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SIZE, PERFORMANCE AND ALLIANCE: AN EXAMINATION OF MARKET SEGMENTATION AND MARKET STRUCTURE

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ABSTRACT

In this study, we compare the performance of audit firms under different market segments in different market structures. In terms of market segmentation, we classify audit firms into four groups: international, national, regional, and local audit firms. Further, we define the audit market structure as the Big 6, Big 5 and Big 4 periods. In addition, we take the alliance between audit firms and consulting companies into account. We find size matters. Specifically, firm performance of international firms is better than that of national, regional, and local firms in the Big 6, Big 5, and Big 4 periods. Firm performance of international firms in the Big 5 and Big 4 periods is inferior to that of the Big 6 period, but no significant difference in firm performance between Big 5 and Big 4 periods. Further, international firms outperform national, regional and local firms in the alliance performance during Big 5 and Big 4 periods, but they have no significant differences in alliance performance between Big 5 and Big 4 periods.

JEL: M41, M42, E24

KEYWORDS: Market Segmentation, Market Structure, Strategic Alliance, Operating Performance, Audit Firms

INTRODUCTION

Long-term cooperation between auditing industries of the US and Taiwan has created a similar audit market structure in both countries. Taiwanese international audit firms became affiliates or members of the US international firms five decades ago. In the past two decades, the largest US international firms are often referred to as the Big N firms, including Big 8, Big 6, Big 5 or Big 4. In addition, many non-international firms are associated with other US firms, such as BDO, Grant Thornton, and Baker Tilly International. Currently, Taiwan exhibits a dual audit market structure, a few large audit firms (e.g. the Big N) and many small audit firms (the non-Big N) (Brocheler, Maijoor and van Witteloostuijn, 2004). Prior studies document the effects of dual market structure on competition (Bills and Stephens, 2016) and on audit quality (Lawrence, Minutti-Meza and Zhang, 2011; Eshleman and Guo, 2014; Jiang, Wang and Wang, 2019).

Big firms provide higher audit quality because they are expected to be more independent due to larger client base for them to have less pressure to succumb to individual audit clients (DeFond & Zhang, 2014). As a result, the Big 8 auditors charge clients an average of 34 percent brand name premium (Craswell, Francis and Taylor, 1995). The Big 4 city-specific industry leaders charge higher audit fees than do non-Big 4 auditors (Basioudis and Francis, 2007). Audit fees of higher risk clients are 42% higher compared to those without such situations for the first year of an audit engagement (Elliott, Ghosh and Peltier, 2013). Although the Big N audit firms charge higher audit fees, whether higher audit fees have been translated into performance enhancement is left unanswered.

Regarding the international firm affiliations, Taiwan had six largest international firms before 1999. The number of international firms was further reduced to five when Price Waterhouse and Coopers & Lybrand merged in 1999 to form the PricewaterhouseCoopers, resulting in the Big 5. The loss of Arthur Andersen in the Enron event leaves 4 international firms in Taiwan after 2003. Two international firm consolidations in Taiwan result in 6 international firms between 1992 and 1998, 5 firms between 1999 and 2002, and 4 firms between 2003 and 2020. In terms of the three time periods, this study defines the audit market structure as the Big 6, Big 5 and Big 4 periods. For all extensive research on the international audit firms, the effect of audit market structure on their performance has rarely been addressed, which motivates us to examine it.

Market segmentation allows audit firms to differentiate themselves from their competitors and thus to gain competitive advantages (McAlexander et al., 1991; Defond et al., 2000; Ghosh & Lustgaten, 2006; Chen et al., 2008; Carson, Redmayne and Liao, 2014; Chen et al., 2022). In terms of market segmentation, we classify audit firms into four groups: international, national, regional, and local audit firms. To the best of knowledge, a few prior studies investigate the auditing industry under different segments, the effects of market segmentation on performance of audit firms warrant further investigation. This constitutes our second motivation.

A variety of businesses are provided by audit firms, including audit services and non-audit services which are also referred to as management advisory services (MAS). The market for audit services has become increasingly competitive, but MAS provides unlimited opportunity for audit firms (Banker et al., 2003). The market for audit services can be regarded as a red ocean market and that of MAS as a blue ocean market (Chen et al., 2022). However, joint provision of audit services and MAS to the same audit client is supposed to impair independence of auditors (Ashbaugh et al., 2003). To overcome the dilemma, audit firms can strategically ally with consulting companies (Brown et al., 1996; Dopuch and King, 1991; Chen et al., 2022). From the perspective of resource-based view, the alliance benefits audit firms and consulting companies as well. Few prior research explores the effects of strategic alliance on performance of audit firms under different market segmentation in market structure. To investigate the effects of strategic alliance on performance of audit firms to bridge the research gap forms our third motivation.

We extend prior studies by four ways: investigation of aggregate financial performance of audit firms, division of audit firms into four segments, establishment of three market structures, and consideration of strategic alliance between audit firms and consulting companies. By establishing two performance measures, audit firm performance and alliance performance, this study finds size matters. Specifically, firm performance of international firms is better than that of national, regional and local firms in the Big 6, Big 5, and Big 4 periods. Consolidations between international firms result in higher market concentration but more unequal market share among international firms. Firm performance of international firms in the Big 5 and Big 4 periods is inferior to that of in the Big 6 period, but no significant difference in firm performance between Big 5 and Big 4 periods.

However, firm performance of national and local firms in the Big 5 period is significantly better than that of in the Big 4 period. Further, international firms outperform national, regional and local firms in the alliance performance during Big 5 and Big 4 periods but they have no significant differences in alliance performance between Big 5 and Big 4 periods. The rest of this paper proceeds as follows. In the next section, this study presents the literature review and hypothesis development. Section 3 details the research methodology. Section 4 reports the empirical results. This study discusses and concludes in Section 5.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Status Quo of International Audit Firms in Taiwan

Regarding the international firm affiliations, Taiwan had six largest international firms before 1999, including Arthur Andersen, KPMG, Price Waterhouse, Ernst & Young, Deloitte & Touche, and Coopers & Lybrand. The number of international firms was further reduced to five when Price Waterhouse and Coopers & Lybrand merged in 1999 to form the PricewaterhouseCoopers (PWC), resulting in the Big 5. The loss of Arthur Andersen in the Enron event leaves 4 international firms in Taiwan after 2003, including Deloitte Touche Tohmatsu Limited (DTTL), KPMG, PWC, and Ernst & Young. Table 1 presents two market shares of international audit firms, auditing industry market share (Market Share 1) and public company market share (Market Share 2). The Market Share 1 of international firms was 40.87% in Big 6 period and rose to 50.75% in Big 5 periods. It continuously climbs to 63.05% in the Big 4 period. Market Share 1 indicates that international firms provide most of the audit services in the auditing industry and maintain a steady growth in market share.

In terms of Market Share 2, international firms occupied 71.75% public company auditing market in the Big 6 period and it leapt up to 82.41% in the Big 5 period. In the Big 4 period, Market Share 2 reaches as high as 91.28%. As shown, international firms dominate the public company auditing market with less than ten percent services left to the non-international firms. Similar to the US and most other western countries, Taiwan has audit market existing a dual market structure with a few large international audit firms and many small ones (Bröcheler, Maijoor & Witteloostuijn, 2004).

Merger of Arthur Andersen and Deloitte & Touche in 2002 results in DTTL and leads to changes in market structure between Big 5 and Big 4 periods. For the international firms, growth rate of Market Share 1 is 24.24% ((63.05-50.75)/50.75). The Market Share 1 of Arthur Andersen was 13.14% and that of Deloitte & Touche was 7.85% in Big 5 period. If Arthur Andersen and Deloitte & Touche remain the same tendency in the growth rate, DTTL should have the corresponding growth rate of 26.08% ((13.14%+7.85%)*(1+24.24%)) but it has actual rate of 25.53%. Likewise, international firms have the growth rate of 10.76% ((91.28-82.41)/82.41) in Market Share 2. The Market Share 2 of Arthur Andersen was 35.23% and that of Deloitte & Touche was 10.55% in Big 5 period. DTTL should have the corresponding growth rate of 50.71% but it has actual rate of 36.38%. We then apply the analyses to the other three international firms given the same tendency in growth rate. The theoretical and actual growth rates of Market Shares 1 in KPMG are 14.85% and15.41% and that of in PWC are 13.24% and13.94%, agreeing with the growth rate of Market Shares 1 in the international firms. However, the theoretical Market Share 2 of KPMG and PWC are 17.27% and 13.86%, respectively. The actual Market Share 2 of KPMG is 26.81%, 55% higher than the expected rate. The actual Market Share 2 of PWC is 17.87%, 29% higher than the expected rate.

After the merger of Arthur Andersen and Deloitte & Touche, some audit partners leave the DTTL with their audit clients and join either KPMG or PWC. Table 1 shows that the public company auditing market, as indicated in Market Share 2, becomes more unequal and increasingly competitive in the Big 4 period. Both DTTL and KPMG capture the market share of public company auditing market as high as 63.19% (36.38% + 26.81%).

Table 1: Market Share of International Audit Firms

Audit Firms	Market Share 1	Market Share 2
Big 6 period: 1992~1997		
Arthur Andersen	10.45%	25.57%
KPMG Peat Marwick	8.30%	14.73%
Price Waterhouse	6.69%	10.36%
Ernst & Young	5.68%	8.01%
Deloitte & Touche	5.24%	7.00%
Coopers & Lybrand	3.75%	6.08%
Total	40.12%	71.75%
Big 5 period: 1998~2002		
Arthur Andersen	13.14%	35.23%
KPMG	11.95%	15.59%
PWC	10.66%	12.51%
Deloitte & Touche	7.85%	10.55%
Ernst & Young	7.15%	8.54%
Total	50.75%	82.41%
Big 4 period: 2003~2020		
DTTL	25.53%	36.38%
KPMG	15.41%	26.81%
PWC	13.94%	17.87%
Ernst & Young	8.17%	10.22
Total	63.05%	91.28%

This table presents two market shares of international audit firms, Market Share 1 and Market Share 2. Table 1 shows that the public company auditing market, as indicated in Market Share 2, becomes more unequal and increasingly competitive in the Big 4 period. Market Shares 1 is based on the auditing industry and Market Shares 2 on the public company auditing market.

Firm Performance Comparisons Between Different Categories of Audit Firms

In theory, scale economies exist in an industry when its constituent firms can reduce their average cost or increase their average revenues by expanding firm size (Christenson & Greene, 1976; Darrough & Heineke, 1978). Scale economies prevail in the auditing industry as well (Banker et al., 2003). Large audit firms earn more fee premiums over small ones due to product differentiation, brand name reputation and audit quality (Francis, 1984; Carson et al., 2012; Palmrose, 1986; Beatty, 1989). For example, the brand name premium of Big 8 auditors over that of non-Big 8 auditors averages around 34 percent (Craswell et al., 1995). Consolidation of Big N audit firms leads to increase in the audit fee premiums paid by Big N clients during Big 6, Big 5, and Big 4 periods (Carson et al., 2012). The Big 4 city-specific industry leaders charge higher audit fees than do Big 4 non-city leaders and other non-Big 4 auditors (Basioudis and Francis, 2007). The US-based Big N principal auditors are associated with higher audit fees because they improve the financial reporting environment by providing higher-quality audited earnings for their US-listed foreign clients (Asthana, Raman and Xu, 2015). In addition, a spate of merger and acquisition shrinks the “Big 8” to the “Big 4” international audit firms. Audit market concentration is significantly associated with higher audit quality and audit fees (Eshleman and Lawson, 2017).

The affiliation between Taiwan and US international firms provides abundant resources for Taiwanese member firms, including professional auditing techniques and expertise, human capital development, and continuing professional education. Further, headquarters of international firms determine the services offered by worldwide member firms which often exchange valuable information. With this professional development, international firms represent a symbol of high quality auditors (DeFond & Zhang, 2014). After the Enron event, the US Congress passes the Sarbanes-Oxley Act of 2002, which creates the Public Company Accounting Oversight Board (PCAOB) to supervise audit firms. The PCAOB establishes

auditing and quality control standards for audits of public companies and performs inspections of quality controls on audit firms rendering services to public companies. The inspections also apply to foreign audit firms offering services to companies issuing the American Depositary Receipt (ADR). Hence, Taiwanese international firms received the PCAOB inspection over the past few years (PCAOB, 2022).

Product differentiations exist in the audit market (Craswell et al., 1995). Taiwanese international firms have more auditors with high academic education level, much work experience, and CPA designation (Chen et al., 2014). International firms also devote more resources on the continuing professional education of auditors. Consequently, Taiwanese international firms render higher audit quality services and charge higher audit fees compared to other audit firms. Prior studies report an audit fee premium of international firm due to greater expertise, audit quality, enhanced auditor independence and more resources international firms have than do non-international firms (Simunic, 1980; DeAngelo, 1981; Chaney, Jeter & Shivakumar, 2004). DeAngelo (1981) regards auditor size as a proxy of audit quality and clams that size alone alters auditor's incentives to supply high quality services, which in turn help incumbent auditors earn client-specific quasi-rents. The quasi-rents then serve as a collateral against opportunistic behavior to maintain high quality audit and to boost firm revenues considerably. To the extent, the fee premiums are also a function of the degree of market power exercised by these large international firms in the audit market (Minyard & Tabor, 1991; Wootton, Tonge & Wolk, 1994; Choi & Ze´ghal, 1999). Because audit firm size is positively associated with audit pricing (Niemi, 2004), we claim that size determines operating performance and establishes the following hypotheses.

H1: The association between audit firm size and firm performance is positive.

Firm Performance Comparisons in Different Time Periods

After two mergers of international firms in 1999 and 2003, audit market in Taiwan is more concentrated in Big 4 period (2003-2012) compared to Big 5 period (1999-2002) and Big 6 period (1992-1998). Further, mergers between two firms leads to synergy, substantial cost savings, increased revenues, and economies of scale (Banker et al., 2003). Audit firm mergers increase audit quality, indicating that larger auditors provide higher audit quality due to the increased incentives provided by larger quasi-rents (Chan and Wu, 2011). Such mergers are also likely to increase the competency of merged audit firm to provide higher audit quality (DeFond & Zhang, 2014).

Audit fees have mostly been reported to increase with increased audit market concentration (Elbardan et al., 2023). In theory, increasing market concentration facilitates monopolistic pricing and allows the obtaining of abnormal profits (Dunn et al., 2011). Prior studies find a positive association between audit market concentration and audit fees (Eshleman & Lawson, 2017; van Raak et al., 2020; Chang et al., 2009). Contrarily, audit fees have been reported to decrease with market concentration increase because of intense competition among the remaining suppliers, or economies of scale (Cahan et al., 2021; Ettredge et al., 2020). Prior research finds that market concentration increased during the 4-international-firm period but market shares of the surviving 4 firms became more equal compared to the 5-international-firm period (Abidin, Beattie and Goodacre, 2010; Dunn et al., 2011).

However, market share of international firms in Taiwan reveals some variants to the findings in prior studies. As shown in Table 1, the merger between Price Waterhouse and Coopers & Lybrand in 1999 leads to the changes in mean auditing industry market share (Market Share 1) and public company market share (Market Share 2). Market Share 1 of Arthur Andersen was 10.45% in Big 6 period and 13.14% in Big 5 period. Its Market Share 2 was 25.57% in Big 6 period and rose to 35.23% in Big 5 period. After the merger between Arthur Andersen and Deloitte Touche, Market Shares 1 and 2 became more unequal compared to the Big 6 and Big 5 periods. Market Share 1 of Arthur Andersen was 13.14% in Big 5 period and grew to 25.53% in Big 4 period. Its Market Share 2 was 25.57% in Big 6 period and rose to 35.23% in Big 5 period.

After Enron, both DTTL and KPMG occupied 40.94% of the entire auditing industry (Market Share 1) and 63.19% of the public company auditing market (Market Share 2).

In this study, international and national firms are eligible for the provision of audit services to public companies, and they compete for the same customer base. After Enron, competition intensifies either between international and national firms or within the international firms. According to DTTL, the number (capital raised in billion NT dollars) of IPO was 39 (14.8) in 2017, 60 (23.5) in 2018, 35 (28) in 2019, 29 (14.7) in 2020, and 28 (32.1) in 2021 in Taiwan capital market. The market share of IPO occupied by DTTL was 62%, 47%, 46%, 52%, and 50%. Although soliciting over fifty IPOs of KY-company, DTTL faces the toughest crisis in its history because of audit failure in some of its KY-company clients. KY is an abbreviation of the Cayman Islands. The business community attributes the accounting scandals of financial statements fraud in the KY-company to fierce competition among the 4 international firms.

According to the Survey Report of Audit Firms in Taiwan published by the Financial Supervisory Commission, the number of national firms reveals a decreasing tendency. Mean number of national firms was 59.6 in the Big 6 period and grew slightly to 62.6 in the Big 5 period but decreases sharply to 42.8 in the Big 4 period. However, both regional and local firms grow year by year. The number of regional firms was 86 in 1992 and tripled to 242 in 2020. Similarly, there were 364 local firms in 1992 and 762 in 2020.

Although international and national firms are qualified for rendering audit service to public companies, the market power of international firms grows steadily during the sample period. Table 1 indicates that international firms occupied 71.75% of the public company auditing market in Big 6 period and 82.41% in the Big 5 period. In the Big 4 period, 91.28% of the public company auditing market belongs to international firms with 8.72% left for national firms.

In practice, national, regional and local audit firms locate in the same market and compete for the clients of small and medium-sized enterprises (SME). When more and more auditors enter the SME auditing market, competition intensifies. Hence, national, regional and local audit firms face a more competitive audit market in the Big 4 period than in the Big 5 and Big 6 periods. Accordingly, we claim that Taiwanese auditing market structure becomes increasingly intense during the sample period. Hence, we predict that operating performance in the Big 6 period will be better than in the Big 5 and Big 4 periods, and in the Big 5 period will be better than in the Big 4 period and we hypothesize:

H2a: Audit firm performance in the Big 6 period is better than in the Big 5 and Big 4 periods.
H2b: Audit firm performance in the Big 5 period is better than in the Big 4 period.

Alliance Performance Comparisons between Different Categories of Audit Firms

Audit firms provide audit and non-audit services. In Taiwan, audit services include attestation of financial statements for public companies and private companies, for granting a bank loan and for special purposes, and attestation of corporate income tax returns. Non-audit services are composed of tax planning, tax administrative remedy, other tax matters, management advisory service, corporate registration, and accounting and bookkeeping services. Recently, audited clients demand advisory services such as business performance consulting, information technology, cybersecurity, digital transformation, workforce development, data analysis and marketing advisory. Audit firms experience the largest growth in technology consulting and attest services. Over 70% audit firms in the US render IT and data security services (Accounting Today, 2021).

For example, Taiwanese PWC renders various IT services, including SAP S/4 HANA, technology consulting, CRM salesforce, and cloud computing. However, joint provision of audit and non-audit services to the same audit clients is supposed to impair independence of auditors (Ashbaugh et al., 2003). Both SEC

and American Institute of Certified Public Accountants concerned about auditor's independence in the past few decades. Further, Section 201 of the SOX imposes severer regulations on audit firms in rendering non-audit services. To overcome the dilemma in joint service provision, audit firms can strategically ally with a consulting company (Brown et al., 1996; Dopuch and King, 1991). The SEC regards consulting company as a separate and distinct legal entity from audit firms (SEC, 1988).

In terms of resource-based view (RBV), the alliance benefits audit firms and consulting companies as well. By the alliance, they mutually support businesses to maintain auditor independence and increase income for each other. From the perspective of RBV, the strategic alliance possesses advantages between both parties, including cross-referring businesses, expanding the scope of services by flexible deployment of human resources, and sharing professional knowledge (Chen et al., 2022).

Because consulting companies are a legal entity, some audit firms set up even more than one company. For example, the PWC in Taiwan establishes alliance with nine consulting companies (Chen et al. 2022). In addition to the international audit firms, non-international audit firms establish strategic alliances to render non-audit services. Size of audit firms facilitates the establishment of strategic alliance, which brings about revenue enhancement for the alliance. Accordingly, we postulate that size determines alliance performance. In addition, Taiwanese auditing market structure becomes increasingly competitive during the sample period. We predict that the alliance performance in the Big 5 period will be better than in the Big 4 periods and hypothesize:

H3a: The association between audit firm size and alliance performance is positive.
H3b: Alliance performance in the Big 5 period is better than in the Big 4 period.

RESEARCH METHODOLOGY

Sample Selection

We obtain empirical data from the 1992-2020 Survey Report of Audit Firms in Taiwan. The annual survey is administered by the Financial Supervisory Commission (FSC), an equivalent of the SEC in USA. The purpose of the survey is to gain insights into the operations of audit firms, analyze macro-economic conditions, and form industrial policies. The annual survey is conducted pursuant to the Statistics Act which obligates all audit firms to accurately complete the questionnaire by the specified deadline, thus receiving an annual response rate of more than 80 percent and representing the reality of auditing practices in Taiwan. To ensure the confidentiality of business transactions, the FSC provides no identity information on individual audit firms. Hence, the survey provides a pooled cross-sectional data, which combine cross-sectional and time series information. Many studies have used pooled data which enables researchers to exploit the entire available sample. In contrast to annual estimates, the results from pooled data reflect the mean effects of independent variables during the sampling period. Accordingly, the statistics obtained from the pooled data are more accurate (Geletkanycz & Hambrick, 1997). However, pooled data suffer from the econometric problem of a correlation between residual terms. To account for the problem, we conduct the Durbin-Watson (DW) test for verification and obtain DW statistics between 1.93 and 2.07, which implies a low correlation between residual terms. Because the sample period covers 29 years, we use the yearly Consumer Price Index to deflate all monetary variables to control for inflation.

In terms of market segmentation, we classify all samples into four groups: international, national, regional, and local audit firms. International firms are the Big N audit firms. National (regional) firms are defined as partnership audit firms who offer (do not offer) audit services to public companies. Local firms are proprietorship audit firms. During the 29-year sample period, two mergers between international firm occurred in 1998 and 2002. Based on the changes in market structure, we divide the sample years into three time periods: Big 6, Big 5, and Big 4. Big 6 period is defined as the six years between 1992 and 1997, and

Big 5 period the five years between 1998 and 2002. Big 4 period is defined as the eighteen years period between 2003 and 2020. As shown in Table 2, the final number of firm-year observations is 23,445, consisting of 133 international firms, 1,442 national firms, 5,499 regional firms, and 16,371 local firms. There are 3,803 observations in the Big 6 period, 3,815 observations in the Big 5 period, and 15,827 observations in the Big 4 period. Further, the number of audit firms establishing alliance with consulting company is 2,040, consisting of 90 international firms, 157 national firms, 685 regional firms, and 1,109 local firms.

Table 2: Sample Distribution

Period	Year	International Firms	National Firms	Regional Firms	Local Firms	Total
Big 6	1992	6	55	86	364	511
	1993	6	54	123	407	590
	1994	6	53	145	427	631
	1995	6	64	142	462	674
	1996	6	71	152	477	706
	1997	6	61	157	467	691
	Subtotal	36	358	805	2,604	3,803
Big 5	1998	5(5)	69(17)	164(21)	501(43)	739(86)
	1999	5(5)	66(16)	176(33)	524(40)	771(94)
	2000	5(5)	68(13)	177(32)	555(45)	805(95)
	2001	5(5)	55(8)	172(22)	525(41)	757(76)
	2002	5(5)	55(9)	175(34)	508(35)	743(83)
	Subtotal	25(25)	313(63)	864(142)	2,613(204)	3,815(434)
Big 4	2003	4(4)	54(10)	174(23)	477(43)	709(80)
	2004	4(4)	47(5)	161(22)	447(38)	659(69)
	2005	4(4)	52(8)	173(26)	473(42)	702(80)
	2006	4(4)	46(7)	184(23)	479(38)	713(72)
	2007	4(4)	48(7)	198(24)	518(44)	768(79)
	2008	4(3)	52(10)	225(31)	608(46)	889(90)
	2009	4(4)	49(7)	219(30)	571(50)	843(91)
	2010	4(4)	46(5)	212(32)	588(47)	850(88)
	2011	4(2)	45(2)	216(29)	683(47)	903(80)
	2012	4(4)	41(4)	217(30)	679(53)	941(91)
	2013	4(4)	41(4)	229(29)	656(53)	930(90)
	2014	4(4)	42(6)	218(33)	665(44)	929(87)
	2015	4(4)	39(4)	222(30)	667(46)	932(84)
	2016	4(3)	38(4)	227(33)	685(54)	954(94)
	2017	4(3)	37(2)	234(40)	736(54)	1,011(99)
	2018	4(3)	34(3)	239(33)	745(63)	1,022(102)
	2019	4(3)	29(2)	240(36)	760(69)	1,033(110)
	2020	4(4)	31(3)	242(39)	762(74)	1,039(120)
	Subtotal	72(65)	771(93)	3,830(543)	11,154(905)	15,827(1,606)
	Total	133(90)	1,442(156)	5,499(685)	16,371(1,109)	23,445(2,040)

This table indicates that the final number of firm-year observations is 23,445, consisting of 133 international firms, 1,442 national firms, 5,499 regional firms, and 16,371 local firms. There are 3,803 observations in the Big 6 period, 3,815 observations in the Big 5 period, and 15,827 observations in the Big 4 period. Further, the number of audit firms establishing alliance with consulting company is 2,040, consisting of 90 international firms, 157 national firms, 685 regional firms, and 1,109 local firms. Numbers in the parentheses are audit firms establishing alliance with consulting companies.

Empirical Model

The structure-conduct-performance (SCP) paradigm links market structures, firm behavior, and economic performance (Ray, 1992; Cowling and Waterson, 1976; Lee, 2012). Based on SCP theory, we estimate the following regression equation to test our hypotheses.

$$PFM\_{firm}\,(PFM\_{alliance}) = \beta_0 + \beta_1 DV + \beta_2 EDU + \beta_3 EXP + \beta_4 CPE + \beta_5 AGE + \beta_6 SIZE + \beta_7 GDP + \varepsilon \quad (1)$$

Dependent variable, *PFM*, is defined as revenues of audit firms. Revenues contain information about future earnings and cash flows because the new information can be immediately reflected in revenues. Compared to earnings or net income, revenues are more useful in summarizing the performance of firms and in conveying new relevant information to the market (Chandra and Ro, 2008; Gordon, 1989; Rouse, Maguire and Harrison, 2011). Our first dependent variable is firm performance, PFM_{firm}, measured by the total revenues of audit firms alone. Another is alliance performance, $PFM\_{alliance}$, is defined as the sum of total revenues of audit firms and consulting companies. *DV* is an indicator variable used to capture different categories of audit firms and different time periods. When comparing performance between different categories of audit firms, we set indicator variables of *BIG_N, NR, NL,* and *RL*. For the different time periods, we establish three time-period indicator variables, including *TIME5, TIME4,* and *TIME54*.

Because audit quality significantly affects the operating performance of audit firms, previous researches identify some key determinants or drivers of audit quality, such as the education level of auditors (*EDU*) (Lee et al., 1999; Liu, 1997; Brocheler et al., 2004; Collins et al., 2004; Fasci & Valdez, 1998), the work experience of auditors (*EXP*) (Aldhizer et al., 1995; FRC, 2006; Collins et al., 2004; Chen et al., 2008; Fasci & Valdez, 1998; Arens et al., 2012), and the professional training of auditors (*CPE*) (Meinhardt et al., 1987; FRC, 2006; Bonner & Pennington, 1991; Groteluesche n, 1990; Thomas et al., 1998). Our regression equation includes the audit quality drivers as control variables and is an audit-quality-controlled model. Following prior studies, we also include some variables to control the regression model, including the age of audit firms (*AGE*) (Chen et al. 2008), size of audit firms (*SIZE)* (Shockley and Holt, 1983; Deis and Giroux, 1992) and external environment effects (*GDP*) (Reynolds & Francis, 2001). Table 3 provides the definitions of all variables in the regression equation.

Table 3: Variable Definitions

Variable	Definition
PFM_{firm}	Firm performance.
$PFM\_{alliance}$	Alliance performance.
BIG_N	Dummy variable, defined as 1 if the audit firm is an international firm, and 0 otherwise.
NR	Dummy variable, equal to 1 if the audit firm is a national firm, and 0 otherwise.
RL	Dummy variable, set to be 1 if the audit firm is a regional firm, and 0 otherwise.
TIME5	Dummy variable, designated as 1 if the years are between 1998 and 2002, and 0 otherwise.
TIME4	Dummy variable, equal to 1 if the years are between 2003 and 2020, and 0 otherwise.
TIME54	Dummy variable, set to be 1 if the years are between 1998 and 2020 and 0 otherwise.
EDU	Education level of auditors.
EXP	Work experience of auditors.
CPE	Professional training of auditors.
AGE	Age of audit firms.
SIZE	Size of audit firms, measured as a natural log of the total number of auditors.
GDP	External environment effects, defined as the local gross domestic product.

This table defines all variables used in the regression equation.

RESULTS

Descriptive Statistics

Table 4 presents the descriptive statistics of regression variables for the three time periods. As shown in Panel A, mean firm performance (*PFM_ firm*) of international firms is $2,684,051,074 which grows from $700,818,530 in the Big 6 period to $4,015,547,522 in the Big 4 period. Average alliance performance (*PFM_ alliance*) is 2,866,459,816, which is $1,867,281,237 in Big 5 period and expands to 4,296,217,465 in the Big 4 period. National and regional firms experience tendency similar to international firms. However, both firm performance and alliance performance of local firms shrinks period to period. In addition, international firms have youngest auditors (*EXP*) with the highest educational level (*EDU*), the longest age of establishment (*AGE*), and devote the most expenditures in professional training (*CPE*). Data of strategic alliance provided by FSC are available since 1998. Hence, no information of alliance performance (*PFM_ alliance*) appears in Big 6 period.

Table 4: Descriptive Statistics

Panel A: International Firms				
	Full Sample Period	**Big 6 Period**	**Big 5 Period**	**Big 4 Period**
PFM_ firm	2,684,051,074	700,818,530	1,705,196,170	4,015,547,522
PFM_ alliance	2,866,459,816	--	1,867,281,237	4,296,217,465
EDU	16.27	16.16	16.04	16.40
EXP	31.17	30.38	31.24	31.54
CPE	18,958,708	9,722,438	19,670,643	23,329,642
AGE	32.05	28.89	31.44	33.83
SIZE	7.66	6.12	6.99	7.57
Panel B: National Firms				
	Full Sample Period	**Big 6 Period**	**Big 5 Period**	**Big 4 Period**
PFM_ firm	63,678,106	43,774,743	58,273,177	75,114,094
PFM_ alliance	64,425,526	--	59,442,863	76,037,138
EDU	15.50	15.16	15.16	15.80
EXP	33.98	32.26	32.55	35.36
CPE	225,418	136,108	154,551	295,657
AGE	17.99	12.66	15.94	21.29
SIZE	3.81	3.53	3.83	3.93
Panel C: Regional Firms				
	Full Sample Period	**Big 6 Period**	**Big 5 Period**	**Big 4 Period**
PFM_ firm	14,794,113	13,316,270	13,277,523	15,446,854
PFM alliance	15,151,317	--	13,765,746	15,849,579
EDU	15.40	14.77	14.79	15.67
EXP	36.74	32.48	34.22	38.21
CPE	67,410	49,463	51,397	74,794
AGE	14.87	6.86	10.04	17.64
SIZE	2.73	2.75	2.78	2.71
Panel D: Local Firms				
	Full Sample Period	**Big 6 Period**	**Big 5 Period**	**Big 4 Period**
PFM_ firm	3,989,092	4,214,056	4,003,868	3,933,110
PFM_ alliance	4,159,596	--	4,196,342	4,138,274
EDU	15.21	14.48	14.62	15.52
EXP	40.14	35.59	37.13	41.91
CPE	24,794	27,349	19,839	25,359
AGE	12.95	9.21	10.07	14.49
SIZE	1.78	1.88	1.86	1.74

This table shows the descriptive statistics for different categories of audit firms in different time periods. PFM_ firm = firm performance; PFM_ alliance = alliance performance; EDU = education level of auditors; EXP = work experience of auditors; CPE = professional training of auditors; AGE = age of audit firms; SIZE = size of audit firms.

Univariate Comparisons of Performance between Different Categories of Audit Firms in Different Time Periods

Table 5 displays the results of performance comparison between different categories of audit firms and in different time periods. First, we compare audit firm size by two variables, total number of owners of audit firms (*TCPA*) and total number of auditors (*TEMPLOYEE*). In terms of either *TCPA* or *TEMPLOYEE*, size of international firms is greater than that of national firms, so on and so forth. Next, Panel A shows that the larger the size of audit firms, the better the firm performance (PFM_{firm}) and alliance performance ($PFM\_{alliance}$). In sum, both size and performance of international firms is greater and better than that of national firms, so on and so forth. We graphically present the results in Figure 1. In panel B, we report the comparisons of alliance performance ($PFM\_{alliance}$) and firm performance (PFM_{firm}) in Big 5 and Big 4 periods. As shown, alliance performance ($PFM\_{alliance}$) is better than firm performance (PFM_{firm}) for the international firms, national firms, regional firms, and local firms.

Table 5: Comparisons of Audit Firm Size and Performance

Panel A: Comparisons Between Different Categories of Audit Firms				
	TCPA	***TEMPLOYEE***	***PFM_ firm***	***PFM_ alliance***
International firms	63.33	1,467.66	$2,684,051,074	$2,866,459,816
National firms	6.47	62.85	63,678,106	64,425,526
Difference	56.86	1,401.82	$2,620,372,968	$2,802,034,290
t-statistic	53.72***	56.05***	49.23***	50.36***
International firms	63.33	1,467.66	$2,684,051,074	$2,866,459,816
Regional firms	2.88	18.40	14,794,113	15,151,317
Difference	60.45	1,449.26	$2,669,256,961	$2,851,308,499
t-statistic	114.57***	115.29***	98.56***	100.60***
International firms	63.33	1,467.66	$2,684,051,074	$2,866,459,816
Local firms	1.00	6.03	3,989,092	4,159,596
Difference	62.33	1461.63	$2,680,061,982	$2,862,300,220
t-statistic	211.50***	201.90***	170.98***	174.45***
National firms	6.47	62.85	$63,678,106	$64,425,526
Regional firms	2.88	18.40	14,794,113	15,151,317
Difference	3.59	44.45	$48,883,993	$49,274,209
t-statistic	50.67***	43.48***	46.92***	46.97***
National firms	6.47	62.85	$63,678,106	$64,425,526
Local firms	1.00	6.03	3,989,092	4,159,596
Difference	5.47	58.82	$59,689,014	$60,265,930
t-statistic	166.71***	105.42***	107.36***	107.28***
Regional firms	2.88	18.40	$14,794,113	$15,151,317
Local firms	1.00	6.03	3,989,092	4,159,596
Difference	1.88	12.37	$10,805,021	$10,991,721
t-statistic	148.52***	81.61***	78.08***	76.65***
Panel B: Comparisons Between Big 5 and Big 4 Periods				
	International Firms	**National Firms**	**Regional Firms**	**Local Firms**
Big 5 Period				
$PFM\_{alliance}$	$1,867,281,237	$59,442,863	$13,765,746	$4,196,342
PFM_{firm}	$1,705,196,170	$58,273,178	$13,277,523	$4,003,868
Difference	$162,085,067	$1,169,685	$488,224	$192,473
t-statistic	8.49***	7.06***	7.47***	7.55***
Big 4 Period				
$PFM\_{alliance}$	$4,296,217,465	$76,037,139	$15,849,579	$4,138,274
PFM_{firm}	$4,015,547,522	$75,114,094	$15,446,854	$3,933,110
Difference	$280,669,944	$923,045	$402,725	$205,164
t-statistic	10.45***	6.31***	11.96***	9.21***

*Table 5 shows the results of performance comparison between different categories of audit firms and in different time periods. In addition, *, **, *** denote significance at 10-percent, 5-percent, and 1-percent confidence levels for two-tailed tests.PFM_{firm} = firm performance; $PFM\_{alliance}$ = alliance performance; TCPA= total number of owners of audit firms; TEMPLOYEE =total number of auditors.*

Comparisons of Firm Performance between Different Category of Audit Firms

Panels A through C of Table 6 present the regression results of firm performance in the three time periods. Except Panel A, we report the regression results on research variables, *BIG_N, NR, NL,* and *RL*, and omit that of control variables to save of space. In Panel A, we report statistically significant coefficients on *BIG_N* for the Big 6 (t = 25.65), Big 5 (t = 25.43), and Big 4 periods (t = 14.46), respectively. These findings suggest that the firm performance of international firms is much better than that of national firms in the Big 6, Big 5, and Big 4 periods. In Panels B and C, we find similar results that international firms significantly outperform both regional firms and local firms in the three time periods. As shown in Panels D through F of Table 6, the firm performance of national firms is better than that of both regional firms and local firms. The firm performance of regional firms is better than that of local firms in the three time periods. In sum, Panels A through F report that the larger the size of audit firms, the better the firm performance (PFM_{firm}). Accordingly, H1 receives supports, indicating the association between audit firm size and firm performance is positive.

Table 6: Regression Results of The Firm Performance Between Different Category of Audit Firms

$PFM\_{firm} = \beta_0 + \beta_1 DV + \beta_2 EDU + \beta_3 EXP + \beta_4 CPE + \beta_5 AGE + \beta_6 SIZE + \beta_7 GDP + \varepsilon$			
Panel A: International Firms vs National Firms			
	Big 6 Period	**Big 5 Period**	**Big 4 Period**
Variables (Predicted Signs)	**Std. Coeff. (t-statistics)**	**Std. Coeff. (t-statistics)**	**Std. Coeff. (t-statistics)**
BIG_N (+)	0.520***	0.705***	0.396***
	(25.65)	(25.43)	(14.46)
EDU (+)	0.030**	-0.057***	-0.014
	(2.17)	(-3.46)	(-0.95)
EXP (?)	0.010	0.019	0.023
	(0.75)	(1.13)	(1.59)
CPE (+)	0.347***	0.142***	0.490***
	(23.29)	(7.08)	(19.96)
SIZE (+)	0.254***	0.205***	0.143***
	(12.62)	(8.00)	(7.23)
AGE (+)	-0.009	-0.015	-0.097***
	(-0.64)	(-0.84)	(-7.41)
GDP (+)	0.038***	0.019	0.079***
	(3.03)	(1.22)	(5.38)
R^2	0.943	0.919	0.897
Adjusted R^2	0.941	0.918	0.896
F-statistic	896***	539***	1,042***
N	394	338	843
Panel B: International Firms vs Regional Firms			
	Big 6 Period	**Big 5 Period**	**Big 4 Period**
BIG_N (+)	0.624***	0.836***	0.396***
	(42.69)	(50.76)	(32.64)
N	841	888	3,902
Panel C: International Firms vs Local Firms			
	Big 6 Period	**Big 5 Period**	**Big 4 Period**
BIG_N (+)	0.688***	0.864***	0.402***
	(94.97)	(99.22)	(56.34)
N	2,640	2,638	11,226

Table 6: Regression Results of The Firm Performance Between Different Category of Audit Firms (continued)

Panel D: National Firms vs Regional Firms			
	Big 6 Period	**Big 5 Period**	**Big 4 Period**
LM (+)	0.085*** (4.24)	0.051** (2.22)	0.123*** (11.44)
N	1,163	1,177	4,601
Panel E: National Firms vs Local Firms			
	Big 6 Period	**Big 5 Period**	**Big 4 Period**
LS (+)	0.237*** (14.26)	0.142*** (7.57)	0.238*** (28.29)
N	2,962	2,926	11,925
Panel F: Regional Firms vs Local Firms			
	Big 6 Period	**Big 5 Period**	**Big 4 Period**
MS (+)	0.081*** (5.39)	0.132*** (9.59)	0.047*** 7.28
N	3,409	3,477	14,984

*This table presents the regression results of firm performance between different categories of audit firms in the three time periods. In addition, *, **, *** denote significance at the 10-percent, 5-percent and 1-percent levels, respectively (one-tailed where coefficient sign has prediction, two-tailed otherwise). All variables are defined in Table 3.*

Comparisons of Alliance Performance between Different Category of Audit Firms

Table 7 presents the comparisons of alliance performance between different categories of audit firms. Because of the data availability about strategic alliance, comparisons of alliance performance are limited to the Big 5 and Big 4 periods. For brevity, coefficients on control variables are not reported in Panels B, C, D, E and F of Table 6 due to the stability of their coefficients across models. As shown in Panel A, we find statistically significant coefficients on *BIG_N* in Big 5 period (t = 7.79) and Big 4 period (t = 5.93), respectively. This indicates that the alliance performance of international firms is much better than that of national firms during Big 5 and Big 4 periods. Also, Panels B and C report that the alliance performance of international firms is better than that of both regional and local firms.

Panels D reveals that the alliance performance of national firms is better than that of regional firms in the Big 4 period only (t = 5.45). Furthermore, Panel E displays that the alliance performance of national firms is inferior to that of local firms in Big 5 period (t = -3.13) but superior to local firms in Big 4 period (t = 5.45). Panel F reports an insignificant difference in the alliance performance between regional and local firms. When we take market segments and market structure into account simultaneously, H3a receives a support in international firms. Namely, international firms have better alliance performance than national, regional and local firms in the Big 5 and Big 4 periods.

Table 7: Regression Results of Alliance Performance Between Different Category of Audit Firms

$PFM\_{alliance} = \beta_0 + \beta_1 DV + \beta_2 EDU + \beta_3 EXP + \beta_4 CPE + \beta_5 AGE + \beta_6 SIZE + \beta_7 GDP + \varepsilon$		
Panel A: International Firms vs National Firms		
	Big 5 Period	**Big 4 Period**
Variables (Predicted Signs)	**Std. Coeff. (t-statistics)**	**Std. Coeff. (t-statistics)**
BIG_N (+)	0.637*** (7.79)	0.405*** (5.93)
EDU (+)	-0.018 (-0.34)	-0.048 (-1.17)
EXP (+)	0.012 (0.33)	0.014 (0.45)
CPE (+)	0.187*** (4.31)	0.239*** (5.09)
AGE (+)	-0.121* (-1.90)	-0.317*** (-0.989)
SIZE (+)	0.302*** (3.74)	0.460*** (7.34)
GDP (+)	0.039 (1.09)	0.251*** (7.82)
R^2	0.897	0.889
Adjusted R^2	0.895	0.887
F-statistic	107***	96***
N	88	158
Panel B: International Firms vs Regional Firms		
	Big 5 Period	Big 4 Period
BIG_N (+)	0.686*** (7.38)	0.383*** (9.74)
N	167	608
Panel C: International Firms vs Local Firms		
	Big 5 Period	Big 4 Period
BIG_N (+)	0.722*** (9.05)	0.358*** (10.82)
N	229	970
Panel D: National Firms vs Regional Firms		
	Big 5 Period	Big 4 Period
NR (+)	-0.068 (-1.35)	0.142*** (5.45)
N	205	636
Panel E: National Firms vs Local Firms		
	Big 5 Period	Big 4 Period
NL (+)	-0.162*** (-3.13)	0.140*** (5.19)
N	267	998
Panel F: Regional Firms vs Local Firms		
	Big 5 Period	Big 4 Period
RL (+)	-0.023 (-0.427)	-0.013 (-0.527)
N	346	1,448

*Table 7 displays regression results to compare the alliance performance between different categories of audit firms. In addition, *, **, *** denote significance at the 10-percent, 5-percent and 1-percent levels, respectively (one-tailed where coefficient sign has prediction, two-tailed otherwise). All variables are defined in Table 3.*

Comparisons of Firm and Alliance Performance Between Different Time Periods

Table 8 reports the comparisons of firm and alliance performance between different time periods. As can be seen in Panel A, we have significantly negative coefficients on dummy variable of Big 5 period (*TIME5*) (t = -2.97) and Big 4 period (*TIME4*) (t = -1.98) in the international firm column. This implies firm performance of international firm in the Big 5 and Big 4 periods is inferior to that of in the Big 6 period. Similarly, the coefficients on dummy variable of Big 5 period (*TIME5*) and Big 4 period (*TIME4*) are significantly negative for the national, regional and local firms. The results show their firm performance in Big 6 period is better than in Big 5 and Big 4 periods. H2a receives support. Next, the Wald test shows an insignificant difference in coefficients between the *TIME5* and *TIME4* for international and regional firms, indicating performance of these two firms in the Big 4 period is not inferior to that of in the Big 5 period. However, firm performance of national and local firms in the Big 5 period is significantly better than that of in the Big 4 period (F = 12.16 and F = 6.44, respectively). H2b receives a support in national and local firms. Panel B displays the comparisons of alliance performance between Big 5 and Big 4 periods. The coefficients on *TIME54* indicate an insignificant difference in alliance performance ($PFM_{\_\ alliance}$) between Big 5 and Big 4 periods for the international, national, regional, and local firms. H3b receives no support.

Table 8 Regression Results of the Firm and Alliance Performance Between Different Time Periods

Panel A: Firm Performance

$$PFM_{\_\ firm} = \beta_0 + \beta_1\ TIME5 + \beta_2\ TIME4 + \beta_3\ EDU + \beta_4\ EXP + \beta_5\ CPE + \beta_6\ AGE + \beta_7\ SIZE + \beta_8\ GDP + \varepsilon$$

Variables (Predicted Signs)	International Firms	National Firms	Regional Firms	Local Firms
	Std. Coeff. (t-statistics)	Std. Coeff. (t-statistics)	Std. Coeff. (t-statistics)	Std. Coeff. (t-statistics)
TIME5 (-)	-0.113*** (-2.97)	-0.050*** (-2.82)	-0.026** (-2.31)	-0.015** (-2.27)
TIME4 (-)	-0.115** (-1.98)	-0.147*** (-5.46)	-0.053*** (-3.39)	-0.042*** (-4.45)
EDU (+)	0.122*** (4.90)	0.053*** (2.95)	0.131*** (13.03)	0.113*** (18.34)
EXP (+)	0.069*** (2.76)	0.088*** (4.83)	0.095*** (8.61)	0.001 (0.14)
CPE (+)	0.096*** (3.60)	0.168*** (10.74)	0.318*** (36.65)	0.168*** (32.62)
AGE (+)	0.594*** (9.71)	-0.054*** (-3.32)	-0.019* (-1.77)	0.051*** (8.163)
SIZE (+)	-0.365*** (-12. 35)	0.783*** (46.50)	0.680*** (66.16)	0.746*** (111.75)
GDP (+)	0.384*** (8.07)	0.118*** (4.57)	0.008 (0.55)	0.045*** (5.35)
R^2	0.938	0.708	0.621	0.575
Adjusted R^2	0.936	0.706	0.619	0.572
F-statistic	242***	434***	1,116***	2,735***
N	133	1,442	5,499	16,371

Table 8 Regression Results of the Firm and Alliance Performance Between Different Time Periods (continued)

Panel B: Alliance Performance				
$PFM\_{alliance} = \beta_0 + \beta_1 TIME54 + \beta_2 EDU + \beta_3 EXP + \beta_4 CPE + \beta_5 AGE + \beta_6 SIZE + \beta_7 GDP + \varepsilon$				
	International Firms	**National Firms**	**Regional Firms**	**Local Firms**
Variables (Pred. Signs)	**Std. Coeff. (t-statistics)**	**Std. Coeff. (t-statistics)**	**Std. Coeff. (t-statistics)**	**Std. Coeff. (t-statistics)**
TIME54 (-)	-0.041 (-1.16)	-0.051 (-0.84)	-0.055 (-1.59)	-0.13 (-0.368)
EDU (+)	0.117*** (4.37)	0.065 (1.31)	0.168*** (5.59)	0.152*** (4.71)
EXP (+)	0.018 (0.63)	0.018 (0.38)	0.089*** (2.79)	0.080** (2.17)
CPE (+)	0.072*** (2.80)	0.224*** (4.65)	0.107*** (4.22)	0.094*** (3.36)
AGE (+)	0.671*** (14.24)	-0.144*** (-2.85)	0.012 (0.381)	0.006 (0.20)
SIZE (+)	-0.246*** (-6.84)	0.806*** (15.50)	0.778*** (26.41)	0.428*** (12.28)
GDP (+)	0.273*** (5.55)	0.069 (1.00)	0.030 (0.83)	-0.044 (-1.12)
R^2 Adjusted R^2	0.955 0.953	0.759 0.758	0.582 0.580	0.156 0.155
F-statistic	259***	70***	136***	30***
N	90	156	685	1,109

*This table reports the comparisons of firm and alliance performance between different time periods. Furthermore, *, **, *** denote significance at the 10-percent, 5-percent and 1-percent levels, respectively (one-tailed where coefficient sign has prediction, two-tailed otherwise). All variables are defined in Table 3.*

CONCLUSIONS

Findings

In this study, we empirically examine the financial performance of audit firms under different segments in different market structures. In terms of different segments, international firms have better firm performance and alliance performance than national, regional, and local firms. For different market structures, firm performance in Big 6 period is better than in Big 5 and Big 4 periods for international, national, regional, and local firms. Next, we find firm performance of national and local firms in the Big 5 period is significantly better than that of in the Big 4 period. Further, no significant difference in alliance performance between Big 5 and Big 4 periods for the international, national, regional, and local firms.

The empirical results of alliance performance above are subject to the following caveat. In practice, audit firms can establish strategic alliances with consulting companies by two ways: the consulting companies can either operate independently or jointly operate with audit firms. For example, all international firms establish strategic alliances with consulting companies. When the alliance form is the former, audit firms do not provide the information of consulting companies to our dataset. Hence, the number of international firms will differ from the number of audit firms establishing alliance in some years. As the alliance performance of audit firms is limited to the audit firms which jointly operate with consulting companies, this will lead to bias in the alliance performance for some audit firms.

Discussions and Future Study

Prior studies indicate combining two firms results in synergy, substantial cost savings, increased revenues, and economies of scale (Banker et al., 2003). Larger auditors via mergers increase audit quality due to the increased incentives provided by larger quasi-rents (Chan and Wu 2011) and big firm mergers are likely to increase the competency to provide higher audit quality (DeFond and Zhang 2014). Past research claims that the market concentration increases during the 4-international-firm period but market shares of the surviving 4 firms become more equal compared to the 5-international-firm period (Abidin, Beattie and Goodacre, 2010; Dunn et al., 2011). Audit market concentration is significantly associated with higher audit quality and audit fees (Eshleman and Lawson, 2017). According to the two events of big firm mergers in the world and Taiwan, we construct three market structures to extend prior studies. Consistent with prior studies, market concentration increases during the 4-international-firm period in Taiwan. Contrarily, we find market share of international firms becomes more unequal in Taiwan during the 4-international-firm period. Fierce competition between international firms leads to their firm performance in the Big 6 period is better than in the Big 5 and Big 4 periods.

International firms dominate auditing industry in Taiwan and western countries as well. In terms of the auditing industry and the public company audit market, the market share of international firms grows steadily over the past three decades. However, they are subject to more regulations and legal liabilities. The Securities and Exchange Act and the Regulations Governing the Preparation of Financial Reports by Securities Issuers directly apply to international firms in Taiwan. After SOX, the PCAOB exercises its supervisions over foreign audit firms offering services to companies issuing the American Depositary Receipt. For example, three Taiwanese international audit firms, KPMG, Ernst & Young and DTTL, were inspected by PCAOB in 2017, 2018 and 2022 (PCAOB, 2022). Prior studies report the inspections improve audit quality (DeFond & Lennox, 2011; Fargher, Jiang & Yu, 2018). In Taiwan, audit reports of public companies are required to be certified by two audit partners from the same audit firm and names of the audit partners should be disclosed on the reports. In addition, Taiwan Stock Exchange and Taipei Exchange, two main stock exchanges in Taiwan, were inspired by the SOX to set up a five-year mandatory partner rotation in 2004. The regulatory and supervisory systems lead to international firms being a symbol of high audit quality and charging higher audit fees, resulting in their performance superior to that of non-international firms.

Taiwan requires audit firms with two or more audit partners when rendering audit or attest services for some organizations, such as the state-own companies. In addition to international firms, national firms and regional firms are partnership audit firms which are qualified to provide audit services to a variety of organizations. Small and medium-sized enterprises (SMEs) account for over 97% of Taiwanese companies. Most SMEs are served by regional and local firms. Although regional and local firms assume less legal liabilities, SMEs change to international or national firms when they go public. Hence, size plays a critical role for the long-term development of audit firms. When size expands, audit firms can enjoy economy of scale. Also, profitable audit firms reinvest more resources to advance their service quality and they might recoup this investment through charging higher audit fees. To have profitable results and to expand businesses with audit quality, auditors are suggested to take firm size into account.

In this study, we find that both firm performance and alliance performance of international firms are better than that of national, regional and local firms. Prior research identifies an audit fee premium in the international firms due to greater expertise, audit quality, enhanced auditor independence and more resources owned. Human resources are critical inputs in audit firms, including education level of auditors, work experience of auditors, and professional training. Future studies are advised to investigate the role played by human resources in the productivities of audit firms to provide additional information on the audit fees.

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