, growth options, and earnings and stock return volatilities than their predecessors, not just in the initial stages of its life cycle, but also for decades after listing (Brown and Kapadia 2007; Srivastava and Tse 2016). As such, the right and the left skewness, respectively, of the cross-sectional distributions of volatility risk and the financial reporting quality increases with the arrival of each new cohort (Fama and French 2004; Srivastava 2014a; Bushman, Lerman, and Zhang 2016).

These changes in the nature of public companies should increase the likelihood of financial misstatements, accounting fraud (Jones et al. 2008), and auditor litigation because a sudden drop in stock prices and financial misstatements are the main determinants of auditor litigation (Lys and Watts 1994; Carcello and Palmrose 1994; Bonner et al. 1998).[2] If Big N firms maintain their litigation-risk thresholds in the selection of new clients or in the retention of existing clients (Asare and Knechel 1995; Simunic and Stein 1987; Johnstone and Bedard 2003; Shu 2000; Huang et al. 2009), then a lower percentage of newer cohorts would meet them, leading to decline in Big N's market share in the market of new issuers.

Changes in the nature of new public firms arguably began in 1970, coinciding with the advent of NASDAQ (Fama and French 2004), and the trend of listing of risky firms accelerated in 1980s and 1990s (Brown and Kapadia 2007). However, the likelihood of a new public issuer having a Big N as an auditor increased steadily from 60% in 1975 to more than 80% in 1995 (Figure 1). Also, until 1995, the likelihood of an auditor upgrade exceeded the likelihood of an auditor downgrade (Figure 2). Ostensibly, the ongoing change in the nature of public companies

[2] Claims against auditors and auditor liability insurance premiums have increased over time (Linville and Thornton 2001; Eigelbach 2011) and significantly affect auditors' profitability.

(that is, client-side factors) increased, not decreased, Big N's market share.

Nevertheless, we find a reversal in the trend of increasing Big N's share in the new-list market in the two time intervals of 1996 to 1999 and 2000 to 2002. These two intervals were characterized by irrational exuberance (Greenspan 1996) and dot-com bubble bust, respectively. The first interval saw a spurt in the listing of small firms with little or no tangible assets, revenues, or profitability (Delong and Magin 2011). The second interval witnessed bankruptcies and delisting of many dot-com companies (Ljungqvist and Wilhelm 2003). Both developments are independently associated with the decline in Big N's market share, consistent with the idea that Big N became more cautious in their client selection during these time intervals.

A second factor that could affect the industry structure is the growing prominence of second-tier audit firms in the auditing market (Hogan and Martin 2009).[3] We test this idea by dividing audit firms into three categories: Big N, second-tier, and small firms. However, no significant trend emerges in the market share of second-tier firms. Additional tests show that smaller audit firms, not second-tier firms, are making inroads into the market of new public firms.

We next examine two 21st century regulatory developments that could impact Big N's decision to accept new, high-risk clients. Before Section 201 of the Sarbanes-Oxley Act (SOX) of 2002, large auditors with their multifaceted organizational structures often commanded large revenues from tax, information technology (IT), risk, and strategy advisory services rendered to their audit clients. For Big N, revenues from such non-audit services often exceeded audit revenues and their rents could be used to compensate for litigation costs from high-risk clients (Simunic 1984; Shu 2000; GAO 2003; Johnstone and Bedard 2003). SOX, however, prevents an auditor from providing consulting services to its audit clients. After this regulation, three out of four Big

[3] The firms are BDO, Grant Thornton, Crowe Horwath, and McGladrey.

N divested their advisory and consulting practices (Harris 2014). Implementation of Section 201 would thus more likely affect the client-selection decisions of large than small auditors.

Second, the creation of the Public Company Accounting Oversight Board (PCAOB) following SOX dramatically shifts the monitoring of public auditors, from a self-regulatory basis to a not-for-profit regulatory third party. The PCAOB conducts inspections of firms that audit public companies. These inspections are annual for firms that audit more than 100 public companies and triennial otherwise, and thus more intense for larger audit firms. An inspection encompasses two elements: The inspection of selected portions of audits of individual engagements, and an inspection of the quality control systems of an audit firm. The latter encompasses a review of client acceptance and retention policies. While the PCAOB only inspects a small number of client engagements of a given auditor, such inspections can reveal systematic deficiencies across engagements which rise to the level of quality control issues (e.g., Aobdia 2016). Overall, dealing with PCAOB inspections is costly for an auditor besides the initial resources expanded to interact with the PCAOB, because 1) remediation of quality control criticisms is costly and 2) firms' reputation and market share can decline when deficiencies are publicly criticized by the PCAOB (e.g., Nagy 2014; Aobdia 2016).

Because 1) engagements selected for inspection are based on an initial risk assessment that is potentially based on the magnitude of accounting estimates and lower financial reporting quality (e.g., Aobdia 2015, Gunny and Zhang 2013, PCAOB 2016), 2) The PCAOB reviews client acceptance and retention policies, and 3) The PCAOB monitoring is more intense for larger auditors, a large auditor is more likely than a small auditor to drop or not initially accept a client with poor financial reporting quality to avoid potential remediation and reputational costs.

We find a significant decline in the market concentration of Big N auditors from the pre–to the post–SOX and PCAOB periods. These two 21st regulatory events by themselves appear to explain approximately 14 percent point decline in Big N's market concentration. Compare it to a total of 22 percent point decline from a peak of 83% in 1996 to 61% now. Correspondingly, the market concentration of smaller auditors increase despite their one-time, large-scale, post–SOX exodus (DeFond and Lennox 2011, p. 27). Results are consistent with the idea that SOX related regulatory developments had a significant impact on Big N's acceptance/retention of risky clients.

Despite the dramatic increase in the numerical market share of non–Big N auditors from 18% in 2000 to 38% in 2010, we find a less significant reversal in non–Big N's market share when using a proxy for audit fees.[4] This share, which had declined from 12% in the 1970s to just 6% by the end of the 20th century, increased to 11% by the end of 2010. That non–Big N firms obtain only 11% of audit fee share despite having 38% numerical market share indicates a growing dichotomy in the characteristics of markets addressed by Big N and non–Big N auditors, which is our second contribution to the literature.

We find that the differences between the sizes and the financial reporting qualities of companies serviced by Big N and non–Big N auditors, which were relatively small until 1995, increased dramatically thereafter. [See divergences in trends in log of assets, absolute value of unexplained accruals (Dechow and Dichev 2002), the absolute value of performance-matched discretionary accruals (Kothari et al. 2005), and the percentage of delisting companies for the two market segments in Figure 5.] The difference between the characteristics of Big N and non–Big N clients widens with the arrival of each new cohort of listed firms, with the riskiest clients and the smallest companies being covered by non–Big N auditors.

[4] We use the proportion of the square root of client assets, a reliable predictor of audit fees (e.g., Simunic 1984), because audit fees are publicly disclosed for all companies in the U.S. only after 2000.

[Insert Figure 5 near here]

Increasing divergence between the characteristics of Big N and non–Big N clients likely occurs because of greater selectivity on the part of Big N auditors (Johnstone and Bedard 2003, 2004; Krishnan and Krishnan 1997; Lawrence et al. 2011). This conclusion is supported by a set of apparently inconsistent findings. The client size–adjusted fee premium of Big N versus non–Big N narrows with the arrival of each new cohort, which is opposite to the widening differential of financial reporting qualities. If the widening differential was because of the increasing superiority in auditing by Big N firms, then the Big N audit fee premium would have increased, not declined (Ireland and Lennox 2002; Ball et al. 2012; Hribar et al. 2014). Additional support for the selectivity hypothesis comes from abnormal developments in the first six years of the 21st century, coinciding with dotcom bust and new regulations. These six years witnessed a dramatic improvement in the average financial reporting quality of old issuers that were Big N clients. Meanwhile, the average financial reporting quality of old issuers that were non–Big N clients declined. Additional tests indicate that in those years, Big N dropped *en masse* clients with poorest financial reporting quality. Those client were accepted by smaller auditors, causing a further divergence in the properties of Big N and non–Big N clients even without taking selectivity of new issuers into account.

In sum, our study responds to DeFond and Zhang (2014) and Donovan et al. (2014), who call for studies on time series trends of audit industry structure, quality, and fees. We contribute to the literature by showing a trend of deconsolidation in the audit industry that contrasts with the trends of increasing market concentration in the late 20th century (Shu 2000). Also, the regulatory changes that initially led to increased market concentration of Big N auditors, because of the departure of small auditors from the market (DeFond and Lennox 2011), are now having an

opposite effect. Our results suggest that the peak of Big N's market concentration is past.

Regulators who are concerned about the tight oligopolistic nature of the audit industry might see the decreasing market concentration of Big N auditors as a positive development. Nevertheless, that a growing number of risky and difficult-to-audit new issuers are serviced by small, inexperienced auditors, who easily issue GC opinions, might also alarm regulators. Furthermore, these developments could increase the overall audit costs and the cost of capital for companies, given that economies of scale are an integral feature of the audit industry and that investors appreciate the value of reputed auditors with insurance capabilities. We also document two contrasting trends: a deterioration in the traditional measures of audit quality and an increase in client size–adjusted fees.

The rest of the paper is organized as follows.[5] Section 2 summarizes prior research on the evolving competitive structure in audit industry and highlights the importance of examining this topic. Section 3 describes reversals in trends that affect the competitive structure. Section 4 describes sample section and description of variables. Section 5 presents results of empirical tests to determine reasons for reversal in trends. Sections 6 and 7 examine the implications for audit quality and fees, and Section 8 concludes.

2. Consolidation in audit industry

The audit industry plays a key role in preserving transparency and improving the functioning of capital markets (Watts and Zimmerman 1983, Ball 2001). However, it differs from other for-profit industries in one major characteristic—its demand in the market of public companies is mandated by regulators. Publicly traded firms are compelled to purchase audit services that cannot be substituted with products or services from other industries. Therefore, to

[5] The structure is similar to Bernard and Thomas (1989)

the extent that the competitive structure of the audit industry affects the quality or the prices of those services, as posited by the industrial organizational literature, it is also likely to affect the capital efficiency of public corporations as well as the general investor welfare. This section summarizes the prior literature on the competitive structure of the audit industry.

2.1. Recent surveys

DeFond and Zhang (2014) reason that audit characteristics are strongly related to clients' underlying economics. They claim that a firm's innate characteristics constrain the achievable level of financial reporting quality post-audit (Lennox et al. 2014). Their study, along with Donovan et al. (2014), raises several questions about the changes in the attributes of the public accounting industry, particularly the competitive structure, the audit quality and fees, and the role of high-quality audits in overall financial reporting quality.

2.2. Past trend of increasing concentration in the audit industry

Shu (2000) examines trends in market shares of large versus small auditors from 1974 to 1998. Her Figure 1 (p. 179) shows a monotonic increase in large auditors' market shares for almost all categories of public companies. For example, for companies listed on NYSE, the national market system of NASDAQ, and AMEX, bigger auditors' total numerical market share went above 95%, 90%, and 85%, respectively, by 1998. The only exception was the category of small cap companies of NASDAQ, in which Big N's market share declined.

By extending the 25-year pattern presented in Shu (2000), one may conclude that Big N's market concentration would increase further. This prediction is supported by the economics literature. Economies of scale being a key success factor in the industry and the industry already

being a tight oligopoly are reliable predictors of further tightness (Klepper and Simons 2000).[6] Both factors apply to the audit industry because it is currently a tight oligopoly and because supplier's survivorship, economies of scale, and insurance capabilities are the primary success factors in this industry (Arnett and Danos 1979; Wallace 1980; Danos and Eichenseher 1982).[7] In tight oligopolies, each player's interest lies in not disturbing the equilibrium structures to avoid retaliatory actions from competitors (Kaysen and Turner 1959; Shepherd 1962). Thus, the audit industry could be in a state of stable equilibrium and might become a tighter oligopoly in the future.

2.3. Regulator's concerns about concentration in the audit industry

The evolution of the public accounting industry is characterized by the consolidation of the market in the hands of large audit firms as a decreasing number of large U.S. accounting firms perform audits for the vast majority of public companies (GAO 2008). The number of these firms has fallen from eight to four, as a result of mergers and the dissolution of one firm.[8] The GAO finds that these Big N firms audit 98% of the largest public companies and collect more than 90% of all audit fees paid by public companies. The agency also claims that the U.S. audit market functions as an oligopoly and conjectures that the Big N firms have a large enough market share to use their market power, either unilaterally or through collusion, to influence price and other business practices to their advantage (GAO 2008).

Studies in economics voice similar concerns for concentrated markets. Kaysen and Turner (1959) and Shepherd (1962) claim that a seller in a tight oligopoly can predict its competitors'

[6] Studies offer different criteria for defining a tight oligopoly, all of which are met by the public accounting industry. For example, some define a tight oligopoly as when the top four firms hold more than 60% market share (Shepherd and Shepherd 2004) or when eight or fewer firms hold more than 50% market share (Kaysen and Turner 1959).

[7] See Ferguson et al. (2016) for the investments by audit firms in exogenous and endogenous sunk costs, creating economies of scale.

[8] The eight firms in the 1980s were Arthur Andersen LLP, Arthur Young LLP, Coopers & Lybrand LLP, Deloitte Haskins & Sells LLP, Ernst & Whinney LLP, Peat Marwick Mitchell LLP, Price Waterhouse LLP, and Touche Ross LLP.

reaction even in the absence of overt collusion and realizes that the benefits of cooperation exceed the rewards from cheating. The Department of Justice and Federal Trade Commission (2010) consider a market dominated by five or fewer players to be "highly concentrated." The DOJ is particularly concerned about the systemic risk that a large auditor failure can impose on the U.S. market (Cunningham 2006). Arguably, this concern prevented DOJ from indicting KPMG for its complicity in a $2.5 billion evasion of taxes in 2005 (Nocera 2005).

Regulators, therefore, have consistently argued against the increasing market concentration of Big N firms. For example, in 2003, SEC chairman William Donaldson called the large market share of Big N audit firms "a national problem" (Dwyer 2003). In 2005, SEC chairman Christopher Cox urged the SEC and the American Institute of Certified Public Accountants (AICPA) "to support competition and choice in the market for smaller public company auditing services" (Cox 2005). The pattern is not confined to the U.S. The European Commission (2010, p. 15), upon finding that 90% of audit fees go to Big N firms, warned that "[s]uch concentration might entail an accumulation of systemic risk and the collapse of a 'systemic firm' or a firm that has reached 'systemic proportions' could disrupt the whole market." Academic research remains divided on whether the increased concentration benefits or harms U.S. corporations (e.g., DeFond and Lennox 2011; Gerakos and Syverson 2015).

3. Developments in the competitive structure of the audit industry in the 21st century

The 21st century developments in the competitive structure of the U.S. audit industry have gone contrary to these predictions in Subsection 2.2, as discussed below.

3.1. Changes in initial auditor choice of a new public company

We examine the likelihood of a new public issuer having Big N as an auditor, using longitudinal data from Compustat with non-missing AU variable. We call the first year in which a

company has valid financial and stock price data in Compustat as the listing year (Srivastava 2014a; Bushman et al. 2016). Figure 2 shows that this likelihood increased almost monotonically from 61% in 1975−1979 interval to 80% in 1990−1994. Thereafter, it steadily declined. For the subsequent five-year intervals of 2000−2004, 2005−2009, and 2010−2014, Big N's share in the market segment of new companies was 60%, 52%, and 45%, respectively. Thus, for the first time since the auditor data became available in Compustat (1975), a newly listed firm is more likely to have a non–Big N than a Big N auditor. We find similar results using the Audit Analytics database.[9]

3.2. Changes in upgrade and downgrade patterns

The evolution of competitive structure in auditing industry is a function of the initial auditor choice of newly listed companies and their subsequent upgrade/downgrade over time. The period from 1987 to 1998 was characterized by consolidation in Big N when their count fell from 8 to 5. Such a consolidation should increase the average size of Big N firms. To the extent that auditor size improves its expertise and the quality of services offered, Big N's consolidation should attract clients from smaller audit firms, all else held equal. Indeed before 1995, the number of companies that upgraded their auditor types exceeded the number of downgrades. The trend reverses thereafter. In each of the successive three year intervals of 1996−1999, 2000−2003, and 2001−2004, downgrades exceed upgrades (see Panel A of Figure 2). Over the 2000−2003 and 2004−2006 intervals, the number of downgrades was almost twice that of the upgrades, consistent with the idea of large-scale shedding of less desirable clients by Big N firms in the first six years of the 21st century. (We examine reasons for this development in Section 6.)

3.3. Trend in Big N's overall market share

[9] We consider companies with AUDITOR_FKEY between one and five as having Big N auditors.

The two trend reversals documented in Subsections 2.2 and 2.3, along with the ongoing renewal of the set of listed firms (Figure 3), indicate that the audit industry is evolving toward a looser oligopoly. We test this idea by calculating the percentage of Big N clients in successive five-year periods from 1975–1979 to 2011–2014. Panel A of Figure 4 shows that the numerical market share of Big N auditors increased steadily from 77% in 1975–1979 to 82% in 1991–1995. But it started declining thereafter, going down to 62% by the end of 2010. Correspondingly, the numerical market share of non–Big N more than doubled from 18% to 38% in 2010, a dramatic development in a span of just ten years.

In what follows, we examine potential reasons for the trend reversals.

4. Sample selection and measurement of variables

In this section, we discuss the sample selection and measurement of key variables required for our empirical tests.

4.1. Sample selection

To examine systematic trends in successive cohorts of listed firms, we divide firms by the decade of their listing year. We classify companies as pre-1970s if they are listed before 1970 and as new-lists otherwise (Fama and French 2004). Each cohort of new-lists is tied to a common listing decade. Thus, we divide all companies into six groups: pre-1970s and cohorts for the 1970s, 1980s, 1990s, 2000s, and 2010s. A ten-year classification merely provides six parsimonious, ordered categories for presentation purposes. Similar parsimonious ten-year classifications are used in prior studies [Fama and French (2004), Srivastava (2014a), and Bushman et al. (2006) use 1970–1979, 1980–1989, and so on, and Brown and Kapadia (2007) use 1965–1974, 1975–1984, and so on]. We conduct additional tests using five-year classifications (e.g., 1975–1979, 1980–1984, and so on).

We use three sets of samples in this study. The first requires non-missing observation on AU variable in Compustat that gives us 293,132 firm-year observations from 1975 to 2014. The number of firm-years in this sample by listing cohorts and five-year intervals are presented in Panel A of Table 1. This Panel also shows that the emerging properties of the public companies reflect those of new, not legacy cohorts. 82% of observations after 2010 come from firms listed in 1990s, 2000s, and 2010s. Thus, the likely evolution in the properties of listed companies can be best studied by examining the recent cohorts, not pre-1970s, 1970s, or 1980s.

The second set requires data for calculation of measures of financial reporting quality as well as control variables for multivariate regressions. This leaves us with a sample of 152,149 firm-year observations, described in Panel B of Table 1. Finally, we intersect this sample with audit fees data from Audit Analytics database to obtain 53,196 observations. The sample is greatly reduced because public corporations have been mandated to disclose the fees they pay to their auditors only since 2001. The sample with audit fees is presented in Table 5, which describes the audit-fee tests.

4.2. Measurement of variables

In this subsection, we discuss the measurement of key dependent and independent variables. Detailed measurements are provided in the Appendix.

4.2.1. Intangible intensity

R&D_Intensity represents the extent of intangible usage, and *COGS_Intensity* increases with physical costs of production (material, labor, energy, and inventory). We measure high-technology industries consistent with Schipper (1999) and Kwon et al. (2006).

4.2.2. Factors affecting the amount of accounting estimates and managerial judgment required in financial reports

We measure the complexity of a firm's revenue recognition by the ratio of deferred revenue to revenues (*DeferredRevenueToSalesRatio*), consistent with Prakash and Sinha (2013) and Srivastava (2014b). Revenue recognition is the single largest area of financial misstatements and SEC's investigation of accounting frauds (Efendi et al. 2007; Deloitte Forensic Center 2007). As does Efendi et al. (2007), we define *LargeAcquisition* as one when the contribution to revenues from acquired companies exceeds 20% of total revenues for that year. We argue that the judgment required for the identification of asset classes and the estimation of their fair values increases in *LargeAcquisition*.[10] *SpecialItems* represents restructuring charges, asset impairments, and losses from asset sales (Donelson et al. 2011). Thus, it should also represent the unexpected developments in companies' business environments. In addition, restructuring charges often require estimates of future cash payments. We examine the extent of stock option–based compensation by the ratio of stock-based compensation expenses to total expense. The recording of this expense requires many forward-looking estimates.

We measure managers' judgment in financial reporting (Jones 1991; Kothari et al. 2005) by the absolute value of performance-matched discretionary accruals (*AbsPerMatchedDiscAccruals*). This judgment could be used for an opportunistic reason or to convey useful information to outside investors (Subramanyam 1996; Healy and Wahlen 1999; Fields at al. 2001; Dechow et al. 2010).

[10] See, for example, the first audit deficiency reported by the PCAOB, for issuer A, in the 2011 inspection report of Deloitte. In this inspection, the PCAOB identified a departure from the Generally Accepted Accounting Principles related to allocation of an acquisition's purchase price between definite-lived intangible assets and goodwill.

4.2.3. Uncertainty of future firm performance

We reason that a company's volatilities of cash flows (*CFO*) and sales growth are indicators of the unpredictability of its key economic events (Pástor and Veronesi 2003; Zhang 2010). We also reason that the higher such uncertainty, the lower the managers' ability to forecast future events and the lower the reliability of forward-looking estimates in financial reports. We estimate the standard deviations of *CFO* as well as those of sales growth for each company-year using four rolling annual observations ($t - 3$ through t). For multivariate tests, we control for the uncertainty of firm performance by the standard deviation of cash flows from operations (*VolatilityCFO*).

4.2.4. Measures of financial reporting and audit qualities

We measure financial reporting quality by the extent to which accounting accruals map with economic outcomes. Such a quality of accruals is measured conversely by the absolute value of the residuals from a regression of total current accruals on past, current, and future cash flows (*AbsResidualsDD*) on an industry-year basis (Dechow and Dichev 2002), augmented with gross property, plant, and equipment and sale change, deflated by average total assets (McNichols 2002; Francis et al. 2005). The residual measure also represents the initial error in accounting estimates (Dechow and Dichev 2002) and is a predictor of financial misstatements and accounting frauds (Jones et al. 2008).

We use the frequency of the going-concern assumption issued by audit firms as an additional measure of audit quality. We refine this measure consistent with Knechel et al. (2013). We define type 1 errors as going-concern opinions not associated with future bankruptcies. We call non-issue of going-concern opinions followed by bankruptcy the erroneous clean opinions. We identify bankruptcy companies from the Securities Data Company database and the UCLA-

LoPucki Bankruptcy Research Database. We identify high-litigation industries consistent with Kim and Skinner (2012).

4.2.5. Auditor characteristics

BigN takes a value of one if the auditor is a Big N firm (Arthur Andersen LLP, Arthur Young LLP, Coopers & Lybrand LLP, Deloitte Haskins & Sells LLP, Ernst & Whinney LLP, Peat Marwick Mitchell LLP, Price Waterhouse LLP, and Touche Ross LLP) and zero otherwise. These firms are identified with AU variable having value between 1 and 8. BDO, Grant Thornton, Crowe Horwath, and McGladrey are called second-tier firms. Audit firms that are not Big N or second-tier firms are small firms.

4.2.6. Audit fees

We measure audit fees with data from Audit Analytics. We deflate audit fees by the square root of assets (*AuditFee_SqrtAssets*) to obtain client size–adjusted audit fees for multivariate tests. We deflate fees by the square root of assets instead of by total assets, following prior literature (e.g., Simunic 1980, p. 180). In a univariate regression of log audit fees on log assets, the regression coefficient is approximately 0.5 with *R*-squared exceeding 60%. Hence, Simunic (1984) argues for deflating audit fees by the square root of assets. We also use log of audit fees (*LogAuditFees*) and the commonly used audit fee models to estimate multivariate regressions.

4.3. Industry analysis

We examine the changing industry composition of listed companies and whether and how those changes influence the factors affecting auditor selection and financial reporting quality. To do so, we assign *CohortDummy* values of 0, 1, 2, 3, 4, and 5 to pre-1970s companies and the cohorts from the 1970s, 1980s, 1990s, 2000s, and 2010s, respectively. We categorize all of the firms by the Fama–French 48-industry classification and exclude four industries representing

finance firms and two representing the "coal" and "almost nothing" categories.[11] We calculate an industry's "recency" by averaging the *CohortDummy* of all of its pooled firm-year observations (Srivastava 2014a). Thus, an industry's recency ranges from 0 to 5—the higher the recency, the higher the proportion of company-year observations coming from the most recent cohorts.

We sort industries by the highest to lowest values of recency and present them in Panel A of Table 2. The eight industries with the highest recency are Business services, Pharmaceutical products, Communication, Healthcare, Entertainment, Computers, Medical equipment, and Personal services. All of these industries are innovation and knowledge intensive. The ten industries with the lowest recency are Shipping containers, Machinery, Defense, Textiles, Aircraft, Construction materials, Consumer goods, Fabricated products, Business supplies, and Utilities, all of which are material and asset intensive.

[Insert Table 2 near here]

Panel A of Table 2 also shows the average attributes of each industry based on all of its pooled firm-year observations. Panel B presents the Pearson and Spearman's rank correlations among the average attributes of the industries. Recency is negatively correlated with Big N, indicating that evolving industries employ a lower percentage of Big N auditors. Recency is positively associated with research and development (R&D), absolute values of residuals from the Dechow-Dichev equation, and erroneous going-concern opinions and negatively associated with company size. These results indicate that evolving industries have more difficult-to-audit assets and carry greater risks for company auditors. Big N is negatively associated with R&D and accrual errors, indicating that Big N firms avoid clients with intangible assets and poor financial reporting quality compared with non–Big N auditors.

[11] Interpreting intangible intensity of finance firms is difficult. The coal industry has a limited number of observations for our study period.

5. Reasons for trend reversals

We examine changes in client characteristics (demand shifts), suppliers' cost structure and opportunity set (supply shifts), and regulatory shocks (Brown and Knechel 2016) as reasons for trend reversals discussed in Section 3.

5.1. Changes in the nature of a typical listed company with new listings

Research suggests that the characteristics of listed companies change over time. Ritter and Welch (2002) and Srivastava (2014a) find a shift in industry patterns of new issuers toward knowledge-based industries, such as pharmaceuticals, electronics, and business services. Consistent with this shift, successive cohorts of listed companies show increasing intangible intensity (Srivastava 2014a). Because intangible investments carry higher uncertainty of benefits than tangible investments (Kothari et al. 2002), Srivastava (2014a) shows that successive cohorts present higher volatility of earnings. Other studies find that new-list companies have higher growth but lower survival rates than pre-1970 companies and that successive cohorts display increasing volatility of stock returns beyond those explainable by multifactor models (Fama and French 2004; Brown and Kapadia 2007). Govindarajan and Srivastava (2016) find that each new cohort of listed firms has lower likelihood of survival than its predecessor.

Successive cohorts retain their risk characteristics for several decades beyond the initial public offering (IPO) phase, such that the risk differences across successive cohorts persist. Brown and Kapadia (2007) and Srivastava and Tse (2016) conclude that cohort patterns are not just a result of early listing of new cohorts or differences in firm age or size, but that they also are strongly related to persistent differences in business practices.

5.2. Firm economics, forward-looking estimates, and the quality of financial reporting

Successive cohorts display higher volatilities of cash flows, stock returns, and sales growth,

indicating decreasing predictability of newer cohorts' key economic events, which, in conjunction with their higher accounting estimates, could increase errors in accruals (Barth 2006, Hribar and Nichols 2007). Bushman et al. (2016, Table 6) show that accruals of successive cohort are less and less associated with past, current, and future cash flows (Dechow and Dichev 2002). Because accrual errors predict financial misstatements and accounting frauds (Jones et al. 2008), the cohort trends of increasing accrual errors could increase the risks of litigation and regulatory scrutiny for company auditors. Also, firms from evolving industries are the most frequent subjects of SEC investigations for accounting frauds (Martin et al. 2002; Deloitte Forensic Center 2007). We find that an increasing percentage of successive cohorts enter high-litigation industries.

Litigation imposes significant direct and indirect costs on auditors. Direct costs include case settlements and increases in malpractice insurance premiums. Eigelbach (2011) surveys insurance companies and finds dramatic increases in malpractice claims against accounting firms over time. Indirect costs include costs of remediation and improving inner processes (Lennox and Li 2014) as well as loss of auditor reputation (Skinner and Srinivasan 2012).

The changes in the nature of public companies with each new arriving cohorts increase the magnitude and complexity of accounting estimates as well as the likelihood of financial misstatements, accounting fraud, and auditor litigation. If Big N firms maintain their litigation-risk thresholds in the selection of new clients or in the retention of existing clients (Asare and Knechel 1995; Simunic and Stein 1987; Johnstone and Bedard 2003; Shu 2000; Huang et al. 2009), then a lower percentage of newer cohorts would meet them, leading to decline in Big N's market share in the market of new issuers.

5.3. Regulatory shocks that impact the public accounting industry

Two 21st century regulatory changes should impact the costs, benefits, and business

opportunities that accrue from new audit-client relationships. The first is Section 201 of SOX, which prohibits audit firms from providing many types of non-audit services and subjects their provision to pre-approval of the issuer's audit committee. This regulation should more strongly affect large than small audit firms because the former had multifaceted, interconnected organizational setups created to provide risk, tax, business, strategy, and IT advisory services. These non-audit services typically earn higher revenues and margins than audit services for Big N firms. Prior studies suggest, therefore, that the provision of non-audit services to an audit client is tantamount to rent-seeking behavior and that such rent could be used to cross-subsidize the anticipated litigation costs of risky clients (DeAngelo 1981a; Magee and Tseng 1990; Shu 2000; Beeler and Hunton 2002; Frankel et al. 2002). The impact of SOX regulation can be judged from the fact that three out of four Big N divested their advisory and consulting practices after its implementation (Harris 2014).

The second regulation is a momentous change in the monitoring process of public auditors: the creation of the PCAOB. The PCAOB inspects the audits conducted by public audit firms and replaces the self-monitoring (peer review) process in operation over the past 50-plus years. Given its limited resources, the PCAOB inspects a small number of client engagements of a given auditor, based on an initial risk-based assessment. Furthermore, the PCAOB inspects only the most risky areas of a given audit engagement (e.g., Hanson 2014). Gunny and Zhang (2013), Aobdia (2015), and PCAOB (2016) provide some indications for what these risks could be. For example, PCAOB (2016) indicates that key areas of inspection focus include engagements with large and complex accounting estimates and higher risks of restatements.

The PCAOB publicly discloses deficiencies identified in its inspection of individual engagements. While prior research does not necessarily find a negative market share impact of the

disclosure of such engagement deficiencies (e.g., Lennox and Pittman 2010), dealing with more difficult PCAOB inspections is potentially costly for an audit firm. The PCAOB may, from the identification of similar deficiencies across different engagements, identify an audit performance quality control deficiency that an audit firm must remediate within 12 months to avoid public disclosure of the deficiency (e.g., Aobdia 2016). Eventually, a non-remediated quality control deficiency identified by the PCAOB can be publicly released, which is costly in terms of lost time, spent legal resources, and decline in reputation (e.g., Nagy 2014; Aobdia 2016).

Two arguments suggest that, anticipating PCAOB inspection, large auditors are more likely than small auditors to avoid risky, difficult-to-audit clients. First, monitoring is more intense for larger auditors (with 100 or more SEC–registered clients) as these are inspected every year. Smaller auditors (with fewer than 100 SEC–registered clients) are inspected every three years. Thus, Big N firms could face greater regulatory risk by accepting riskiest clients, all else held equal (e.g., Hanson 2014). Second, the PCAOB conducts more detailed inspections of the quality control systems of the larger audit firms (PCAOB 2006). This includes an assessment of the client acceptance and retention policies of an individual audit firm (Aobdia 2016).

These facts, in addition to trends discussed in Subsection 4.2, suggest that SOX implementation and the advent of the PCAOB reduces the benefits and increases the costs of accepting a new client with poor financial reporting quality to a greater extent for large than small audit firms. Therefore, from the pre– to the post–SOX and PCAOB periods, a significant decline is likely in the proportion of newer cohorts accepted by the large auditors, given that newer cohorts characterize higher litigation risks and lower financial reporting quality, on average. Furthermore, we expect large-scale shedding of less desirable clients by large auditors.

5.4. Reasons for changes in Big N's market shares by cohort over successive time intervals

We test the propositions presented in Subsections 5.1–5.3 by extending the examination of the time-series trend in Big N's overall market concentration, presented in Figure 4, to its examination by cohorts. We additionally conduct finer analysis by three-year intervals, between 1991–1993 and 2012–2014. Panels A and B of Table 3, respectively, present these analyses for the five- and three-year intervals respectively. The bottom rows in each panel show that the Big N's market concentration reached a peak of 83% in 1996 and has declined thereafter to 61%. The last column shows the BigN's market concentration declines almost monotonically with successive listing cohort, from approximately 90% for pre-1970s to approximately 50% for 2010s cohort. Thus, newer cohorts have lower and lower likelihood of having a Big N auditor. This result provides preliminary evidence that the changing nature of listed population plays a significant role in the trend reversals of Big N's market concentration.

[Insert Table 3 near here]

However, this pattern could also reflect a life cycle hypothesis wherein younger firms initially obtain services from a small auditor and subsequently upgrade to a Big N as they mature. This hypothesis is tested by calculating the percentage of companies upgrading and downgrading their auditors over time, an analysis conducted by examining time-series trends within cohorts. Results of percentage upgrades and downgrades by five- and three- year intervals are presented in top and bottom sections of Table 3 Panel C, respectively. Panel D presents the net outcome of upgrades and downgrades for easier interpretation. A positive (negative) number represents net upgrade (downgrade). These panels provide no support for the lifecycle hypothesis. On the contrary, after 1995, each surviving cohort is more likely to downgrade than upgrade its auditor

type. This pattern is also depicted in Panel B of Figure 2.[12] Thus, the Big N's lower overall market share with each new cohort appears to be a relatively persistent cohort characteristic, and not a lifecycle effect.

In addition, the bottom section of Table 3 Panel D shows a spike in the downgrade patterns for all cohorts in the first six years of the 21st century. (2000s cohort had just began its formation.) The 1970s cohort displayed net downgrade of −2.52% and −2.81% over 2000–2002 and 2003–2005, respectively, and the corresponding numbers were −2.48% and −3.44% for the 1980s cohort and −2.08% and −3.32% for the 1990s cohort, respectively. Thus all established cohorts witnessed a decline in Big N's market concentration of more than 5 percent points in those six years. (We use the term percent point to highlight the change in the absolute value because the term percent change can also represent a ratio.) It is unlikely that the characteristics of well-established and mature cohorts changed so suddenly in six years. So the demand shifts (that is, shift in client characteristics) cannot be the sole reason for trend reversals. The net-downgrade pattern for all cohorts continued in each of the subsequent three-year interval (2006–2008, 2009–2011, and 2012–2014). Thus during our entire 21st century period, Big N appear to have dropped more clients from the legacy cohorts than they have additionally accepted from the same cohorts. This pattern coupled with the declining percentage of new lists being accepted by Big N, shown in Figure 1, indicate that the peak of Big N's market concentration is behind us.

5.5. The growing prominence of second-tier audit firms

We next test the idea whether the change in Big N's concentration is caused by the growing

[12] We track each cohort after its formation year and examine its average auditor type after successive five-year intervals. We start examining the proportion of Big N for pre-1970s and 1970s cohort from 1979, the last year of the 1970s cohort formation, and then in successive five-year intervals, that is, in the years 1984, 1989, 1994, 1999, 2004, and 2009. We also examine the 1980s, 1990s, and 2000s cohorts beginning from 1984, 1999, and 2004, respectively, and then in successive five-year intervals.

prominence of the second-tier firms in the auditing market (Hogan and Martin 2009). We divide audit firms into three categories: Big N, second-tier, and small firms, and focus on market shares of smaller auditors in Panel E of Table 3. The last column of Panel E shows that the percent share of small auditors increases from approximately 8% for pre-1970s to 46% for the 2010s cohort. Panel E also presents market shares of small auditors by cohorts over successive five-year intervals. The last row shows a monotonic increase in their numerical market share beginning from the mid-1990s. It was 18% over 1991-1995, approximately doubling to 34% in 2011-2014. DeFond and Lennox (2011, p. 27) document a one-time large-scale exodus of small audit firms post–SOX. Thus, the increase market concentration of small auditors after 2004 we find is noteworthy, because it arises despite their large-scale post–SOX exodus of small audit firms.

However, no significant trend emerges in the market share of second-tier firms (results not tabulated). These results do not support the idea that emergence of second-tier audit firms is the principal reason for trend reversals. Instead, results suggest that smaller audit firms are making inroads into the market of new public firms.

5.6. Multivariate tests to examine the effect of regulations

We examine the effect of one-time events and the changing nature of public firms in the the regression

$$BigN = \alpha + \beta_1 \times Time + \beta_2 \times CohortDummy + \beta_3 \times IrrationalExuberance + \beta_4 \times PostDotComCrash + \beta_5 \times PostSOX + \beta_6 \times PostPCAOB + \beta_7 \times PostAS5 + \sum \beta_s \times Controls + \varepsilon, \quad (1)$$

where *Time* is a number representing fiscal year and captures the overall time trend. Following dummy variables take the value of zero unless indicated otherwise: *IrrationalExuberance* is one for years after 1995 (Greenspan 1996), *PostDotComCrash* is one for years after 1999, *PostSOX* is

a one for years after 2002 (Sarbanes Oxley Act), *PostPCAOB* is one for years after 2005 (PCAOB began its inspections), and *PostAS5* is one for years after 2008 (the year Auditing Standard No. 5 became effective).

We control for financial reporting quality (*AbsResidualsDD* and *AbsPerMatchedDiscAccruals*), client size (*LogAssets*), intangibility (*R&D_Intensity*), acquisitions (*LargeAcquisitions*), uncertainty of firm performance (*VolatilityCFO*), and losses (*Loss*). We also control for length of auditor–client relationship (*RelationshipLength*), *Litigation* (an indicator variable equal to one when the company is a high-litigation industry), and *DecYearEnd* (an indicator variable that takes a value of one if the company's fiscal year ends in December). *BusinessSegments* and *GeographicSegments* represent the number of client's business and geographic segments. Standard errors are clustered by company.

Panel F of Table 3 presents results of equation (1) in the first two columns. The coefficient on *Time* is negative and significant, indicating that all else held equal, Big N's market concentration has declined, not increased over time. Furthermore, the coefficient on *CohortDummy* is positive and significant, showing that absent any other development and change in the economic characteristics of new lists, the likelihood of a newly listed firm having a Big N auditor would increase over time, arguably, continuing the trends from the 20th century.

The coefficients on *IrrationalExuberance*, *PostDotComCrash*, *PostSOX*, and *PostPCAOB* are all significant and negative. These coefficients are −0.039, −0.063, −0.100, −0.042. These coefficients taken together indicate that beginning from 1995, economic events contribute approximately 25 percent-point decline in Big N's market concentration. This decline more than overcomes the increase in the concentration that occurs because of the other factors. Also, the negative coefficients on *IrrationalExuberance* and *PostDotComCrash* indicate that both

developments are independently associated with the decline in Big N's market share, consistent with the idea that Big N became extra cautious in their client selection during these two time intervals and dropped risky clients when market was overheated and when the dotcom bubble bust.

The largest of the events affecting Big N's market concentration appears to be the promulgation of SOX, which by itself contributes a 10 percent-point decline. Furthermore, the advent of PCAOB contributes incrementally to SOX promulgation. Thus, assuming that SOX and the creation of PCAOB are related events, SOX-led regulatory events appear to be the single largest factor, explaining a 14.2 percent-point decline in Big N's market concentration. Compare it to the overall 22 percent-point reduction in market concentration of Big N from 1996 to 2008.

We next estimate a regression by including additional terms of interaction of *CohortDummy* with the event dummies identified in equation (3)

$$\begin{aligned} BigN = {} & \alpha + \beta_1 \times Time + \beta_2 \times CohortDummy + \beta_{3A} \times IrrationalExuberance \\ & + \beta_{4A} \times PostDotComCrash + \beta_{5A} \times PostSOX + \beta_{6A} \times PostPCAOB \\ & + \beta_{7A} \times PostAS5 + \beta_{3B} \times CohortDummy \times IrrationalExuberance \\ & + \beta_{4B} \times CohortDummy \times PostDotComCrash + \beta_{5B} \times CohortDummy \times PostSOX \\ & + \beta_{6B} \times CohortDummy \times PostPCAOB + \beta_{7B} \times CohortDummy \times PostAS5 \\ & + \sum \beta_s \times Controls + \varepsilon. \end{aligned} \quad (2)$$

The interaction terms show whether the effect of events examined in the section had an incremental effect on Big N's client acceptance/retention decision concerning newer cohorts. For example, a negative coefficient on β_{5B} (the interaction of *CohortDummy* and *PostSOX*) would indicate that SOX implementation more strongly affects the Big N's decision to initially accept or retain clients from newer than older cohorts.

Results are presented in the last two columns of Panel F of Table 3. The coefficient on the

first three interaction terms (*CohortDummy* × *IrrationalExuberance*, *CohortDummy* × *PostDotComCrash*, and *CohortDummy* × *PostSOX*) are negative and significant, indicating that each of these events decreased the likelihood of Big N's selecting or retaining clients from newer cohorts. Thus, Big N appear to have become more cautious in their client acceptance/retention decisions concerning newer cohorts during those events. The coefficient on the interaction term, *CohortDummy* × *PostPCAOB*, however, is not negative. Nevertheless, the sum of the coefficients ($\beta_{3B} + \beta_{4B} + \beta_{5B} + \beta_{6B}$) is negative and significant (not tabulated), indicating that post 1995 events reduced the likelihood of a new cohort having a Big N auditor. These results are consistent with the idea of more stringent auditor–client selectivity post 1995.

6. Trends in measures of audit and financial reporting quality (FRQ)

In this section, we examine whether the average FRQ measures of the market segments addressed by Big N and non–Big N firms diverges over time. We therefore test the proposition that trend reversal is a joint product of regulation and more stringent client selection by Big N.

If clients from new cohorts were randomly assigned to Big N and non–Big N auditors, and if both types of auditors shed clients using similar retention thresholds, then the differences between the financial reporting qualities of the two market segments should not change over time. However, in the post *IrrationalExuberance*, *DotComCrash*, SOX, and PCAOB periods, Big N auditors could more stringently select high-quality clients (Johnstone and Bedard 2003, 2004; Krishnan and Krishnan 1997; Lawrence et al. 2011). In addition, high-quality clients from successive cohorts may have greater incentives to select Big N auditors to signal their separation from the remaining pool of low financial quality clients (Titman and Trueman 1986; Datar et al. 1991). As a result, a greater number of clients from successive cohorts, with lower and lower financial reporting quality, would be serviced by non–Big N auditors. This should cause

divergence between the financial reporting qualities of markets addressed by Big N and non–Big N auditors. Panels B and C of Figure 5 show divergence in the trends of FRQs of Big N and non–Big N markets over successive five-year intervals.

We more finely examine these trends by listing cohorts. Panels A and B of Table 4 present these results for *AbsPerMatchedDiscAccruals* and *AbsResidualsDD*, respectively. The last column in each panel represent the cohort trends in difference in FRQs of by Big N and non–Big N clients while the last row represents the time-series trends. For example, Panel A shows that the difference in *AbsPerMatchedDiscAccruals* of Big N and non–Big N clients for the 1970s, 1980s, 1990s, 2000s, and 2010s cohort were 0.02, 0.03, 0.05, 0.08, 0.10, and 0.11, respectively, indicating a near monotonous increase in these differences with successive cohorts.

[Insert Table 4 near here]

The cohort-wise time trends presented in the Panel A and B provide additional information on the reasons for the growing divergence. For the pre-1970s cohort, the *AbsPerMatchedDiscAccruals* for successive five-year intervals beginning in 1996 was 0.046, 0.038, 0.033, and 0.028, showing improvement in FRQs of Big N clients within the same cohort over time. More importantly, from 1996–2000 to 2001–2005, for the pre-1970s Big N clients, *AbsPerMatchedDiscAccruals* declined from 0.046 to 0.038. Similar pattern was observed for the 1970s cohort (0.064 to 0.048), 1980s cohort (0.077 to 0.057), and 1990s cohort (0.096 to 0.066), 1970s cohort (0.064 to 0.048). All point to improvement in FRQs of Big N clients within same cohorts from the end of the 20th century to 2005. In contrast, *AbsPerMatchedDiscAccruals* increased for non–Big N clients within the same cohort over the same period [1970s cohort (0.111 to 0.124), 1980s cohort (0.139 to 0.154), and 1990s cohort (0.159 to 0.179). Over the same time interval, the average difference between the of Big N and non–Big N clients doubled from 0.066

to 0.119. Similar opposite patterns for Big N and non–Big N are observable using *AbsResidualsDD* as a measure of FRQ. These results, in conjunction with dramatic decline in Big N's market concentration within cohorts in the same period (see Panel D of Table 3) point to increased selectivity by Big N firms during the first five years of the 21st century. That is, immediately after dotcom bust and SOX and PCAOB implementation, Big N firms shed clients with the poorest financial reporting qualities. Thus, the divergence between FRQs of Big N and non–Big N firms would have occurred in the early 21st century even without the listing of new firms. Panel C of Table 4 show divergence in average client size (log of assets) of Big N and non–Big N markets, both over time and across cohorts, providing additional evidence for growing auditor–client selectivity.

Some may argue that the growing divergence in FRQs may be caused by incrementally higher quality audit conducted by Big N because "high audit quality results in a larger improvement in financial reporting quality for companies with relatively lower quality financial reporting system" (DeFond and Zhang 2014, p. 283).[13] Panel D of Table 4 tests this proposition by examining variables that are less affected by accounting or auditing (volatility of sales growth and CFO). It shows that the difference in unpredictability of economic events of Big N and non–Big N clients also increases with each new cohort. Within the same 2010s cohort, the volatility of cash flows is approximately 20 times higher for non–Big N clients than for Big N clients. Compare this to two times difference within the pre-1970s. Similar patterns are observed in the volatility of sales growth. Also Panel D of Panel 5 shows divergence in the percentage of clients that delist. The percentage for non–Big N firms in recent years is almost twice that for Big N firms.

Panel D of Table 4 also shows that non–Big N audit firms respond to their increased audit

[13] Weber and Willenborg (2003) find that going-concern opinions issued by Big N audit firms are more predictive of future events than those of non–Big N audit firms.

risks by liberally issuing conservative GC opinions.[14] For example, within the 2000s cohort, non–Big N audit firms issue conservative GC opinions for approximately 21% of their clients, ten times more frequently than Big N audit firms (2%). Some may find it alarming that one in five companies from the newest cohort audited by non–Big N firms receive a GC opinion that turns out to be wrong. Others may interpret this result as indicating a trigger-happy response on the part of smaller auditors when dealing with risky clients. Prior studies indicate that a going-concern opinion lowers the perceived or actual litigation risk for an auditor (Mutchler 1984; Kaplan and Williams 2013).

We next examine the statistical significance of divergence in FRQs associated with Big N and non–Big N audit firms. We first examine this trend with successive cohorts by estimating the regression

$$InverseMeasureOfQuality = \alpha + \beta_1 \times CohortDummy + \beta_2 \times NonBigN + \beta_3 \times CohortDummy \times NonBigN + \varepsilon, \quad (3)$$

InverseMeasureOfQuality is the *AbsResidualsDD* or *AbsPerMatchedDiscAccruals*.

We next estimate the divergence over time

$$InverseMeasureOfQuality = \alpha + \beta_1 \times Time + \beta_2 \times NonBigN + \beta_3 \times Time \times NonBigN + \varepsilon, \quad (4)$$

For these tests, we use an indicator variable of *NonBigN* instead of *BigN* for ease of interpretation because we anticipate positive coefficients on *CohortDummy*, *NonBigN*, and their interaction term (β_3) if the characteristics of Big N and non–Big N clients diverge. More positive values of dependent variable indicate lower financial reporting quality. We do not include control variables because our aim is solely to test the statistical tests of divergence of the markets addressed by Big

[14] These opinions almost entirely represent type 1 errors.

N and non–Big N clients.[15]

Panel D and E of Table 4 presents the results of equations (3) and (4), respectively. The first four columns present the results without interaction variable. The coefficients on *CohortDummy*, *NonBigN*, and *Time* are positive and significant, indicating that newer cohorts have lower FRQ than legacy cohorts, non–Big N clients have lower FRQ than Big N clients, and that the average FRQ declines with time. More important, the last four columns of both panels show that the coefficient on the interaction term β_3 is positive and significant. Both results establish the statistical significance of the widening difference in the FRQs of Big N and non–Big N clients with successive cohorts as well as with time.

In sum, Table 4 results provide convincing evidence of the growing separation between the client pools of Big N firms and non–Big N firms, and that this divergence is due to greater selectivity on part of Big N.

7. Trends in audit fees

How the changing economic characteristics of successive cohorts' affect audit fees remains unexamined. On one hand, the effort required for verification of accounting estimates is likely to increase with successive cohorts. Further, given that successive cohorts show decreasing survival rates and higher stock return volatility, litigation risk, potential PCAOB scrutiny, and potential damage to an auditor's reputation, audit fees might increase with successive cohorts, controlling for firm size and auditor type (e.g., Thoman 1996). Furthermore, auditors may increase their fees from new clients to compensate from loss of rents from non-audit services, especially because setting a new fee arrangement with a new client is easier than altering a fee arrangement in an ongoing relationship. Big N may plausibly increase their fees to a greater extent because they

[15] The test variables are strongly related to traditional control variables of size, growth, and risk, which are themselves diverging and point to selectivity. Including them in the regression would be like throwing the baby out of bath water.

suffer more from the loss of non-audit service rents or because they are more selective in their clients from successive cohorts. Nevertheless, to the extent that audit fee incorporates premiums for litigation risk (Seetharaman et. al 2002, Badertscher et al. 2014) and that non–Big N auditors absorb the riskiest clients from the successive cohort, the size-adjusted fees should increase to a greater extent for smaller auditors than Big N auditors.

We test these propositions by first examining aggregate fee shares of Big N and non–Big N auditors. We then conduct tests using average client data.

7.1. Trend in aggregate audit fees

Given the lack of longitudinal data on audit fees before 2000, we examine the square root of assets (Compustat AT), a reliable predictor of audit fees. We estimate, for this audit fee proxy, the proportion of non–Big N fees for each of our five-year intervals. (We examine the percentage of the sum of square root of assets that belongs to non–Big N clients.) Panel B of Figure 4 shows that this proportion declined to as low as 6% by the end of the 20th century, consistent with the concerns raised by regulators. However, since then, this proportion has doubled to 11%. Nevertheless, that non–Big N audit firms obtain just 11% of audit fee share despite having 38% numerical market share in the last five years indicates a growing dichotomy in the characteristics of markets addressed by Big N and non–Big N audit firms. The divergence in the size of client sizes in the market segments addressed by Big N and non–Big N audit firms, as shown in Panel D of Figure 5, could explain this wide discrepancy in numerical and audit-fee market shares.

[Insert Table 5 near here]

We further investigate the trends by using actual audit fee data obtained from Audit Analytics. These data are available only for recent years. The last column of Panel A of Table 5 shows that the non–Big N's share of total audit fees in a cohort increases tenfold, from 1.1% to

12.0%, from the 1970s cohort to the 2010s cohort.[16] While Big N firms continue to command the dominant share of total audit fees, non–Big N firms appear to play an increasing role in the audit industry with the arrival of each new cohort. We conduct a finer analysis by three-year interval and find a steady increase in non–Big N's share over time.

7.2. Trend in per-client fees

We conduct further tests by examining average audit fees per client. Panel B of Table 4 shows that new-lists have significantly lower audit fees per client (*LogAuditFees*) than the pre-1970 companies. However, this difference could reflect lower client size of non–Big N firms. Hence, we calculate another measure of audit fees adjusted for client size [audit fees per square root of total assets (*AuditFee_SqrtAssets*)]. Fees charged by Big N are higher even for this scaled variable, arguably, indicating the Big N premium.

7.3. Multivariate tests

We next examine whether the premiums that Big N firms obtain relative to non–Big N firms change with successive cohorts after controlling for companies' innate characteristics. We estimate the regression

$$AuditFee = \alpha + \beta_1 \times CohortDummy + \beta_2 \times BigN + \beta_3 \times CohortDummy \times BigN + \sum \beta_s \times Controls + \varepsilon. \quad (5)$$

We use two proxies for audit fees, *LogAuditFees* and *AuditFee_SqrtAssets*. Control variables are similar to equation (1). The trend in the premium charged by high-quality audit firms

[16] This trend does not necessarily imply a decline in total revenues of Big N firms, which could still rise due to an increase in the size of Big N clients, continuing globalization, and growth of Big N's consulting services (Shubber 2015). PwC, Deloitte & Touche, and Ernst & Young reported revenue increases of 10%, 11.6%, and 7.2%, respectively, for fiscal year 2014, largely due to more consulting revenues (Shubber 2015). For example, PwC's audit (consulting) revenues grew by 6% (18%).

from successive cohorts is captured by the interaction term (β_3). Panel C of Table 4 shows that β_1 is significant and positive, indicating that successive cohorts pay higher fees, despite controlling for other determinants of audit fees. Arguably, this result (positive β_1) could reflect the ability of auditors to set fees to a higher level with newer cohorts than to renegotiate fees from an existing client (to compensate for reduction in rents from non-audit services in the post–SOX period). β_2 is also significant and positive indicating that Big N audit firms charge premium fees, on average., More important, β_3 is negative and significant, indicating that client size– adjusted Big N premium declines with successive cohorts.

These results reinforce our conclusion of increased selectivity as the potential explanation for the trend reversals in market concentration of Big N. The audit fee differential between the two types of clients (that is, the Big N fee premium) narrows with each new cohort, which is opposite to the widening differential of the financial reporting qualities (as shown on Panel E of Table 3). If the trend of widening financial reporting qualities emerged because of greater improvement in financial reporting quality brought about by the superiority of Big N audits for successive cohorts, then the Big N premium would have increased, not declined (Ball et al. 2012).

8. Conclusion

During the last half of the 20th century, the public accounting industry became concentrated in the hands of a few players and its competitive structure evolved into a tight oligopoly. We contribute to the literature by showing a reversal of this trend. We also demonstrate that this reversal is a joint effect of 21st century regulatory changes and shifts in nature of client companies. In sum, the new issuers of public equity, which steadily replace legacy firms in the set of public firms, display less verifiable assets, more complex accounting estimates, and higher audit risks. Unlike those of the 20th century, the current new issuers appear to be less attractive to Big

N auditors because of the increased risks of litigation and PCAOB scrutiny and because of reduced opportunities to sell high-margin consulting services based on audit relationships.

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Figure 1.
Initial auditor choice of a newly listed company

This figure plots the auditor choice of newly listed companies in the year they were first listed. The first year in which a firm's data are available in Compustat is the listing year. Data for this plot are obtained from Compustat with non-missing observation on AU variable. Big N auditors have AU greater than 0 and less than 9. All companies are divided into nine listing cohorts in five-year intervals. All variables are defined in the Appendix.

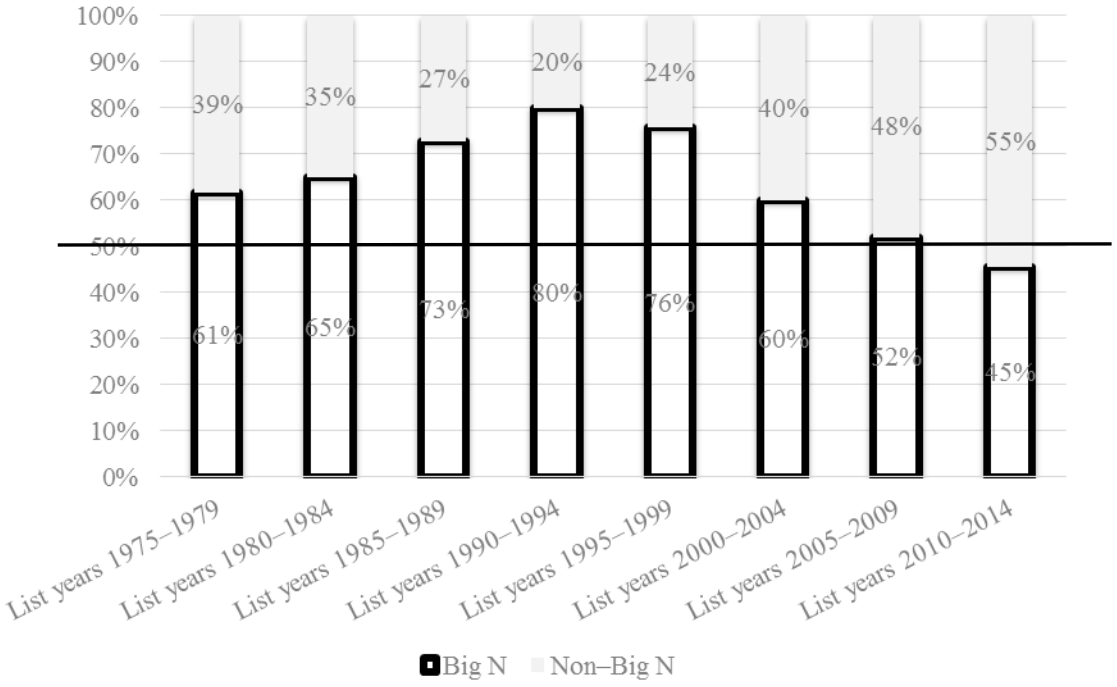
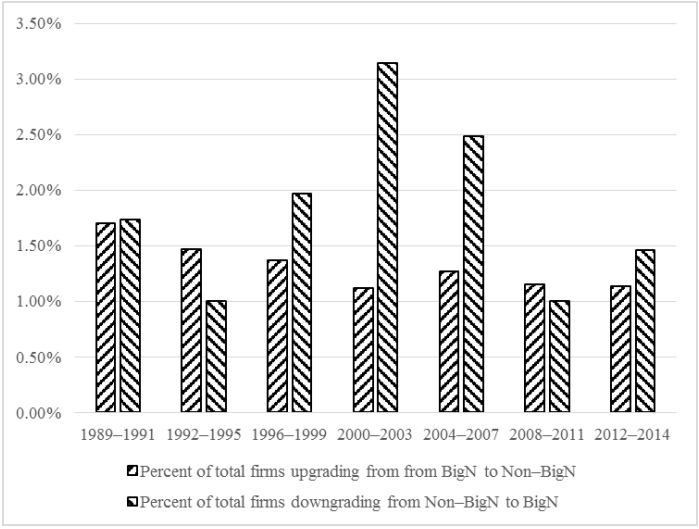


Figure 2.
Changes in upgrade and downgrade patterns in auditor–client relationship over time

This figure shows the changes in upgrade (non–Big N to Big N) and downgrade (Big N to non–Big N) patterns over time. Panel A shows percentage of the total companies upgrading and downgrading their auditor types over successive three-year periods of 1989–1991 to 2012–2014. The first year in which a firm's data are available in Compustat is the listing year. All companies with a listing year before 1970 are classified as pre-1970 companies. The remaining companies are classified as new-list companies. All of the cohorts listed in a common ten-year interval constitute a cohort of new-list companies. The figure plots the average percentage of listed companies serviced by Big N audit firms in the years 1979, 1984, 1989, 1994, 1999, 2004, and 2009. Data for this plot are obtained from Compustat with non-missing observation on AU variable. *BigN* equals one if AU is greater than 0 and less than 9. The plot shows that auditor–client relationships, based on whether the auditor is Big N or non–Big N, is generally sticky. Before 1994, the likelihood of a surviving company upgrading its auditor type exceeded the likelihood of downgrading. Since 1995, however, the likelihood of downgrading exceeds that of upgrading.

Panel A: Percentage of the total companies upgrading and downgrading their auditor types



Panel B: The average percentage of common cohorts serviced by Big N audit firms in successive five years

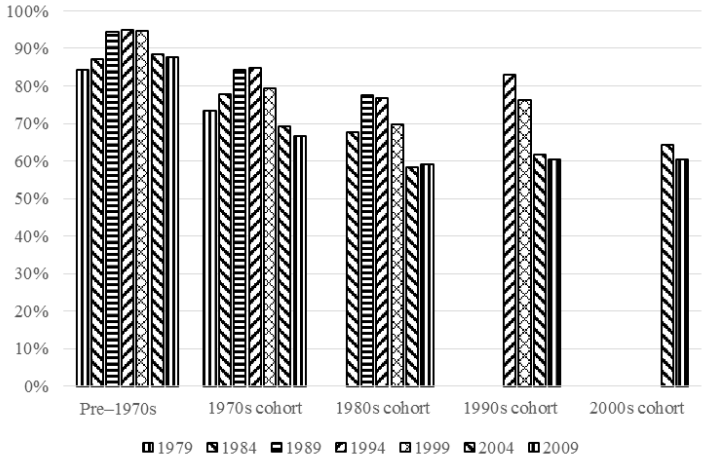


Figure 3.
The changing composition of the set of listed companies

This figure shows that the set of listed companies at a given time is dominated by the most recently listed companies. All companies are divided into five listing cohorts. The first year in which a firm's data are available in Compustat is the listing year. Companies with a listing year before 1970 are classified as pre-1970s. The remaining companies are classified as new-list companies. All of the cohorts listed in a common ten-year interval constitute a cohort of new-list companies. The figure plots the number of companies in each cohort as a percentage of the total listed company population in a given year. Data for this plot are obtained from Compustat with non-missing observation on AU variable.

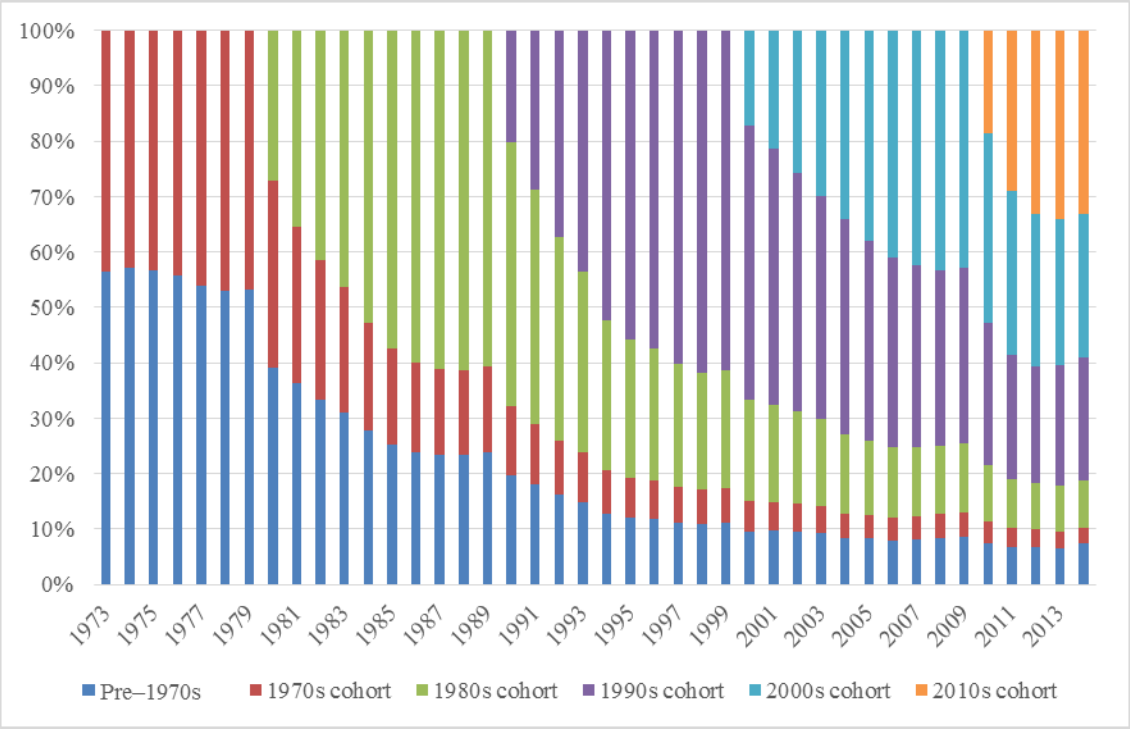
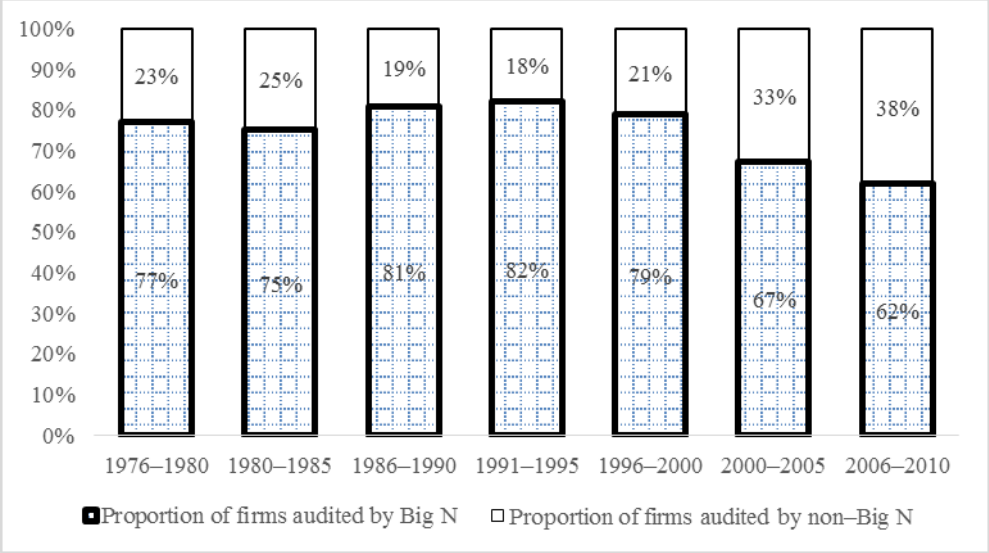


Figure 4.

Changes in the proportion of public market addressed by Big N and non–Big N auditors over time

Panel A plots the average percentage of listed companies serviced by Big N and non–Big N audit firms in the successive five-year periods of 1975–1980 to 2010–2010. Panel B plots the average percentage of total value of the square root of client assets (a proxy for total audit fee market) serviced by Big N and non–Big N firms for the same five-year periods. Data for this plot are obtained from Compustat with non-missing observation on AU variable. Big N auditors have AU greater than 0 and less than 9. Assets is measured by AT.

Panel A: Big N's market concentration by number of clients

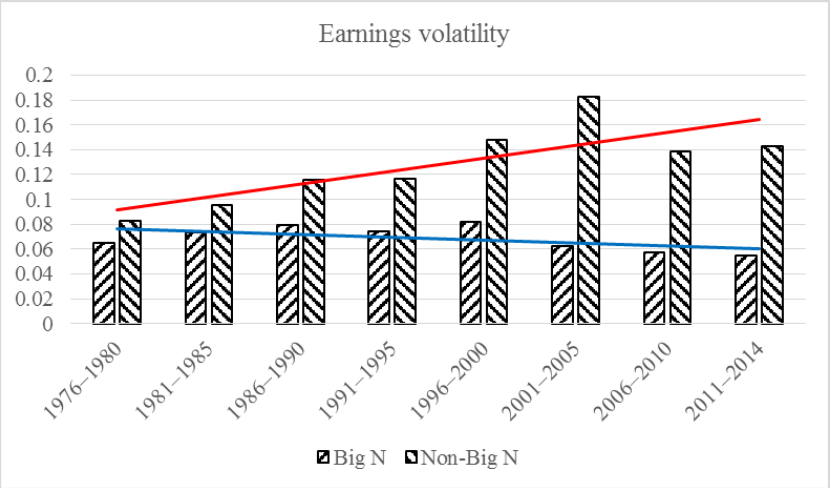


Panel B: Big N's market concentration by square root of client assets

Figure 5.
Divergence in characteristics of companies audited by Big N and non–Big N audit firms

Panels A and B plot the average properties of listed companies serviced by Big N and non–Big N audit firms in the successive five-year periods of 1976–1980 to 2011–2014. Data for these plots are obtained from Compustat with non-missing observation on AU variable. Financial variables are defined in the Appendix. Big N auditors have AU greater than 0 and less than 9. Panel A plots the earnings volatility [standard deviation of the firm's earnings (Compustat IB, scaled by average total assets {AT} for the year)], computed from year $t-3$ to year t. Panel B plots errors in accruals measured by the absolute value of residuals from a regression of total current accruals on past, current, and future cash flows on an industry-year basis (Dechow and Dichev 2002) augmented with gross property, plant, and equipment and sale change, both deflated by average total assets (McNichols 2002; Francis et al. 2005), in which accruals are measured using the balance sheet approach. Panel C plots the absolute value of performance-adjusted discretionary accruals (Kothari et al. 2005). Panel D plots the percentage of clients that delist next year (based on data until 2012). Panel E plots client size measured by the log of total assets.

Panel A: Divergence in the average earnings volatility of Big N and non–Big N clients in the successive five-year periods



Panel B: Divergence in the average accruals errors of Big N and non–Big N clients in the successive five-year periods

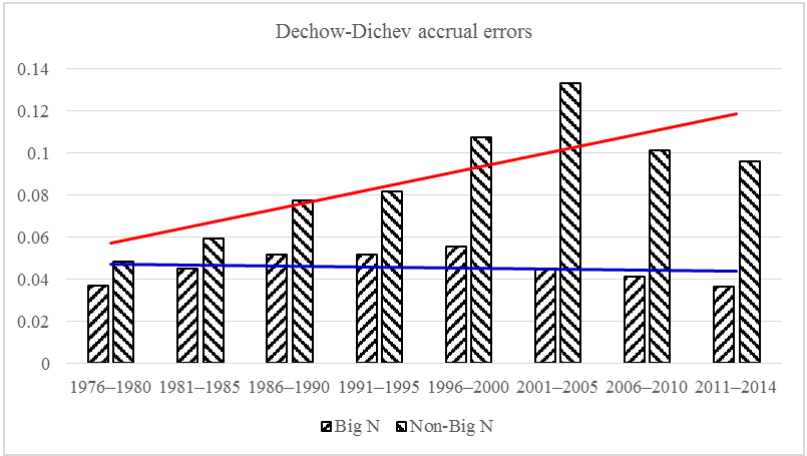
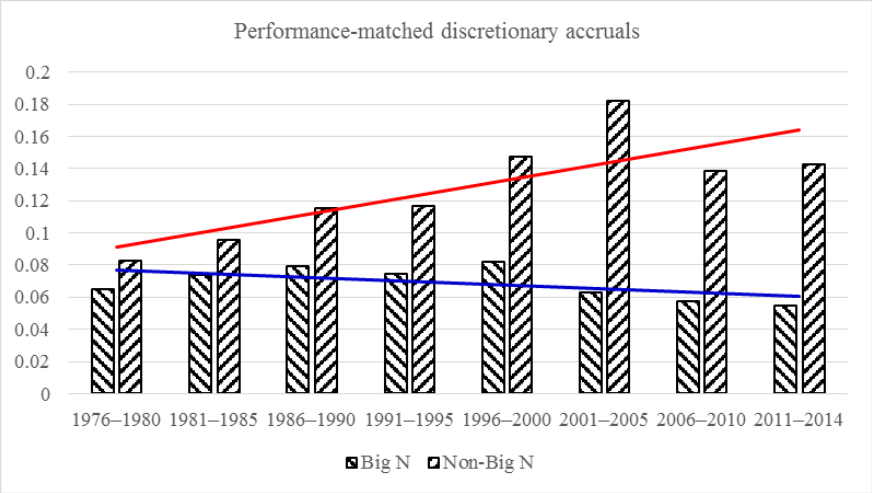


Figure 5. continued

Panel C: Divergence in the average discretionary accruals errors of Big N and non–Big N clients in the successive five-year periods



Panel D: Divergence in the percentage Big N and non–Big N clients that delist next year

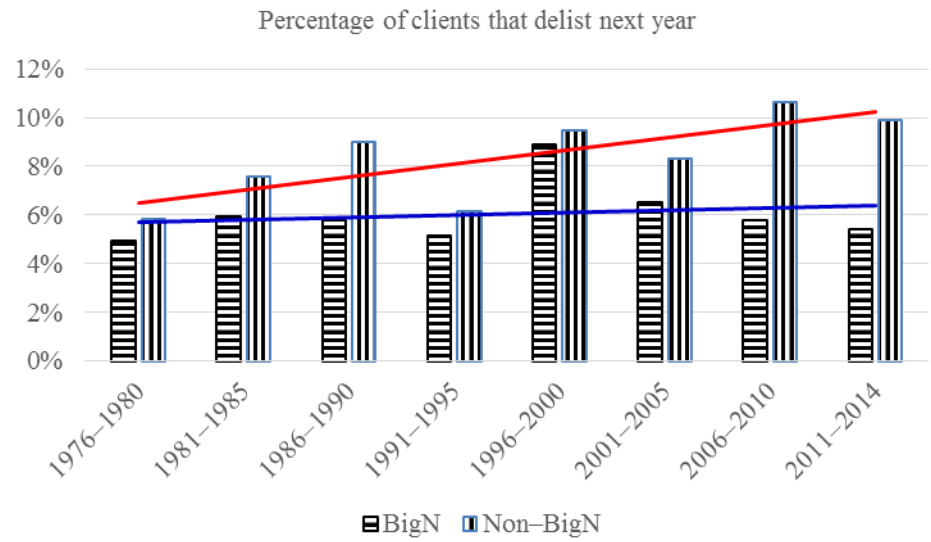
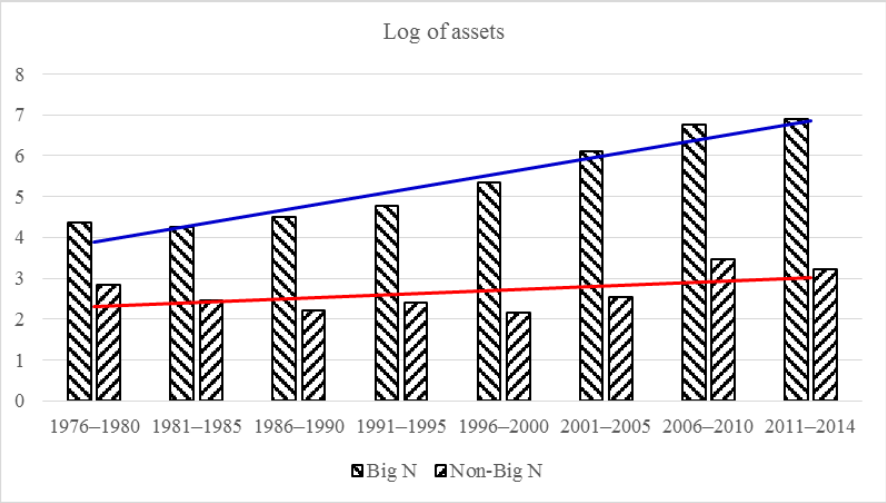


Figure 5.
Divergence in characteristics of companies audited by Big N and non–Big N audit firms

Panel E: Divergence in the average size of Big N and non–Big N clients in the successive five-year periods



Appendix

Definitions of variables

The company population consists of all nonfinancial companies that in a sample formation year have asset data for the previous four years, along with earnings and revenue data for the current year, the previous three years, and the next year (from Compustat). All observations should have data on audit fees in Audit Analytics. Further, at least ten observations are needed in each industry-year to estimate discretionary accruals and Dechow and Dichev (2002) regressions. The corresponding data items in the Compustat annual database are in capital letters.

Variable	Definition
Total Assets	AT
LogAssets	Natural logarithm of client *Total Assets*
Revenues	SALE, scaled by average *Total Assets* for the year
Earnings	IB, scaled by average *Total Assets* for the year
Total Expenses	(SALE – IB)
COGS Intensity	Cost of Goods Sold (COGS) / *Total Expenses*
R&D Intensity	Research and Development Expenditures (XRD) / *Total Expenses*
Accruals	Change in Current Assets (ACT) – Change in Cash (CHE) – Change in Current Liabilities (LCT) + Change in Debt in Current Liabilities (DLC) – Depreciation and Amortization (DP), scaled by beginning *Total Assets*
CFO	Cash flow from operations excluding extraordinary items (OANCF − XIDOC), scaled by beginning *Total Assets*; balance sheet method of calculating cash flows used for tests in Table 2, Panel D
DeferredRevenueToSalesRatio	Ratio of deferred revenue (DRC and DRLT) to Sale
LargeAcquisition	Dummy variable that take a value of one when the contribution from acquired assets (AQS) exceeds 20% of revenues for that year
AbsPerMatchedDiscAccrual	Absolute values of performance-matched discretionary accruals (Kothari et al. 2005); accruals are measured using the balance sheet approach
AbsResidualsDD	Absolute value of residuals from a regression of total current accruals on past, current, and future cash flows on an industry-year basis (Dechow and Dichev 2002) augmented with gross property, plant, and equipment and sale change, both deflated by average total assets (McNichols 2002; Francis et al. 2005); accruals are measured using the balance sheet approach
VolCFO	Uncertainty of firm performance; standard deviations of *CFO* using four rolling annual observations ($t - 3$ through t)
VolSaleGrowth	Standard deviation of the firm's percentage sales growth, computed from year $t - 3$ to year t
BusinessSegments	Number of business segments (BUSSEG) as per Compustat SEGMENTS
GeographicSegments	Number of geographic segments (GEOSEG) as per Compustat SEGMENTS
Litigation	Indicator variable equal to one when the company is a high-litigation industry (SIC code between 2833 and 2836, 8731 and 8734, 3570 and 3577, 7370 and 7374, 3600 and 3674, or 5200 and 5961)
DecYearEnd	Dummy variable that takes a value of one if the company's fiscal year ends in December and zero otherwise

Variable	Definition
GoingConcernOpinion	Uncertainty regarding the going-concern assumption issued by audit firms (Audit Analytics variable GOING_CONCERN)
ConservativeGoingConcernOpinion	Going-concern opinion not associated with bankruptcy next year; bankruptcy companies are identified from the Securities Data Company database and the UCLA-LoPucki Bankruptcy Research Database
LogAuditFees	Log of audit fees from Audit Analytics
Auditor attributes	
BigN	Dummy variable that takes a value of one for Big N firms and zero otherwise; Ernst & Young, KPMG, Deloitte & Touche, PwC, and Arthur Andersen are Big N firms. *NonBigN* = 1− *BigN*.
Tier2	Dummy variable that takes a value of one for second-tier firms and zero otherwise; BDO, Grant Thornton, Crowe Horwath, and McGladrey are second-tier firms
SmallFirm	Audit firms that are not Big N or second-tier firms are small firms; measured as 1− (*Tier2* + *BigN*)
Downgrade	Percent of total companies changing from a Big N auditor to a non–Big N auditor.
Upgrade	Percent of total companies changing from a non–Big N auditor to a Big N auditor.
Company category	
Listing year	First year in which the company has valid data in CRSP and Compustat
Pre-1970s	Companies whose listing year is before 1970
New-lists	Companies that are not pre-1970s
Listing cohorts	All of the cohorts listed in a common decade are referred to as a cohort of new companies; all of the companies are divided into the pre-1970s cohort or a cohort from the 1970s, 1980s, 1990s, 2000s, or 2010s.
CohortDummy	Values of 0, 1, 2, 3, 4, and 5 are assigned to the pre-1970s cohort and the companies listed in the decades of the 1970s, 1980s, 1990s, 2000s, and 2010s respectively
Year category	
Time	A number representing fiscal year.
IrrationalExuberance	Dummy variable that takes a value of one for years after 1995 (Greenspan's 1996) and zero otherwise.
PostDotComCrash	Dummy variable that takes a value of one for years after 1999 and zero otherwise.
PostSOX	Dummy variable that takes a value of one for years after 2002 (years after Sarbanes Oxley Act) and zero otherwise.
PostPCAOB	Dummy variable that takes a value of one for years after 2005 (PCAOB began its inspections) and zero otherwise.
PostAS5	Dummy variable that takes a value of one for years after 2008 (Auditing Standard No. 5 became effective) and zero otherwise.

Notes:

- All continuous variables are winsorized at the 1st and 99th percentiles.
- An attribute for a cohort is first calculated on a company-year basis and then averaged across all of the cross-sectional observations in that cohort.

Table 1
Number of observations

The first year in which a firm's share price data are available in CRSP-Compustat merged database is the listing year. The companies are divided into six listing cohorts based on their listing year. All companies with a listing year before 1970 are classified as pre-1970s. The remaining companies are classified as new-lists. Consequently, all of the companies are divided into the pre-1970s cohort or a cohort from the 1970s, 1980s, 1990s, 2000s, or 2010s. Panel A presents the number of firm-year observations by listing cohort over successive five-year periods of 1976–1980 to 2011–2014 with non-missing AU variable. These observations are used for tests described in Figures 1–4 and Panels A–D of Table 3. Panel B presents the same information for non-missing observations for regression variables by listing cohort over successive five-year periods of 1976–1980 to 2011–2014 with non-missing variables to calculate earning quality and control variables for Panel F of Table 3. These observations are used for Tables 2, Panel F of Table 3, and Table 4.

Panel A. Number of observations by listing cohorts with nonmissing AU variable (five-year intervals from 1975–1980 to 2011–2014)

	Fiscal years								
Listing cohort	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	Total
Pre–1970s	11,415	9,843	7,603	6,450	5,052	3,933	3,170	2,184	49,650
1970s cohort	9,746	7,251	4,957	3,875	2,877	2,072	1,633	994	33,405
1980s cohort	1,432	15,195	19,320	14,166	9,852	6,719	4,700	2,718	74,102
1990s cohort			1,423	19,715	26,774	17,778	12,253	6,997	84,940
2000s cohort					1,563	12,998	15,946	8,745	39,252
2010s cohort							1,487	10,296	11,783
Total	22,593	32,289	33,303	44,206	46,118	43,500	39,189	31,934	293,132

Panel B. Number of observations by listing cohorts with nonmissing variables to calculate audit and earnings quality and regression control variables (five-year intervals from 1975–1980 to 2011–2014)

	Fiscal years								
Listing cohort	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	Total
Pre–1970s	8,968	7,537	5,392	4,704	3,571	2,901	2,383	825	36,281
1970s cohort	5,760	5,264	3,340	2,575	1,943	1,432	1,139	341	21,794
1980s cohort	416	5,819	10,338	8,859	6,455	4,463	3,067	896	40,313
1990s cohort			190	6,611	13,721	10,865	7,196	2,165	40,748
2000s cohort					368	3,805	5,981	2,046	12,200
2010s cohort							132	681	813
Total	15,144	18,620	19,260	22,749	26,058	23,466	19,898	6,954	152,149

Table 2
Analysis by Fama–French 48-industry classification

All of the firms are categorized using the Fama–French 48-industry classification. Four industries representing finance firms and two representing the "coal" and "almost nothing" categories are excluded. The first year in which a firm's share price data are available in CRSP-Compustat merged database is the listing year. The companies are divided into six listing cohorts based on their listing year. All companies with a listing year before 1970 are classified as pre-1970s. The remaining companies are classified as new-lists. Consequently, all of the companies are divided into the pre-1970s cohort or a cohort from the 1970s, 1980s, 1990s, 2000s, or 2010s. All of the industries are sorted by the highest to lowest values of recency, which is calculated as follows. First, the firms listed before 1970 and the firms listed in the 1970s, 1980s, 1990s, 2000s, and 2010s are assigned *CohortDummy* of 0, 1, 2, 3, 4, and 5, respectively. Then, an industry's recency is calculated by averaging the cohort dummy values of all of its pooled firm-year observations. The higher the recency, the higher the percentage of firm-year observations from the most recently listed firms. All variables are defined in the Appendix. The average characteristics of each industry are calculated using pooled data from 1976 to 2014 and presented in Panel A. Panel B shows the correlations among the average industry attributes. Number of observations are described in Table 1.

Panel A. Pooled average characteristics by industry

Fama–French industry code	Industry name	Recency	*R&D Intensity*	*LogAsset*	*BigN*	*AbsResidualsDD*	*ConservativeGoingConcernOpinion*
13	Pharmaceutical	2.475	0.334	4.219	0.772	0.095	0.076
34	Business	2.437	0.076	4.193	0.745	0.104	0.051
32	Communication	2.363	0.011	6.447	0.807	0.070	0.042
11	Healthcare	2.295	0.013	4.548	0.761	0.077	0.033
12	Medical	2.262	0.106	3.729	0.726	0.088	0.052
29	Coal	2.156	0.002	6.255	0.868	0.050	0.030
35	Computers	2.116	0.104	4.281	0.797	0.107	0.036
7	Entertainment	2.112	0.006	4.646	0.700	0.081	0.046
33	Personal	1.989	0.005	4.829	0.826	0.055	0.018
3	Candy	1.986	0.000	6.035	0.808	0.061	0.054
27	Precious	1.969	0.001	4.867	0.744	0.075	0.048
36	Electronic	1.958	0.098	4.493	0.774	0.085	0.028
43	Meals	1.872	0.001	4.636	0.736	0.050	0.016
40	Transportation	1.868	0.002	6.136	0.905	0.044	0.023
4	Beer	1.808	0.006	6.172	0.832	0.055	0.024
30	Petroleum	1.782	0.005	5.308	0.774	0.074	0.027
37	Measuring	1.775	0.101	3.924	0.751	0.077	0.038
1	Agriculture	1.769	0.033	4.521	0.666	0.049	0.040
6	Recreation	1.752	0.028	4.319	0.725	0.102	0.037
28	Non-Metallic	1.687	0.010	5.727	0.803	0.074	0.042

Table 2 continued
Analysis by Fama–French 48-industry classification

Panel A continued

Fama–French industry code	Industry name	Recency	*R&D Intensity*	*LogAsset*	*BigN*	*AbsResidualsDD*	*ConservativeGoingConcernOpinion*
42	Retail	1.665	0.002	5.543	0.863	0.063	0.009
41	Wholesale	1.642	0.006	4.593	0.740	0.089	0.020
22	Electrical	1.556	0.054	4.574	0.743	0.075	0.044
18	Construction	1.500	0.005	4.931	0.772	0.074	0.024
26	Defense	1.485	0.027	5.504	0.691	0.084	0.046
10	Apparel	1.475	0.002	4.834	0.760	0.076	0.009
15	Rubber	1.469	0.015	4.238	0.751	0.065	0.035
23	Automobiles	1.431	0.023	5.635	0.813	0.076	0.030
14	Chemicals	1.408	0.036	5.788	0.819	0.060	0.040
25	Shipbuilding,	1.393	0.010	5.155	0.779	0.082	0.004
21	Machinery	1.356	0.036	4.806	0.801	0.074	0.025
20	Fabricated	1.326	0.007	3.888	0.775	0.063	0.001
19	Steel	1.317	0.007	5.904	0.888	0.057	0.020
2	Food	1.281	0.004	5.465	0.802	0.062	0.017
9	Consumer	1.263	0.020	4.868	0.780	0.073	0.018
8	Printing	1.260	0.006	5.233	0.815	0.059	0.013
5	Tobacco	1.236	0.005	7.773	0.969	0.034	0.000
39	Shipping	1.055	0.006	6.365	0.887	0.042	0.005
38	Business	1.052	0.008	5.862	0.828	0.049	0.006
17	Construction	1.029	-0.002	4.821	0.811	0.059	0.015
16	Textiles	1.008	0.005	4.989	0.786	0.058	0.004
24	Aircraft	0.996	0.027	5.524	0.777	0.083	0.027
31	Utilities	0.671	0.000	7.416	0.906	0.025	0.006

Table 2 continued

Analysis by Fama–French 48-industry classification

Panel B. Correlations among industry attributes

		Pearson correlation					
	N = 42	Recency	*R&D intensity*	*LogAsset*	*BigN*	*AbsResidualsDD*	*ConservativeGoingConcernOpinion*
Spearman rank correlation	Recency		0.441***	−0.377**	−0.345**	0.468***	0.701***
	R&D intensity	0.233*		−0.409***	−0.222	0.605***	0.597***
	LogAsset	−0.349**	−0.514***		0.781***	−0.690***	−0.358**
	BigN	−0.364**	−0.398***	0.760***		−0.642***	−0.502***
	AbsResidualsDD	0.388**	0.714***	−0.598***	−0.608***		0.636***
	ConservativeGoingConcernOpinion	0.679***	0.510***	−0.312**	−0.502***	0.607***	

Table 3

Trends in the competitive structure of the public accounting industry

The first year in which a firm's share price data are available in CRSP-Compustat merged database is the listing year. The companies are divided into six listing cohorts based on their listing year. All companies with a listing year before 1970 are classified as pre-1970s. The remaining companies are classified as new-lists. Consequently, all of the companies are divided into the pre-1970s cohort or a cohort from the 1970s, 1980s, 1990s, 2000s, or 2010s. Number of observations are presented in Table 1. Ernst & Young, KPMG, Deloitte & Touche, PwC, and Arthur Andersen are the Big N firms. BDO, Grant Thornton, Crowe Horwath, and McGladrey are the second-tier firms (*Tier2*). Audit firms that are not Big N or second-tier firms are small firms. All variables are defined in the Appendix. In Panel A, the market concentration of Big N auditors is calculated by listing cohort over successive five-year periods of 1976–1980 to 2011–2014. Panel B presents the same data over successive three-year periods of 1991–1993 to 2012–2014. Panel C shows percentage of the total companies upgrading and downgrading their auditor types over successive five-year and three-year periods. Panel D presents the net of upgrades and downgrades over the time intervals described in Panel C. Panel E presents the average market concentration of small firms over successive five-year periods. Panels F and G presents the results of a multivariate regression mode, with Big N as the dependent variable. Standard errors are clustered by company. All variables are defined in the Appendix.

Panel A. BigN's market concentration in audit industry by listing cohorts (five-year intervals from 1975–1980 to 2011–2014)

	Fiscal years								
Listing cohort	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	**Average**
Pre–1970s	84%	87%	93%	92%	95%	91%	87%	89%	**89%**
1970s cohort	72%	77%	83%	84%	81%	71%	66%	68%	**76%**
1980s cohort	58%	67%	76%	77%	72%	62%	58%	63%	**70%**
1990s cohort			80%	82%	79%	67%	60%	63%	**73%**
2000s cohort					64%	62%	59%	63%	**61%**
2010s cohort							53%	50%	**50%**
Average	**77%**	**75%**	**81%**	**82%**	**79%**	**67%**	**61%**	**61%**	

Panel B. BigN's market concentration in audit industry by listing cohorts (three-year intervals from 1991–1993 to 2012–2014)

	Fiscal years								
	1991–1993	1994–1996	1997–1999	2000–2002	2003–2005	2006–2008	2009–2011	2012–2014	**Average**
Pre–1970s	90%	95%	94%	93%	89%	87%	88%	89%	**91%**
1970s cohort	84%	85%	81%	75%	69%	65%	66%	69%	**77%**
1980s cohort	77%	76%	71%	67%	59%	57%	60%	63%	**70%**
1990s cohort	82%	83%	79%	74%	63%	59%	62%	64%	**73%**
2000s cohort				65%	61%	58%	61%	63%	**61%**
2010s cohort							50%	51%	**50%**
Average	**81%**	**83%**	**79%**	**73%**	**64%**	**61%**	**61%**	**61%**	

Table 3 continued

Panel C. Upgrade/Downgrade patterns in audit industry by listing cohorts (five- and three- year intervals)

Listing cohort	Pattern	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	Average
Pre–1970s	Upgrade	1.08%	0.82%	1.34%	1.94%	0.30%	0.31%	0.25%	0.28%	**0.95%**
	Downgrade	*0.34%*	*0.41%*	*0.26%*	*2.03%*	*0.59%*	*1.91%*	*0.60%*	*0.41%*	***0.73%***
1970s cohort	Upgrade	2.22%	1.64%	1.74%	1.19%	0.87%	0.72%	0.37%	0.40%	**1.55%**
	Downgrade	*0.90%*	*0.75%*	*0.97%*	*1.45%*	*1.60%*	*4.05%*	*1.23%*	*1.31%*	***1.22%***
1980s cohort	Upgrade	2.79%	2.26%	2.54%	1.30%	1.42%	0.88%	0.85%	0.44%	**1.77%**
	Downgrade	*1.26%*	*1.30%*	*1.57%*	*1.72%*	*2.63%*	*4.02%*	*1.19%*	*1.07%*	***1.86%***
1990s cohort	Upgrade			1.34%	1.31%	1.66%	1.13%	1.12%	1.07%	**1.34%**
	Downgrade			*0.56%*	*0.81%*	*2.23%*	*4.17%*	*1.67%*	*1.60%*	***2.15%***
2000s cohort	Upgrade					1.28%	1.46%	1.82%	1.04%	**1.51%**
	Downgrade					*1.54%*	*1.95%*	*1.30%*	*1.66%*	***1.61%***
2010s cohort	Upgrade							0.81%	1.48%	**1.39%**
	Downgrade							*0.40%*	*1.21%*	***1.11%***
Average	Upgrade	**1.68%**	**1.68%**	**2.09%**	**1.39%**	**1.39%**	**1.10%**	**1.26%**	**1.06%**	
	Downgrade	***0.64%***	***0.90%***	***1.14%***	***1.34%***	***2.07%***	***3.27%***	***1.31%***	***1.36%***	

Listing cohorts	Pattern	1991–1993	1994–1996	1997–1999	2000–2002	2003–2005	2006–2008	2009–2011	2012–2014	Average
Pre–1970s	Upgrade	2.93%	0.30%	0.36%	0.20%	0.35%	0.26%	0.22%	0.31%	**0.80%**
	Downgrade	*3.11%*	*0.22%*	*0.70%*	*1.14%*	*2.38%*	*0.87%*	*0.22%*	*0.44%*	***1.27%***
1970s cohort	Upgrade	1.29%	0.89%	0.87%	0.79%	0.85%	0.30%	0.44%	0.43%	**0.84%**
	Downgrade	*1.62%*	*1.22%*	*1.86%*	*3.31%*	*3.66%*	*1.28%*	*1.44%*	*0.99%*	***1.91%***
1980s cohort	Upgrade	1.33%	1.34%	1.43%	0.98%	0.90%	0.93%	0.54%	0.56%	**1.14%**
	Downgrade	*1.91%*	*1.58%*	*2.72%*	*3.46%*	*4.34%*	*1.39%*	*0.86%*	*1.12%*	***2.25%***
1990s cohort	Upgrade	1.20%	1.41%	1.64%	1.46%	1.12%	1.12%	1.08%	1.10%	**1.34%**
	Downgrade	*0.81%*	*0.92%*	*2.38%*	*3.54%*	*4.44%*	*1.99%*	*1.27%*	*1.56%*	***2.17%***
2000s cohort	Upgrade				1.28%	1.55%	1.74%	1.71%	1.00%	**1.51%**
	Downgrade				*1.78%*	*1.98%*	*1.42%*	*1.17%*	*1.80%*	***1.61%***
2010s cohort	Upgrade							0.91%	1.64%	**1.39%**
	Downgrade							0.43%	1.46%	**1.11%**
Average	Upgrade	**1.54%**	**1.22%**	**1.41%**	**1.18%**	**1.16%**	**1.25%**	**1.13%**	**1.13%**	
	Downgrade	***1.67%***	***1.02%***	***2.23%***	***2.91%***	***3.38%***	***1.55%***	***0.98%***	***1.46%***	

Table 3 continued

Panel D. Net of upgrade/downgrade patterns in audit industry by listing cohorts (five- and three- year intervals)

Listing cohorts	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	Average
Pre–1970s	0.74%	0.42%	1.08%	−0.09%	−0.30%	−1.60%	−0.35%	−0.14%	**0.22%**
1970s cohort	1.31%	0.90%	0.77%	−0.26%	−0.73%	−3.33%	−0.86%	−0.91%	**0.32%**
1980s cohort	1.54%	0.96%	0.97%	−0.42%	−1.21%	−3.14%	−0.34%	−0.63%	**−0.09%**
1990s cohort			0.77%	0.50%	−0.58%	−3.04%	−0.55%	−0.53%	**−0.81%**
2000s cohort					−0.26%	−0.48%	0.52%	−0.62%	**−0.10%**
2010s cohort							0.40%	0.26%	**0.28%**
Average	**1.04%**	**0.78%**	**0.95%**	**0.05%**	**−0.68%**	**−2.18%**	**−0.05%**	**−0.29%**	
	1991–1993	1994–1996	1997–1999	2000–2002	2003–2005	2006–2008	2009–2011	2012–2014	Average
Pre–1970s	−0.18%	0.08%	−0.33%	−0.95%	−2.02%	−0.61%	0.00%	−0.12%	**−0.47%**
1970s cohort	−0.33%	−0.33%	−0.99%	−2.52%	−2.81%	−0.98%	−0.99%	−0.57%	**−1.07%**
1980s cohort	−0.58%	−0.24%	−1.29%	−2.48%	−3.44%	−0.46%	−0.33%	−0.56%	**−1.11%**
1990s cohort	0.39%	0.49%	−0.74%	−2.08%	−3.32%	−0.87%	−0.19%	−0.45%	**−0.84%**
2000s cohort			0.00%	−0.50%	−0.44%	0.32%	0.54%	−0.80%	**−0.10%**
2010s cohort							0.48%	0.18%	**0.28%**
Average	**−0.13%**	**0.20%**	**−0.83%**	**−1.73%**	**−2.22%**	**−0.30%**	**0.15%**	**−0.32%**	

Table 3 continued

Panel E. Market shares of smaller auditors (those other than Big N and Tier 2) by listing cohorts over successive five-year intervals

Listing cohorts	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	Average
Pre–1970s	16.35%	12.76%	7.05%	8.20%	4.43%	5.67%	7.26%	7.97%	**10.15%**
1970s cohort	27.77%	23.17%	17.11%	15.85%	16.51%	20.90%	25.78%	27.16%	**22.29%**
1980s cohort	42.04%	33.33%	24.32%	23.00%	24.78%	28.34%	31.00%	29.84%	**27.31%**
1990s cohort			20.45%	17.55%	18.31%	25.12%	29.42%	29.76%	**22.14%**
2000s cohort					33.53%	33.63%	34.86%	33.01%	**33.99%**
2010s cohort							42.17%	46.48%	**45.94%**
Average	**22.90%**	**24.78%**	**19.14%**	**17.78%**	**18.58%**	**26.20%**	**30.36%**	**34.48%**	

Table 3 continued

Panel F. Multivariate regression (enhanced) model with Big N as the dependent variable

	Estimate	*t*-statistic	Estimate	*t*-statistic
Intercept	11.593	23.712	14.131	26.58
Time	−0.006	−22.876	−0.007	−25.82
CohortDummy	0.036	34.348	0.051	32.11
IrrationalExuberance	−0.039	−11.107	−0.027	−4.95
PostDotComCrash	−0.063	−15.511	−0.019	−2.36
PostSOX	−0.100	−21.632	−0.071	−7.97
PostPCAOB	−0.042	−9.333	−0.057	−6.51
PostAS5	−0.004	−0.959	0.006	0.64
CohortDummy × *IrrationalExuberance*			−0.006	−2.78
CohortDummy × *PostDotComCrash*			−0.018	−5.81
CohortDummy × *PostSOX*			−0.010	−2.94
CohortDummy × *PostPCAOB*			0.008	2.51
CohortDummy × *PostAS5*			−0.001	−0.46
LogAsset	0.084	166.847	0.085	168.23
R&D_Intensity	0.105	3.430	0.105	3.42
Litigation	0.050	14.420	0.050	14.53
AbsPerMatchedDiscAccruals	−0.130	−9.341	−0.131	−9.44
AbsDDAccrualErros	−0.056	−2.715	−0.051	−2.44
DecYearEnd	0.003	1.345	0.005	2.37
RelationshipLength	0.006	39.697	0.007	40.11
SaleGrowth	−0.001	−3.294	−0.001	−3.40
Leverage	−0.018	−10.213	−0.018	−10.13
BTM	−0.006	−6.803	−0.006	−6.69
Loss	0.006	2.125	0.006	2.27
BusinessSegments	−0.009	−14.739	−0.009	−14.58
GeographicSegments	0.007	13.571	0.007	12.61
N		152,149		152,149
F-statistic		2,929		2,356
R-square		0.2756		0.2766

Table 4

Differences in trends of financial reporting attributes of companies audited by Big N and non–Big N firms

The first year in which a firm's share price data are available in CRSP-Compustat merged database is the listing year. The companies are divided into six listing cohorts based on their listing year. All companies with a listing year before 1970 are classified as pre-1970s. The remaining companies are classified as new-lists. Consequently, all of the companies are divided into the pre-1970s cohort or a cohort from the 1970s, 1980s, 1990s, 2000s, or 2010s. These six cohorts are assigned *CohortDummy* of 0, 1, 2, 3, 4, and 5, respectively. Ernst & Young, KPMG, Deloitte & Touche, PwC, and Arthur Andersen are the Big N firms. BDO, Grant Thornton, Crowe Horwath, and McGladrey are the second-tier firms (*Tier2*). Audit firms that are not Big N or second-tier firms are small firms. In Panel A, the absolute value of performance matched accruals by Big N and non–Big N auditors by listing cohorts is calculated by listing cohort over successive five-year periods of 1976–1980 to 2011–2014. Panel B and C presents the patterns for the absolute value of Dechow-Dichev accrual errors and client size, respectively. Panel D presents the average volatility of cash flows, volatility of sales growth, and conservative going concern opinions by listing cohorts using pooled data from 1976 to 2014. Panel E presents the results of a multivariate regression model, with an inverse measure of earnings quality as the dependent variable. *Time* is measured by fiscal year. Standard errors are clustered by company. All variables are defined in the Appendix. Number of observations are described in Table 1.

Panel A. Absolute value of performance matched accruals by Big N and non–Big N auditors by listing cohorts (five-year intervals)

Listing cohorts	Auditor	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	Average	Difference
Pre–1970s	Non–Big N	0.063	0.061	0.072	0.054	0.092	0.074	0.053	0.056	0.064	**0.02**
	Big N	*0.054*	*0.052*	*0.050*	*0.045*	*0.046*	*0.038*	*0.033*	*0.028*	*0.048*	
1970s	Non–Big N	0.093	0.094	0.093	0.099	0.111	0.124	0.106	0.069	0.098	**0.03**
	Big N	*0.081*	*0.077*	*0.074*	*0.063*	*0.064*	*0.048*	*0.042*	*0.035*	*0.071*	
1980s	Non–Big N	0.116	0.112	0.125	0.127	0.139	0.154	0.129	0.117	0.129	**0.05**
	Big N	*0.106*	*0.104*	*0.098*	*0.083*	*0.077*	*0.057*	*0.048*	*0.040*	*0.084*	
1990s	Non–Big N	-	-	0.142	0.124	0.159	0.179	0.143	0.124	0.155	**0.08**
	Big N	-	-	*0.090*	*0.090*	*0.096*	*0.066*	*0.057*	*0.049*	*0.079*	
2000s	Non–Big N	-	-	-	-	0.215	0.241	0.150	0.144	0.176	**0.10**
	Big N	-	-	-	-	*0.083*	*0.081*	*0.071*	*0.059*	*0.072*	
2010s	Non–Big N	-	-	-	-	-	-	0.163	0.197	0.195	**0.11**
	Big N	-	-	-	-	-	-	*0.093*	*0.087*	*0.088*	
Average	Non–Big N	0.082	0.096	0.115	0.117	0.148	0.182	0.139	0.143		
	Big N	*0.065*	*0.074*	*0.079*	*0.074*	*0.082*	*0.063*	*0.058*	*0.055*		
	Difference	**0.017**	**0.022**	**0.036**	**0.042**	**0.066**	**0.119**	**0.081**	**0.088**		

Table 4 continued

Panel B. Absolute value of Dechow-Dichev accrual errors by Big N and non–Big N auditors by listing cohorts (five-year intervals)

Cohorts	Auditor	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	Avera	Diff
Pre–1970s	Non–Big N	0.036	0.036	0.045	0.036	0.062	0.053	0.039	0.038	0.039	**0.01**
	Big N	*0.030*	*0.030*	*0.033*	*0.032*	*0.031*	*0.027*	*0.025*	*0.020*	*0.030*	
1970s	Non–Big N	0.055	0.058	0.066	0.072	0.081	0.086	0.077	0.056	0.064	**0.02**
	Big N	*0.047*	*0.048*	*0.051*	*0.046*	*0.045*	*0.036*	*0.031*	*0.026*	*0.046*	
1980s	Non–Big N	0.069	0.071	0.084	0.089	0.104	0.117	0.095	0.078	0.091	**0.03**
	Big N	*0.060*	*0.067*	*0.064*	*0.057*	*0.056*	*0.042*	*0.037*	*0.028*	*0.057*	
1990s	Non–Big N	-	-	0.092	0.085	0.114	0.136	0.107	0.094	0.115	**0.06**
	Big N	-	-	*0.056*	*0.061*	*0.064*	*0.050*	*0.041*	*0.036*	*0.055*	
2000s	Non–Big N	-	-	-	-	0.163	0.161	0.107	0.101	0.124	**0.08**
	Big N	-	-	-	-	*0.059*	*0.052*	*0.049*	*0.042*	*0.049*	
2010s	Non–Big N	-	-	-	-	-	-	0.103	0.122	0.119	**0.07**
	Big N	-	-	-	-	-	-	0.057	0.049	0.051	
Average	Non–Big N	0.048	0.059	0.077	0.082	0.107	0.133	0.101	0.096		
	Big N	0.037	0.045	0.052	0.051	0.056	0.045	0.041	0.037		
	Difference	**0.011**	**0.014**	**0.025**	**0.030**	**0.052**	**0.088**	**0.060**	**0.059**		

Panel C. Size of client firms (Log of assets) by Big N and non–Big N auditors by listing cohorts (five-year intervals)

Cohorts	Auditor	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2014	Avera	Diff
Pre–1970s	Non–Big N	4.16	4.58	4.26	5.29	3.83	4.22	4.70	4.84	4.43	**−2.11**
	Big N	*5.21*	*5.91*	*6.41*	*6.66*	*7.25*	*7.89*	*8.54*	*8.86*	*6.54*	
1970s	Non–Big N	2.26	2.68	2.60	2.62	2.60	2.85	3.42	3.73	2.63	**−1.99**
	Big N	*3.44*	*3.99*	*4.46*	*5.08*	*5.72*	*6.70*	*7.50*	*8.02*	*4.62*	
1980s	Non–Big N	1.41	1.86	1.95	2.02	1.94	2.36	3.07	3.62	2.15	**−2.31**
	Big N	*2.46*	*2.99*	*3.67*	*4.44*	*5.27*	*6.40*	*7.45*	*7.98*	*4.45*	
1990s	Non–Big N			1.58	2.29	2.31	2.75	3.74	4.25	2.94	**−2.36**
	Big N			3.73	4.22	4.92	5.88	6.83	7.39	5.30	
2000s	Non–Big N					0.45	2.17	3.42	3.53	2.94	**−2.95**
	Big N					5.14	5.44	5.99	6.56	5.90	
2010s	Non–Big N							2.19	2.34	2.32	**−3.20**
	Big N							5.36	5.54	5.52	
Average	Non–Big N	2.85	2.46	2.21	2.41	2.16	2.53	3.46	3.23		
	Big N	4.36	4.25	4.51	4.76	5.35	6.12	6.75	6.88		
	Difference	**-1.52**	**−1.79**	**−2.30**	**−2.35**	**−3.19**	**−3.59**	**−3.29**	**−3.65**		

Table 4 continued

Panel D. Trends in uncertainty of future performance of companies audited by listing cohorts by Big N and non–Big N firms (2001–2014)

	VolCFO			*VolSalegrowth*			*ConservativeGoingConcernOpinion*		
	Companies audited by			Companies audited by			Companies audited by		
Listing cohort	Big N firms	Non–Big N	Difference	Big N firms	Non–Big N	Difference	Big N firms	Non–Big N	Difference
Pre-1970s	0.034	0.063	0.029	0.187	0.272	0.085	1.26%	4.54%	3.28%
1970s	0.042	0.161	0.118	0.203	1.046	0.843	0.93%	12.05%	11.12%
1980s cohort	0.102	2.299	2.197	0.402	3.501	3.100	2.02%	20.06%	18.04%
1990s cohort	0.082	1.245	1.163	0.770	7.376	6.606	2.93%	19.77%	16.84%
2000s	0.084	1.567	1.484	3.334	8.453	5.119	2.41%	21.11%	18.70%
2010s	0.105	2.360	2.255	1.218	6.457	5.239	2.19%	21.02%	18.83%

Table 4 continued

Panel D. Tests of widening difference in reporting quality of Big N and non–Big N clients with successive cohorts

	Inverse measure of audit and financial reporting quality							
	AbsResidualsDD		*AbsDDAccrualErrors*		*AbsResidualsDD*		*AbsDDAccrualErrors*	
Independent variable	Estimate	*t*-statistic	Estimate	*t*-statistic	Estimate	*t*-statistic	Estimate	*t*-statistic
Intercept	0.0003	144.48	0.0308	135.10	0.055	184.889	0.035	181.70
CohortDummy	0.0002	53.46	0.0086	68.08	0.007	40.657	0.006	55.18
NonBigN	0.0009	55.17	0.0364	60.46	0.009	6.971	0.007	7.51
CohortDummy × *NonBigN*					0.018	25.404	0.014	28.70
N		152,149		152,149		152,149		152,149
F-value		6,231		4,618		4,697		3,498
Probability		< 0.001		< 0.001		< 0.001		< 0.001
Adjusted *R*-squared		0.0749		.0566		0.0838		.0637

Panel E. Tests of widening difference in reporting quality of Big N and non–Big N clients over time

	Inverse measure of audit and financial reporting quality							
	AbsResidualsDD		*AbsDDAccrualErrors*		*AbsResidualsDD*		*AbsDDAccrualErrors*	
Independent variable	Estimate	*t*-statistic	Estimate	*t*-statistic	Estimate	*t*-statistic	Estimate	*t*-statistic
Intercept	−0.709	−22.640	−0.018	−0.390	0.105	3.790	1.049	25.340
Time	0.000	24.080	0.000	1.820	0.000	−2.150	0.000	−23.750
NonBigN	0.040	65.120	0.052	60.250	−3.416	−34.400	−4.479	−30.970
Time × *NonBigN*					0.002	34.700	0.002	31.250
N		152,149		152,149		152,149		152,149
F-value		4,474		3,373		4,431		3,263
Probability		< 0.001		< 0.001		< 0.001		< 0.001
Adjusted *R*-squared		0.0549		0.0420		0.0747		.0598

Table 5

Differences in trends of audit fees of companies audited by Big N and non–Big N audit firms

The first year in which a firm's share price data are available in CRSP-Compustat merged database is the listing year. The companies are divided into six listing cohorts based on their listing year. All companies with a listing year before 1970 are classified as pre-1970s. The remaining companies are classified as new-lists. Consequently, all of the companies are divided into the pre-1970s cohort or a cohort from the 1970s, 1980s, 1990s, 2000s, or 2010s. These six cohorts are assigned *CohortDummy* of 0, 1, 2, 3, 4, and 5, respectively. Ernst & Young, KPMG, Deloitte & Touche, PwC, and Arthur Andersen are the Big N firms. For Panel A, the total audit fees of each cohort are calculated by adding audit fees from Audit Analytics. Panel C presents the results of a multivariate regression model, with two scaled measures of audit fees as the dependent variable. Standard errors are clustered by company. All variables are defined in the Appendix.

Panel A. Share of non–Big N's total audit fees in the listing cohort (three-year intervals)

Listing cohort	Number of observations	1997–1999	2000–2002	2003–2005	2006–2008	2009–2011	2012–2014	Average
Pre–1970s	6,883	0.50%	0.50%	1.09%	1.44%	1.26%	1.08%	**1.13%**
1970s	3,218	6.15%	3.27%	2.79%	6.10%	5.39%	2.41%	**4.45%**
1980s	9,081	4.57%	5.29%	6.93%	7.98%	7.21%	5.21%	**6.91%**
1990s	22,218	6.56%	6.24%	7.32%	8.71%	7.73%	6.86%	**7.62%**
2000s	11,021		5.99%	7.40%	9.24%	8.14%	8.51%	**8.28%**
2010s	775					12.06%	12.02%	**12.04%**
Average		**3.46%**	**3.65%**	**4.86%**	**6.26%**	**5.57%**	**5.18%**	

Panel B. Cohort trend in audit fees of companies audited by Big N and non–Big N audit firms

	Audit fees divided by square root of assets			*LogAuditFees*		
Listing cohort	Companies audited by Big N firms	Companies audited by non–Big N firms	Difference	Companies audited by Big N firms	Companies audited by non–Big N firms	Difference
Pre–1970s	46,654	30,404	16,250	14.54	12.43	2.11
1970s cohort	41,955	28,148	13,807	13.66	11.70	1.96
1980s cohort	39,385	36,115	3,270	13.48	11.68	1.80
1990s cohort	39,829	40,561	−732	13.31	11.87	1.45
2000s cohort	48,173	39,764	8,408	13.68	11.83	1.86
2010s cohort	52,336	39,380	12,956	13.86	12.10	1.76

Table 5 continued

Differences in trends of audit fees of companies audited by Big N and non–Big N audit firms

Panel C. Multivariate tests

Independent variable	Audit fees divided by square root of assets		*LogAuditFees*	
	Estimate	*t*-statistic	Estimate	*t*-statistic
Intercept	20,019	20.34	9.689	431.10
CohortDummy	10,780	11.35	0.137	6.32
BigN	2,340	9.54	0.057	8.99
CohortDummy × BigN	−1,602	−5.50	−0.014	−2.04
LogAsset	−1,503	−8.44	0.490	200.85
RelationshipLength	448	17.22	0.013	26.02
Loss	8,061	20.19	0.178	20.94
BTM	1,496	3.95	0.038	4.51
DecYearEnd	1,658	6.09	0.041	6.96
Leverage	1,632	14.92	0.037	16.68
AbsPerMatchedDiscAccruals	2,766	40.46	0.070	50.06
AbsPerMatchedDiscAccruals	−193	−0.50	0.018	1.59
BusinessSegments	−67	−0.68	−0.002	−2.18
GeographicSegments	54	2.97	0.001	3.63
R&D_Intensity	3,298	8.68	0.104	12.88
COGS_Intensity	20,019	20.34	9.689	431.10
DeferredRevenueToSalesRatio	10,780	11.35	0.137	6.32
LargeAcquisition	2,340	9.54	0.057	8.99
VolCFO	−1,602	−5.50	−0.014	−2.04
Litigation	−1,503	−8.44	0.490	200.85
N		53,196		53,196
F-value		244		9,901
Probability		< 0.001		< 0.001
Adjusted *R*-squared		0.0601		0.7231