A re-examination of the effect of industry specialization on audit fees:

Methodological and empirical implications

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Abstract

This paper revisits the effect of using various definitions and measures of auditor industry specialization in empirical audit research and proposes a new methodology to examine the effect of audit industry specialization on audit pricing. Industry specialist (ISP) auditors are auditors who have developed a specific expertise in their industry and who are therefore able to provide higher quality and more efficient audits. On a sample of 29,726 US-listed firms over the 2000–2010 period, we computed and compared 35 ISP measures. We find that the use of different definitions of auditor industry specialization results in inconsistent classifications of audit firms as specialists (or not) in a given industry. We further demonstrate that this lack of consistency between ISP measures represents a serious measurement issue because the various measures of industry specialization employed in empirical research have a low degree of internal and external construct validity. Our results suggest a potential explanation for the mixed evidence of prior studies examining the relation between ISP and audit pricing. We more specifically find that industry expertise measures based on audit fees or on number of clients cannot be used interchangeably and that they convey two distinct specialization strategies (resp. fee dominance and economies of scales) We therefore posit that to get a more complete view of the effect of auditor industry specialization strategies on audit fees, both the audit fee based and the number of client based ISP metrics must be included simultaneously in audit pricing models.

Keywords: auditor industry specialists, audit fees, construct validity

1. Introduction

The characteristics of audit firms and their influence on audit pricing are of major interest for accounting researchers. Besides the dichotomy between Big and non-Big audit firms, another main feature is the difference in industry expertise (Francis, 2011).

In academic research, auditor industry specialization (ISP) is analyzed on the basis of the composition of the auditor's clienteles. Industry specialization is a strategy used by auditors who devote resources to develop industry-specific knowledge in order to gain competitive advantage, obtain larger market shares, increase their reputation in that industry and charge ISP fee premiums relative to audit firms that are not industry specialists (Hay and Jeter, 2011). Nevertheless, it is possible to attain a large industry market share not only by auditing a few relatively large clients in a given industry but also by auditing many relatively small ones (Cahan et al., 2011). Therefore through scale economies, auditors with many clients in an industry should be able to spread their specializations costs and to compete on price (Danos and Eichenseher, 1982) and potentially provide ISP fee discounts.

The ISP effect on audit pricing has been widely examined in the literature and there is a fair amount of evidence showing that ISP auditors can earn an audit fee premium. However, the conditions under which such premiums arise are less clear (Causholli at al., 2010). Overall, results exhibit inconsistencies and uncertainties and can be seen as mixed or inconclusive (Francis, 2011; Cahan et al., 2011; Hay and Jeter, 2011). Given that the level of industry specialization of an audit

firm is very difficult to observe directly, researchers use indicators to build different proxies of this concept. However, there is a lack of consensus as to how auditor industry specialization should be measured. Methods of identifying industry specialists include market share–based and portfolio-based approaches[1]. Furthermore, because information on audit fees was not publicly available until recently, audit fee–based measures were not available in most of the early ISP research, and researchers used a variety of audit fee surrogates (e.g. client size, number of clients) to calculate auditor shares of clientele. Aside from the different calculations of auditor industry market shares, the criteria applied to assign auditor industry specialists are also diversified. For instance, some researchers define auditor industry specialists as those who possess the largest market share in a given industry (relative measure), whereas others define specialists as those who possess a market share in a given industry that exceeds certain cut-off levels (absolute measure). The diversity of proxies used to measure auditor market and portfolio shares and the various criteria adopted to classify auditors as industry specialists render the empirical results difficult to compare and interpret. This then raises questions concerning the reliability and validity of the results obtained from these measures.

Our research attempts to disentangle the potentially opposite effects of those various measures of industry specialization on the pricing of the audit services provided by specialist auditors. We first investigate the validity of the measures of industry specialization and then propose a new methodology to capture the industry specialization concept and to improve the research designs in

[1] In addition, Neal and Riley (2004) have provided evidence that these two approaches produce inconsistent results and therefore proposed to combine them to create a weighted market share method.

audit pricing research.

Our study builds on, and expands the prior methodological contributions of Neal and Riley (2004) and Cahan et al. (2011), as we exhaustively compare all ISP proxies used by prior audit pricing research. Both papers take as a starting point that prior ISP research has provided inconclusive empirical results, and they propose an analysis of how various industry specialization strategies are imperfectly captured by ISP measurement proxies and present new methodologies. On the one hand, Neal and Riley (2004) compare market share based and portfolio share based auditor specialization measures and indicate that they sometimes produce inconsistent results because they capture two different strategies. They argue that the positioning of an audit firm in a given industry market (market share) and the structure of its portfolio of client (portfolio share) both matter for industry specialization and therefore introduce a weighted market share measure aiming at reconciling these two dimensions of specialization. On the other hand, Cahan et al. (2011) focus their study on the market share approach and show that in addition to the audit fee market share obtained in a given industry, the proportion of clients audited in that industry also matters to determine the type of industry specialization strategy adopted by the audit firm. Our paper proposes to disentangle the relative importance of the effects of the market share versus portfolio share (or mix of both) and of the audit fee based versus number of clients based (or other indicators) measures on the audit pricing consequences of industry specialization strategies.

We use US data from 2000 to 2010 to compute different measures of auditor industry specialization in order to investigate whether they produce different auditor industry specialist designations. Based on seven different measures of the auditors' industry market shares (based on

audit fees, client size or number of clients) and five criteria to designate industry specialists (based on relative or absolute market and portfolio shares), we test the internal association between 35 different measures of the ISP construct. We then alternatively use the 35 ISP measures to estimate the ISP audit fee effect and analyze whether the various ISP measures have different impacts on audit pricing. This analysis allows us to test the external association of the ISP construct. We finally test a new research design to simultaneously take into account two opposite effects of industry specialization on the audit pricing namely, fee dominance and economies of scales.

We find that the choice of the type of measure used to identify industry specialists has a real influence on the designation of auditors as industry specialists. First, we confirm and expand the findings of Neal and Riley (2004) and show that the use of the five different assignment approaches (absolute or relative market share, absolute or relative portfolio share and weighted market share) modifies the classification of auditors as specialists or not. We further find that the use of different calculating variables (audit fees, client size, number of clients) to compute these shares also leads to different classifications.

One major consequence of this mis-classification is that it leads to significant measurement errors regarding the estimation of the ISP fee premium or discount. Our results show that in the test of our 35 ISP fee premium models, only 11 lead to the determination of a significant ISP fee premium, 2 lead to the determination of a fee discount, and 22 produce non-significant results regarding the effect of ISP on the pricing of the audit. Furthermore, coefficient comparisons illustrate that the

magnitude of the ISP premium is not always consistent between the models. The use of audit fee–based measures consistently leads to positive and significant ISP fee premiums (of various magnitudes), which is not the case when measures based on client size or number of clients are used. Audit fees incorporate information about the audit effort needed to audit a given client. While the audit effort is indeed linked to the size of the client, it is also a function of its complexity and risk and has an industry-specific dimension.

This paper contributes to the literature in different ways. First, by conducting a systematic comparison between 35 ISP measures on a large sample, this paper provides a large-scale analysis of the classification inconsistencies produced by the use of various industry specialist assignment methodologies. Second, this research shows that the classification discrepancies are significant and large enough to influence the statistical results of the estimation of the effect of ISP on audit fees. Third, our study provides a formal comparison between market share, portfolio share, and the combined metric proposed by Neal and Riley (2004), i.e., the weighted market share. Finally and most importantly, our paper provides evidence that different ISP strategies can lead: or to fee premiums (when auditors earn large shares of fees in a given industry) or to fee discounts (when auditors serve a large number of clients in a given industry) and demonstrates that the inclusion of both an audit fees based measure and of a number of client based measure of ISP in audit fee models is important to capture and disentangle these two opposite effects.

The remainder of the paper is organized as follows. The literature review and hypotheses

development are presented in Section 2, followed by our research design description in Section 3. Section 4 provides detailed information about sample and data, Section 5 presents the empirical results and Section 6 comprises conclusion.

2. Literature review and hypotheses development

2.1. Auditor industry specialization and audit pricing: mixed evidence

Auditor industry specialization is a major topic in auditing literature[2] as well as for practitioners and is factored into Client Company's auditor selection decision (GAO, 2008). This is explained by the fact that auditor industry expertise is presumably associated with better auditor performance and higher audit quality (Solomon and Shields, 1999; Low, 2004). Based on the assumption that audit specialists provide higher quality audits, the audit literature examined whether these specialists receive fee premiums. In theory, audit firms will invest in the development of an industry specialized expertise if they can use it to increase their reputation and attract new clients, and also in order to create specific knowledge that could lead to economies of scale and efficiency gains for the audit firm (McMeeking et al., 2006). The development of such an expertise requires costly investments and audit firms will therefore charge an ISP fee premium (Habib, 2011). In theory, ISP could therefore lead to a fee premium effect or to a fee discount effect.

The empirical results of previous studies are mixed regarding the impact of industry specialization on audit fees. While many studies find a positive relation between auditor industry specialization and audit fees (e.g., Craswell et al. 1995; Defond et al., 2000; Ferguson et al. 2003; Mayhew and

[2] For literature reviews of industry specialization and/or related audit outcomes (audit quality and audit fees), see Causholli et al., 2010; Gramling and Stone, 2001; Habib, 2011; and Hay et al., 2006.

Wilkins 2003; Castarella et al., 2004; Francis et al. 2005; Huang et al., 2007, Basioudis and Francis, 2007; and Carson 2009, Cahan et al., 2011), other studies find marginal results or no relation (e.g., Palmrose, 1986; Ferguson and Stokes, 2002; and Ferguson et al., 2006) or a negative relationship in some instances (e.g., Ettredge and Greenberg, 1990; Mayhew and Wilkins, 2003).

One possible explanation for these inconsistencies could be related to the fact that the choice of either a market share approach or a portfolio approach produces very different results (Neal and Riley, 2004), mainly because the metrics are not highly correlated (Krishnan, 2001). A second possible explanation could be linked to the use of various proxies (audit fees metrics, clients size metrics or number of clients) for the calculation of auditor market share. It is not unified in the literature, regardless of the approach chosen to define industry specialization (market share, portfolio share or combined approach). Finally recent studies begin to explore other possible explanations for the inconsistent results regarding the influence of industry specialization on audit fees. For instance, Cahan et al. (2011) argue that the way through which specialist auditors gain the market shares affects the audit fees. Only the specialists who derive a large share of total industry audit fees by auditing a small number of large clients in the industry (i.e., auditing a small portion of the clients in the industry) charge a premium for their services. Performing the analyses at city office level, Fung et al. (2012) find that the audit fee premium of industry specialist auditors coexist with the economies of scale offered by the specialist, and the two effects are highly interactive. The audit fee premium for specialists is smaller for auditors with a larger city-industry scale. Finally, Numan and Willekens (2012) suggest that the audit fee premium earned by the industry specialists is due to their client-auditor industry alignment as well as their product

differentiation strategy to soften price competition.

2.2. A lack of consistent definition and measurement of auditor industry specialization

Market share or portfolio share

Although studies on auditor industry specialization are extensive, the definition and designation of industry-specialized auditors are not clearly agreed upon by researchers. Regarding the definition, most research follows Palmrose (1986), who defines auditor industry specialists to include both the largest supplier in each industry and the second and third largest suppliers in the industry in which readily observable differences existed between the second and the third or between the third and the remaining suppliers. This definition basically takes the within-industry market share approach in which an auditor is considered to be an industry specialist if he possesses a significant part of the market shares in that industry. The justification for defining specialists on the basis of market share is that auditors who devote resources to develop the industry knowledge required for becoming industry specialists tend to have larger market shares. This enables them to split the knowledge-developing costs between several clients and to eventually achieve economy of scales. The market-share approach defines an industry specialist as an audit firm that has differentiated itself from its competitors in terms of market share *within a particular industry* (Neal and Riley, 2004).

An alternative definition of auditor industry specialization emphasizes the individual auditor firm and focuses on the relative distribution of audit services across the various industries for each audit firm. This within-firm portfolio share approach defines audit firms as specialists in those industries

that comprise their largest portfolio shares. The rationale behind this kind of designation is that the industries constituting the largest portfolio shares of a given firm are those that generate the most revenues for that firm and those in which the firm has invested the most resources. The portfolio share approach gives consideration to the relative distribution of audit services and related fees across the various industries served by each audit firm considered individually.

The market share approach does not take into account the size of the industries. In this way, it fails to recognize that some industries are too small to merit the development of industry specialization, or that some industries are so large that most audit firms (and of course all Big 4 firms) will be prompted to make major investments in the development of industry specialization through technologies and expertise (Neal and Riley, 2004). On the other hand, the portfolio approach generally assumes that industries in which a given audit firm is able to earn large revenues is an industry where this audit firm has allocated above-average resources and efforts to develop industry-specific expertise. However, one limitation of this approach is that it is driven by the size of the industry. For this reason, the approach may not be specific enough to identify the investments made to develop industry expertise. This applies in particular to large industries, which are targeted heavily by Big 4 firms for their prospect of earning them larger revenues. With the portfolio approach, the designation of industry specialists could well be overstated in large industries and understated in small industries. In order to address the shortcomings of both the market share and portfolio share approaches, Neal and Riley (2004) developed a weighted market

share approach that combines the two previous approaches[3]. In the weighted market share approach, the audit firm's market share is weighted by its portfolio share.

Choice of measurement variables

Regardless of the approach chosen to define industry specialization (market share, portfolio share or combined approach), the choice of the variables used for the calculation of auditor market share is not unified in the literature. Gramling and Stone (2001) indicate that the market shares of auditor firms in industry k,[4] is measured as the total audit fees earned by an auditor firm in industry k, deflated by the total audit fees generated by all clients in industry k. However, because information on audit fees was usually not publicly available[5] up to ten years ago, researchers have often approximated audit fees using (i) client size (proxied by client assets and sales revenue) or (ii) the number of clients. Furthermore, industry specialist auditors are also selected based on either their relative or absolute levels of market shares. For the relative level, an audit firm is considered as a specialist if it has the largest, second largest or third largest market share. And for the absolute level, an audit firm is considered a specialist if its market share is 20% greater than what it would be if the audit firms were to divide the industry evenly among them. Some researchers adopt a more rigid approach and identify a specialist as being the one with the largest market share, whereby that share should also be at least 10% higher than the second-largest market share (i.e.,

3 Finally, some researchers (e.g., Krishnan 2001, Cahan et al., 2011) sometimes adopt a straightforward self-proclaimed approach in which audit firms are considered to be industry specialists if they promote their particular industry specialization on their websites.

4 Most existing research uses 2-, 3-, or 4-digit SIC codes to assign companies to different industries.

5 With the exception of pioneer countries such as Australia and the U.K., where audit fee disclosures started in the 1990s, audit fee disclosures have become more commonly enforced from 2000 on (in the U.S.) and after the post-Enron regulations had been adopted in many countries worldwide.

the dominance).

2.3. Hypotheses development

Given that the level of industry specialization of an audit firm is very difficult to measure directly, researchers use observable indicators to build different proxies of this unobservable concept. The diversity of metrics used to determine whether an audit firm is the specialist of a given industry or not raises the question of the reliability and validity of these measures (Carmines and Zeller, 1979). Reliability refers to the extent to which a measurement procedure yields the same results (or at least consistent results) on repeated trials. In our setting, the indicators used are taken from the financial statements of the audited client firms, by way of which each of these indicators is individually reliable. But, to provide an accurate representation of an abstract concept, an indicator must also be "valid," which means that it needs to measure what it is intended to measure (Carmines and Zeller, 1979). The most important aspect of the validity assessment is construct validity. Campbell and Fiske (1959) define the concepts of convergent and discriminant validity, which refer to construct validity when constructs are measured by multiple methods. Convergent validity implies that different methods of measuring the same trait should converge on the same result, and discriminant validity implies that identical methods of measuring different traits should lead to different results.

Regarding convergent validity, two main methods can be used to evaluate the degree to which indicators measure the concept they are designed to measure and therefore test construct validity.

The first one is internal association, wherein several variables measuring the same concept should be highly correlated. The second one is external association, wherein several variables measuring the same concept should behave similarly in terms of direction, strength and consistency with regard to theoretically relevant external variables (Carmines and Zeller, 1979; Zeller and Carmines, 1980). The implication is that if two indicators relate differently to a same theoretically relevant related variable, they do not represent the same theoretical concept.

The use of a multiplicity of industry specialist measures in the audit literature, and the use of publicly disclosed audit fees in the most recent industry specialization studies, raise the question of whether dissimilar ISP measures produce similar industry specialization classifications. Our research attempts to shed light on this issue by comparing the designations of auditor industry specialist across various industry specialist measures.

Regarding internal association, we hypothesize that different measurement proxies produce inconsistent results of auditor industry specialist designations. Our Hypothesis 1 is formulated as follows:

H1: Different ISP measures result in inconsistent ISP designations.

Regarding external association, we use the effect of ISP on audit fees paid to industry specialists as a theoretically relevant external variable (Carmines and Zeller, 1979). Regardless of the potential explanations for or against findings with respect to the auditor industry specialization audit fee premium, the lack of consistent results in prior empirical research suggests that measurement

issues matter and that ISP classification based on "arbitrary market share percentage will misclassify some specialists as non-specialists and weaken the design and statistical tests" (Habib, 2011). The analysis of the impact of this classification issue on the determination of the fee premium paid to industry specialist auditors enables us to test the external association of the ISP measures with a related concept. If the assignment results are highly inconsistent, the auditor industry specialists identified from different measurement methods will produce dissimilar impacts when auditor industry specialization is used as an independent variable in audit fee pricing models. Our research investigates to what extent the use of various ISP measurement methods has an impact on the industry specialization effect on audit fees.

H2: The use of different ISP measures leads to significantly different results regarding the pricing of the industry specialization in audit fee models.

3. Research design

In this paper, we investigate whether the use of different ISP measures results in different ISP assignments and whether any assignment differences have a significant effect on the relationship between ISP and audit fees. We adopt a two-step research design in order to investigate our research questions. We aim at exploring the validity of the ISP construct in testing its internal and external validity (see Carmines and Zeller, 1979). We first compute the different measures of market share, portfolio share and weighted market share with seven different calculating variables. We then identify industry specialist auditors in each industry according to the different specialist assignment criteria. Then we compare ISP designations to test the internal validity of the construct. Finally, we investigate whether these designations lead to consistent results in empirical pricing models of audit fees, namely as a test of the external validity of the construct.

3.1. Computation and designation of ISP

Based on prior evidence (e.g., Gramling and Stone, 2001; Neal and Riley, 2004), we adopt five ISP assignment approaches that are commonly employed to designate industry specialist auditors. Among these five approaches, two are based on market shares (largest market share approach, market share cut-off approach), two on portfolio shares (three largest portfolio shares approach, portfolio share cut-off approach), and one on weighted market shares (weighted market share cut-off approach). In each assignment approach, market or portfolio shares are calculated using seven calculating variables to estimate the importance of the clientele. These are audit fees, total fees, assets, sales, square root of assets, square root of sales, and number of clients. A detailed description of the name and construction of the 35 ISP variables obtained is presented in Table 1

Insert Table 1 here

According to Palmrose (1986), the first assignment criterion (Approach 1) is defined as the largest market share. The audit firm with the largest market share in an industry is designated as the industry specialist in that industry. The second specialist assignment approach (Approach 2) defines industry specialist auditors as those who have a market share that is 20% greater than the calculated average (i.e., their market share is 20% larger than the market share cut-off ratio)[6].

The rationale of using relative portfolio shares to designate industry specialist auditors is that the presence of a large portfolio of clients from the same industry implies that that audit firm has invested significantly in order to develop industry knowledge in that industry. Thus, even though the audit firm may not have a leading market share in that industry, the audit firm is considered to be a specialist in the industries in which it generates the most revenue and presumably devotes the most resources into developing industry-specific knowledge. In line with this argument, the third assignment approach (Approach 3) considers industries with the three largest portfolio shares as those in which the audit firm is designated as a specialist.

The fourth assignment approach (Approach 4) takes a similar stand as the market share cut-off approach, although relying on portfolio shares. As argued by Krishnan (2001), if there is no a priori industry specialization, an audit firm's portfolio shares are expected to be evenly distributed

[6] In this paper, given that we consider Big 5 auditors for year 2000 and year 2001, the market share cut-off ratio for year 2000 and 2001 is calculated as (1/5)*1.2, which is equal to 0.24. For the period from year 2002 to 2010, only Big 4 auditors are considered, as a result of which the market share cut-off ratio is calculated as (1/4)*1.2, which is equal to 0.3.

across all industries, with each industry generating $1/N_{industries}$ of total revenues for that audit firm, where $N_{industires}$ is the number of industries served by the audit firm in a specific year. Therefore, $1/N_{industries}$ is deemed as the portfolio share cut-off ratio, and the audit firm is designated as an industry specialist if the industry in which the audit firm serves has a portfolio share larger than the portfolio share cut-off ratio[7].

Consistent with Neal and Riley (2004), the criterion employed by the weighted market share–based assignment approach (Approach 5) is that the weighted market share for an audit firm in an industry is larger than the weighted market share cut-off ratio. The weighted market share cut-off ratio is calculated as the market share cut-off ratio multiplied by the portfolio share cut-off ratio. An audit firm is designated as an industry specialist if its weighted market share is larger than the weighted market share cut-off ratio.

As indicated above, the industry specialist measures are far from perfect. In recent years, the industry specialist research stream began examining more fine-tuned measures of industry specialization. In large countries where the geographical dispersion has permitted the development of large local audit market to serve the needs of local clients, researchers have examined the effect of industry specialization at the regional, office or city level (e.g., in the U.K.: Basioudis and Francis, 2007; in Australia: Ferguson et al., 2003, in the U.S.: Francis et al., 2005). In other countries where the name of the audit engagement partner is available in the audit report, it is even

[7] In our sample, the number of industries served by each Big 5 or Big 4 auditor changes over time.

possible to analyze the industry specialization at the engagement partner level in order to capture the industry-specific partner expertise (e.g., in Taiwan: Chi and Chin, 2011; in Sweden: Zerni, 2012). For purposes of parsimony and comparability reasons, we chose to exclude these approaches from the core of our study, which focuses on measurement issues related to the industry specialization at the national level.

3.2 Test of internal and external associations for ISP construct validity

We compare, within each assignment approach, whether ISPs measured by different calculating variables result in same ISP designations and have the same effect on audit fees.

3.2.1. Internal association: Consistency of ISP assignments and analysis of correlations

In the first analysis, for each sample year, we calculate market shares, portfolio shares and weighted market shares for each audit firm in each industry. Since we use seven different calculating variables, this process produces seven different market shares, seven different portfolio shares and seven different weighted market shares for each auditor industry. Then, we apply the five specialist assignment approaches, resulting in 35 (5 assignment approaches * 7 calculating variables) different industry specialist auditor designations. For each of our 35 ISP measures, we identify the audit firms that are considered as industry specialists and create dummy variables to indicate whether a client firm is using an ISP auditor or not. We then build comparative tables to describe the consistency of the ISP measures, and conclude with an analysis of the correlations between the 35 ISP measures, within and across approaches.

3.2.2. External association: Audit fee pricing and ISP coefficient comparison

In the second part of the analysis, we investigate whether ISPs within the same assignment approach have different effects on the relationship between audit fees and ISP. Based on previous audit fee studies (Simunic, 1980; Francis et al., 2005; Hay et al., 2006), we developed the following audit fee regression model:

$$\begin{aligned} LnAF_{it} = {} & \alpha_0 + \alpha_1 LnAT_{it} + \alpha_2 YE_{it} + \alpha_3 CATA_{it} + \alpha_4 DE_{it} + \alpha_5 QUICK_{it} \\ & + \alpha_6 ROI_{it} + \alpha_7 LOSS_{it} + \alpha_8 FOREIGN_{it} + \alpha_9 OPINION_{it} + \alpha_{10} ISP_{it} \\ & + \alpha_{11} Industry + \alpha_{12} Year + \varepsilon_{it} \end{aligned} \qquad (1)$$

Where:

LnAF = natural logarithm of audit fees;

LnAT = natural logarithm of total assets;

YE = 1 if the client firm has a Dec 31 year-end, 0 otherwise;

CATA = ratio of current assets to total assets;

DE = ratio of long-term debt to total assets, winsorized at top 1%;

QUICK = ratio of current assets (less inventory) to current liabilities, winsorized at top 1%;

ROI = ratio of earnings before interest and tax to total assets, winsorized at top and bottom 1%;

LOSS = 1 if a client firm has a negative net income; 0 otherwise;

FOREIGN = 1 if a firm has foreign activities; 0 otherwise;

OPINION = 1 if a firm receives qualified audit report, 0 otherwise;

ISP = 1 if audit firm is classified as industry specialist (35 measures if industry specialization are used, as described in table 1), 0 otherwise;

Industry = industry fixed effect based on two-digit SIC code;

Year = year-fixed effect;

In all regressions, standard errors are corrected for firm clusters.

We first regress audit fees on different ISPs and then compare the coefficients of different ISPs. Our comparison is performed with a within-assignment approach. Specifically, for the ISPs measured by different calculating variables but in the same assignment approach, we run the audit fee regression seven times (because we have seven different calculating variables that result in seven different ISPs in each of the 5 assignment approach) using different ISPs each time. The coefficient of interest is $\alpha_{10.}$ Our main purpose is to test whether, within one and the same assignment approach, an ISP measure based on audit fees yields the same results as an ISP measure using other calculating variables. To this end, we first check whether ISPs in the same assignment approach are all significant in each respective regression. We then compare ISP coefficients in pairs to see whether they differ significantly from each other.

4. Sample and data

4.1. Sample

Our sample includes US-listed firms audited by Big 5 audit firms in year 2000 and 2001 and firms audited by Big 4 audit firms in the period 2002–2010. We limit our analysis on clients audited by Big 4/5 firms in order to rule out the Big /non-Big auditor selection issue and the possible confounding effect of the Big 4 premium with the ISP premium. Table 2 presents the sample selection process.

Insert Table 2 here

The initial population consists of 81,142 firm-year observations; audit-related variables are from Audit Analytics and financial statement data from Compustat. We first delete 8,589 non-US firms and 18,880 inactive firms because we limit our analysis to active US companies. A total of 8,050 observations with missing values are also dropped. Finally, we delete 15,897 observations associated with firms audited by non-Big 5 or non-Big 4 audit firms. We end up with a final sample for the ISP assignment analysis of 29,726 firm-year observations.

For the regression analysis and ISP coefficient comparison, we delete financial institutions (SIC code 6000–6999) and observations with missing values for variables in the audit fee model. The final regression sample is composed of 23,887 firm-year observations. Table 3 provides descriptive statistics on the full sample.

Insert Table 3 here

Table 4 presents the number of observations for each audit firm (Big 5 or Big 4) for each year, showing that while the number of observations remains relatively constant over the years, EY (Ernst & Young) has the largest number of observations (8,905), accounting for 29.96% of the total sample. Since AA (Arthur Andersen) only appears in year 2000 and year 2001, it has the smallest number of observations (943). Appendix 1 shows the number of observations in each industry. For the audit fee regression sample, the distribution of observations among the audit firms and years

remains qualitatively unchanged compared to the full sample used for ISP calculation.

4.2. Descriptive statistics

Table 4, Panel A provides a description of the audit fee and size variables used for the calculation of the market share, portfolio share and weighted market share allocations, and Table 4, Panel B presents descriptive statistics for the variables used in the audit fee regression.

Insert Table 4

The two panels show that our sample covers a wide range of firms with mean (median) assets of $10,254.76 ($856.59) million US dollars and mean (median) audit fees paid to auditors in the order of $1.99 ($0.79) million US dollars. Moreover, Table 4 Panel B shows that on average 31.6% of the sample firm-years experience losses and that 42.1% of the firm-years have foreign activities.

5. Results

5.1. Internal association: Results of ISP assignments and analysis of correlations

We applied the five assignment methods with seven different measurement variables in order to classify the audit firms as "industry specialists" for each of the 70 industries and each of the 11 years included in our sample. To simplify the presentation and the discussion of the descriptive results, we selected the largest industry, SIC 28 "Chemical and allied products" (in terms of number of observations) and used it as an example to illustrate the inconsistencies of ISP assignments. For one year selected randomly (year 2004) the ISP designation results for this

industry are shown in Table 5.

Insert Table 5 here

Table 5 provides descriptive evidence of the designation discrepancies across assignment approaches as well as of the inconsistencies between the measurement approaches within each assignment approach. For example, as described in Table 5 in the chemical and allied products (SIC 28) industry segment, for the largest market share approach and the year 2004, PW is designated as industry specialist when market shares are measured by audit fees, total fees, square root of assets or square root of sales. However, DT is designated as industry specialist when market shares are calculated on the basis of total assets or sales metrics. Moreover, when market shares are measured using number-of-clients, EY becomes the industry specialist. For the same industry in the same year, if the three-largest-portfolio-shares approach is considered, the ISP designations vary across different calculating variables as well. More specifically, if portfolio shares are measured by audit fees, audit firms PW and KP are assigned as industry specialists. However, if portfolio shares are measured by total fees or square root of sales, auditor firms PW, DT and KP become specialists. Additionally, only DT and KP are designated as specialists when portfolio shares are calculated by sales, whereas audit firms PW, EY, DT are designated as specialists when portfolio shares are measured by number-of-clients. When portfolio shares are measured by assets or square root of assets, none of the audit firms are assigned as a specialist in the chemical and allied chemical products industry.

Results for the other years and industries are qualitatively similar[8], suggesting that within a given assignment criterion, the use of different ISPs measures lead to inconsistent ISP allocations. It is also worthwhile to note that audit fee–based ISP measures appear to significantly differ from ISPs measured by other variables that are used as proxies for audit firm revenues.

To further illustrate the contrasting results of ISP designation, we present the number of clients audited by each industry specialist auditor in Appendix 3. Based on the descriptive evidence provided by these different classification methods, we can conclude that the ISP assignment is very sensitive to the chosen ISP indicators.

The analysis of the correlations between our 35 ISP variables is conducted across and within classification approaches. Table 6 provides the correlation tables for each of the seven measurement variables, across the five assignment approaches. Table 7 provides the correlations between the seven measurement variables within each assignment approaches

Insert Tables 6 and 7 here

On the across-assignment approach side, correlations in Table 6 exhibit a lot of variance. The two market share–based approaches lead to reasonably high and consistent correlations between each other, ranging from 71.7 to 81.7% depending on the calculating variable chosen. However, the correlations between market-based and portfolio-based approaches are much weaker (less than 20% on average), which suggests that the two approaches probably capture different concepts. From the

[8] The four largest industries detailed allocations are presented in Appendix 2, Panels A, B, C and D.

correlation tables, our findings demonstrate that, in agreement with Krishnan's (2001), overall, ISP measures exhibit relatively low correlations within and across assignment approaches. Table 7 shows that within each assignment approach, the ISPs are all positively correlated (with correlations ranging from 0.13 to 0.95). Audit fee and total fee–based measures are, not surprisingly, strongly correlated to each other, and client size measures are also correlated to each other. However, although the correlation between client size–based and audit fee-based measures are rather large, the average is 70%, which means that the use of client size instead of audit fee is not neutral.

Our first findings regarding internal association are that: On an industry-by-industry basis, we find many instances in which different ISP measures lead to inconsistent industry expert designations. We nevertheless find that the correlation coefficients between the ISP variables are usually positive and significant, and that the strength of the association varies depending on the method used. In general, it was found to be low, except between the two market share-based approaches.

5.2. External association: Results of audit fee pricing regression and ISP coefficient comparison

Table 8 presents the summary of the 35 regression results[9]. We investigate whether the use of diversified measures of industry specialization leads to inconsistent results (significance and magnitude) in the estimation of the audit fee premium paid to industry specialist auditors.

[9] Detailed results of each audit fee pricing models are presented in Appendix 4.

Insert Table 8 here

For the seven regressions in the largest-market-share approach, the table shows that the coefficients of ISP_1 and ISP_2 are significant at level 0.01. Results for the market share cut-off approach underline that ISP_1 and ISP_2 are also significant at level 0.01, whereas ISP_3 and ISP_4 are significantly positive at level 0.05 and 0.01 respectively. Regarding the portfolio share–based assignment approaches, the table shows that for the three-largest-portfolio-shares approach, only ISP_ps1 and ISP_ps5 are statistically significant at level 0.1 and the coefficient of ISP_ps5 is negative. However, when the portfolio share cut-off approach is considered, ISP_p1, ISP_p2 are significantly positive and ISP_p7 is significantly negative. In the weighted market share cut-off approach, only ISP_m1 and ISP_m2 are positive and statistically significant at level 0.05.

Taken together, the results as summarized in Table 8 illustrate that ISP differences resulting from the use of different calculating variables affect the interpretation of the relationship between ISP and audit fees. Interestingly, when market shares, portfolio shares or weighted market share criteria are calculated using audit fees, the ISP variable remains significant and positive in all regressions. Conversely, if market share, portfolio share or weighted market share are measured by other proxies, the results are mixed and inconsistent regarding the existence or magnitude of an industry specialist audit fee premium. Moreover the coefficients are always negative when the number of clients is used as calculating variable for the five assignment approaches.

Our results show that on the test of our 35 ISP fee premium models, only 11 lead to the determination of a significant ISP fee premium, 2 lead to the determination of a fee discount, and 22 produce non-significant results regarding the effect of ISP on the pricing of the audit.

To further explain the extent to which ISPs within the same assignment approach but measured by different calculating variables can differ from each other in an audit fee pricing model, we compare the ISP coefficients based on audit fees with the ISP coefficients based on other measurement variables in Table 9.

Insert Table 9 here

As shown in Table 9, ISPs measured by audit fees are quite different from ISPs measured by other calculating variables (i.e., proxies for audit fees) in all assignment approaches. For example, in both the largest-market-share approach and the market share cut-off approach, ISPs measured by audit fees (ISP_1 and ISP_m1) are significantly different from ISPs calculated by other calculating variables at level 0.01, except for ISP measured by total fees (ISP_2 and ISP_m2). Comparison results for the two portfolio share–based approaches are quite dissimilar. While in the three-largest-portfolio-shares approach, ISP measured by audit fees (ISP_ps1) differ significantly from ISP measured by square-root-of-assets (ISP_ps5) or by number-of-clients (ISP_ps7), in the portfolio share cut-off approach, ISP measured by audit fees (ISP_p1) is significantly different from all other ISPs. With respect to the results of the weighted market share cut-off approach, ISP

measured by audit fees (ISP_w1) differs significantly from ISPs measured by square root of assets (ISP_w5), square root of sales (ISP_w6) and number of clients (ISP_w7). These coefficient comparisons illustrate the fact that even if an ISP premium is found, the magnitude of the ISP premium is not always consistent between the models. Taken together these results show that only ISPs measured by number of clients are consistently different from ISPs measured by audit fees.

The findings based on the external association criteria shows that audit fee–based measures appear to produce the most consistent results. Audit fees incorporate information about the audit effort needed to audit a given client. The audit effort is linked with the size of the client, but not only. Instead, it is also a function of its complexity and risk and has an industry-specific dimension. We therefore argue that previous empirical results obtained with audit fee estimates would benefit from a re-examination with the use of actual audit fee data.

Moreover our results suggest that ISP measured with audit fees and ISP measured with number of clients, whatever the assignment approach is, capture two different economic concepts.

Towards a new methodology to re-examine the audit industry specialist fee effects

The low level of internal and external association between the diverse industry specialization measures analyzed in the first part of the paper suggests that these measures are in fact capturing two different underlying concepts.

On the one hand, auditors who manage to get a higher reputation and to earn significant fee revenue shares in a given industry should be able to extract an industry specialization fee premium

(*Fee Dominance effect*). On the other hand, auditor working with many clients in a given industry should be able to realize efficiency gains by spreading the cost of the development of their specialized industry knowledge between a large numbers of clients. The benefits of this decrease of audit costs, could hence be transferred to the clients through a decrease of audit fees (*Economies of Scale effect*), i.e. a fee discount (McMeekling et al., 2006; Habib, 2011).

Two different patterns emerge from the results of Table 9, as ISP variables based on audit fees measurements exhibit consistent positive coefficients with audit fees (fee premium) and ISP variables based on the number of clients show negative (whereas non statistically significant) coefficients with audit fees, suggesting the existence of a fee discount.

We argue that both the fee dominance effect (hereafter "FD") and the economies of scale effect (hereafter "ES") matter. In order to address this issue we develop and propose a new methodology aiming at disentangling the two main contradictory expected effects of the industry specialization on audit fees. Therefore we propose to introduce those two variables (and their interaction term) into our audit fees pricing model as follows:

$$\begin{aligned} LnAF_{it} &= \alpha_0 + \alpha_1 ISP_{audit\_fees} + \alpha_2 ISP_{number\_clients} + \alpha_3 ISP_{audit\_fees} * ISP_{number\_clients} + \alpha_4 LnAT_{it} \\ &+ \alpha_5 YE_{it} + \alpha_6 CATA_{it} + \alpha_7 DE_{it} + \alpha_8 QUICK_{it} + \alpha_9 ROI_{it} + \alpha_{10} LOSS_{it} + \alpha_{11} FOREIGN_{it} \\ &+ \alpha_{12} OPINION_{it} + \alpha_{13} Industry + \alpha_{14} Year + \varepsilon_{it} \end{aligned} \quad (2)$$

Where,

ISP_{audit_fees}: is the audit industry specialization variable based on audit fee measures i.e. ISP_1, ISP_m1, ISP_ps1, ISP_p1 and ISP_w1 as defined in Table 1.

$ISP_{number\_clients}$: is the audit industry specialization variable based on the number of clients i.e.

ISP_7, ISP_m7, ISP_ps7, ISP_p7 and ISP_w7 as defined in Table 1.

All other variables are as previously defined in equation (1).

We expect a positive sign for α_1 (ISP fee premium) and a negative sign for α_2 (ISP fee discount).

The results corresponding to the test of this new model specification are presented in table 10.

Insert Table 10 here

Our first variable of interest, ISP_{audit_fees}, shows positive and statistically significant associations with audit fees for all assignment approaches (except for the portfolio share cut-off). This result is consistent with the existence of a fee premium for industry specialist auditors when specialization is measured with audit fees. Moreover, our second variable of interest, $ISP_{number\_clients}$, exhibits negative and significant coefficients for all assignment approaches (except for the weighted market share). This result could be interpreted as the sign of a fee discount when industry specialization is measured with the number of clients. Taken together, these results show that different measurements of industry specialization capture two different economic concepts. Therefore the main take-away finding of our study is that in order to get a complete picture of how industry specialization influences the pricing of audit fees, it is important to include both metrics in audit fees pricing models.

6. Conclusion

In this paper, we conducted a methodological study of the consequences of the use of multiple measures in empirical audit research to capture the concept of auditor industry specialization. We

identified 35 ISP measures that correspond to the use of five assignment approaches (based on market share, portfolio or weighted market share approaches combined with the relative versus absolute dimension of market leadership) as well as to seven measurement variables (based on various audit fee–, client size– or number-of-client–based indicators). For each of the 35 measurement approaches, we tested two dimensions of the construct validity (the internal and the external association) on a large sample of US-listed firms in order to explore the validity of these measures.

Regarding internal association, our study shows that the use of different measurement methods results in inconsistent classifications of audit firms as being specialists, or not, in a given industry. The relatively low internal association between the various ISP measures creates a significant lack of consistency between the ISP measures.

Regarding external association, we find that this measurement issue is severe enough to trigger the validity of the ISP fee premium estimation. Because of their industry-specific expertise, ISP auditors are able to differentiate themselves from non-specialists and to charge ISP premiums. Based on the test of 35 models to determine the ISP audit fee premium, our results show that the magnitude, sign and significance of the ISP fee premium strongly varies depending on the chosen ISP measure. We finally document the existence of a fee premium for industry specialist auditors when specialization is measured with audit fees and the sign of a fee discount when industry specialization is measured with the number of clients.

A first take-away result of this research is that audit fee–based ISP measures produce more consistent results than client size–based or number-of-client–based measures of industry specialization. This finding suggests that audit fee–based measures need to be preferred by researchers and that previous empirical findings using other measurement variables need to be re-examined. A second contribution is that the sensitivity of the ISP fee premium models to the measure of the ISP variable suggests that different measurements of industry specialization capture two different economic concepts, respectively a specialization fee premium effect and economies of scale effect. This result suggests that to properly account for auditor industry specialization in audit fees pricing model, two distinct measures of ISP (one based on audit fees, but also one based on the number of clients) have to be tested simultaneously.

One limitation of this research is that, for comparability and generalizability reasons, it focuses on audit firm industry expertise at the national level, whereas recent studies have also analyzed city-level, office-level or partner-level industry expertise. However, our findings at the national level regarding ISP measurement issues are also applicable to other levels of analysis used in recent ISP literature. Another limitation is that this research does not cover the entire scope of the auditor industry specialization concept, as it is focused on clients audited by Big 4 firms only. This choice is justified by the necessity to rule out the confounding effects with Big 4 premium in order to estimate the ISP fee premium more precisely, and to avoid the selection bias linked with the decision to select Big 4 auditors.

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Table 1: Construction of different ISP variables by the combination of assignment approach and measurement variable

		Measurement Variable						
	Assignment Approach	Audit fees	Total fees	Assets	Sales	Square root of assets	Square root of sales	Number of clients
1	Largest MS	ISP_1	ISP_2	ISP_3	ISP_4	ISP_5	ISP_6	ISP_7
2	MS > (1/N)*1.2	ISP_m1	ISP_m2	ISP_m3	ISP_m4	ISP_m5	ISP_m6	ISP_m7
3	3 largest PS	ISP_ps1	ISP_ps2	ISP_ps3	ISP_ps4	ISP_ps5	ISP_ps6	ISP_ps7
4	PS > 1/K	ISP_p1	ISP_p2	ISP_p3	ISP_p4	ISP_p5	ISP_p6	ISP_p7
5	WMS > [(1/N)*1.2]*(1/K)	ISP_w1	ISP_w2	ISP_w3	ISP_w4	ISP_w5	ISP_w6	ISP_w7

N = the number of audit firms in a given industry; K = the number of industries that an audit firm serves

MS: market share; PS: portfolio share; WMS: weighted market share.

$$MS_{ik} = \frac{\sum_{j=1}^{J_{ik}} X_{ijk}}{\sum_{i=1}^{I_k} \sum_{j=1}^{J_{ik}} X_{ijk}} \qquad PS_{ik} = \frac{\sum_{j=1}^{J_{ik}} X_{ijk}}{\sum_{k=1}^{K} \sum_{j=1}^{J_{ik}} X_{ijk}} \qquad WMS_{ik} = MS_{ik} * PS_{ik}$$

where: MS_{ik} = market share of audit firm i in industry k; PS_{ik} = portfolio share of industry *k* for auditor *i;* WMS_{ik} = weighted market share for audit firm *i* in industry *k;* X = one of the calculating variables including audit fees, total fees, assets, sales, square root of assets, square root of sales, and number of clients ; *i* = auditor; *k* = industry; *j* = client.

Table 2: Sample selection details

Observations from merged dataset :	81,142
Less:	
Non-US firms	(8,589)
Inactive firms	(18,880)
Observations with missing values for calculating variables	(8,050)
Observations audited by small audit firms	(15,897)
Full sample for ISP assignment	**29,726**
Less:	
Financial Institutions	(5,832)
Observations with missing values of variables in audit fee model	(7)
Regression sample for audit fee regression	**23,887**

Table 3: Full sample description by year-auditor

	Auditor					
Year	**PW**	**EY**	**DT**	**KP**	**AA**	**Total**
2000	464	491	320	356	433	2,064
2001	558	628	434	460	510	2,590
2002	696	839	633	647	0	2,815
2003	710	855	634	648	0	2,847
2004	690	813	656	642	0	2,801
2005	644	837	655	611	0	2,747
2006	621	866	664	600	0	2,751
2007	629	882	654	575	0	2,740
2008	625	896	647	587	0	2,755
2009	650	909	651	589	0	2,799
2010	657	889	655	616	0	2,817
Total	**6,944**	**8,905**	**6,603**	**6,331**	**943**	**29,726**
%	**23.4**	**30.0**	**22.2**	**21.3**	**3.2**	**100**

The BIG 4/5 audit firms are PricewaterhouseCoopers LLP (PW), Ernst & Young LLP (EY), Deloitte & Touche LLP (DT), KPMG LLP (KP), and Arthur Andersen LLP (AA).

Table 4: Descriptive statistics

Panel A: Variables used for calculating market shares, portfolio shares, and weighted market shares

Variable	N	Mean	Sd	min	p25	p50	p75	max
AF	29,726	1.998	4.830	0.002	0.317	0.794	1.815	201.560
TF	29,726	2.844	6.904	0.002	0.471	1.075	2.469	201.560
AT	29,726	10,254.760	72,613.280	0.004	216.578	856.593	3,333.457	3,221,972.000
SA	29,726	3,541.613	13,721.010	0.001	124.154	535.567	2,017.300	425,071.000
SQAT	29,726	52.757	86.439	0.063	14.717	29.268	57.736	1,794.985
SQSA	29,726	37.346	46.335	0.032	11.142	23.142	44.914	651.975

This table shows the descriptive statistics of the variables (excluding the variable the number of clients) which are used for calculating market shares, portfolio shares, and weighted market shares. The variables are audit fees (AF), total fees (TF), assets (AT), sales (SA), square root of assets (SQAT), and square root of sales (SQSA). Numbers are in millions.

Panel B: Variables used in audit fee model

Variable	N	mean	Sd	min	p25	p50	p75	max
LnAF	23,887	-0.204	1.282	-6.049	-1.089	-0.180	0.631	4.546
LnAT	23,887	6.505	2.019	-3.058	5.170	6.521	7.848	13.59
YE	23,887	0.703	0.457	0	0	1	1	1
CATA	23,887	0.458	0.260	0	0.240	0.451	0.664	0.970
DE	23,887	0.207	0.221	0	0.00448	0.160	0.318	1.066
QUICK	23,887	2.120	2.468	0	0.833	1.329	2.341	15.41
ROI	23,887	0.0210	0.216	-1.097	0.0124	0.0690	0.118	0.356
LOSS	23,887	0.316	0.465	0	0	0	1	1
FOREIGN	23,887	0.421	0.494	0	0	0	1	1
OPINION	23,887	0.0305	0.172	0	0	0	0	1

Variables are: LnAF = natural logarithm of audit fees, Ln AT = natural logarithm of total assets, YE = indicator variable which equals to 1 for Dec 31. Year-end, 0 otherwise, CATA = ratio of current assets to total assets, DE = ratio of long-term debt to total assets, winsorized at top 1%, QUICK = ratio of current assets (less inventory) to current liabilities, winsorized at top 1%, ROI = ratio of earnings before interest and tax to total assets, winsorized at top and bottom 1%, LOSS = indicator variable which equals to 1 if a firm has negative net income, 0 otherwise, FOREIGN = indicator variable which equals to 1 if a firm has foreign activities, 0 otherwise, OPINION = indicator variable which equals to 1 if a firm receives qualified audit report

Table 5: An example if divergent ISP designations across assignment approach-measurement variable combinations

ISP Designations of Chemicals and Allied Products Industry (SIC 28) in year 2010

	Measurement Variables:						
Assignment Approaches	Audit fees	Total fees	Assets	Sales	Square root of assets	Square root of sales	Number of clients
Largest MS	PW	PW	PW	DT	PW	PW	EY
MS cut-off	PW	PW	PW, DT	PW, DT	PW	PW	EY
Largest PS	PW, EY	.	.	DT	.	PW, DT	PW, EY, DT
4PS cut-off	PW, EY, DT, KP	PW, EY, DT, KP	PW, EY, DT, KP	PW, EY, DT, KP	PW, EY, DT, KP	PW, EY, DT, KP	PW, EY, DT, KP
Weighted MS	PW, EY, DT, KP	PW, EY, DT, KP	PW, DT, KP	PW, DT, KP	PW, EY, DT, KP	PW, EY, DT, KP	PW, EY, DT, KP

This table shows the ISP designation differences resulted from inconsistent ISP measurements and assignment approaches

Table 6: Correlations across ISP variables measured by same calculating variables but different assignment approaches

Panel A: Audit fees

	ISP 1	ISP m1	ISP ps1	ISP p1	ISP w1
ISP 1	1				
ISP m1	0.8173*	1			
ISP ps1	0.2443*	0.1416*	1		
ISP p1	0.0890*	0.0450*	0.3779*	1	
ISP w1	0.2963*	0.2566*	0.3724*	0.7862*	1

All ISP variables are defined in Table 1.

Panel B: Total fees

	ISP 2	ISP m2	ISP ps2	ISP p2	ISP w2
ISP 2	1				
ISP m2	0.8103*	1			
ISP ps2	0.2295*	0.1824*	1		
ISP p2	0.0830*	0.0556*	0.3852*	1	
ISP w2	0.3244*	0.2969*	0.3852*	0.7523*	1

All ISP variables are defined in Table 1.

Panel C: Assets

	ISP 3	ISP m3	ISP ps3	ISP p3	ISP w3
ISP 3	1				
ISP m3	0.8124*	1			
ISP ps3	0.2687*	0.2434*	1		
ISP p3	0.1292*	0.1607*	0.2444*	1	
ISP w3	0.4179*	0.4574*	0.2745*	0.6944*	1

All ISP variables are defined in Table 1.

Panel D: Sales

	ISP 4	ISP m4	ISP ps4	ISP p4	ISP w4
ISP 4	1				
ISP m4	0.7837*	1			
ISP ps4	0.3787*	0.3263*	1		
ISP p4	0.1620*	0.1943*	0.2422*	1	
ISP w4	0.4151*	0.4956*	0.3045*	0.6723*	1

All ISP variables are defined in Table 1.

Panel E: Square root assets

	ISP 5	ISP m5	ISP ps5	ISP p5	ISP w5
ISP 5	1				
ISP m5	0.7172*	1			
ISP ps5	0.1896*	0.1812*	1		
ISP p5	0.0802*	0.0458*	0.2102*	1	
ISP w5	0.2877*	0.2636*	0.2222*	0.7672*	1

All ISP variables are defined in Table 1.

Panel F: Square roots sales

	ISP 6	ISP m6	ISP ps6	ISP p6	ISP w6
ISP 6	1				
ISP m6	0.7437*	1			
ISP ps6	0.2122*	0.0831*	1		
ISP p6	0.1408*	0.0992*	0.3565*	1	
ISP w6	0.3082*	0.2815*	0.3799*	0.7904*	1

All ISP variables are defined in Table 1.

Panel G: Number of clients

	ISP 7	ISP m7	ISP ps7	ISP p7	ISP w7
ISP 7	1				
ISP m7	0.7870*	1			
ISP ps7	0.1066*	0.0463*	1		
ISP p7	0.0452*	0.0112	0.4220*	1	
ISP w7	0.1905*	0.1642*	0.4389*	0.8303*	1

All ISP variables are defined in Table 1.

Table 7: Correlations of variables in audit fee model

Panel A: Correlations of variables in audit fee model in largest market share approach

	ISP_1	ISP_ 2	ISP_ 3	ISP_4	ISP_5	ISP_6	ISP_7
ISP_ 1	1						
ISP_ 2	0.9485*	1					
ISP_ 3	0.7910*	0.7817*	1				
ISP_4	0.7189*	0.7076*	0.8519*	1			
ISP_5	0.7914*	0.7766*	0.7489*	0.6588*	1		
ISP_6	0.7541*	0.7400*	0.7095*	0.6686*	0.8687*	1	
ISP_7	0.3618*	0.3671*	0.2881*	0.2765*	0.4381*	0.4270*	1

Panel B: Correlations of variables in audit fee model in market share cut-off approach

	ISP_m1	ISP m2	ISP m3	ISP m4	ISP m5	ISP m6	ISP m7
ISP_m1	1						
ISP_m2	0.8845*	1					
ISP_m3	0.7738*	0.7911*	1				
ISP_ m4	0.6998*	0.7492*	0.8109*	1			
ISP_m5	0.7710*	0.7746*	0.7568*	0.6414*	1		
ISP_m6	0.7933*	0.8133*	0.7350*	0.6917*	0.8895*	1	
ISP_m7	0.4636*	0.4490*	0.3823*	0.3054*	0.6046*	0.5582*	1

Panel C: Correlations of variables in audit fee model in three largest portfolio shares approach

	ISP ps1	ISP ps2	ISP ps3	ISP ps4	ISP ps5	ISP ps6	ISP ps7
ISP_ps1	1						
ISP_ps2	0.8330*	1					
ISP_ps3	0.3318*	0.3728*	1				
ISP_ps4	0.4341*	0.4494*	0.6179*	1			
ISP_ps5	0.3382*	0.3599*	0.5090*	0.5611*	1		
ISP_ps6	0.7582*	0.7331*	0.2688*	0.3992*	0.4807*	1	
ISP_ps7	0.4964*	0.5056*	0.1333*	0.2265*	0.2755*	0.5361*	1

Panel D: Correlations of variables in audit fee model in portfolio share cut-off approach

	ISP p1	ISP p2	ISP p3	ISP p4	ISP p5	ISP p6	ISP p7
ISP_p1	1						
ISP_p2	0.9530*	1					
ISP_p3	0.6043*	0.6122*	1				
ISP_p4	0.7461*	0.7497*	0.5941*	1			
ISP_p5	0.8535*	0.8529*	0.6204*	0.7792*	1		
ISP_p6	0.7930*	0.7887*	0.5272*	0.8204*	0.8342*	1	
ISP_p7	0.7326*	0.7342*	0.4817*	0.6419*	0.7755*	0.7678*	1

Panel E: Correlations of variables in audit fee model in weighted market share cut-off approach

	ISP w1	ISP w2	ISP w3	ISP w4	ISP w5	ISP w6	ISP w7
ISP_ w1	1						
ISP_w2	0.9054*	1					
ISP_w3	0.5224*	0.5358*	1				
ISP_w4	0.6145*	0.6471*	0.6424*	1			
ISP_w5	0.8440*	0.8190*	0.5681*	0.6776*	1		
ISP_w6	0.8159*	0.7927*	0.4842*	0.6993*	0.8374*	1	
ISP_w7	0.6968*	0.6802*	0.4051*	0.4785*	0.7200*	0.7218*	1

Table 8: Summary of Coefficients of the ISP variable in the 35 audit fee pricing models

	Measurement Variable:						
Assignment Approach	Audit fees	Total fees	Assets	Sales	Square root of assets	Square root of sales	Number of clients
Largest MS	0.0572***	0.0562***	0.0208	0.0229	0.0185	0.0112	-0.0219
MS cut-off	0.0637***	0.0586***	0.0310**	0.0290*	0.0105	0.0145	-0.0172
Largest PS	0.0338*	0.0316	0.0414	0.00568	-0.0899*	0.0179	-0.0419
PS cut-off	0.0840***	0.0504**	0.000651	0.00212	-0.0206	-0.000740	-0.0496*
Weighted MS	0.0480**	0.0376**	0.0245	0.0212	-0.0102	-0.000270	-0.0229

N = the number of audit firms in a given industry; K = the number of industries that an audit firm serves

* p<0.1 ** p<0.05 *** p<0.01

This table shows the coefficient of each ISP variable in each assignment approach-measurement variable combination.

$$LnAF_{it} = \alpha_0 + \alpha_1 LnAT_{it} + \alpha_2 YE_{it} + \alpha_3 CATA_{it} + \alpha_4 DE_{it} + \alpha_5 QUICK_{it} + \alpha_6 ROI_{it} + \alpha_7 LOSS_{it} + \alpha_8 FOREIGN_{it} + \alpha_9 OPINION_{it} + \alpha_{10} ISP_{it} + \alpha_{11} Industry + \alpha_{12} Year + \varepsilon_{it}$$

Where: LnAF = natural logarithm of audit fees, Ln AT = natural logarithm of total assets, YE = indicator variable which equals to 1 for Dec 31. Year-end, 0 otherwise, CATA = ratio of current assets to total assets, DE = ratio of long-term debt to total assets, winsorized at top 1%, QUICK = ratio of current assets (less inventory) to current liabilities, winsorized at top 1%, ROI = ratio of earnings before interest and tax to total assets, winsorized at top and bottom 1%, LOSS = indicator variable which equals to 1 if a firm has negative net income, 0 otherwise, FOREIGN = indicator variable which equals to 1 if a firm has foreign activities, 0 otherwise, OPINION = indicator variable which equals to 1 if a firm receives qualified audit report.

Table 9: Summary of the statistical differences between the audit fee-based measures and the other measures of ISP coefficients

	Audit fees coefficients compared to:					
Approach	Total fees	Assets	Sales	Square root of assets	Square root of sales	Number of clients
Largest MS	0.13	45.40***	31.76***	57.01***	64.21***	83.15***
MS cut-off	1.83	35.38***	33.21***	88.97***	83.51**	97.62***
Largest PS	0.07	0.12	4.21**	24.25***	2.59	20.53***
PS cut-off	12.49***	24.53***	29.04***	50.25**	31.38***	49.27***
Weighted MS	3.03*	4.62**	7.95***	61.41***	35.18***	42.03***

chi-square statistics, * p<0.1 ** p<0.05 *** p<0.01

This table shows how ISP measured by **audit fees** can be significantly different from ISPs measured by other variables in each assignment approach (i.e., all comparisons are between one ISP variable measured by audit fees and one of the ISP variables measured by other variables in the same assignment approach).

Table 10: Tests of fee dominance and economies of scale of ISP

	Assignment Approach				
	Largest MS	MS Cut-off	3 largest PS	PS Cut-off	Weighted MS
ISP_{audit_fees}	.0892428***	.0853923***	.1524915***	0.033	.1352349***
	(4.177)	(4.028)	(3.416)	(1.204)	(3.870)
$ISP_{number\_clients}$	-.0362886**	-.0563635***	-.057079*	-.0537435*	-0.031
	(-2.022)	(-3.023)	(-1.927)	(-1.910)	(-1.252)
ISP_{audit_fees}*$ISP_{number\_clients}$	-0.030	0.004	-0.077	0.011	-.0918845**
	(-1.066)	(0.143)	(-1.491)	(0.304)	(-2.278)
LnAT	.5125762***	.5120119***	.513471***	.5147245***	.5132205***
	(80.250)	(79.965)	(80.524)	(80.088)	(80.155)
YE	.0670202***	.0674774***	.0676839***	.0683476***	.0662161***
	(3.568)	(3.596)	(3.613)	(3.638)	(3.529)
CATA	.7070513***	.7074654***	.7041263***	.7103865***	.7048188***
	(13.400)	(13.403)	(13.314)	(13.408)	(13.321)
DE	.0782239*	.0793291*	.0749896*	.073498*	.0760483*
	(1.893)	(1.920)	(1.809)	(1.778)	(1.832)
QUICK	-.0638189***	-.0636873***	-.0642242***	-.06401***	-.0643219***
	(-18.492)	(-18.450)	(-18.499)	(-18.371)	(-18.503)
ROI	-.4105332***	-.4093092***	-.4049152***	-.4108045***	-.4024386***
	(-10.455)	(-10.438)	(-10.297)	(-10.406)	(-10.226)
LOSS	.1030405***	.1015924***	.1016048***	.1032027***	.1024402***
	(7.268)	(7.162)	(7.148)	(7.264)	(7.213)
FOREIGN	.3354406***	.3361787***	.336579***	.3370487***	.3351312***
	(16.871)	(16.914)	(16.924)	(16.941)	(16.906)
OPINION	.2526871***	.2529842***	.2552763***	.2531594***	.2560897***
	(7.963)	(8.001)	(7.990)	(7.933)	(8.042)
Constant	-4.758359***	-4.758969***	-4.766689***	-4.757518***	-4.762677***
	(-87.380)	(-87.419)	(-80.915)	(-87.475)	(-84.516)
N	23,887	23,887	23,887	23,887	23,887
adj. R-sq	0.821	0.821	0.821	0.821	0.821
IndustryFixed	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses, * p<0.1 ** p<0.05 *** p<0.01, standard errors are corrected for firm cluster.

This table presents the regression results testing the coexistence of ISP fee premium and ISP fee discount. FD is designated as fee dominance and it is measured by the ISPs based on audit fees. ES is designated as economies of scale and it is measured by the ISPs based on the number of clients. FD*ES is the interaction term between FD and ES.

Appendix 1: Number of observations for each industry-auditor

SIC code	Industry Name	Auditor PW	EY	DT	KP	AA	Total
1	Agricultural Production Crops	22	9	24	4	2	61
2	Agriculture production livestock	11	6	0	0	0	17
7	Agricultural Services	0	10	10	9	3	32
8	Forestry	0	0	0	9	0	9
10	Metal Mining	23	13	10	21	7	74
12	Coal Mining	16	40	16	20	0	92
13	Oil And Gas Extraction	190	213	155	234	46	838
14	Mining - Nonmetallic Minerals	3	38	4	10	0	55
15	Building Construction General Contractors	11	96	49	15	4	175
16	Heavy Construction Other	23	24	16	22	2	87
17	Construction Special Trade Contractors	9	40	15	4	7	75
20	Food And Kindred Products	174	159	120	100	9	562
21	Tobacco Products	25	0	4	7	0	36
22	Textile Mill Products	24	20	31	28	2	105
23	Apparel And Other Finished Products	55	81	101	14	6	257
24	Lumber And Wood Products, Except Furniture	16	46	12	39	4	117
25	Furniture And Fixtures	63	62	29	48	7	209
26	Paper And Allied Products	79	83	77	27	6	272
27	Printing, Publishing, And Allied Industries	23	96	80	48	5	252
28	**Chemicals And Allied Products**	**622**	**961**	**397**	**411**	**61**	**2,452**
29	Petroleum Refining And Related Industries	35	67	13	38	4	157
30	Rubber And Miscellaneous Plastics Products	82	79	19	38	10	228
31	Leather And Leather Products	2	37	24	32	0	95
32	Stone, Clay, Glass, And Concrete Products	32	44	27	0	11	114
33	Primary Metal Industries	132	110	72	24	6	344
34	Fabricated Metal Products, Except Machinery	119	95	92	33	8	347
35	Machinery And Computer Equipment	392	441	281	291	54	1,459
36	**Electronic And Other Electrical Equipment**	**652**	**597**	**338**	**431**	**59**	**2,077**
37	Transportation Equipment	163	226	173	47	22	631
38	Measuring Instruments	489	512	220	257	56	1,534
39	Miscellaneous Manufacturing Industries	32	46	86	37	8	209
40	Railroad Transportation	26	14	23	24	2	89
41	Local And Suburban Transit	0	2	0	3	0	5
42	Freight Transportation And Warehousing	27	44	34	104	16	225
44	Water Transportation	9	58	18	11	4	100
45	Transportation By Air	5	100	46	55	11	217
46	Pipelines, Except Natural Gas	5	26	9	6	0	46

(Appendix 1 - continued)

SIC code	Industry Name	Auditor PW	EY	DT	KP	AA	Total
47	Transportation Services	13	40	16	11	4	84
48	Communications	233	296	137	191	42	899
49	Electric, Gas, And Sanitary Services	505	211	912	99	68	1,795
50	Wholesale Trade-durable Goods	78	270	82	121	19	570
51	Wholesale Trade-non-durable Goods	81	95	102	46	11	335
52	Building Materials, Hardware, Garden Supply	1	15	14	25	0	55
53	General Merchandise Stores	25	69	28	71	5	198
54	Food Stores	34	35	28	42	2	141
55	Automotive Dealers And Gas Service Stations	1	67	66	49	8	191
56	Apparel And Accessory Stores	69	102	184	42	17	414
57	Home Furniture, Furnishings Stores	11	49	34	27	0	121
58	Eating And Drinking Places	47	107	106	124	4	388
59	Miscellaneous Retail	101	146	165	70	20	502
60	**Depository Institutions**	**208**	**442**	**359**	**972**	**58**	**2,039**
61	Non-depository Credit Institutions	104	65	106	102	11	388
62	Security And Commodity Brokers, Dealers	143	118	141	112	10	524
63	Insurance Carriers	194	271	189	307	7	968
64	Insurance Agents, Brokers, And Service	20	27	26	2	4	79
65	Real Estate	55	64	49	41	10	219
67	Holding And Other Investment Offices	354	562	296	358	45	1,615
70	Hotels, Rooming Houses, Camps	12	32	7	1	6	58
72	Personal Services	56	20	10	23	3	112
73	**Business Services**	**595**	**772**	**557**	**648**	**80**	**2,652**
75	Automotive Repair, Services, And Parking	23	8	22	6	0	59
76	Miscellaneous Repair Services	0	0	1	10	0	11
78	Motion Pictures	19	27	39	39	1	125
79	Amusement And Recreation Services	53	83	119	38	17	310
80	Health Services	118	138	83	63	20	422
81	Legal Services	0	6	0	5	0	11
82	Educational Services	49	44	18	20	6	137
83	Social Services	0	23	1	18	0	42
87	Engineering, Accounting, Research, Management, And Related Services	111	178	64	101	19	473
99	Nonclassifiable Establishments	40	28	17	46	4	135
Total		6,944	8,905	6,603	6,331	943	29,726

This table shows the number of observations for each auditor-year in the full sample which is used for industry specialized auditor assignments. Only Big5 audit firms (in year 2000 and 2001) and Big4 audit firms (in the period from 2002 to 2010) are included. The BIG 4/5 audit firms are PricewaterhouseCoopers LLP (PW), Ernst & Young LLP (EY), Deloitte & Touche LLP (DT), KPMG LLP (KP), and Arthur Andersen LLP (AA).

Appendix 2: ISP assignment difference in four largest industries

Panel A: ISP assignment difference in chemical and allied products industry (SIC 28)

Assignmen	Calculatin	ISP	Year										
Approach	Variable	Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	AF	ISP_1	1	1	1	1	1	1	3	3	3	1	1
	TF	ISP_2	1	1	1	1	1	1	3	3	3	1	1
Largest	AT	ISP_3	1	1	3	1	3	3	3	3	3	3	1
	SA	ISP_4	1	3	3	1	3	3	3	3	3	3	3
	SQAT	ISP_5	1	1	1	1	1	1	1	1	3	1	1
	SQSA	ISP_6	1	1	1	1	1	1	1	1	1	1	1
	NC	ISP_7	2	2	2	2	2	2	2	2	2	2	2
	AF	ISP_m1	1	1	1	1	1	1	13	3	3	1	1
	TF	ISP_m2	1	1	1	1	1	1	13	3	3	1	1
MS cut-off	AT	ISP_m3	13	13	13	13	13	13	3	3	3	13	13
	SA	ISP_m4	13	13	13	13	13	13	13	13	3	13	13
	SQAT	ISP_m5	1	1	1	1	1	1	-	-	-	1	1
	SQSA	ISP_m6	1	1	1	1	1	1	1	1	-	1	1
	NC	ISP_m7	2	2	2	2	2	2	2	2	2	2	2
	AF	ISP_ps	1	5	1	13	14	134	34	3	3	3	1
	TF	ISP_ps	1	14	13	13	134	13	13	3	3	3	-
3 largest	AT	ISP_ps	-	-	-	-	-	-	-	-	-	-	-
	SA	ISP_ps	-	35	3	3	34	3	3	3	3	3	3
	SQAT	ISP_ps	-	1	-	-	-	-	-	-	-	-	-
	SQSA	ISP_ps	13	13	13	13	134	13	13	13	13	13	13
	NC	ISP_ps	234	25	12	123	123	123	123	123	123	123	12
	AF	ISP_p1	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	TF	ISP_p2	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
PS cut-off	AT	ISP_p3	1345	12345	123	1234	1234	1234	1234	1234	1234	1234	1234
	SA	ISP_p4	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SQAT	ISP_p5	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SQSA	ISP_p6	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	NC	ISP_p7	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	AF	ISP_w1	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	TF	ISP_w2	1234	1345	134	1234	1234	1234	1234	1234	1234	1234	1234
WMS	AT	ISP_w3	13	13	13	134	134	134	134	13	3	134	134
	SA	ISP_w4	134	1345	134	134	134	134	134	134	134	134	134
	SQAT	ISP_w5	1234	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SQSA	ISP_w6	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	NC	ISP_w7	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234

ISPs are measured by seven different calculating variables including audit fees (AF), total fees (TF), assets (AT), sales (SA), square root of assets (SQAT), square root of sales (SQSA), and the number of clients (NC). In the cells of the table, the numbers indicate the specialist auditor(s), with number 1,2,3,4, and 5 referring to PW, EY, DT, KP, and AA respectively.

Panel B: ISP assignment difference in electronic and other electronic equipments industry (SIC 36)

Assignment Approach	Calculating Variable	ISP Name	Year 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	AF	ISP_1	2	1	2	2	2	2	1	1	1	2	1
	TF	ISP_2	2	1	2	2	2	2	1	1	1	2	1
Largest	AT	ISP_3	2	2	2	2	2	2	2	2	2	2	1
	SA	ISP_4	2	2	2	2	2	2	2	2	2	2	2
	SQAT	ISP_5	2	2	2	2	2	2	1	2	1	1	1
	SQSA	ISP_6	2	2	2	2	2	2	2	2	1	2	1
	NC	ISP_7	12	1	1	1	1	1	1	1	1	12	1
	AF	ISP_m1	12	12	12	2	12	12	1	12	1	12	1
	TF	ISP_m2	12	12	2	2	12	12	12	12	1	12	1
MS cut-off	AT	ISP_m3	12	12	2	2	2	2	2	12	12	12	12
	SA	ISP_m4	2	24	24	24	24	24	24	2	2	2	2
	SQAT	ISP_m5	12	12	12	12	12	12	12	12	12	12	1
	SQSA	ISP_m6	12	12	2	2	12	12	12	12	12	12	1
	NC	ISP_m7	12	12	12	1	1	1	1	12	1	12	1
	AF	ISP_ps1	2	24	2	2	2	2	2			2	2
	TF	ISP_ps2	2	2	2	2	2	2	2				
3 largest	AT	ISP_ps3											
	SA	ISP_ps4	2	24									
	SQAT	ISP_ps5	2	2									
	SQSA	ISP_ps6	2	124	2	2	2	2	2	2		2	2
	NC	ISP_ps7	12	12	124	124	124	14	14	14	14	1	14
	AF	ISP_p1	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	TF	ISP_p2	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
PS cut-off	AT	ISP_p3	2	24	2	2	2	2	2	2	2	2	2
	SA	ISP_p4	12	124	124	124	124	124	124	124	124	124	124
	SQAT	ISP_p5	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SQSA	ISP_p6	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	NC	ISP_p7	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	AF	ISP_w1	124	124	124	1234	124	124	124	1234	1234	124	124
	TF	ISP_w2	12	1234	124	1234	124	124	124	1234	1234	124	124
WMS	AT	ISP_w3	2	24	2	2	2	2	2	2	2	2	2
	SA	ISP_w4	12	124	24	24	24	24	124	124	124	124	124
	SQAT	ISP_w5	124	124	124	124	124	124	124	124	124	124	124
	SQSA	ISP_w6	124	124	124	124	124	124	124	124	124	124	124
	NC	ISP_w7	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234

ISPs are measured by seven different calculating variables including audit fees (AF), total fees (TF), assets (AT), sales (SA), square root of assets (SQAT), square root of sales (SQSA), and the number of clients (NC). In the cells of the table, the numbers indicate the specialist auditor(s), with number 1,2,3,4, and 5 referring to PW, EY, DT, KP, and AA respectively.

Panel C: ISP assignment difference in depository institutions (SIC 60)

Assignment Approach	Calculating Variable	ISP Name	Year 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	AF	ISP_1	1	1	1	1	1	1	1	1	1	1	1
	TF	ISP_2	1	1	1	1	1	1	1	1	1	1	1
Largest MS	AT	ISP_3	1	1	1	1	1	1	1	1	1	1	1
	SA	ISP_4	1	1	1	1	1	1	1	1	1	1	1
	SQAT	ISP_5	4	4	4	4	4	4	4	4	4	4	4
	SQSA	ISP_6	4	4	4	4	4	4	4	4	4	4	4
	NC	ISP_7	4	4	4	4	4	4	4	4	4	4	4
	AF	ISP_m1	1	1	1	1	14	14	1	14	1	1	1
	TF	ISP_m2	1	1	1	1	1	1	1	14	1	1	1
MS cut-off	AT	ISP_m3	1	1	1	1	1	1	1	1	1	1	1
	SA	ISP_m4	1	1	1	1	1	1	1	1	1	1	1
	SQAT	ISP_m5	24	4	4	4	4	4	4	4	4	4	4
	SQSA	ISP_m6	24	4	4	4	4	4	4	4	4	4	4
	NC	ISP_m7	4	4	4	4	4	4	4	4	4	4	4
	AF	ISP_ps1	12	-	-	-	-	-	-	4	4	14	14
	TF	ISP_ps2	124	14	-	-	-	-	-	4	14	14	14
3 largest PS	AT	ISP_ps3	1245	1245	124	124	124	124	124	124	124	124	124
	SA	ISP_ps4	1	-	-	-	-	-	1	14	-	14	14
	SQAT	ISP_ps5	12345	12345	1234	1234	1234	1234	124	124	124	124	124
	SQSA	ISP_ps6	24	4	4	4	4	4	4	4	4	4	4
	NC	ISP_ps7	2345	234	34	34	4	4	4	4	4	4	4
	AF	ISP_p1	12345	12345	1234	1234	1234	1234	1234	1234	124	124	1234
	TF	ISP_p2	1234	12345	1234	1234	1234	1234	1234	1234	124	124	124
PS cut-off	AT	ISP_p3	112345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SA	ISP_p4	112345	12345	1234	1234	1234	1234	1234	1234	124	124	124
	SQAT	ISP_p5	112345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SQSA	ISP_p6	112345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	NC	ISP_p7	112345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	AF	ISP_w1	124	124	124	124	124	124	124	124	124	124	124
	TF	ISP_w2	124	124	124	124	124	124	124	124	124	124	124
WMS cut-off	AT	ISP_w3	12345	12345	1234	1234	1234	1234	1234	1234	124	124	124
	SA	ISP_w4	124	124	14	14	14	14	14	124	14	14	14
	SQAT	ISP_w5	12345	12345	1234	1234	1234	1234	1234	1234	124	1234	1234
	SQSA	ISP_w6	12345	12345	124	124	1234	1234	1234	124	124	124	124
	NC	ISP_w7	2345	2345	234	234	234	234	234	234	234	234	234

ISPs are measured by seven different calculating variables including audit fees (AF), total fees (TF), assets (AT), sales (SA), square root of assets (SQAT), square root of sales (SQSA), and the number of clients (NC). In the cells of the table, the numbers indicate the specialist auditor(s), with number 1,2,3,4, and 5 referring to PW, EY, DT, KP, and AA respectively.

Panel D: ISP assignment difference in business services industry (SIC 73)

Assignment Approach	Calculating Variable	ISP Name	Year										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	AF	ISP_1	1	1	1	1	1	1	1	1	1	1	3
	TF	ISP_2	1	1	1	1	1	1	1	1	1	1	1
Largest MS	AT	ISP_3	1	1	1	1	1	1	1	1	1	1	1
	SA	ISP_4	1	1	1	1	1	1	1	1	1	1	1
	SQAT	ISP_5	1	1	1	1	1	1	2	2	2	2	2
	SQSA	ISP_6	1	1	1	1	1	2	2	1	2	2	2
	NC	ISP_7	1	2	2	2	2	2	2	2	2	2	2
	AF	ISP_m1	1	1	1	1	1	1	1				3
	TF	ISP_m2	1	1	1	1	1	1	1	1	1	1	1
MS cut-off	AT	ISP_m3	1	13	1	1	1	1	1	1	1	1	1
	SA	ISP_m4	1	1	1	1	1	1	1	1	1	1	1
	SQAT	ISP_m5	1	1	-	-	-	-	-	-	-	-	-
	SQSA	ISP_m6	1	1	1	1	-	-	-	-	-	-	-
	NC	ISP_m7	1	2	-	2	-	2	2	2	2	-	-
	AF	ISP_ps1	5	12	24	24	124	124	124	124	124	1234	234
	TF	ISP_ps2	5	25	14	124	124	124	124	124	124	1234	1234
3 largest PS	AT	ISP_ps3	-	-	-	-	-	-	-	-	-	-	-
	SA	ISP_ps4	5	-	-	-	-	-	-	-	-	-	-
	SQAT	ISP_ps5	5	-	-	-	-	-	-	-	-	-	-
	SQSA	ISP_ps6	145	235	24	24	24	24	24	234	234	1234	234
	NC	ISP_ps7	12345	12345	1234	1234	1234	234	1234	1234	1234	1234	1234
	AF	ISP_p1	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	TF	ISP_p2	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
PS cut-off	AT	ISP_p3	1245	1234	123	123	123	123	1234	1234	123	123	123
	SA	ISP_p4	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SQAT	ISP_p5	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SQSA	ISP_p6	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	NC	ISP_p7	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	AF	ISP_w1	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	TF	ISP_w2	1245	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
WMS cut-off	AT	ISP_w3	14	123	123	123	123	123	12	12	123	123	12
	SA	ISP_w4	15	123	123	123	123	123	123	123	1234	1234	123
	SQAT	ISP_w5	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	SQSA	ISP_w6	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234
	NC	ISP_w7	12345	12345	1234	1234	1234	1234	1234	1234	1234	1234	1234

ISPs are measured by seven different calculating variables including audit fees (AF), total fees (TF), assets (AT), sales (SA), square root of assets (SQAT), square root of sales (SQSA), and the number of clients (NC). In the cells of the table, the numbers indicate the specialist auditor(s), with number 1,2,3,4, and 5 referring to PW, EY, DT, KP, and AA respectively.

Appendix 3: Count of clients audited by industry specialized auditors

Panel A: Count of client companies audited by industry specialized auditor PW

Approach	Variable	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
	AF	250	363	362	354	363	328	311	285	302	281	308	3507
	TF	246	381	361	358	359	335	318	282	305	287	348	3580
ISP by	AT	235	314	318	372	290	258	242	245	251	281	380	3186
Largest	SA	255	266	308	363	283	238	238	240	239	231	248	2909
MS	SQAT	244	288	332	352	319	279	282	233	177	269	264	3039
	SQSA	236	298	306	297	294	231	230	256	219	166	240	2773
	NC	247	240	207	207	220	157	110	154	148	147	142	1979
	AF	326	422	431	372	491	406	403	284	310	344	359	4148
	TF	346	435	409	389	437	403	398	320	328	391	458	4314
ISP by	AT	332	401	378	471	414	339	264	341	339	415	411	4105
MS cut-off	SA	299	367	390	370	380	357	355	348	275	362	409	3912
	SQAT	339	403	347	421	351	318	249	244	258	343	335	3608
	SQSA	321	427	319	394	323	313	324	324	245	321	329	3640
	NC	287	229	262	283	272	182	158	167	187	194	190	2411
	AF	63	105	116	120	153	148	101	101	101	89	98	1195
	TF	63	96	162	163	153	148	127	101	79	89	86	1267
ISP by	AT	42	48	55	57	55	51	46	44	43	45	46	532
3 largest	SA	34	32	40	38	38	35	34	31	52	36	37	407
PS	SQAT	51	75	97	105	99	90	79	80	72	84	80	912
	SQSA	103	139	148	159	150	151	144	146	141	166	149	1596
	NC	140	169	190	247	183	177	169	214	159	172	224	2044
	AF	308	400	500	509	494	438	458	469	408	433	467	4884
	TF	297	385	483	482	481	440	450	469	442	433	444	4806
ISP by	AT	204	254	322	330	313	276	267	268	261	285	288	3068
PS cut-off	SA	307	384	472	490	471	453	441	448	440	456	470	4832
	SQAT	331	407	513	497	508	467	459	470	462	487	486	5087
	SQSA	360	431	527	542	521	497	478	489	500	519	523	5387
	NC	360	439	540	554	535	488	456	478	472	474	504	5300
	AF	300	410	509	515	501	466	456	484	443	462	463	5009
	TF	324	401	511	515	501	471	456	484	443	452	471	5029
ISP by	AT	265	320	391	393	357	337	263	283	203	285	304	3401
WMS	SA	329	419	449	458	404	399	447	450	432	457	464	4708
cut-off	SQAT	355	438	535	528	516	499	480	489	482	508	518	5348
	SQSA	362	454	553	520	500	469	466	467	467	487	480	5225
	NC	336	434	477	503	508	443	438	449	453	469	486	4996

Panel B: Count of client companies audited by industry specialized auditor EY

Approach	Variable	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
	AF	160	137	255	310	275	273	222	239	249	401	319	2840
	TF	159	147	288	294	282	267	210	239	245	386	324	2841
ISP by	AT	166	196	283	284	286	292	299	315	324	341	276	3062
Largest MS	SA	158	162	291	297	298	294	303	304	332	383	363	3185
	SQAT	166	205	295	280	286	274	302	371	419	410	401	3409
	SQSA	149	186	290	306	274	350	364	328	401	471	446	3565
	NC	249	324	495	558	457	540	580	634	667	733	651	5888
	AF	164	209	314	331	323	318	336	418	349	429	355	3546
	TF	177	223	341	345	366	366	403	404	358	460	397	3840
ISP by	AT	178	245	308	297	292	293	360	386	451	464	429	3703
MS cut-off	SA	169	218	321	372	305	315	366	427	430	468	436	3827
	SQAT	247	257	316	358	372	385	439	469	465	480	403	4191
	SQSA	249	241	379	407	376	391	405	430	448	480	425	4231
	NC	252	418	447	589	451	566	623	669	680	651	566	5912
	AF	100	136	173	167	162	164	157	146	148	162	178	1693
	TF	100	136	138	167	162	152	157	146	148	148	144	1598
ISP by	AT	70	73	98	101	102	98	95	94	93	93	92	1009
3 largest PS	SA	63	75	46	43	41	44	46	44	43	43	41	529
	SQAT	100	115	98	101	126	122	95	121	122	125	129	1254
	SQSA	104	136	173	167	162	164	157	156	148	174	166	1707
	NC	183	228	223	221	209	215	223	224	234	244	242	2446
	AF	367	454	569	570	566	577	629	637	677	655	642	6343
	TF	356	449	554	570	566	577	609	637	662	671	642	6293
ISP by	AT	217	381	488	503	482	501	568	597	611	618	617	5583
PS cut-off	SA	275	392	560	565	539	539	558	566	571	585	569	5719
	SQAT	343	439	590	609	582	606	652	639	658	662	649	6429
	SQSA	374	477	603	639	586	625	649	656	665	684	661	6619
	NC	349	440	573	601	563	600	621	641	652	657	656	6353
	AF	369	479	609	662	603	602	637	630	671	679	650	6591
	TF	334	377	535	594	586	600	649	630	644	633	632	6214
ISP by	AT	201	339	421	430	411	419	431	450	469	470	445	4486
WMS cut-off	SA	177	344	389	408	380	395	409	462	414	430	405	4213
	SQAT	359	471	587	608	569	599	654	636	702	676	671	6532
	SQSA	386	492	611	621	590	599	619	654	694	721	696	6683
	NC	377	456	602	614	572	600	619	645	671	652	649	6457

Panel C: Count of client companies audited by industry specialized auditor DT

Approach	Variable	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
	AF	57	81	186	190	221	220	270	243	209	156	211	2044
	TF	57	39	205	195	215	217	262	245	211	164	161	1971
ISP by	AT	71	64	225	195	242	236	247	228	201	172	161	2042
Largest MS	SA	78	105	226	207	249	261	261	251	208	193	188	2227
	SQAT	45	81	198	207	212	237	238	210	214	155	173	1970
	SQSA	55	79	211	217	231	229	221	213	206	197	162	2021
	NC	44	46	192	221	233	244	248	181	155	165	180	1909
	AF	69	122	232	239	248	251	309	297	273	244	289	2573
	TF	93	120	237	256	255	260	299	312	281	236	225	2574
ISP by	AT	115	178	255	261	282	275	289	280	265	310	328	2838
MS cut-off	SA	119	137	275	285	298	295	308	301	296	276	299	2889
	SQAT	94	92	231	240	221	246	249	233	209	234	207	2256
	SQSA	93	111	242	244	219	220	228	221	222	222	208	2230
	NC	86	114	207	216	245	246	266	219	203	204	194	2200
	AF	41	53	119	155	126	155	159	151	147	194	171	1471
	TF	41	53	137	155	147	155	159	151	147	194	175	1514
ISP by	AT	41	53	119	130	43	44	47	45	125	122	120	889
3 largest PS	SA	41	78	147	155	154	155	159	151	148	147	146	1481
	SQAT	63	84	148	155	152	154	133	128	125	127	120	1389
	SQSA	59	106	147	155	154	155	159	190	190	194	192	1701
	NC	77	112	176	219	187	186	193	190	190	194	194	1918
	AF	173	269	377	398	376	368	420	391	382	391	421	3966
	TF	187	258	408	439	378	428	422	391	367	391	394	4063
ISP by	AT	94	176	266	278	284	283	276	306	325	330	336	2954
PS cut-off	SA	158	246	399	430	413	388	382	382	354	382	374	3908
	SQAT	188	280	429	436	424	448	430	413	416	442	425	4331
	SQSA	208	292	436	450	499	455	468	473	469	476	491	4717
	NC	223	290	452	487	519	504	499	472	462	470	464	4842
	AF	130	184	344	391	329	340	358	378	365	316	315	3450
	TF	109	197	352	394	329	342	366	400	348	313	350	3500
ISP by	AT	97	170	264	274	286	281	222	210	292	288	235	2619
WMS cut-off	SA	110	191	318	320	334	332	340	330	298	305	332	3210
	SQAT	162	193	328	351	374	364	374	352	324	380	382	3584
	SQSA	164	247	339	346	398	395	409	363	325	326	388	3700
	NC	224	313	454	461	459	476	501	469	410	426	401	4594

Panel D: Count of client companies audited by industry specialized auditor KP

Approach	Variable	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
	AF	18	28	90	47	36	45	49	74	78	71	75	611
	TF	22	23	57	50	36	50	60	74	78	71	72	593
ISP by	AT	19	20	56	49	49	49	54	49	53	61	52	511
Largest MS	SA	17	23	60	28	27	37	38	37	40	49	52	408
	SQAT	86	104	176	159	163	169	171	160	162	154	160	1664
	SQSA	96	117	187	177	179	169	166	158	160	167	164	1740
	NC	112	132	215	198	206	206	206	172	170	197	199	2013
	AF	42	37	113	72	193	161	73	171	90	81	86	1119
	TF	43	46	69	71	79	65	73	172	90	89	96	893
ISP by	AT	49	49	56	57	58	57	72	68	79	78	99	722
MS cut-off	SA	38	83	117	115	113	108	115	77	82	65	71	984
	SQAT	100	124	185	185	187	180	177	166	166	167	153	1790
	SQSA	102	123	196	198	194	180	176	176	183	152	160	1840
	NC	124	155	173	168	181	184	183	176	176	162	170	1852
	AF	31	45	85	81	116	101	103	155	158	155	160	1190
	TF	88	122	85	81	116	68	71	155	158	155	160	1259
ISP by	AT	77	94	119	117	120	109	103	98	96	91	96	1120
3 largest PS	SA	31	45	25	26	60	44	19	98	18	91	96	553
	SQAT	97	113	135	137	141	136	130	124	123	120	125	1381
	SQSA	127	143	177	172	209	182	180	175	177	176	179	1897
	NC	130	171	216	209	210	193	189	184	184	182	190	2058
	AF	213	291	463	444	445	432	419	401	399	391	401	4299
	TF	214	279	443	444	440	432	414	401	380	382	401	4230
ISP by	AT	161	238	155	202	223	229	267	261	202	203	210	2351
PS cut-off	SA	205	299	433	420	421	387	387	369	389	388	406	4104
	SQAT	240	320	449	445	440	418	398	380	411	398	408	4307
	SQSA	268	346	495	505	504	473	457	426	441	429	450	4794
	NC	264	340	483	477	477	469	447	417	449	440	471	4734
	AF	231	267	395	386	388	396	356	357	370	355	383	3884
	TF	203	282	339	342	388	403	356	354	370	326	343	3706
ISP by	AT	137	156	155	223	224	229	190	148	149	185	192	1988
WMS cut-off	SA	168	229	306	303	332	318	309	291	356	344	307	3263
	SQAT	222	269	399	395	396	387	366	366	362	354	383	3899
	SQSA	227	309	477	467	482	437	443	419	429	431	452	4573
	NC	241	332	472	454	454	416	405	396	378	381	410	4339

Panel E: Count of client companies audited by industry specialized auditor AA

Approach	Variable	2000	2001	Total
	AF	90	89	179
	TF	92	98	190
ISP by	AT	57	82	139
Largest MS	SA	36	107	143
	SQAT	94	83	177
	SQSA	102	81	183
	NC	155	188	343
	AF	142	152	294
	TF	118	157	275
ISP by	AT	136	155	291
MS cut-off	SA	120	169	289
	SQAT	139	152	291
	SQSA	113	148	261
	NC	170	211	381
	AF	98	102	200
	TF	98	104	202
ISP by	AT	62	71	133
3 largest PS	SA	78	80	158
	SQAT	100	89	189
	SQSA	98	104	202
	NC	100	112	212
	AF	279	354	633
	TF	269	330	599
ISP by	AT	229	221	450
PS cut-off	SA	269	310	579
	SQAT	294	343	637
	SQSA	314	361	675
	NC	325	372	697
	AF	230	262	492
	TF	207	292	499
ISP by	AT	152	158	310
WMS cut-off	SA	182	180	362
	SQAT	251	328	579
	SQSA	306	338	644
	NC	328	400	728

Appendix 4: 35 Audit fees pricing models

Panel A: Results of regressions in largest market share approach

	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAT	+	0.512***	0.512***	0.514***	0.514***	0.514***	0.514***	0.515***
		(80.08)	(80.08)	(80.14)	(79.96)	(80.05)	(80.09)	(80.27)
YE	+	0.0678***	0.0677***	0.0681***	0.0683***	0.0681***	0.0683***	0.0680***
		(3.61)	(3.60)	(3.62)	(3.64)	(3.63)	(3.63)	(3.63)
CATA	+	0.704***	0.704***	0.706***	0.705***	0.706***	0.706***	0.708***
		(13.31)	(13.31)	(13.32)	(13.29)	(13.33)	(13.32)	(13.39)
DE	+	0.0779*	0.0775*	0.0757*	0.0758*	0.0751*	0.0746*	0.0734*
		(1.88)	(1.87)	(1.83)	(1.83)	(1.81)	(1.80)	(1.77)
QUICK	-	-0.0641***	-0.0641***	-0.0642***	-0.0641***	-0.0642***	-0.0642***	-0.0641***
		(-18.51)	(-18.52)	(-18.46)	(-18.45)	(-18.47)	(-18.46)	(-18.43)
ROI	-	-0.404***	-0.404***	-0.405***	-0.405***	-0.406***	-0.406***	-0.410***
		(-10.29)	(-10.28)	(-10.30)	(-10.29)	(-10.31)	(-10.32)	(-10.39)
LOSS	+	0.102***	0.103***	0.102***	0.103***	0.102***	0.102***	0.103***
		(7.21)	(7.22)	(7.20)	(7.21)	(7.20)	(7.19)	(7.22)
FOREIGN	+	0.338***	0.337***	0.338***	0.338***	0.338***	0.338***	0.337***
		(16.95)	(16.94)	(16.98)	(16.98)	(16.97)	(16.97)	(16.95)
OPINION	+	0.255***	0.255***	0.255***	0.255***	0.255***	0.255***	0.254***
		(8.00)	(8.00)	(7.97)	(7.98)	(8.00)	(7.99)	(7.96)
ISP_1		0.0572***						
		(3.76)						
ISP_2			0.0562***					
			(3.68)					
ISP_3				0.0208				
				(1.25)				
ISP_4					0.0229			
					(1.39)			
ISP_5						0.0185		
						(1.22)		
ISP_6							0.0112	
							(0.72)	
ISP_7								-0.0219
								(-1.57)
_cons		-4.768***	-4.768***	-4.765***	-4.765***	-4.766***	-4.765***	-4.758***
		(-87.67)	(-87.67)	(-87.53)	(-87.56)	(-87.45)	(-87.45)	(-87.03)
Industry Fixed		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		23887	23887	23887	23887	23887	23887	23887
F(20, 3182)		1682.02	1680.73	1680.25	1676.48	1671.54	1670.19	1670.89
Prob > F		0	0	0	0	0	0	0
R-squared		0.8215	0.8214	0.8211	0.8211	0.8211	0.8211	0.8211
Adj R-squared		0.8208	0.8208	0.8205	0.8205	0.8205	0.8205	0.8205

t statistics in parentheses, * p<0.1 ** p<0.05 *** p<0.01, standard errors are corrected for firm clusters. ISP variables are defined in table 1, and other variables defined in table 6.

Panel B: Results of regressions in market share cut-off approach

	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAT	+	0.512***	0.512***	0.513***	0.513***	0.514***	0.514***	0.515***
		(79.78)	(79.84)	(79.99)	(79.86)	(79.76)	(79.76)	(80.21)
YE	+	0.0679***	0.0679***	0.0682***	0.0685***	0.0682***	0.0683***	0.0681***
		(3.61)	(3.61)	(3.63)	(3.64)	(3.63)	(3.64)	(3.63)
CATA	+	0.703***	0.702***	0.706***	0.705***	0.706***	0.706***	0.708***
		(13.29)	(13.28)	(13.33)	(13.30)	(13.32)	(13.31)	(13.38)
DE	+	0.0780*	0.0784*	0.0767*	0.0767*	0.0747*	0.0749*	0.0737*
		(1.88)	(1.90)	(1.85)	(1.85)	(1.80)	(1.81)	(1.78)
QUICK	-	-0.0641***	-0.0641***	-0.0641***	-0.0640***	-0.0642***	-0.0642***	-0.0641***
		(-18.51)	(-18.51)	(-18.48)	(-18.43)	(-18.46)	(-18.46)	(-18.44)
ROI	-	-0.402***	-0.403***	-0.405***	-0.406***	-0.406***	-0.405***	-0.410***
		(-10.24)	(-10.25)	(-10.30)	(-10.30)	(-10.29)	(-10.29)	(-10.37)
LOSS	+	0.101***	0.102***	0.102***	0.102***	0.102***	0.102***	0.102***
		(7.14)	(7.16)	(7.19)	(7.19)	(7.19)	(7.19)	(7.20)
FOREIGN	+	0.338***	0.337***	0.338***	0.338***	0.338***	0.338***	0.338***
		(16.96)	(16.94)	(16.97)	(16.97)	(16.97)	(16.97)	(16.97)
OPINION	+	0.255***	0.255***	0.255***	0.255***	0.255***	0.255***	0.254***
		(8.00)	(8.01)	(7.99)	(7.98)	(7.98)	(7.99)	(7.98)
ISP_m1		0.0637***						
		(4.26)						
ISP_m2			0.0586***					
			(3.88)					
ISP_m3				0.0310**				
				(2.03)				
ISP_m4					0.0290*			
					(1.91)			
ISP_m5						0.0105		
						(0.68)		
ISP_m6							0.0145	
							(0.95)	
ISP_m7								-0.0172
								(-1.24)
_cons		-4.772***	-4.771***	-4.769***	-4.768***	-4.766***	-4.766***	-4.759***
		(-87.68)	(-87.66)	(-87.47)	(-87.61)	(-87.42)	(-87.48)	(-87.04)
Industry Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		23887	23887	23887	23887	23887	23887	23887
F(20, 3182)		1679.12	1681.83	1679.71	1678.14	1668.67	1669.67	1668.78
Prob > F		0	0	0	0	0	0	0
R-squared		0.8216	0.8215	0.8212	0.8212	0.8211	0.8211	0.8211
Adj R-squared		0.821	0.8209	0.8206	0.8206	0.8204	0.8205	0.8205

t statistics in parentheses, * p<0.1 ** p<0.05 *** p<0.01, standard errors are corrected for firm clusters. ISP variables are defined in table 1, and other variables defined in table 6.

Panel C: Results of regressions in three largest portfolio shares approach

	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAT	+	0.514***	0.514***	0.514***	0.514***	0.515***	0.514***	0.515***
		(80.13)	(80.15)	(80.12)	(79.91)	(80.01)	(80.01)	(80.11)
YE	+	0.0683***	0.0681***	0.0684***	0.0682***	0.0680***	0.0683***	0.0683***
		(3.64)	(3.63)	(3.64)	(3.63)	(3.62)	(3.64)	(3.63)
CATA	+	0.708***	0.707***	0.706***	0.707***	0.706***	0.707***	0.709***
		(13.37)	(13.37)	(13.32)	(13.34)	(13.34)	(13.36)	(13.36)
DE	+	0.0749*	0.0747*	0.0749*	0.0741*	0.0717*	0.0743*	0.0724*
		(1.81)	(1.81)	(1.81)	(1.79)	(1.73)	(1.79)	(1.75)
QUICK	-	-0.0641***	-0.0641***	-0.0642***	-0.0642***	-0.0642***	-0.0641***	-0.0642***
		(-18.42)	(-18.45)	(-18.45)	(-18.44)	(-18.42)	(-18.40)	(-18.41)
ROI	-	-0.408***	-0.409***	-0.407***	-0.407***	-0.407***	-0.407***	-0.408***
		(-10.36)	(-10.36)	(-10.33)	(-10.32)	(-10.34)	(-10.34)	(-10.36)
LOSS	+	0.102***	0.102***	0.102***	0.102***	0.102***	0.102***	0.103***
		(7.20)	(7.19)	(7.19)	(7.19)	(7.19)	(7.21)	(7.24)
FOREIGN	+	0.338***	0.338***	0.338***	0.338***	0.337***	0.338***	0.337***
		(16.96)	(16.96)	(16.99)	(16.97)	(16.93)	(16.97)	(16.96)
OPINION	+	0.254***	0.254***	0.255***	0.255***	0.256***	0.255***	0.254***
		(7.95)	(7.95)	(7.98)	(7.97)	(8.02)	(7.98)	(7.97)
ISP_ps1		0.0338*						
		(1.66)						
ISP_ps2			0.0316					
			(1.44)					
ISP_ps3				0.0414				
				(0.93)				
IS_ps4					0.00568			
					(0.17)			
ISP_ps5						-0.0899*		
						(-1.85)		
ISP_ps6							0.0179	
							(0.79)	
ISP_ps7								-0.0419
								(-1.60)
_cons		-4.768***	-4.768***	-4.765***	-4.765***	-4.755***	-4.768***	-4.755***
		(-87.66)	(-87.63)	(-87.62)	(-87.69)	(-87.46)	(-87.99)	(-87.44)
Industry Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		23887	23887	23887	23887	23887	23887	23887
F(20, 3182)		1671.17	1673.84	1669.63	1668.72	1668.52	1669	1668.38
Prob > F		0	0	0	0	0	0	0
R-squared		0.8211	0.8211	0.8211	0.8211	0.8212	0.8211	0.8211
Adj R-squared		0.8205	0.8205	0.8205	0.8204	0.8205	0.8205	0.8205

t statistics in parentheses, * p<0.1 ** p<0.05 *** p<0.01, standard errors are corrected for firm clusters. ISP variables are defined in table 1, and other variables defined in table 6.

Panel D: Results of regressions in portfolio share cut-off approach

	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAT	+	0.513***	0.514***	0.515***	0.515***	0.515***	0.515***	0.515***
		(80.25)	(80.14)	(79.91)	(79.59)	(79.91)	(79.93)	(80.30)
YE	+	0.0681***	0.0683***	0.0682***	0.0682***	0.0682***	0.0682***	0.0680***
		(3.63)	(3.63)	(3.63)	(3.63)	(3.63)	(3.63)	(3.63)
CATA	+	0.703***	0.704***	0.707***	0.706***	0.707***	0.707***	0.708***
		(13.26)	(13.28)	(13.33)	(13.33)	(13.34)	(13.33)	(13.39)
DE	+	0.0736*	0.0735*	0.0738*	0.0738*	0.0737*	0.0738*	0.0743*
		(1.77)	(1.77)	(1.78)	(1.78)	(1.78)	(1.78)	(1.79)
QUICK	-	-0.0642***	-0.0642***	-0.0642***	-0.0642***	-0.0642***	-0.0642***	-0.0643***
		(-18.47)	(-18.45)	(-18.45)	(-18.45)	(-18.45)	(-18.45)	(-18.48)
ROI	-	-0.404***	-0.405***	-0.407***	-0.407***	-0.408***	-0.407***	-0.408***
		(-10.27)	(-10.28)	(-10.32)	(-10.32)	(-10.35)	(-10.33)	(-10.34)
LOSS	+	0.101***	0.102***	0.102***	0.102***	0.102***	0.102***	0.102***
		(7.13)	(7.17)	(7.19)	(7.18)	(7.19)	(7.19)	(7.20)
FOREIGN	+	0.338***	0.338***	0.338***	0.338***	0.338***	0.338***	0.337***
		(16.98)	(16.98)	(16.97)	(16.96)	(16.94)	(16.96)	(16.94)
OPINION	+	0.255***	0.255***	0.255***	0.255***	0.255***	0.255***	0.255***
		(7.97)	(7.99)	(7.98)	(7.98)	(7.98)	(7.98)	(7.97)
ISP_p1		0.0840***						
		(3.22)						
ISP_p2			0.0504**					
			(1.99)					
ISP_p3				0.000651				
				(0.03)				
ISP_p4					0.00212			
					(0.09)			
ISP_p5						-0.0206		
						(-0.74)		
ISP_p6							-0.000740	
							(-0.03)	
ISP_p7								-0.0496*
								(-1.85)
_cons		-4.808***	-4.790***	-4.764***	-4.765***	-4.753***	-4.764***	-4.732***
		(-84.55)	(-84.92)	(-86.91)	(-86.81)	(-85.03)	(-84.65)	(-82.27)
Industry Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		23887	23887	23887	23887	23887	23887	23887
F(20, 3182)		1670.9	1670.43	1668.49	1668.34	1668.88	1668.41	1669.8
Prob > F		0	0	0	0	0	0	0
R-squared		0.8213	0.8211	0.8211	0.8211	0.8211	0.8211	0.8211
Adj R-squared		0.8207	0.8205	0.8204	0.8204	0.8204	0.8204	0.8205

t statistics in parentheses, * p<0.1 ** p<0.05 *** p<0.01, standard errors are corrected for firm clusters. ISP variables are defined in table 1, and other variables defined in table 6.

Panel E: Results of regressions in weighted market share cut-off approach

	Exp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAT	+	0.513***	0.513***	0.514***	0.514***	0.515***	0.515***	0.515***
		(79.94)	(79.95)	(79.95)	(79.75)	(79.88)	(79.87)	(80.24)
YE	+	0.0682***	0.0683***	0.0685***	0.0684***	0.0681***	0.0682***	0.0678***
		(3.63)	(3.64)	(3.64)	(3.64)	(3.63)	(3.63)	(3.61)
CATA	+	0.704***	0.704***	0.707***	0.706***	0.707***	0.707***	0.708***
		(13.26)	(13.28)	(13.36)	(13.34)	(13.34)	(13.33)	(13.36)
DE	+	0.0744*	0.0740*	0.0757*	0.0750*	0.0737*	0.0738*	0.0741*
		(1.79)	(1.78)	(1.83)	(1.81)	(1.78)	(1.78)	(1.79)
QUICK	-	-0.0642***	-0.0642***	-0.0641***	-0.0641***	-0.0642***	-0.0642***	-0.0643***
		(-18.44)	(-18.43)	(-18.44)	(-18.42)	(-18.46)	(-18.45)	(-18.48)
ROI	-	-0.403***	-0.404***	-0.407***	-0.407***	-0.408***	-0.407***	-0.408***
		(-10.23)	(-10.27)	(-10.34)	(-10.33)	(-10.35)	(-10.31)	(-10.34)
LOSS	+	0.102***	0.102***	0.102***	0.102***	0.102***	0.102***	0.102***
		(7.16)	(7.18)	(7.19)	(7.20)	(7.19)	(7.19)	(7.19)
FOREIGN	+	0.338***	0.338***	0.338***	0.338***	0.338***	0.338***	0.337***
		(16.97)	(16.97)	(16.98)	(16.96)	(16.97)	(16.97)	(16.96)
OPINION	+	0.256***	0.256***	0.255***	0.255***	0.255***	0.255***	0.254***
		(8.03)	(8.01)	(7.96)	(7.97)	(7.98)	(7.99)	(7.97)
ISP_w1		0.0480**						
		(2.54)						
ISP_w2			0.0376**					
			(2.12)					
ISP_w3				0.0245				
				(1.41)				
ISP_w4					0.0212			
					(1.26)			
ISP_w5						-0.0102		
						(-0.52)		
ISP_w6							-0.000270	
							(-0.01)	
ISP_w7								-0.0229
								(-1.03)
_cons		-4.784***	-4.778***	-4.770***	-4.770***	-4.760***	-4.764***	-4.750***
		(-86.68)	(-86.96)	(-87.28)	(-87.23)	(-86.78)	(-86.31)	(-84.42)
Industry Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		23887	23887	23887	23887	23887	23887	23887
F(20, 3182)		1671.86	1670.24	1672.74	1670.77	1667.09	1667.43	1668.65
Prob > F		0	0	0	0	0	0	0
R-squared		0.8212	0.8212	0.8211	0.8211	0.8211	0.8211	0.8211
Adj R-squared		0.8206	0.8205	0.8205	0.8205	0.8204	0.8204	0.8205

t statistics in parentheses, * p<0.1 ** p<0.05 *** p<0.01, standard errors are corrected for firm clusters. ISP variables are defined in table 1, and other variables defined in table 6.