

# MARKET COMPETITION AND MERGERS IN PROFESSIONAL SERVICE FIRMS

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## ABSTRACT

*This study examines competition level and merger in Taiwanese audit industry over a long time interval of 1992-2008. Total public accounting firms are divided into four sub-samples in terms of market segment, including big, large, medium, and small firms. Next, based on prior studies and service attribute, this study establishes four practice sub-markets: auditing, tax, consultation, and accounting. Empirical results indicate that big firms have the highest competition level but the other three sub-samples show no significant differences in competition level. Next, the auditing, tax, and accounting sub-markets become more concentrated over time but consultation sub-market does not change significantly. Big firms exhibit the highest competition level in the four sub-markets and four sub-markets but achieve the best in three financial performance measures, net profit per partner, profit ratio, and productivity per employee. Post-merger firms financially outperform pre-merger firms for Taiwanese two big firms' mergers occurred in 1999 and 2003.*

**JEL:** M42

**KEYWORDS:** Market Competition, Herfindahl-Hirschman Index, Operating Performance, Public Accounting Firms

## INTRODUCTION

The global economy is changing from an industry-based to a knowledge-intensive landscape which transforms the basis of technological innovation and corporate competition (Drucker, 1994; Van de Ven, 2004). Public accounting firms (also referred to as audit firms) are a professional service organization and a knowledge-intensive entity. Following the Enron debacle, the world largest public accounting firms then, Arthur Andersen, dissolved in 2002. This caused its Taiwanese affiliate firm to combine with that of Deloitte & Touche and created the largest public accounting firm in Taiwan, Deloitte Touche Tohmatsu, in 2003. Previous research indicates that regulatory agencies are concerned about market concentration and closely monitor any mergers between large public accounting firms due to increased post-merger audit market concentration (e.g., McMeeking, Peasnell and Pope, 2007). For example, in its 2008 report on market concentration for audits of public company, the U.S. Government Accountability Office indicated that the market concentration at that time lacked significant adverse concentration effect required for immediate action (GAO, 2008). In theory, a high market concentration level denotes low competition in a market (Besanko, Dranove and Shanley, 2000). Information about market concentration of service industry is useful to governmental agencies, companies, and academics alike (Wernerheim, 2010). Because of regulations, mergers between firms, and economic development, market concentration levels change over time (Jennequin, 2008). Previous studies typically focus on the short-term or discrete audit market concentration, which motivates this study to examine the long-term concentration to fill the gap left.

Prior studies document the existence of market segmentation in the audit market owing to government regulations or the size of clients served (DeFond, Francis and Wong, 2000; Ghosh and Lustgarten, 2006). Public accounting firms are often categorized in terms of their size, service area, or practices offered. Market segmentation leads to varied market concentrations in different public accounting firm categories. Base on prior studies (Ghosh and Lustgarten, 2006; Chen, Chang and Lee, 2008), this study partitions total public accounting firms into four sub-samples to better reflect audit market attributes. The first purpose of this study is to examine the long-term audit market concentration for each

sub-sample. Public accounting firms traditionally provide audit services but recently expand to other scope of services. When determining the effects of PricewaterhouseCoopers merger on audit market competition, the Australian Consumer and Competition Commission (ACCC) identifies six markets in which public accounting firms compete: audit services, accounting services, management consultancy services, corporate recovery and insolvency consulting, corporate financial consulting, and actuarial services (Goddard, 1998). The identification of six practice markets implies a varied degree of competition among different service markets. Previous studies use aggregate audit fee information to measure audit market concentration and cannot determine the concentration at any lower level (Minyard and Tabor, 1991). Audit market concentration in different practice markets provides useful information for regulators and practitioners in further. Based on the ACCC, this study divides total samples into four practice sub-markets and investigates their market concentration, which constitutes the second purpose of this study. With the primary concern that post-merger public accounting firms might possess monopoly power in the industry, regulatory agencies closely monitor mergers between large public accounting firms (e.g., McMeeking et al., 2007). Public accounting firms with monopoly power might reduce competition due to increased market concentration for audit services (Minyard and Tabor, 1991; McMeeking et al., 2007). Economic theory suggests that price-cost margins (profits) should be higher in more concentrated markets (Besanko et al., 2000). The third and final purposes of this study are to determine whether public accounting firms in a more concentrated market produce better operating performance, and whether merged public accounting firms lead to superior operating performance.

Empirical data of this study are from the 1992-2008 Survey Report of Public Accounting Firms in Taiwan. First, this study subdivides total public accounting firms into four sub-samples in terms of market segment, including big, large, medium, and small firms. Further, this study establishes four practice sub-markets: auditing, tax, consultation, and accounting. The Herfindahl-Hirschman index (HHI) is used to estimate the market concentration level for the four sub-samples and four practice sub-markets. This study establishes a standardized HHI to facilitate cross-sample market concentration comparisons. A greater standardized HHI represents a higher level of market concentration and a lower degree of market competition. Empirical results indicate varied long-term concentration levels among the four sub-samples and four sub-markets. In terms of long-term concentration level, big firms have the highest competition level but the other three sub-samples show no significant differences in competition level. Further, the long-term concentration levels do not change significantly for the four sub-samples. Next, the auditing and accounting sub-markets have significantly lower concentration level than the tax and consultation sub-markets. The market structures of the auditing, tax, and accounting sub-markets become more concentrated over time, while that of consultation sub-market does not change significantly. Big firms exhibit the lowest concentration level, the highest competition level, in the four sub-markets but achieve the best in three financial performance measures, net profit per partner, profit ratio, and productivity per employee. Post-merger firms financially outperform pre-merger firms for two big firms' mergers occurred in 1999 and 2003.

This study accesses to the audit fee information of all public accounting firms in the audit industry, and is the first to estimate audit market concentration based on a theoretically defined market share. The empirical results of this study contribute to the related literature by extending the findings of existing researches. First, previous studies tend to use a proxy variable of audit fees to examine short-term audit market concentration for large public accounting firms only (e.g., Minyard and Tabor, 1991; Thavapalan, Moroney and Simnett, 2002). This study estimates market concentration using long-term actual audit fees for both large and small public accounting firms, providing a better and more complete picture of market concentration in the audit industry. Second, previous studies only examine market concentration using aggregate data, and are unable to analyze at lower levels (e.g., Choi and Zeghal, 1999; Minyard and Tabor, 1991). Using detailed practice data for individual public accounting firm, this study examines market concentration at a lower level by identifying four practice sub-markets. This approach provides a unique evidence of audit market concentration in different practice markets. Third, economic theory suggests a higher price-cost margin (profit) in a more concentrated market (Besanko et al., 2000) and a positive association between market price and market concentration (Weiss, 1989). However, this study finds that public accounting firms in less concentrated market financially outperform those in more

concentrated market do. The finding contributes to the industrial economic literature. Finally, findings of this study convey important managerial implications to the practitioners of service industry. In practice, product differentiation and overall cost leadership are two commonly used marketing strategies with which to achieve a sustainable competitive advantage and to earn abnormal rate of return in a hostile environment (Hall, 1980; Porter, 1980). Although various product differentiation alternatives exist, superior quality is the most adopted approach to characterize this strategy (Kiechel, 1981). This study finds that public accounting firms in a more competitive market produce superior financial performance to firms in less competitive market. Prior studies report that competition improves overall efficiency and technical efficiency (Lee, Park and Oh, 2000). This study argues that competition enhances service quality and thereby solicits more clients, resulting in performance improvement. For practitioners especially in service sector, upgrade of service quality is the most useful weapon to counter competition. The remainder of this study proceeds as follows. Section 2 reviews previous studies followed by the empirical data and sample classification shown in Section 3. Section 4 presents the standardized HHIs and compares the differences in market concentration for the four sub-samples and sub-markets. This study displays the comparisons of operating performance for different sub-samples in Section 5. Section 6 demonstrates the implications of the empirical results, while Section 7 makes additional tests and provides managerial implications. This study concludes in Section 8.

## BACKGROUND AND LITERATURE REVIEW

*Audit Market in Taiwan:* The most authoritative source of information on Taiwanese audit industry comes from the Survey Report of Public Accounting Firms in Taiwan, published by Taiwanese Financial Supervisory Commission beginning in 1988. As shown in Table 1, the number of public accounting firms was 532 in 1992 and climbed to 913 in 2008, and the number of practicing Certified Public Accountants (CPAs), owners of the firms, was 1,066 in 1992 and rose to 1,910 in 2008. Growth rates of number of firms and practicing CPAs are 71.62% and 79.17%, respectively. In practice, main clients of public accounting firms include public companies (listed and non-listed) and small and medium-sized enterprises (SMEs). Table 1 indicates that the number of public companies was 1,337 in 1992 and climbed to 3,049 in 2008, resulting in a 128% growth for the period. For the same period, the number of SMEs was 871,726 in 1992 and rose to 1,234,749 in 2008 with a growth rate of 41.64%. To the extent, both the growth of number in firms and number in practicing CPAs run parallel with that of audit clients, public companies and SMEs.

Table 1: Audit Clients and Public Accounting Firms

Year	Number of Public Accounting Firms	Number of Practicing CPAs	Public Companies	Small & Medium Enterprises
1992	532	1,066	1,337	871,726
1993	613	1,208	1,444	901,768
1994	654	1,310	1,571	932,852
1995	690	1,393	1,775	991,615
1996	714	1,498	2,032	1,003,325
1997	703	1,469	2,537	1,020,435
1998	753	1,613	3,036	1,045,117
1999	783	1,720	3,470	1,060,738
2000	814	1,797	3,919	1,070,310
2001	769	1,660	3,787	1,078,162
2002	754	1,675	3,372	1,104,706
2003	719	1,622	3,312	1,146,352
2004	663	1,594	3,315	1,164,009
2005	702	1,672	3,189	1,226,095
2006	714	1,693	3,111	1,244,099
2007	774	1,738	3,091	1,236,586
2008	913	1,910	3,049	1,234,749

*This table shows the information about numbers of audit clients, practicing CPAs, and public accounting firms.*

Long-term cooperation between U.S. and Taiwanese audit industries has created a similar audit market structure in both countries. Many Taiwanese international public accounting firms became affiliates or members of U.S. international firms four decades ago. In addition to the international firm affiliations, many local firms are associated with other U.S. firms, such as BDO, Grant Thornton, and Baker Tilly

International. For the international firm affiliations, the Taiwanese six largest international firms, Big Six, included Arthur Andersen, KPMG, Price Waterhouse, Ernst & Young, Deloitte & Touche, and Coopers & Lybrand before 1999. The ranks of the largest international firms were further reduced to the Big Five when Taiwanese associates of Price Waterhouse and Coopers & Lybrand merged in 1999 to form the PricewaterhouseCoopers. The loss of Arthur Andersen leaves the Big Four international firms in Taiwan after 2003, including KPMG, PricewaterhouseCoopers, Ernst & Young, and Deloitte Touche Tohmatsu. The largest public accounting firm was always the Arthur Andersen except 1999 due to the merged PricewaterhouseCoopers. The successor of Arthur Andersen, Deloitte Touche Tohmatsu, has ranked the first since 2003. Some regulations over Taiwanese audit industry occurred in the past two decades. Beginning in 1988, Taiwanese authorities have raised the passing rate of the CPAs uniform examination, resulting in substantial increases in the number of qualified CPAs and in market competition.

The authorities abolished the long-standing audit fee standard to ensure fair audit market competition in 1998. Cancelling the audit fee standard adversely impacts the traditional auditing practice market. Since then, a rumor of price-cutting strategy for client solicitation has prevailed in the industry and led to enhanced market competition. Furthermore, the tax authorities established a tax agent system and legalized the provision of corporate registration and accounting services by tax agents to SMEs in 2004. By the end of 2008, the cumulative number of qualified tax agents who are eligible for practicing services has been 10,120, much more than the number of practicing CPAs, 1,910. Proprietorship public accounting firms have provided the same services to the SMEs for years. Tax agent legalization negatively influences proprietorship public accounting firms because of the competitive advantages the tax agents possess for a relatively lower service fees and easy service access by the clients.

### Measure of Market Structure

Theoretically, the number of firms in a market and the firms' monopoly power can explain market structure. Industrial economics is particularly concerned with the relationships between market concentration, market behavior, pricing and market performance (Akehurst, 1984). Oligopoly theorists note a positive association between market price and degree of market concentration (Weiss, 1989). In a highly concentrated industry, a few suppliers dominate the industry and oligopoly behaviors appear. Conspiracy or collusion among these leading suppliers provides them with price-setting power (Yardley, Kauffman, Cairney and Albrecht, 1992). Prior accounting studies show that audit market structure is related to audit pricing, audit fees, and market power (McMeeking et al., 2007; Bandyopadhyay and Kao, 2004; Lee, 2005). Further, different market structure gives rise to varied levels of rivalry, fee-setting practices, and client turnover (Ghosh and Lustgarten, 2006). In theory, measuring a market's structure is a quick and accurate way to assess the likely nature of its competition (Besanko et al., 2000). Researchers typically use two measures of market structure. The first is the *n*-firm concentration ratio (CR<sub>*n*</sub>). This measure represents the combined market share of the *n* largest firms in a market,

$$CR_n = \sum_{i=1}^n MKS_i$$

where *n* is a specified number of the largest firms in a market and *MKS<sub>i</sub>* represents the market share of firm *i*. Prior researches typically use sale revenues to calculate market share, but may also use other measures such as production capacity. The concentration ratio is often calculated for either the four (CR4), six (CR6), or eight (CR8) largest firms in the sample. Another commonly used measure of market structure is the Herfindahl-Hirschman index (HHI). This index equals the sum of squared market shares for all firms in a market,

$$HHI = \sum_{i=1}^n MKS_i^2$$

where  $n$  is the total number of firms in a market and  $MKS_i$  represents the market share of firm  $i$ . A market with  $n$  equal-sized firms generally has a mean HHI of  $1/n$ . A market with  $n$  firms, either equal-sized or unequal-sized, has a mean HHI of  $1/n$  too. The mean HHI is also called a base level HHI. In theory, the HHI can range from a minimum of close to zero (a perfectly competitive market) to a maximum of 10,000 points (a monopoly market).

As both CR $n$  and HHI measure market concentration level, a high CR $n$  or HHI denotes low competition in a market. The HHI is sensitive to the number of firms active in an industry and to varying activity levels across firms. The CR $n$  suffers from a number of weaknesses, such as its lack of information about all firms in an industry and its equal weighting of the market shares of all firms (Cowling, Yusof and Vernon, 2000). In addition, CR $n$  is not obvious about how to select the most appropriate  $n$  largest firms (Hardwick, 1996). The HHI conveys more information than the CR $n$  (Besanko et al., 2000) and because it has the advantage that it takes into account the market share of every single firm in the industry (Hardwick, 1996). However, researchers state that to assess the circumstances surrounding the competitive interaction of firms to make conclusions about the nature of competition is essential, rather than rely solely on the CR $n$  or HHI (Besanko et al., 2000). As annual data is available for all public accounting firms in the Taiwanese audit industry, this study uses the HHI to measure market structure.

#### Measurement Base for Audit Market Concentration

A multitude of prior studies use the CR $n$  or HHI to examine audit market concentration. They use various proxies for audit fees, including sales or assets of audit clients, squared root of client sales, number of clients, and number of audits (Thavapalan et al., 2002). Concentration measures based on proxy variable often produce measurement errors Moizer and Turley (1987). As a result, some studies use actual public accounting firm revenue data, a more pertinent and homogeneous measure, to calculate CR $n$  and HHI (e.g., Choi and Zeghal, 1999). Revenue data are preferable to any proxy variable because they provide a direct measure of audit market concentration. However, previous studies only use revenue data in aggregate amounts, and are therefore unable to examine concentration at any lower level without using proxy information (Minyard and Tabor, 1991). In contrast, this study analyzes detailed fee data of each firm, which make it possible to measure market concentration of the Taiwanese audit industry at lower level, a unique approach in the world. As a result, this study first calculates the theoretically defined market share as individual firm revenues divided by the total industry revenues. Next, to estimate the annual market concentration for each sub-sample or sub-market, this study calculates market share as individual firm revenues divided by the total revenues of each sub-sample or sub-market.

### **DATA METHODOLOGY**

#### Data and Sample Classification

Taiwanese regulatory agencies began to administer public accounting firm survey in 1989 to collect business information on the audit industry for macro-economic analysis and industrial policy formation. The regulatory agencies publish the Survey Report of Public Accounting Firms in Taiwan annually but 1991, due to its data inseparable from other industry's statistics. The data used in this study are commercially available from the Financial Supervisory Commission, Taiwan. Surveyed items include total revenues and their compositions, total expenditures and their compositions, employee demographics, ending amounts of and changes in fixed assets. This survey also collects qualitative information using an open questionnaire that asks about operating difficulties encountered and future business strategies to be taken by public accounting firms. Because the survey is administered pursuant to the Statistics Act, the surveyed firms are obligated to fill out the questionnaire correctly and in a timely manner. The annual response rate, according to the Survey Report, exceeds eighty percent.

This study obtains empirical data from 1992 to 2008 to presents a continuous long-term analysis of audit market concentration. Market segmentation exists in audit industry due to either varied government

regulation or size of clients served (Defond et al., 2000; Ghosh and Lustgarten, 2006). Market segmentation refers to a group of consumers within a broader market who possess a common set of characteristics. Segmentation characteristics include demographic factors, geography, buyer's industry, and size of purchasing firm (Besanko et al., 2000). Practically, the larger the company, the more complicated the organization structure, and the higher the internal agency cost. As a result, companies employ larger public accounting firms to audit their financial statements to alleviate the agency cost (Francis, Maydew and Sparks, 1999). Public companies are larger in size and revenues compared to private companies. Substantial difference in size exists between public accounting firms offering and not offering services to public companies. Hence, this study divides public accounting firms into four different categories in terms of market segmentation: big, large, medium, and small firms.

Big firms refer to the Taiwanese affiliates or members of the international firms in the U.S. during the sample period. Large firms are non-big partnership firms that provide audit services to public companies, while non-big partnership firms that do not offer this kind of service are medium firms. Small firms represent proprietorship firms. As the sample period of this study is 17 years, this study deflates all monetary variables by the yearly consumer price index to account for inflation. The Survey Report provides information about ten services that can be offered by public accounting firms. Based on the ACCC (Goddard, 1998) and Banker, Chang, and Cunningham (2003), this study groups these services into four practice sub-markets by their attributes: auditing, tax, consultation, and accounting sub-markets. In the auditing sub-market, four audit services are provided, including auditing the financial statements of public companies, auditing financial statements for granting a bank loan, auditing financial statements for other purposes, and auditing income tax returns. The tax sub-market offers such services as tax planning, administrative remedy of internal taxation, and other tax operation services. The consultation sub-market renders management advisory services. In the accounting sub-market, corporate registration and accounting and bookkeeping practices are served.

During the sample period, we delete firm-year observations: (1) newly established in the survey year; (2) with dependent variable having value more or less than three standard deviations away from its mean; and (3) with no revenue or no expenditure. The final sample consists of 12,264 firm-year observations after 143 observations are deleted. Panel A in Table 2 reports the annual number and percentage of each sub-sample. The sample includes 86 big firms and 972 large firms, which accounting for 0.72% and 8.01% of the final observations, respectively. Number of medium and small firms is 2,795 and 8,411, which depicts 22.64% and 68.63% of the final observations. Panel B in Table 2 shows the annual total revenues and market share for each sub-sample. Total revenues of big firms was NT\$ 2,386 million in 1992 and soared up to NT\$ 15,200 million in 2008, while the market shares increased from 41.38% in 1992 to 62.81% in 2008. Big firms earned over half of the total industry revenues with NT\$ 8,010 million in 2000, and have dominated the audit market ever since, a situation similar to western countries such as the U.S. and U.K. (Daniels, Leyshon and Thrift, 1988).

A dual market structure exists in the audit market with a few large public accounting firms and many small ones (Brocheler, Maijoor and Witteloostuijn, 2004). Table 2 shows a market structure with a few large firms (i.e., big firms) and many small firms (i.e., medium and small firms) in Taiwan. Big firms, on average, account for only 0.72% of the number of observations, but earn 51.19% of the total revenues. Conversely, medium and small firms account for 91.27% (22.64%+68.63%) of the number of observations, but earn only 28.20% (14.67%+13.53%) of the total revenues. Hence, the Taiwanese audit market structure is similar to that in the U.S. and in most other western countries. Panel C in Table 2 displays annual revenues and market share for each sub-market. Auditing and accounting services are traditional practices that public accounting firms have provided for years. These traditional services are law-protected and statutory practices, auditing and accounting sub-markets occupy 73.52% and 12.61% of the total industry revenues. Total revenues of auditing sub-market was NT\$ 1,879 million in 1992 increasing to NT\$ 10,993 million in 2008. However, the corresponding market share of the auditing sub-market was 78.74% in 1992, and fell to 72.32% in 2008. Similarly, total revenues of the accounting sub-market increased from NT\$ 327 million to 1,617 million from 1992 to 2008, while its market share dropped from 13.72% in 1992 to 10.64% in 2008. In contrast, tax and consultation services grew

steadily from a market share of 7.55% (3.46%+4.09%) in 1992 to 17.03% (11.55%+5.48%) in 2008.

Table 2: Annual Numbers, Revenues, and Market Share of Public Accounting Firms

Panel A Number and Percentage of Public Accounting Firms								
Year	Big Firms	%	Large Firms	%	Medium Firms	%	Small Firms	%
1992	6	1.13	55	10.34	87	16.35	384	72.18
1993	6	0.98	54	8.81	126	20.55	427	69.66
1994	6	0.92	53	8.10	147	22.48	448	68.50
1995	6	0.87	64	9.28	142	20.58	478	69.28
1996	6	0.84	71	9.94	153	21.43	484	67.79
1997	6	0.85	61	8.68	158	22.48	478	67.99
1998	6	0.80	68	9.03	164	21.78	515	68.39
1999	5	0.64	66	8.43	176	22.48	536	68.45
2000	5	0.61	68	8.35	177	21.74	564	69.29
2001	5	0.65	56	7.28	173	22.50	535	69.57
2002	5	0.66	56	7.43	175	23.21	518	68.70
2003	4	0.56	54	7.51	175	24.34	486	67.59
2004	4	0.60	48	7.24	162	24.43	449	67.72
2005	4	0.57	52	7.41	172	24.50	474	67.52
2006	4	0.56	46	6.44	184	25.77	480	67.23
2007	4	0.52	48	6.20	198	25.58	524	67.70
2008	4	0.44	52	5.70	226	24.75	631	69.11
1992-2008	86	0.72	972	8.01	2,795	22.64	8,411	68.63
Panel B Total Revenues and Market Share for Four Sub-Samples (in Million New Taiwan Dollars)								
Year	Big Firms	%	Large Firms	%	Medium Firms	%	Small Firms	%
1992	2,386	41.38	1,601	27.77	673	11.67	1,107	19.19
1993	2,710	39.37	1,741	25.29	1,142	16.59	1,291	18.75
1994	3,061	38.14	1,845	22.99	1,646	20.51	1,473	18.35
1995	3,539	38.97	2,192	24.14	1,731	19.06	1,620	17.84
1996	4,202	40.53	2,669	25.75	1,732	16.71	1,765	17.02
1997	4,951	43.06	2,826	24.58	1,951	16.97	1,770	15.39
1998	5,867	44.90	3,388	25.93	1,937	14.82	1,876	14.35
1999	6,647	47.75	3,431	24.65	1,969	14.14	1,874	13.46
2000	8,010	50.58	3,599	22.73	2,254	14.23	1,972	12.46
2001	8,937	57.47	2,759	17.74	1,966	12.64	1,888	12.14
2002	9,217	58.32	2,770	17.53	2,080	13.16	1,737	10.99
2003	9,533	58.75	2,885	17.78	2,059	12.69	1,749	10.78
2004	10,100	61.47	2,410	14.67	2,270	13.82	1,650	10.04
2005	10,800	60.30	2,890	16.14	2,400	13.40	1,820	10.16
2006	12,500	62.72	2,880	14.45	2,600	13.05	1,950	9.78
2007	14,100	63.66	3,160	14.26	2,810	12.69	2,080	9.39
2008	15,200	62.81	3,400	14.05	3,060	12.64	2,420	10.00
1992-2008	131,760	51.19	46,446	20.61	34,280	14.67	30,042	13.53
Panel C Total Revenues and Market Share for Four Sub-Markets (in Million New Taiwan Dollars)								
Year	Auditing	%	Tax	%	Consultation	%	Accounting	%
1992	1,879	78.74	83	3.46	97	4.09	327	13.72
1993	2,114	78.02	90	3.32	155	5.72	351	12.94
1994	2,359	77.08	129	4.23	170	5.56	402	13.13
1995	2,754	77.83	135	3.81	189	5.35	461	13.02
1996	3,144	74.82	204	4.86	290	6.90	564	13.42
1997	3,722	75.17	302	6.10	273	5.51	655	13.22
1998	4,342	74.01	341	5.80	341	5.81	843	14.37
1999	4,960	74.62	421	6.33	361	5.43	905	13.62
2000	5,961	74.41	566	7.07	514	6.42	970	12.10
2001	6,728	75.29	652	7.29	546	6.11	1,011	11.31
2002	6,871	74.55	724	7.86	561	6.08	1,060	11.50
2003	7,038	73.83	844	8.86	561	5.88	1,090	11.43
2004	7,331	72.58	1,042	10.32	396	3.92	1,331	13.18
2005	7,885	73.01	1,051	9.73	440	4.07	1,424	13.18
2006	9,076	72.61	1,362	10.89	507	4.06	1,556	12.45
2007	10,225	72.52	1,614	11.44	682	4.84	1,579	11.20
2008	10,993	72.32	1,756	11.55	833	5.48	1,617	10.64
1992-2008	94,108	73.52	14,591	8.50	6,916	5.37	16,145	12.61

Table 2 reports the annual numbers, percentage, revenues, and market share of public accounting firms. Panel A shows the number and percentage for four sub-sample firms including big, large, medium, and small audit firms. Total revenues and market shares of the four sub-samples are appeared in Panel B. The Panel C reports the total revenues and market share for four sub-markets, auditing, tax, consultation, and accounting.

### Measurement and Comparisons of Market Structure

*Standardized HHI:* Traditionally, previous studies often calculate the Herfindahl-Hirschman index (HHI) for the four (HHI4), six (HHI6), or eight (HHI8) largest firms in the sample under analysis. Because annual data are available for all public accounting firms in the Taiwanese audit industry, this study

includes all firms in estimating the theoretically defined HHI and does not report the traditional ones for brevity. Theoretically, the HHI includes a base level (or mean HHI) that depends on the number of firms estimated. For example, if  $n$  firms are used to calculate the HHI, the base level is  $1/n$ . This study estimates the annual HHI by the total number of public accounting firms for each sub-sample, shown in Panel A of Table 2. For example, there were 55 large firms in 1992, creating a year's base level HHI of  $1/55$ , or 1.82%. As the annual number of observation for each sub-sample is different, this results in different base level HHI. Consequently, this study estimates a standardized HHI as a consistent benchmark for cross-sample comparisons. First, this study calculates the difference between actual HHI and the base level HHI to allow a concentration assessment above the base level. This difference represents an excess concentration:

$$\text{Excess concentration} = \text{actual HHI} - \text{base level HHI} = \text{actual HHI} - 1/n \quad (1)$$

Then, the excess concentration is divided by the base level for each sub-sample. The resulting index is referred to as a standardized HHI as follows.

$$\text{Standardized HHI} = \text{Excess concentration}/\text{base level HHI} \quad (2)$$

A greater standardized HHI denotes a relatively higher market concentration degree and a relatively lower market competition level. This study uses the same procedure to calculate standardized HHI for the four practice sub-markets. The following sections use these standardized HHIs to compare the concentration (competition) levels among sub-samples and sub-markets.

## RESULTS

### Comparisons of Competition Levels among Sub-Samples

Panel A in Table 3 shows the annual standardized HHIs for the four sub-samples. Big firms have the least mean standardized HHIs (0.10) followed by large firms (0.78) and small firms (0.79). Medium firms have the largest mean standardized HHIs (0.95). Panel B in Table 3 displays the testing results of differences in standardized HHIs among different sub-samples. This panel shows that big firms have less standardized HHIs than large, medium, and small firms, all significantly at the 1% level ( $Z = -4.902, -4.981, \text{ and } -4.903$ ). However, the pair-wise differences in standardized HHIs between large, medium, and small firms are statistically insignificant. This indicates that big firms have the least concentrated and the most competitive market in the long run among the four sub-samples. However, no significant difference exists in long-term competition levels among large, medium, and small firms.

Next, Figure 1 illustrates the annual standardized HHIs to present the long-term concentration level during the sample period. This figure shows that the standardized HHIs of big firms present a smooth upward movement. The standardized HHIs of large firms move upward until 2001, fall briefly, and then continue to rise after 2004. The long-term trend of standardized HHIs for medium firms varies, exhibiting a sharp decline in 1996, a significant increase after 2001, and then another fall after 2004. Finally, the standardized HHIs of small firms drift downward until 2006, when they began to rise.

To assess the long-term tendency of standardized HHIs statistically, this study performs the following linear regression.

$$YEAR = \gamma_0 + \gamma_1 SHHI + \epsilon \quad (3)$$

where  $YEAR$  denotes year of 1992, 1993, ..., and 2008, and  $SHHI$  is the standardized HHIs for each sub-sample. Regression results show that t-statistics of coefficients on the  $SHHI$  for big, large, medium, and small firms are 1.621, 1.189, 0.840, and -1.696. All coefficients are insignificant at the 10% level (two-tailed), indicating that the long-term level of market competition does not change significantly for the four sub-samples.



Table 3: Standardized HHIs and Differences between Sub-Samples

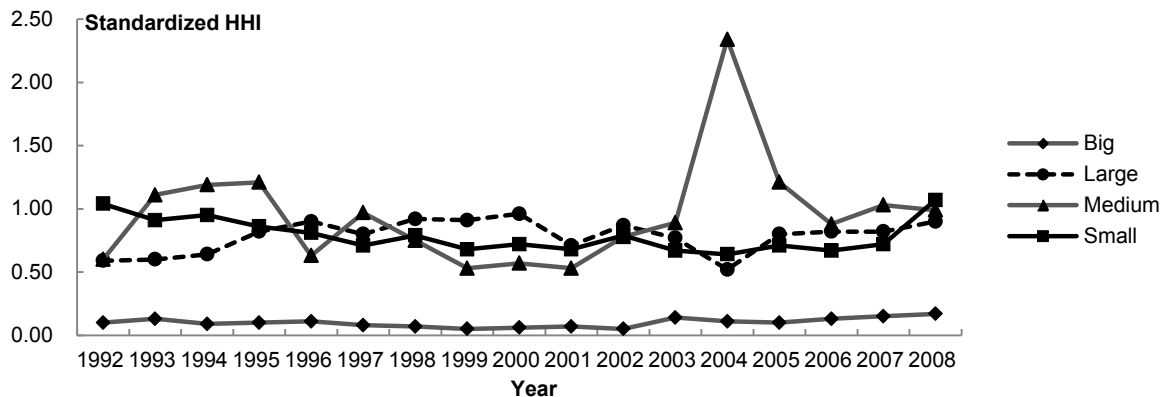
Panel A Standardized HHIs				
Year	Big Firms (n=86) (A)	Large Firms (n=972) (B)	Medium Firms (n=2,795) (C)	Small Firms (n=8,411) (D)
1992	0.10	0.59	0.60	1.04
1993	0.13	0.60	1.11	0.91
1994	0.09	0.64	1.19	0.95
1995	0.10	0.82	1.21	0.86
1996	0.11	0.90	0.63	0.81
1997	0.08	0.80	0.97	0.71
1998	0.07	0.92	0.75	0.79
1999	0.05	0.91	0.53	0.68
2000	0.06	0.96	0.57	0.72
2001	0.07	0.71	0.53	0.68
2002	0.05	0.87	0.78	0.79
2003	0.14	0.77	0.89	0.67
2004	0.11	0.52	2.34	0.64
2005	0.10	0.80	1.21	0.71
2006	0.13	0.82	0.88	0.67
2007	0.15	0.82	1.03	0.72
2008	0.17	0.90	0.99	1.07
Mean	0.10	0.78	0.95	0.79
Ho: Std.HHI=0	0.000***	0.000***	0.000***	0.000***

Panel B Test of Difference in Standardized HHIs							
	(A)-(B)	(A)-(C)	(A)-(D)	(B)-(C)	(B)-(D)	(C)-(D)	
Wilcoxon Signed-Rank Test Z Statistics	-4.902**	-4.981**	-4.903**	-1.206	-0.362	-1.017	
Asymptotic Significant Level	0.000	0.000	0.000	0.228	0.717	0.309	

Panel A of this table displays the annual standardized HHIs estimated for four sub-samples, big, large, medium, and small audit firms. Panel B reports the testing results of differences in standardized HHIs among the four different sub-samples. . . , \*\* , \*\*\* Denote two-tailed significance at the 10 %, 5 % and 1 % levels. Both t-test and two-sample sign test were performed to analyze the differences in standardized HHIs between sub-samples with the same results (un-tabulated) as reported here.

Figure 1: Tendency of Standardized HHIs for Each Sub-Sample



This figure illustrates the long-term concentration level during the sample period by the annual standardized HHIs for four sub-samples, big, large, medium, and small audit firms.

Comparisons of Competition Levels among Sub-Markets

This study classifies four practice markets based on the sub-markets identified by the ACCC: auditing, tax, consultation, and accounting sub-markets. Panel A in Table 4 shows the annual standardized HHIs for the four sub-markets. As can be seen, the accounting sub-market has the least mean standardized HHIs (0.063) followed by the auditing (0.073) and tax (0.086) sub-markets. The consultation sub-market has the largest mean standardized HHIs (0.099). Next, this study uses the standardized HHIs to compare the differences in long-term concentration levels among the four sub-markets. Panel B in Table 4 shows that the auditing sub-market has significantly lower standardized HHIs than the tax and consultation sub-markets at the 10% and 5% levels, respectively (Z = -1.292 and -1.809). Similarly, the accounting

sub-market has significantly lower standardized HHIs than the tax and consultation sub-markets at the 1% level ( $Z = -2.550$  and  $-2.850$ ). However, the differences in standardized HHIs between the auditing and accounting sub-markets and between the tax and consultation sub-markets are statistically insignificant. This indicates that the auditing and accounting sub-markets are the most competitive markets among the four sub-markets.

Table 4: Standardized HHI and Test of Difference between Sub-Markets

Panel A Standardized HHI		(n=12,264)			
Year	Auditing (A)	Tax (B)	Consultation (C)	Accounting (D)	
1992	0.034	0.087	0.032	0.056	
1993	0.029	0.074	0.123	0.047	
1994	0.027	0.054	0.093	0.042	
1995	0.028	0.052	0.103	0.037	
1996	0.029	0.066	0.159	0.036	
1997	0.035	0.060	0.043	0.048	
1998	0.037	0.074	0.084	0.050	
1999	0.050	0.104	0.051	0.046	
2000	0.057	0.098	0.095	0.054	
2001	0.074	0.101	0.191	0.061	
2002	0.076	0.083	0.128	0.060	
2003	0.107	0.106	0.103	0.076	
2004	0.113	0.115	0.056	0.105	
2005	0.108	0.093	0.067	0.092	
2006	0.117	0.118	0.086	0.103	
2007	0.124	0.133	0.125	0.090	
2008	0.202	0.047	0.149	0.072	
Mean	0.073	0.086	0.099	0.063	
Ho: Standardized HHI=0	0.000***	0.000***	0.000***	0.000***	

Panel B Difference Test of Standardized HHI						
	(A)-(B)	(A)-(C)	(A)-(D)	(B)-(C)	(B)-(D)	(C)-(D)
Wilcoxon Signed-Rank Test Z Statistics	-1.292	-1.809*	-0.034	-0.792	-2.550***	-2.850**
Asymptotic Significant Level	0.196	0.071	0.973	0.428	0.011	0.011

Panel A of this table shows the annual standardized HHIs estimated for the four sub-markets including auditing, tax, consultation, and accounting. The testing results of differences in standardized HHIs among the four different sub-markets are shown in Panel B. \*, \*\*, \*\*\* Denote two-tailed significance at the 10 %, 5 % and 1 % levels. Both t-test and two-sample sign test were performed to analyze the difference in standardized HHIs between sub-markets with the same results (un-tabulated) as reported here.

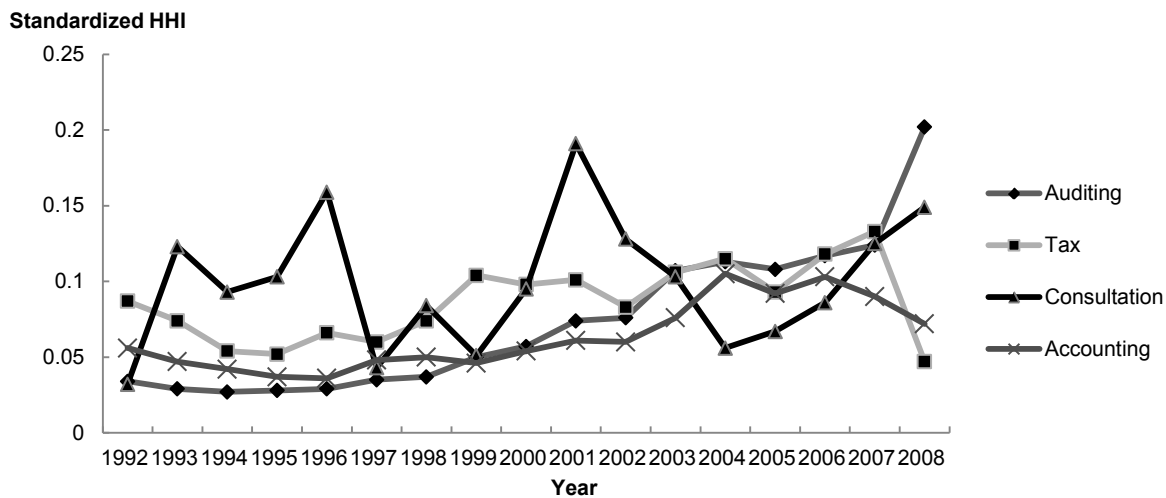
Next, Figure 2 demonstrates the annual standardized HHIs to present the long-term concentration levels during the sample period for the four sub-markets. As shown, the standardized HHIs of auditing sub-market present a steep upward movement. Both the standardized HHIs of taxing and accounting sub-markets move upward and fall after 2007 and 2006, respectively. The long-term trend of standardized HHIs for consultation sub-markets varies, exhibiting a sharp decline in 1996, a significant increase after 1999, another fall after 2001, and then beginning to rise in 2004.

To assess the long-term tendency of standardized HHIs statistically for the four sub-markets and based on model (3), this study performs a linear regression as follows.

$$YEAR = \gamma_0 + \gamma_1 SHHI + \varepsilon \tag{4}$$

where  $YEAR$  denotes year of 1992, 1993, ..., and 2008, and  $SHHI$  is the standardized HHIs for each sub-market. Coefficients on the  $SHHI$  of the auditing, tax, and accounting sub-markets have t-statistic of 8.630, 2.255, and 5.261, respectively. The coefficients are significant at either the 1% or 5% level (two tailed). However, the coefficient on the  $SHHI$  of consultation sub-market is positive but insignificant ( $t = 0.820$ ). Empirical results show that while the long-term market structure of auditing, tax, and accounting sub-markets become more concentrated and less competitive, the consultation sub-market does not change significantly.

Figure 2: Tendency of Standardized HHIs for Each Sub-Market



This figure depicts the annual standardized HHIs to present the long-term concentration levels during the sample period for the four sub-markets, auditing, tax, consultation, and accounting.

Comparisons of Competition Levels Among Sub-Samples in Different Practice Sub-Markets

*Standardized HHIs for the Four Sub-Samples in the Four Sub-Markets:* Based on the results in Tables 3 and 4 for the sub-samples and sub-markets, this section further compares the concentration levels among sub-samples in different sub-markets and lists the results in Table 5. Panel A presents the mean standardized HHIs for each sub-sample in the four practice sub-markets. Specifically, big firms have the lowest standardized HHIs (0.12) in the four sub-markets. For example, the standardized HHI of big firms in the consultation sub-market is 1.34, followed by medium (5.69), large (5.88), and small firms (9.52).

*Test of Differences in Standardized HHIs:* Univariate test is used to compare the differences in concentration level among the four sub-samples in the four practice sub-markets. Panel B in Table 5 displays the results. In the auditing sub-market, big firms have significantly lower standardized HHIs than large, medium, and small firms at the 1% level ( $Z = -4.502, -4.508, \text{ and } -4.501$ ). However, the pair-wise differences in standardized HHIs between large, medium, and small firms are statistically insignificant in the auditing sub-market. These results indicate that the competition level of big firms is the highest in the auditing sub-market. Similarly, big firms have higher competition level than the other three sub-samples in the tax sub-market.

In the consultation sub-market, big firms have lower standardized HHIs than large, medium, and small firms significantly at the 1% level ( $Z = -3.676, -4.503, \text{ and } -4.513$ ). However, large and medium firms show statistically insignificant differences in standardized HHIs. Large firms have lower standardized HHIs than small firms at the 5% level ( $Z = -2.343$ ), while medium firms are lower than small firms at the 1% level ( $Z = -4.135$ ). These results reveal that big firms are the least concentrated in the consultation sub-market, followed by both large and medium firms and then by small firms.

In the accounting sub-market, big firms have significantly lower standardized HHIs than large, medium, and small firms at the 1% level ( $Z = -4.505, -4.535, \text{ and } -4.537$ ). Large firms have significantly lower standardized HHIs than medium and small firms at the 1% level ( $Z = -3.219 \text{ and } -4.412$ ), while medium firms are significantly lower than small firms at the 10% level ( $Z = -1.884$ ). These findings indicate that competition levels of the four sub-samples in the accounting sub-market follow the increasing order of big, large, medium, and small firms.

In summary, big firms have the highest competition level in the auditing, tax, consultation, and accounting sub-markets. There is no significant difference in competition level among large, medium, and small firms in the auditing and tax sub-markets. Small firms have the lowest competition level in both consultation and accounting sub-markets.

Table 5: Standardized HHIs and Difference between Sub-Samples in Sub-Markets

Panel A Standardized HHI						
Sub-Sample Sub-Market	Big Firms (n=86) (A)	Large Firms (n=972) (B)	Medium Firms (n=2,795) (C)	Small Firms (n=8,411) (D)		
Auditing	0.12*** (0.000)	1.30*** (0.000)	1.44*** (0.000)	1.29*** (0.000)		
Tax	0.13 (0.001)	1.22 (0.002)	3.09* (0.080)	1.53 (0.001)		
Consultation	1.34*** (0.000)	5.88*** (0.000)	5.69*** (0.000)	9.52*** (0.000)		
Accounting	0.29*** (0.000)	1.62*** (0.000)	3.30*** (0.001)	3.36*** (0.000)		
Ho: Mean Standardized HHI=0						
Panel B Test of Differences in Standardized HHIs between Sub-Samples						
Sub-Market	Wilcoxon Signed-Rank Test Z-statistics (Asymptotic Significant Level)					
	(A)-(B)	(A)-(C)	(A)-(D)	(B)-(C)	(B)-(D)	(C)-(D)
Auditing	-4.502*** (0.000)	-4.508*** (0.000)	-4.501*** (0.000)	-0.851 (0.395)	-0.552 (0.581)	-0.965 (0.335)
Tax	-4.408*** (0.000)	-4.518*** (0.000)	-4.521*** (0.000)	-0.230 (0.818)	-1.409 (0.159)	-1.175 (0.240)
Consultation	-3.676*** (0.000)	-4.503*** (0.000)	-4.513*** (0.000)	-0.781 (0.435)	-2.343** (0.019)	-4.135*** (0.000)
Accounting	-4.505*** (0.000)	-4.535*** (0.000)	-4.537*** (0.000)	-3.219*** (0.001)	-4.412*** (0.000)	-1.884* (0.060)

Panel A of this table shows the annual standardized HHIs estimated for the four sub-samples in the four sub-markets. The four sub-samples are big, large, medium, and small audit firms. The four sub-markets include auditing, tax, consultation, and accounting. Panel B reports the testing results of differences in standardized HHIs among the four different sub-samples in four sub-markets. \*, \*\*, \*\*\* Denote two-tailed significance at the 10 %, 5 % and 1 % levels. Both t-test and two-sample sign test were performed to analyze the differences in standardized HHIs with the same results (un-tabulated) as reported here.

## DISCUSSION OF THE RESULTS

Tables 3, 4, and 5 reveal some results with managerial implications. For example, big firms have the highest competition level among the four sub-samples and in the four practice sub-markets. Taiwanese big firms have associated with international public accounting firms in the U.S. for more than four decades. The members of these big firms share abundant resources, including professional auditing techniques and expertise, human resource development, and continuing professional education. Further, the headquarters of international firms determine the services offered by their worldwide members, who often exchange valuable information. With this systematic mechanism of professional development, big firms have become a symbol of high quality auditors, and their reputation remains strong in Taiwan.

For example, the 2008 Public Company Accounting Oversight Board (PCAOB) reports on two Taiwanese big firms, PricewaterhouseCoopers and Ernst and Young, indicate that the inspection team did not identify any quality control defects worthy of mention (PCAOB, 2008). As stated above, both big and large firms render audit services to public companies in Taiwan. As a result, the big firms in this study account for approximately 84% of the revenues generated from offering audit services to public companies, while large firms account for the remaining 16%. Because the general public rates each big firm with equal service quality, big firms compete with each other for business within the same market. For example, to solicit new client, a Taiwanese big firm sets a zero audit fee on initial audit engagements (China Times, April 7, 2003). The firm then maneuvers a low-balling practice to expand its market share and increases future profit by realizing client-specific quasi-rents to the incumbent firms. As big firms provide services with homogeneous quality, they exhibit the highest relative competition level among the four sub-samples and in the four practice sub-markets.

Although the long-term market structures of auditing and accounting sub-markets become less competitive, Table 4 indicates that both sub-markets have the highest long-term competition level among the four sub-markets. The two most important sub-markets for the sample period are auditing and accounting, which depicts approximately 73.52% and 12.61% of total industry revenues (see the Panel C in Table 2). Auditors lend credibility to financial statements by rendering auditing services and facilitate the sound functioning of capital market. Because the auditing and accounting services are a general requirement by various governmental agencies, they are services that clients need but do not necessarily want (Istvan, 1984). Earlier entrants to this market gain a competitive advantage over subsequent ones. The entry barrier makes the auditing and accounting sub-markets become less competitive in the long run. When compared with other sub-markets, however, both sub-markets have the highest long-term competition level due to the following regulations in Taiwanese audit industry. One is the raise of passing rate of the Certified Public Accountants (CPAs) uniform examination in 1988. Next, the Taiwanese Fair Trade Commission abolished the long-standing audit fee standard to ensure fair audit market competition in 1998. The other is the establishment of tax agent system to provide accounting services to small and medium-sized enterprises by tax agents in 2004.

In 1998 the Taiwanese Fair Trade Commission abolished the long-standing audit fee standard, established by the Taiwan Institute of CPAs, to ensure fair audit market competition. Since that time, market competition has increased. Further, the Ministry of Finance established a tax agent system and legalized the provision of corporate registration and accounting services by tax agents to small and medium-sized enterprises in 2004. The legalization of tax agents negatively affects the accounting sub-market due to the competitive advantages enjoyed by tax agents for their relatively lower fees and ease of service access by client. In contrast, the provision of consultation services typically requires greater involvement and communication between auditors and clients to meet specific service demands. Because consultation businesses are not regulated by the auditing standards, they are more flexible in formats, timing, and places of service provisions. Consultation services are often tailor-made and have no service fee standard, thereby making them more profitable than auditing and accounting services (Banker, Chang, and Cunningham, 2005). Consequently, consultation services create better business opportunities for auditors to expand their scope of services. Panel A in Table 4 shows that the consultation sub-market has the highest mean standardized HHIs (0.099) among the four sub-markets. Further, Panel A in Table 5 shows that consultation sub-market has highest mean standardized HHIs in the big firms (1.34), large firms (5.88), medium firms (5.69), and small firms sub-samples (9.52). These results indicate that the consultation sub-market is the least competitive of the four practice sub-markets for the four sub-samples.

## **COMPARISONS OF OPERATING PERFORMANCE FOR DIFFERENT SUB-SAMPLES**

As shown in Tables 3 and 5, big firms have the least concentrated and the most competitive market among the four sub-samples in the long run. Economic theory suggests that price-cost margins (profits) should be higher in more concentrated markets (Besanko et al., 2000). Does a highly concentrated market lead to superior operating performance for firms in that market? Specifically, whether the big firms are inferior in operating performance to the large, medium, and small firms?

Operating performance can be assessed by non-financial measures, such as product quality and customer satisfaction index, or by financial measures, such as profit, return on assets (ROA), and return on invested capital (ROI). As a professional service organization, public accounting firms rarely possess the fixed assets typically owned by a manufacturing or merchandising company (Collins-Dodd, Gordon, and Smart, 2004). This study omits ROA and ROI and estimates three financial measures used in previous studies related to public accounting firms: net profit per partner (Chen et al., 2008), profit ratio (Fasci and Valdez, 1998), and productivity/product per employee (Collins-Dodd et al., 2004). The operational definitions of these financial performance measures are as follows.

1. Net profit per partner = (total revenues – total expenses + salaries paid to partners)/ number of partners;
2. Profit ratio = (total revenues – total expenses + salaries paid to partners)/ total revenues;
3. Productivity per employee = total revenues/ number of employees.

Partners are the owners and residual interest claimants of a public accounting firm. Their annual income comprises salaries and share of operating profits of the firm. The salaries of partners, weekly or monthly, are a part of total expenses of the firm. The more the salaries of the partners, the less the operating profits of the firm. It makes no difference to the partners whether they receive salaries or not in terms of their total annual income. In addition, the criteria for salary payments to partners vary across firms. Based on prior study (Chen et al., 2008), in calculating the net profit per partner and profit ratio, this study adds the partner salaries back to net income to reduce such an artificial noise.

Table 6 compares the operating performance for different sub-samples. Panel A shows that big firms have much higher net profit per partner (\$6,012,216) than large firms (\$1,619,321), medium firms (\$834,083), and small firms (\$671,045). Big firms have the highest profit ratio (0.243), followed closely by large firms (0.242), and then medium firms (0.216) and small firms (0.184). On average, productivity per employee is much higher in the big firms (\$1,414,679) than in the large firms (\$913,113), medium firms (\$743,546), and small firms (\$662,980).

Table 6: Comparisons of Operating Performance between Sub-Samples

<b>Panel A Mean Operating Performance</b>						
	<b>Big Firms (n=86) (A)</b>	<b>Large Firms (n=972) (B)</b>	<b>Medium Firms (n=2,795) (C)</b>	<b>Small Firms (n=8,411) (D)</b>		
Net Profit Per Partner	6,012,216	1,619,321	834,083	671,045		
Profit Ratio	0.243	0.242	0.216	0.184		
Productivity Per Employee	1,414,679	913,113	743,546	662,980		
<b>Panel B Test of Difference in Operating Performance</b>						
	<b>(A)–(B) (t-statistic)</b>	<b>(A)–(C) (t-statistic)</b>	<b>(A)–(D) (t-statistic)</b>	<b>(B)–(C) (t-statistic)</b>	<b>(B)–(D) (t-statistic)</b>	<b>(C)–(D) (t-statistic)</b>
Net Profit Per Partner	4,392,895 (16.181)***	5,178,133 (19.239)***	5,341,171 (19.862)***	785,238 (18.924)***	948,276 (23.722)***	163,038 (8.957)***
Profit Ratio	0.001 (0.259)	0.027 (4.088)***	0.059 (9.201)***	0.026 (5.090)***	0.058 (12.425)***	0.032 (7.207)***
Productivity Per Employee	501,566 (9.453)***	671,133 (10.509)***	751,699 (8.499)***	169,567 (9.022)***	250,133 (14.310)***	80,566 (5.436)***

Table 6 compares the operating performance among the four sub-samples. Measures of operating performance include net profit per partner, profit ratio, and productivity per employee. Panel A lists the mean operating performance for the four sub-samples and Panel B shows the testing results of difference in operating performance between different sub-samples. \*, \*\*, \*\*\* Denote two-tailed significance at the 10 %, 5 % and 1 % levels. Both net profit per partner and productivity per employee are expressed in new Taiwan dollars. A two-sample sign test was performed to analyze the difference in standardized HHIs with the same results (un-tabulated) as that reported here.

Panel B shows performance differences between sub-samples. Big firms have higher net profit per partner than large firms (t = 16.181), medium firms (t = 19.239), and small firms (t = 19.862), all statistically significant at the 1% level. Large firms have significantly higher net profit per partner than medium firms (t = 18.924) and small firms (t = 23.722) at the 1% level. Finally, medium firms have significantly better net profit per partner than small firms at the 1% level (t = 8.957). The differences in profit ratio between big and large firms are positive but insignificant. However, big firms have a significantly higher profit ratio than medium and small firms at the 1% level (t = 4.088 and 9.201). Likewise, large firms have a significantly higher profit ratio than medium and small firms at the 1% level (t = 5.090 and 12.425).

The profit ratio of medium firms is significantly better than that of small firms (t = 7.207). Finally, in terms of productivity per employee, big firms are better than large firms (t = 9.453), large firms are better than medium firms (t = 9.022), and medium firms are better than small firms (t = 5.436). All of these results are statistically significant at the 1% level. Collectively, big firms perform the best in net profit per partner, profit ratio, and productivity per employee. Large firms outperform medium and small firms, and medium firms outperform small firms in the three performance measures. Classification of

the four sub-samples used in this study is equivalent to audit firm size category. Hence, the larger the size of public accounting firms, the better the financial performance of the firms. Although big firms experience the highest long-term competition level, they achieve the best operating performance among the four sub-samples.

### COMPARISONS OF OPERATING PERFORMANCE BETWEEN PRE- AND POST-MERGER PUBLIC ACCOUNTING FIRMS

Mergers between big international firms are notable events for regulators and academics (e.g., McMeeking et al., 2007). Two mergers between Taiwanese big firms occur during the sampling period. The first is the 1999 merger of Coopers and Lybrand (CL) and Price Waterhouse (PW), which shrinks the Big Six to the Big Five (hereafter, the PwC event). The second merger is the 2003 Arthur Andersen (AA) and Deloitte & Touche (DT) merger, which creates the largest firms in Taiwan, Deloitte Touche Tohmatsu (hereafter, the DTT event). The 1999 merger provides PricewaterhouseCoopers (PwC) with the largest market share and a two-firm concentration ratio (CR2) that climbed from 42.69% in 1998 to 49.19% in 1999. The Deloitte Touche Tohmatsu ranked first in market share in 2003 and a CR2 soared up from 48.94% in 2002 to 64.08% in 2003. These results confirm that mergers between public accounting firms yield increased concentration within the audit market (e.g., McMeeking et al., 2007).

Does the more concentrated and less competitive market lead to superior operating performance in the post-merger public accounting firms? Panel A in Table 7 displays the three financial performance figures of pre-merger and post-merger public accounting firms for the PwC and DTT events, including net profit per partner, profit ratio, and productivity per employee. The first two figures represent measures of individual firms, while the last figure represents their weighted average measure. In the PwC event, the first figure is for Price Waterhouse (PW) and the second is for Coopers and Lybrand (CL). In the DTT event, the first figure is for Arthur Andersen (AA) and the second is for Deloitte & Touche (DT). Size of PW is larger than CL, and AA is larger than DT before the merger. However, financial performance does not always the case, and depends upon the measures used. In the DTT event, for example, mean net profit per partner for AA (\$5,817,561) in 1992 was higher than that of DT (\$4,989,567), but mean productivity per employee for AA (\$1,104,140) was lower than that of DT (\$1,282,850).

Table 8 shows differences in operating performance between pre and post-merger accounting firms. Table 8, Panels 1, 2, and 3 report the statistical testing results of differences in the three financial performance measures between pre-merger and post-merger public accounting firms. Panel B-1 shows that post-merger firms have significantly higher net profit per partner than pre-merger firms for the PwC and DTT events at the 1% and 5% levels ( $t = 3.932$  and  $2.192$ ;  $Z = 3.191$  and  $1.868$ ). Panel B-2 indicates that post-merger firms have a lower profit ratio than pre-merger firms but insignificant for both the PwC and the DTT events.

Panel B-3 displays the differences in productivity per employee. Similar to the trend in Panel B-1, post-merger firms have significantly higher productivity per employee than pre-merger firms in the PwC and DTT events at the 1% level ( $t = 4.500$  and  $4.199$ ;  $Z = 4.450$  and  $3.270$ ). For the PwC and DTT events, mergers lead to increased concentration and superior operating performance in both net profit per partner and productivity per employee, but produce an immaterial change in the profit ratio. Combining two firms achieves substantial savings in fixed costs for knowledge sharing and support personnel. This is because a post-merger firm may be better able to exploit opportunities and generate additional revenues because of its size, professional skills, and experience. The synergy between these factors may reduce costs, increase revenues, and create economies of scale (Banker et al., 2003).

#### Additional Test and Managerial Implications

*Additional Test of Audit Market Concentration:* To provide audit services to public companies in Taiwan, public accounting firms must have more than two partners to practice. In the previous sample classification, both big and large firms meet this requirement. Tyranski (2008) states that while the

reputation of Big 4 firms remains strong in the U.S. audit market, many large and medium firms continue to gain market share among public companies. To some extent, big and large firms in effect compete for clients in the same market (Elder, Beasley, and Arens, 2008). Hence, this study groups the big and large firms into a category called public firms for additional analysis.

Table 7: Comparisons of Performance between Pre- and Post-Merger Public Accounting Firms

Annual Performance of The Pre- and Post-Merger Public Accounting Firms						
Year	Net profit Per Partner	PwC event Profit Ratio	Productivity Per Employee	Net profit Per Partner	DTT event Profit Ratio	Productivity Per Employee
1992	\$4,960,386	0.231	\$1,068,122	\$5,817,561	0.269	\$1,104,140
	6,183,084	0.258	1,106,578	4,989,567	0.218	1,282,850
	5,296,628	0.245	1,079,292	5,281,800	0.244	1,215,893
1993	4,249,714	0.217	1,026,354	5,118,411	0.276	1,007,275
	2,935,850	0.143	973,783	5,324,113	0.177	1,660,700
	3,858,350	0.180	1,009,562	5,236,499	0.227	1,379,175
1994	6,112,756	0.225	1,353,847	5,494,696	0.277	1,250,062
	3,751,976	0.201	1,240,609	3,479,095	0.122	1,744,499
	5,188,972	0.213	1,317,045	4,342,924	0.199	1,536,481
1995	5,429,694	0.198	1,160,871	5,656,901	0.223	1,367,214
	4,983,434	0.264	1,224,082	5,898,877	0.175	1,787,767
	5,251,190	0.231	1,180,064	5,803,984	0.199	1,624,464
1996	6,032,793	0.281	1,048,273	5,933,573	0.176	1,767,183
	6,560,655	0.245	1,308,749	3,171,739	0.187	1,165,726
	6,371,421	0.263	1,215,165	4,591,015	0.182	1,515,011
1997	7,197,075	0.227	1,268,167	5,232,794	0.275	1,126,407
	8,583,860	0.329	1,181,675	7,332,175	0.222	1,793,716
	7,746,556	0.278	1,236,394	6,296,864	0.248	1,479,231
1998	—	—	—	5,697,949	0.180	1,750,797
	—	—	—	4,631,143	0.208	1,120,871
	5,277,024	0.202	1,387,415	5,195,923	0.194	1,440,177
1999	—	—	—	5,834,061	0.215	1,795,315
	—	—	—	5,338,826	0.249	1,283,270
	7,644,118	0.257	1,418,019	5,602,059	0.232	1,542,203
2000	—	—	—	7,425,935	0.296	1,586,026
	—	—	—	7,577,200	0.230	2,162,901
	7,093,224	0.217	1,476,282	7,509,971	0.263	1,901,168
2001	—	—	—	9,491,483	0.269	2,575,964
	—	—	—	4,586,726	0.195	1,777,322
	7,837,157	0.213	2,030,910	7,887,729	0.232	2,230,435
2002	—	—	—	7,374,727	0.205	2,657,304
	—	—	—	8,134,741	0.287	1,589,983
	8,117,745	0.231	2,197,096	7,713,907	0.246	2,107,851
2003	8,089,860	0.243	2,157,043	9,189,091	0.268	2,473,793
2004	8,101,415	0.252	3,412,142	8,136,970	0.296	2,638,740
2005	7,881,657	0.239	1,730,970	6,902,613	0.267	2,096,446
2006	5,682,412	0.149	1,722,005	5,180,018	0.157	2,194,549
2007	9,578,168	0.231	1,866,581	6,731,827	0.158	2,289,222
2008	8,959,812	0.216	1,951,902	7,429,128	0.158	2,276,921

Table 7 displays annual operating performance for the pre- and post-merger public accounting firms. It lists nine (three) figures for the pre-merger (post-merger) years for both PwC and DTT events. In the pre-merger years in each column, the first two figures are shown for individual firms and the last figure for their weighted average measure. After merger, the three figures are for the merged firm. Measures of performance include net profit per partner, profit ratio, and productivity per employee. Both net profit per partner and productivity per employee are expressed in new Taiwan dollars.



Table 8: Differences in Operating Performance between Pre and Post-Merger Accounting Firms

	Post-Merger Mean (Median)	Pre-Merger Mean (Median)	Difference	t-statistic (Z-statistic)
<b>Panel 1 Net Profit Per Partner</b>				
PwC	7,660,236 (7,881,657)	5,594,133 (5,363,161)	2,066,103 (2,518,496)	3.932*** (3.191***)
New DT	7,261,608 (7,165,871)	5,909,241 (5,656,901)	1,352,366 (1,508,970)	2.192** (1.868**)
<b>Panel 2 Profit Ratio</b>				
PwC	0.223 (0.231)	0.236 (0.231)	-0.013 (0.001)	-0.875 (-0.860)
New DT	0.220 (0.215)	0.225 (0.220)	-0.005 (-0.005)	-0.194 (-0.371)
<b>Panel 3 Productivity Per Employee</b>				
PwC	1,940,942 (1,866,581)	1,166,591 (1,180,870)	774,352 (685,711)	4.500*** (4.450***)
New DT	2,328,279 (2,283,072)	1,616,042 (1,586,026)	712,237 (697,046)	4.199*** (3.270***)

Table 8 shows the testing results of difference in operating performance between pre- and post-merger public accounting firms. \*, \*\*, \*\*\* Denote two-tailed significance at the 10 %, 5 % and 1 % levels. Both net profit per partner and productivity per employee are expressed in new Taiwan dollars.

After calculating the standardized HHIs for the newly established sub-sample, this study compares the HHI differences between the three sub-samples: public firms, medium firms, and small firms. The differences in standardized HHIs and operating performance for the three sub-samples are then statistically tested in the four practice sub-markets. The un-tabulated empirical results are similar to those reported in Panel B of Tables 3 through 6. Public firms have the lowest concentration and highest competition levels for the three sub-samples and in the four practice sub-markets. Public firms perform the best in net profit per partner, profit ratio, and productivity per employee.

### Managerial Implications of the Results

The empirical results of this study show that the auditing and accounting sub-markets are the most competitive in the four sub-markets, while the tax and consultation sub-markets are the least competitive. This study defines tax practices as tax planning, administrative remedy of internal taxation, and other tax operation services. Practically, tax and consultation practices are often referred to as a broadly defined management advisory service (MAS). For the past few decades, traditional practice market, such as auditing and accounting sub-markets of this study, has been increasingly competitive and less lucrative for practitioners. The findings of this study suggest that practitioners may expand their services to the MAS because it creates unlimited business opportunity and has no adverse effect on their auditor independence, especially for practitioners in the medium and small firms which provide no audit services to public companies. Next, this study demonstrates that mergers between big firms increase market concentration level. However, the long-term concentration level of big firms sub-sample does not change significantly. This indicates that mergers between big firms do not adversely change market structure and post-merger firms achieve better operating performance than pre-merger ones. This suggests that practitioners take into account the mergers between public accounting firms because combining two firms leads to synergy, substantial cost savings, increased revenue, and economies of scale (Banker et al., 2003). Long-term cooperation between U.S. and Taiwanese audit industries has created a similar audit market structure in both countries. Hence, the implications of this study apply to practitioners in any countries with audit markets similar to that in the U.S.

### CONCLUSIONS

Based on long-term audit fee information for all public accounting firms in Taiwan, this study presents a direct measure of market share for estimating the Herfindahl-Hirschman index (HHI). To facilitate cross-sample comparisons, this study creates a standardized HHI and obtains the following results. First, this study presents empirical results for four sub-samples: big, large, medium, and small firms. Standardized HHIs indicate variance in the long-term market competition levels for the four

sub-samples. Big firms have the highest competition level, but large, medium, and small firms exhibit no significant difference in the competition level. However, the long-term level of market competition does not change significantly in the four sub-samples.

Next, this study reports findings on the long-term market structure for the four practice markets, including auditing, tax, consultation, and accounting sub-markets. The auditing and accounting sub-markets have significantly higher competition level than the tax and consultation sub-markets. Further, the long-term market structure of auditing, tax, and accounting sub-markets becomes less competitive, while that of the consultation sub-market does not change significantly. Big firms have the highest competition level in the four sub-markets. Given the highest competition level, big firms have better financial performance than the other three sub-samples. Post-merger firms outperform pre-merger firms for both the 1999 PwC and the 2003 DTT events.

The results above should be interpreted in light of the following limitations. First, this study utilizes the Herfindahl-Hirschman index (HHI) to assess audit market concentration and then use it to determine the competition level. Prior studies state that it is essential to assess the circumstances surrounding the competitive interaction of firms to make conclusions about the nature of competition, rather than rely solely on the HHI (Besanko et al., 2000). Second, this study uses a univariate test to compare the operating performance for different sub-samples and for pre- and post-merger public accounting firms. This method does not control for other factors affecting operating performance. Comparison of operating performance has important implications for practitioners, academics and regulators alike. Adopting a more rigorous method, such as a multiple regression model, on this issue constitutes a promising avenue for future studies.

## REFERENCES

- Akehurst, G. (1984) "Checkout: The Analysis of Oligopolistic Behaviour in the UK Grocery Retail Market," *The Service Industries Journal*, vol. 4(2), p. 189-242.
- Bandyopadhyay, S.P. and J.L. Kao (2004) "Market Structure and Audit Fees: A Local Analysis," *Contemporary Accounting Research*, vol. 21(3), p. 529-561.
- Banker, R.D., H. Chang and R. Cunningham (2003) "The Public Accounting Industry Production Function," *Journal of Accounting and Economics*, vol. 35(2), p. 255-281.
- Banker, R.D., H. Chang and R. Cunningham (2005) "Productivity Change, Technical Progress, and Relative Efficiency Change in the Public Accounting Industry," *Management Science*, vol. 51(2), p. 291-304.
- Besanko, D., D. Dranove and M. Shanley (2000) "Economics of Strategy," NY: John Wiley & Sons, Inc.
- Brocheler, V., S. Maijoor and A.V. Witteloostuijn (2004) "Auditor Human Capital and Audit Firm Survival: The Dutch Audit Industry in 1930-1992," *Accounting, Organizations and Society*, vol. 29(7), p. 627-646.
- Chen, Y.S., B.G. Chang and C.C. Lee (2008) "The Association between Continuing Professional Education and Financial Performance of Public Accounting Firms," *The International Journal Human Resources Management*, vol. 19(9), p. 1720-1737.
- China Times (Taiwan), April 7, 2003.
- Choi, M.S. and D. Zeghal (1999) "The Effect of Accounting Firm Mergers on International Markets for Accounting Services," *Journal of International Accounting, Auditing and Taxation*, vol. 8(1), p. 1-22.

Collins-Dodd, C., I. M. Gordon and C. Smart (2004) "Further Evidence on The Role of Gender in Financial Performance," *Journal of Small Business Management*, vol. 42(4), p.395-417.

Cowling, K., F.M. Yusof and G. Vernon (2000) "Declining Concentration in UK Manufacturing? A Problem of Measurement", *International Review of Applied Economics*, vol. 14(1), p. 45-54.

Daniels, P.W., A. Leyshon and N.J. Thrift (1988) "Large Accountancy Firms in the UK: Operational Adaptation and Spatial Development," *The Service Industries Journal*, vol. 8(3), p. 317-346.

DeFond, M.L., J.R. Francis and T.J. Wong (2000) "Auditor Industry Specialization and Market Segmentation: Evidence from Hong Kong," *Auditing: A Journal of Practice and Theory*, vol. 19(1), p.49-66.

Drucker, P. (1994) "The Age of Social Transformation," *The Atlantic Monthly*, vol. 274, p. 53-80.  
Elder, R.J., M.S. Beasley and A.A. Arens (2008) "Auditing and Assurance Services: An Integrated Approach," NJ: Prentice Hall.

Fasci, M.A. and J. Valdez (1998) "A Performance Contrast of Male- and Female-Owned Small Accounting Practices," *Journal of Small Business Management*, vol. 36(3), p. 1-7.

Francis, J.R., E.L. Maydew and C.H. Sparks (1999) "The Role of Big 6 Auditors in the Credible Reporting of Accruals," *Auditing: A Journal of Practice and Theory*, vol. 18(2), p. 17-34.

GAO, (2008) "Audits of Public Companies: Continued Concentration in Audit Market for Large Public Companies Does Not Call For Immediate Action," United States Government Accountability Office Report to Congressional Addressees.

Ghosh, A. and S. Lustgarten (2006) "Pricing of Initial Audit Engagements by Large and Small Audit Firms," *Contemporary Accounting Research*, vol. 23(2), p. 333-368.

Goddard, G.K. (1998) "ACCC Assessment of the Coopers & Lybrand and Price Waterhouse Merger: Analysis of Competition in The Provision of Professional Services by Big Six Accounting Firms," *Australian Business Law Review*, vol. 26, p. 402-417.

Hall, W.K. (1980) "Survival Strategies in A Hostile Environment," *Harvard Business Review*, 58, p. 75-85.

Hardwick, P. (1996) "Concentration and Stability in the Mutual Building Society Industry," *The Service Industries Journal*, vol. 16(1), p. 47-57.

Istvan, D.F. (1984) "The Future of the Accounting Profession: Will Your Firm Survive Until 1990?" *The Practical Accountant*, vol. 17(April), p. 71-74.

Jennequin, H. (2008) "The Evolution of the Geographical Concentration of Tertiary Sector Activities in Europe," *The Service Industries Journal*, vol. 28(3), p. 291-306.

Klein, B. and Leffler, K.B. (1981) "The Role of Market Forces in Assuring Contractual Performance," *Journal of Political Economy*, 89, p. 615-641.

Lee, S.D. (2005) "The Impact of the Big 8 Mergers on Market Power: Evidence from the Hong Kong Market," *Journal of International Financial Management & Accounting*, vol. 16(1), p. 69-96.

Lee, Y.Y., Y.T. Park and H.S. Oh (2000) "The Impact of Competition on the Efficiency of Public Enterprise: The case of Korea Telecom," *Asia Pacific Journal of Management*, vol. 17, p. 423-442.

McMeeking, K.P., K.V. Peasnell and P.F. Pope (2007) “The Effect of Large Audit Firm Mergers on Audit Pricing in the UK,” *Accounting & Business Research*, vol. 37(4), p. 301-319.

Minyard, D.H. and R.H. Tabor (1991) “The Effect of Big Eight Mergers on Auditor Concentration,” *Accounting Horizons*, vol. 5(4), p. 79-90.

Moizer, P. and W.S. Turley (1987) “Surrogates for Audit Fees in Concentration Studies,” *Auditing: A Journal of Practice & Theory*, vol. 7(1), p. 118-123.

Porter, M.E. (1980) “*Competitive Strategy*,” NY: The Free Press.

Public Company Accounting Oversight Board—PCAOB (2008) *Inspection Reports*. Accessed June 19 and Sept. 30, 2008 from the Public Company Accounting Oversight Board Web site: [pcaobus.org/Inspections/Reports/Pages/default.aspx](http://pcaobus.org/Inspections/Reports/Pages/default.aspx)

Thavapalan, S., R. Moroney and R. Simnett (2002) “The Effect of the PricewaterhouseCoopers Merger on Auditor Concentration in Australia: A Note,” *Accounting & Finance*, vol. 42(2), p. 153-167.

Tyranski, G.W. (2008) “Concentration and Competition in the Auditing Profession,” *CPA Journal*, October, p. 10-11.

Van de Ven, A. (2004) “The Context-Specific Nature of Competence and Corporate Development,” *Asia Pacific Journal of Management*, vol. 21, p. 123-147.

Weiss, L. (1989) “Concentration and Price,” MA: MIT Press.

Wernerheim, C.M. (2010) “The Tendency of Advanced Services to Co-Locate and the Implications for Regional Government Policy,” *The Service Industries Journal*, vol. 30(5), p. 731-748.

Yardley, J., N. Kauffman, T. Cairney and W. Albrecht (1992) “Supplier Behavior in the U.S. Audit Market,” *Journal of Accounting Literature*, vol. 2, p. 151-184.

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