

**Economies of Scale and Industry Specialist Audit Pricing:
Evidence from Audit Firm Merger in Hong Kong**

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ABSTRACT

This paper examines the economies of scale effect on audit pricing by using the merger of a specialist auditor with a non-specialist. The issue is not investigated in prior literature because the observed higher audit fees for specialist are the net result of the unobservable premium for specialisation and the scale of economies effect which is also unobservable. To investigate the issue, I use the merger of a specialist (Deloitte & Touche) with a non-specialist (Kwan Wong Tan & Fong (KWTF)) in Hong Kong. The effect of the merger with the non-specialist is the larger economies of scale effect alone because the non-specialist will not bring in increased specialisation that is sufficient to command a premium for specialisation. Thus, I analyse the changes in audit fees of old clients of Deloitte & Touche before and after its merger with KWTF. I report that Deloitte & Touche only earns a fee premium before but not after the merger. In addition, all clients (old and new) do not pay a fee premium after the merger. Furthermore, the results hold for new clients that formerly employ KWTF and other new clients. Thus, the scale of economies effect is a widespread phenomenon and is sufficient to offset the premium due to specialisation.

Keywords: Economies of scale, audit fee premium, industry specialist, audit firm merger

Data Availability: Data are publicly available from sources identified in the paper.

1 INTRODUCTION

This paper examines the scale of economies effect on audit pricing by studying audit fee premium of industry specialist. The scale of economies effect is an important issue because it lowers audit costs of production and hence audit fees. However, the scale of economies effect is unobservable because of the lack of data on audit costs. Therefore, Ferguson and Stokes (2002, footnotes 2 and 3), using merger of big audit firms, do not examine the effect of economies of scale on audit fees. Nevertheless, as economies of scale lowers audit fees, changes in economies of scale will be reflected in changes in audit fees. Merger of audit firms will increase economies of scale of the merged firm and provide a good opportunity to examine the scale of economies effect on audit pricing. In this paper, I examine the effect of economies of scale on audit pricing by using merger of an industry specialist with a non-specialist.

Auditors who are industry specialists are reported to have higher audit fees for their specialised knowledge (Craswell et al. (1995) and DeFond et al. (2000)). Industry specialists are usually defined as the market leader, either in terms of clients or audit fees.¹ By being the market leader, the specialist accumulates his knowledge over the industry and achieves economies of scale. Therefore, the observed audit fee premium for industry specialist is the net result of the higher audit fees of the unobservable specialisation effect over the effect (also unobservable) of the economies of scale. The merger of large audit firms could not throw light on the effect of economies of scale on audit pricing because Big 8 or Big 6 auditors are usually specialists in the same industry and their merger will increase audit fee premium for specialists and such an increase may offset the savings from further

increase in economies of scale. What is needed is the merger of an industry specialist with a non-specialist.² Old clients of the specialist will be paying the same premium for specialisation effect but at the same time, the savings from economies of scale, if passed to the clients, will mean a reduction in the observable premium paid by the old clients.

In this paper, I use the merger in April 1997 of Deloitte & Touche³ with Kwan Wong Tan & Fong (KWTF) in Hong Kong to study the effect of economies of scale on audit pricing. In Hong Kong, listed firms are classified into one of the seven industries: industrials, property development, hotels, utilities, consolidated enterprises, finance and others. DeFond et al. (2000, 58), using 1992 data, report that Deloitte & Touche is the market leader in the “industrial” industry but KWTF is not. KWTF is the largest local firm in Hong Kong and its merger with Deloitte & Touche enlarges the client base of Deloitte & Touche considerably. For Deloitte & Touche, its presence in Hong Kong since 1972 is the result of a number of successful mergers, including the one with KWTF.⁴ If after the merger, savings of economies of scale are passed to the clients, then the observable premium paid by old clients of Deloitte & Touche may be lower. Hence, in this paper, I examine changes in audit fees of firms in the industrial sector in Hong Kong⁵ before and after the merger.

A paper that also uses sample firms (clients) of Deloitte & Touche’s merger with KWTF is Firth and Lau (2004). However, that paper does not examine audit pricing of specialist in the industrial sector⁶ or “attribute any premium ... to industry specialism” in the sample (Firth and Lau, 2004, 202). In addition, the research design does not allow reliable inferences to be made from the results. For example, the sample only comprises clients of Deloitte & Touche and KWTF but not clients of

other auditors. Hence, the paper lacks a control group of firms for events that happen in the sample period that apart from the merger could also drive the results. Second, clients are regarded as clients of Deloitte & Touche once they are clients of that auditor in the long sample period (1993 to 1999) despite auditor change during that period. This would probably cause misclassification of observations or render a lack of control for firms that change auditors in the research design. Last, the long sample period (being a long window) is not sufficient to focus sharply on the effect of merger on audit pricing.

I report that before and after its merger, Deloitte & Touche is a specialist in the industrial sector based on its share of clients or audit fees in the industry. However, it commands an audit fee premium only before its merger with Kwan Wong Tan & Fong. In addition, I report that both old and new (which previously employ KWTF or others) clients of Deloitte & Touche do not pay a fee premium after the merger. Hence, there is scale of economies effect on audit pricing by Deloitte & Touche and this effect spreads to all clients of Deloitte & Touche.

This paper contributes to the auditing literature by providing insight into the market structure of auditing. It is the first paper to examine the scale of economies effect on audit pricing and the results suggest that the effect is at work, and able to offset audit fee premium. Therefore, in the audit market, merger is beneficial to the firms and their clients.

The next section of the paper develops the hypothesis. The research method is then discussed, followed by a description of the sample selection. The last two sections discuss the results, including sensitivity analyses, and the conclusions of the paper.

2 HYPOTHESIS

To be a specialist requires in-depth knowledge, focus and experience. By focus and experience, a specialist spends most of his time in his chosen area of specialisation. For knowledge, it can be general or specific. While general knowledge can be gained easily by learning (e.g., a subject), specific knowledge requires frequent contact of, or involvement in, the situation and is idiosyncratic (see Jensen and Meckling (1995)). Hence, general knowledge can be transferred easily but specific knowledge can only be transferred at high costs.⁷ A specialist requires not only general knowledge but also specific knowledge. It is this specific knowledge that represents mostly the invested capital of a specialist and commands a premium.⁸ Furthermore, “(a)n auditor with a large client base can support more areas of specialized knowledge and can more efficiently utilize individuals with specialized knowledge than auditors with few clients” (Sullivan, 2002, 381). More importantly, auditors with more clients are exposed to a wider variety of industrial situations and accounting and auditing issues than auditor with a few clients.⁹ Therefore, specialists are likely to be market leaders in the industry¹⁰ and command a fee premium.¹¹

Prior studies (e.g., DeFond et al. (2000) and Ferguson et al. (2003)) report that specialist auditors earn a premium for specialisation. However, given that the specialist is the market leader in the industry, the specialist also achieves economies of scale.¹² Hence, the observed audit fee premium is the net effect of two unobservable factors: upward drive on audit fees due to specialisation and downward drive on audit fees due to economies of scale. In order to disentangle the effect of one factor from that of another, it is necessary to find a setting in which one factor is likely to be stationary or unchanged. Merger of audit firms provide such an

opportunity. However, major mergers of audit firms usually involve the Big 8 or Big 6 firms. These mergers would not be suitable to disentangle the different effects because premium for specialisation is likely to increase after the merger as Big 8 or Big 6 firms are likely to be specialists in the same industry. Hence, what is required is the merger of a specialist with a non-specialist which has an enough size to achieve further economies of scale.

If an industry specialist merges with a non-specialist in the same area, the economies of scale will increase further.¹³ Such an increase could be a result of increased labour productivity and greater division of labour within the merged firm. More importantly, “(b)ecausue of of switching costs, it may be difficult to achieve such scale economies without a merger” (Sullivan, 2002, 381). However, the premium for specialisation is unlikely to increase after the merger because the non-specialist may not bring in sufficient specialised knowledge to the merged audit firm. Hence, old clients of the specialist, if they are passed savings of economies of scale from the merger, will pay lower net (observable) fee premium. New clients of the specialist will pay audit fees which are the net effect of the industry specialist’s premium for specialisation, the effect, if any, of economies of scale, and low-balling. Of course, if there is no passing of the savings from economies of scale to the clients (old and new), old clients of the specialist will pay the same observable fee premium as before the merger, holding all other factors constant, and new clients pay audit fees which are the net effect of specialisation and low-balling. Hence, by comparing changes in audit fee premium of old clients of a specialist before and after the merger, it is possible to disentangle the effect of economies of scale from the premium for

specialisation. Thus, using the merger of Deloitte & Touche with KWTF in Hong Kong (see previous discussion), I formulate the following hypothesis for testing.

Hypothesis (H₁) 1 Existing clients of Deloitte & Touche in the “industrial” industry are more likely to pay lower audit fee premium to Deloitte & Touche after the merger of Deloitte & Touche with Kwan Wong Tan & Fong.

3 RESEARCH METHOD AND SAMPLE

To investigate the audit fee premium of Deloitte & Touche before and after its merger with Kwan Wong Tan & Fong in the industrial sector, I run ordinary least squares regression on the following equation.

$$\begin{aligned} \text{LAF} = & a_0 + a_1\text{LTA} + a_2\text{SUBS} + a_3\text{FOREIGN} + a_4\text{CATA} + \\ & a_5\text{QUICK} + a_6\text{DE} + a_7\text{ROI} + a_8\text{YE} + a_9\text{LOSS} + \\ & a_{10}\text{MODIFY} + a_{11}\text{DTT} \end{aligned} \quad (1)$$

where

LAF	=	natural logarithm of total audit fees
LTA	=	natural logarithm of total assets (in thousands)
SUBS	=	square root of the number of subsidiaries
FOREIGN	=	proportion of subsidiaries that are foreign
CATA	=	current assets divided by total assets
QUICK	=	current assets minus inventories divided by current liabilities
DE	=	long-term debt divided by total assets
ROI	=	earnings before interest and taxes divided by total assets
YE	=	1 if the firm has non-March 31 fiscal year end, or 0 otherwise
LOSS	=	1 if the firm has a reported loss in the current year, or 0 otherwise
MODIFY	=	1 if the audit opinion is modified, or 0 otherwise
DTT	=	1 if the firm’s auditor is Deloitte & Touche, or 0 otherwise

In line with prior studies, I expect a_1 , a_2 and a_3 to be positive because larger firms (LTA), or more complex firms (SUB and FOREIGN), necessitate greater audit effort (Simunic, 1980 and Craswell et al., 1995). More current assets in the firms' asset composition (CATA) increase audit risk (Turpen, 1990) and a_4 is expected to be positive. As firms with less liquid assets (QUICK) are more risky (Francis, 1984), I expect a_5 to be negative. The higher the accounting return (ROI), the more the risk sharing between auditor and client, and hence the lower the audit fees (Craswell and Francis, 1999). Thus, I expect a_7 to be negative. Firms with modified audit opinion (MODIFY) and firms with reported loss (LOSS) increase the audit firms' litigation risk (see Simunic and Stein (1996) for a review of the literature). Hence, I expect a_9 and a_{10} to be positive. Prior studies (e.g., Craswell and Francis (1999) and Seetharaman et al. (2002)) show mixed results on leverage, and hence I do not have expectations on the direction of a_6 . Following Ferguson et al. (2003), I add the dummy YE to capture the effect of off-peak seasons and expect a_8 to be negative. The variable of interest is DTT which is for clients of Deloitte & Touche.

Equation (1) will be run separately for observations before and after the merger of Deloitte & Touche with Kwan Wong Tan & Fong in April 1997. To ensure that observations before the merger is not affected by the merger, I define observations before the merger as those for which audit reports are issued before 1 April 1997. To ensure that observations after the merger will capture the full effect of the merger, I define observations after the merger as those for which the financial statements begin on or after 1 April 1997.

The sample consists of firms in the industrial sector with available data before and after the merger of Deloitte & Touche with Kwan Wong Tan & Fong. Data on

audit report date, audit fees, audit opinion and details of subsidiaries are manually collected from annual reports of firms. Other data are obtained from the Pacific-Basin Capital Market Database (PACAP). This database is commonly used in prior studies using Hong Kong data (e.g., DeFond et al. (2000)).

4 RESULTS AND DISCUSSION

I first identified firms in the industrial sector from the 1998 Fact Book of Hong Kong Stock Exchange. The Book provides names of companies listed on the Exchange as at 31 December 1998 and other information. Then I searched fiscal year end date and audit reports for audit report date from the annual reports of companies to classify observations as before or after the merger event. I also identified audit opinion from the audit report and collected audit fees data and details of subsidiaries from the annual report. Secondly, I collected other data for equation (1) from PACAP and deleted observations that were more than four standard deviations from the means of the variables. The final sample consists of 166 (244) observations before (after) the merger event.¹⁴

4.1 Descriptive Statistics

Table 1 shows the auditors' share of audit fees and clients in the "industrial" category before and after the merger event. Before the event (panel A), Deloitte & Touche has 30 per cent share of the clients and 27 per cent share of audit fees. Ernest & Young has 25 per cent share of the clients but 30 per cent share of audit fees. Based on audit fees and number of clients, both Ernst & Young and Deloitte & Touche are specialists in the industry. However, if economies of scale are primarily a function of the number of clients, then Deloitte & Touche is the dominant market

leader in the industry. The non-Big 6 firm, Kwan Wong Tan & Fong, has only 9 per cent and 7 per cent shares of clients and audit fees respectively. It is regarded as a non-specialist in the industry. This pattern of share of audit fees and clients is roughly consistent with the same pattern reported for 1992 by DeFond et al. (2000). Hence, market structure for the industry does not change much since 1992.

(Insert Table 1 here)

Panel B shows the same information after the event. Deloitte & Touche, after its merger with Kwan Wong Tan & Fong, has 40 per cent share of clients and 36 per cent share of audit fees in the industry. The market share in terms of clients is roughly the total of share of Deloitte & Touche before its merger and of share of Kwan Wong Tan & Fong. Ernst & Young occupies the second position. Note that if Deloitte & Touche had not merged with Kwan Wong Tan & Fong, it would have had only 34 per cent share of clients in the industry.¹⁵ Furthermore, if Kwan Wong Tan & Fong had instead merged with Ernst & Young, Ernst & Young would have had 33 per cent of clients in the industry. Therefore, the merger of Deloitte & Touche with Kwan Wong Tan & Fong has strategic value to Deolitte & Touche by maintaining its leadership in the industry. In addition, during 1998, Price Waterhouse merged with Coopers & Lybrand to become PWC. Hence, clients in the industry are audited by the three audit firms in 1998 (i.e., after the merger event). Once again, the total market share of Price Waterhouse and Coopers & Lybrand before the event is roughly the same as the total share of two firms and PWC after the event. Hence, market structure in the industry dose not change much before and after the merger event.

Table 2 shows the descriptive statistics of the variables of the sample. Panel A is for the continuous variables and the results suggest that firms after the merger event are more liquid (QUICK), lower levered (DE) and less profitable (ROI) than firms before the event. Panel B is for the dummy variables. There is a larger proportion of firms with reported loss (LOSS) and modified opinion (MODIFY) after than before the merger event. However, the results are not strong.

(Insert Table 2 here)

The correlation matrix of the variables of the sample is provided in Table 3. Firm size (LTA) is positively correlated with audit fees (LAF), consistent with prior studies. Return on investments (ROI) and reported loss (LOSS) are negatively correlated, consistent with expectation. Other coefficients of correlation are relatively small. Except for CATA and YE, the other variables that have significant correlation with LAF have coefficients in the expected direction.

(Insert Table 3 here)

4.2 Results

The results of regressions on equation (1) are provided in Table 4.¹⁶ For regression using observations before the merger event, the variables LTA, SUBS, FOREIGN and MODIFY are significant and in the expected direction. The dummy DTT (for clients of Deloitte & Touche) is positive and significant. The estimated coefficient represents an average fee premium of 15.12 per cent.¹⁷ This result suggests that Deloitte & Touche earns a premium in the industry as a specialist and is

consistent with the result of DeFond et al. (2000) for 1992.¹⁸ Note that this fee premium is for the average (old and new) clients. As auditors may low-ball (pricing audit fees below audit costs for initial audits) to get new clients, I split the dummy DTT into two (one for new clients and the other for old clients) in the regressions. I find that the estimated parameter for old clients is 0.13778 and significant at two-tailed p value of 0.091 and the estimated parameter for new clients is positive and insignificant. Thus, old clients of Deloitte & Touche are paying on average a premium of 14.77 per cent and this is the net result of industry specialisation and (existing) economies of scale effects. In addition, Deloitte & Touche does not low-ball to get new clients. Column (4) reports the results for Ernst & Yong. The related dummy EY is insignificant. Hence, Ernst & Young does not earn a fee premium in the industry as a specialist. This result is also consistent with the result of DeFond et al. (2000). A conjecture for the result is that Ernst & Young passes savings from economies of scale to its clients and the savings offset the industry specialisation premium. However, the importance of testing for the price effect of Ernst & Young is to provide support for the results of Deloitte & Touche because it is Deloitte & Touche and not Ernst & Young who is engaged in the merger.¹⁹

(Insert Table 4 here)

The last two columns of Table 4 show the results of regressions using observations after the merger event. As compared with the results using observations before the event, QUICK becomes significant and in the expected direction while MODIFY is insignificant. More importantly, the dummy DTT is insignificant. This result suggests that Deloitte & Touche does not earn a fee premium after its merger

with Kwan Wong Tan & Fong. In addition, the dummy EY is still insignificant. Hence, the overall results suggest that the merger drives down the audit fee premium of Deloitte & Touche because it is Deloitte & Touche but not Ernst & Young which is not involved in merger, that experiences decline in audit fees in 1998 (i.e., after the merger event).²⁰

To provide further information on the effect of economies of scale of merger, I investigate the different types of clients of Deloitte & Touche after its merger with KWTF. I first split the dummy DTT in two: (1) OC for firms that employ Deloitte & Touche both before and after the merger, and (2) NC for firms that employ Deloitte & Touche after the merger only. OC is expected to be insignificant (negative) if the scale of economies effect is just (more than) sufficient to offset the price premium effect already in place. I do not have expectation for the direction of NC because new clients are subject to the price premium effect, scale of economies effect and low-balling effect. I re-run the regression on equation (1) with these dummies and report the results in column (3) of Table 5. Both OC and NC are insignificant. These results suggest that effect of economies of scale spreads to all clients of Deloitte & Touche after the merger. For the result of OC alone, it suggests that effect of economies of scale from the merger is sufficient to offset the price premium of specialisation. Hence, H_1 is supported. For the result of NC alone, the negative sign of the parameter is consistent with the existence of the effect of economies of scale and low-balling effect.

(Insert Table 5 here)

Then, I further split the dummy NC into two: (1) FKWTF which is for Deloitte & Touche clients after the merger that previously employ Kwan Wong Tan & Fong before the merger and (2) FOTHER which is for other new Deloitte & Touche clients after the merger. I re-run the regression on equation (1) with these new dummies and report the results in column (4) of Table 5. Both FKWTF and FOTHER are insignificant. Thus, the economies of scale effect is not only limited to Kwan Wong Tan & Fong clients that are taken up by Deloitte & Touche after the merger but also to other new clients. Furthermore, if Deloitte & Touche does not have to low-ball to get clients that formerly employ Kwan Wong Tan & Fong because these clients voluntarily choose Deloitte & Touche after the merger, then the insignificance of both FKWTF and FOTHER suggests that Deloitte & Touche does not low-ball to get new clients, and this interpretation is consistent with the results before the merger.

4.3 Self-selection Bias

Recent studies (e.g., Chaney et al. (2004)) on audit pricing suggest that auditees may self-select Big 4 or non-Big 4 auditors with the result that audit fees would be different if they have made the opposite choice. The implication is that the estimated audit fee premium for Big 4 auditors may be due to the self-selection but not the higher brand-name capital of Big 4 auditors. For the choice of specialist auditors, a recent paper by Chen et al. (2005) examines the effect of board characteristics on the selection of specialist but it does not address specialist premium or whether self-selection of specialist, if it exists, would affect the premium. This paper is the first to address the issue.

The procedures that I use follow Maddala (1983). First, I need an auditor choice equation to estimate the selectivity variable that captures self-selection bias. I do not follow Chen et al. (2005) because their results are not strong and their model is not applicable to Hong Kong in my sample period.²¹ However, Chaney et al. (2004) suggest that it is appropriate to use a subset of variables from the audit fee model to design the auditor choice equation. Basing on this suggestion and taking into account prior studies that use Hong Kong data (e.g., Gul and Tsui (1998)), I estimate the following auditor choice equation by probit analysis.

$$\begin{aligned}
 DTT &= b_0 + b_1LTA + b_2SUBS + b_3FOREIGN + b_4CATA + \\
 &\quad b_5QUICK + b_6DE + b_7ROI + b_8LOSS
 \end{aligned}
 \tag{2}$$

DTT takes the value of 1 if the auditor is Deloitte & Touche, or 0 otherwise. All the other variables are defined in equation (1). As compared with equation (1), I do not use the variable YE and MODIFY in the auditor choice equation because there is no reasonable basis to expect that firms with certain year end dates are more likely to be associated with Deloitte & Touche and audit opinion is not observable before the auditor choice is made. Furthermore, in the absence of prior guidance, I do not have expectations for the directions of the variables.

The results of the probit regressions are reported in Table 6. Most of the variables are not significant but the model as a whole is significant and has explanatory power (similar to that of Chen et al. (2005)). From the results in Table 6, I calculate the selectivity variable according to prior studies (e.g., Maddala (1983) and Shehata (1991)).²² Then, I divide the sample into auditees of Deloitte & Touche and auditees of other auditors, and run equation (1) with the addition of the selectivity

variable for each group of auditees. The results are reported in Table 7. As shown, the selectivity variable is not significant for observations before the merger event and hence no further analysis is necessary. For observations after the merger event, the selectivity variable in the regression for auditees of other auditors is positive and significant but the result is not strong. To correct for possible self-selection bias, I use all observations after the merger event and re-run equation (1) with the addition of the selectivity variable.²³ Both the selectivity variable and the dummy DTT are insignificant.²⁴ Hence, there is no evidence to suggest that self-selection of specialist, if it exists, has affected the results.

(Insert Table 6 and Table 7 here).

5 CONCLUSION

In this paper, I examine the scale of economies effect on audit pricing by using the merger of a specialist with a non-specialist. A non-specialist will not bring in sufficient specialised knowledge to command a fee premium but at the same time it will enable the merged audit specialist firm to achieve further economies of scale. Hence, existing clients of the specialist may be passed cost savings from the larger scale of operation and may not be charged a fee premium after the merger. New clients of the specialist may pay a fee premium because they avail themselves of the specialised knowledge of the specialist. However, they may also not pay a premium if the effect of scale of economies is large enough to offset the price premium of specialisation, keeping constant the effect of low-balling.

Using the merger in Hong Kong of Deloitte & Touche (a specialist for firms in the industrial sector) with Kwan Wong Tan & Fong (a non-specialist), I report that Deloitte & Touche only commands a fee premium before the merger. After the merger, all clients of Deloitte & Touche, whether old clients, new clients that previously employ KWTF or other new clients, do not pay a fee premium. Hence, the scale of economies effect is pervasive and is sufficient to offset the fee premium arising from specialisation.

Endnotes

¹ Another measure is the auditors' portfolio of clients (see Kwon (1996)) but as discussed in note 10, this is not a reliable measure of defining specialist.

² The merger of a non-specialist with another non-specialist will not serve the purpose because both of them will not have an observable price premium before the merger.

³ Deloitte & Touche is known as Deloitte Touche Tohmatsu in Hong Kong.

⁴ See firm history on the website of Deloitte & Touche (www.deloitte.com.hk).

⁵ There are two advantages of using Hong Kong data. First, different effects of reputation on national versus city-level bases could be avoided because Hong Kong is one large city-level market. Second, industry expertise is likely to be at city level (Ferguson et al., 2003).

⁶ In this regard, note that there is no separate analysis for firms in the industrial sector in Firth and Lau (2004).

⁷ The costs include inefficient decision making due to the transfer of information to the decision makers.

⁸ This view suggests that transferring personnel from one office to another within a national firm does not add to industry expertise and is consistent with the findings of Ferguson et al. (2003) that industry expertise is likely to be located at city level.

⁹ Audit tenure is not a measure of specialisation because no matter for how long an auditor is with a particular client, he does not have an exposure wide enough to gain specialised knowledge compared with another auditor with many clients.

¹⁰ An important implication of the discussion of specialist in the main text is that defining industry specialist on the basis of auditors' portfolio of clients is not appropriate. For example, an auditor may be defined as a specialist in an industry where its portfolio of clients is largest but it may not be the largest provider of audit services in that industry. The critical point is that he does not have sufficiently large number of clients in that industry to enable him to accumulate his knowledge and achieve specialisation despite the fact that he has the largest proportion of clients in the industry in his own portfolio.

¹¹ One would query why an industry consists of both specialists and non-specialists but not just specialists. A simple answer to the question is that clients match their own characteristics and requirements with the level and quality of the services provided by auditors who may be specialist or non-specialist. A very relevant example here is that audit market consists of both high quality Big 5 auditors and other auditors. The existence of Big 5 auditors does not drive other auditors out of business.

¹² The issue of audit costs is subsumed under economies of scale because a larger scale means lower audit costs.

¹³ In theory, there would be a point where diseconomies will set in if scale continues to increase. However, as the firms involved will not merge if they foresee diseconomies, the fact that they merge may suggest the absence of diseconomies. For the case of Deloitte & Touche, its merger with Kwan Wong Tan & Fong is completed in 1997 and there is no break-up of the merged firm to suggest diseconomies.

¹⁴ In Hong Kong, companies have a statutory 6 months' period to file annual accounts. Thus, financial statements with year end on or after 31 December 1996 will be issued after April 1997 when Deloitte & Touche merge with Kwan Wong Tan & Fong. Therefore, in my sample, observations classified as before the merger event have fiscal year end on 31 December 1995 or earlier. The Securities Journal (a monthly publication of the Hong Kong Stock Exchange) indicates that there are 191 firms in the industrial sector trading in December 1995. Using this as a benchmark, my final sample consists of a large proportion of firms (87 per cent) before the merger event. In addition, the Securities Journal indicates that there are 270 firms in the industrial sector trading in December 1998. Again, using this as a benchmark, my final sample also consists of a large proportion of firms (90 per cent) after the merger event.

¹⁵ In the sample, all clients of Kwan Wong Tan & Fong are taken up by Deloitte & Touche. In general, auditor-client realignment will occur when audit firms merge. However, I am not interested in the realignment but given realignment the effect of the merger on audit pricing.

¹⁶ Diagnostics indicate that heteroskedascity is not present in any of the models presented in the paper.

¹⁷ The average audit fee premium is found by $e^Z - 1$ where Z is the estimated parameter of DTT in the fitted regression (see Craswell et al. (1995)).

¹⁸ DeFond et al. (2000) report an average fee premium of 21 per cent for Deloitte & Touche for 1992.

¹⁹ I also add a dummy for clients of Kwan Wong Tan & Fong (KWTF) in the regression. The dummy is negative and significant ($p = 0.019$). The results of other variables are substantially unchanged. The result of the dummy suggests that KWTF does not earn a fee premium in the industrial sector. However, it does not mean that KWTF offers discount to its clients because the dummy for KWTF may simply reflect the fact that Big 5 auditors earn a fee premium due to brand name capital.

²⁰ If after the merger, competition in the audit market increases, audit fees may be lower. In the absence of a variable that captures competition, the issue could be inferred from audit fees of new clients. By definition, low-balling is new auditors' response to competitive pressure to earn future quasi-rents of incumbency by offering lower audit fees to new clients. As shown in Table 5, new clients of Deloitte & Touche after the merger do not pay lower audit fees. Thus, competition after the merger may not explain the results.

²¹ In the sample period, audit committee is not a mandatory requirement either by law or listing rules and only a few firms have audit committee voluntarily.

²² For clients of Deloitte & Touche (i.e., the dependent variable DTT equals to 1 in equation (2)), the selectivity variable is defined as $-\phi(\gamma Z)/\Phi(\gamma Z)$ where γZ is the vector of independent variables and the associated coefficients in equation (2), ϕ is the probability density function of the standard normal distribution and Φ is its cumulative distribution. For other clients, (i.e., the dependent variable DTT equals to 0 in equation (2)), the selectivity variable is defined as $\phi(\gamma Z)/[1-\Phi(\gamma Z)]$.

²³ This procedure follows Khurana and Raman (2004). Essentially, the self-selection bias represents an omitted variable problem (for self-selection) in the regression of interest (e.g., audit fees equation) and hence adding the selectivity variable is an appropriate approach for testing the variable of interest (e.g., dummy for DTT) while controlling for self-selection bias. Note, however, that prior studies also predict what the dependent variable (e.g., audit fees) would be if alternative choices are made (e.g., non-Big 5 instead of Big 5 auditors are employed). The purpose of this prediction as Maddala (1983, 260) points out is to throw light on the effects of self-selection but does not answer what the variable of interest would be after controlling for self-selection bias.

²⁴ The estimated equation is $6.67 + 0.39LTA + 0.011SUBS + 1.382FOREIGN - 0.106CATA - 0.194QUICK - 0.953DE + 1.262ROI + 0.107YE + 0.46LOSS - 0.016MODIFY + 3.172DTT + 1.946selectivity\ variable$, and the associated p value is respectively 0.001, 0.000, 0.850, 0.069, 0.674, 0.006, 0.292, 0.204, 0.143, 0.151, 0.882, 0.138 and 0.139. Hence, the intercept, LTA, FOREIGN and QUICK are significant in the regression and LTA, FOREIGN and QUICK are in the expected direction.

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Table 1
Share of Audit Fees and Clients for Hong Kong-Listed Companies in the “Industrial” Category

Auditor	Auditor Type	Audit Fees (in HK dollars)		Clients	
		Total	Industry Percentage	Total	Industry Percentage
Panel A : Before the merger event					
Ernst & Young	Big 6	84,987,277.91	30.71	42	25.30
Deloitte & Touche	Big 6	74,869,404.23	27.05	51	30.72
KPMG	Big 6	33,440,604.19	12.08	14	8.43
Price Waterhouse	Big 6	28,159,026.30	10.18	15	9.04
Kwan Wong Tan & Fong	Non-Big 6	20,504,247.13	7.41	16	9.64
Arthur Andersen	Big 6	14,965,525.13	5.41	12	7.23
Coopers & Lybrand	Big 6	11,572,443.84	4.18	9	5.42
All others	Non-Big 6	8,251,590.00	2.98	7	4.22
Total		276,750,118.73	100	166	100
Panel B : After the merger event					
Deloitte & Touche	Big 6	144,406,995.00	36.61	98	40.16
Ernst & Young	Big 6	106,950,889.00	27.12	65	26.64
KPMG	Big 6	41,943,651.83	10.63	18	7.38
Price Waterhouse	Big 6	29,564,645.85	7.50	9	3.69
Arthur Andersen	Big 6	25,828,892.63	6.55	18	7.38
PWC	Big 6	25,754,799.68	6.53	21	8.60
All others	Non-Big 6	11,048,100.00	2.80	7	2.87
Coopers & Lybrand	Big 6	8,930,200.00	2.26	8	3.28
Total		394,428,173.99	100	244	100

Table 2
Selected Descriptive Statistics of the Variables of the Sample

Panel A: Mean and standard deviation (beneath) of continuous variables with t-tests performed on the difference between means			
Variable	(a) Before the merger event (n = 166)	(b) After the merger event (n = 244)	(c) = (a) – (b) Difference between means
LAF	14.056 (0.693)	14.044 (0.674)	0.012
LTA	13.841 (1.050)	13.792 (1.346)	0.050
SUBS	4.113 (1.561)	3.899 (1.624)	0.214
FOREIGN	0.536 (0.260)	0.536 (0.261)	0.000
CATA	0.526 (0.175)	0.498 (0.201)	0.028
QUICK	0.938 (0.688)	1.145 (0.800)	-0.207***
DE	0.077 (0.092)	0.057 (0.077)	0.020**
ROI	0.068 (0.083)	0.042 (0.134)	0.026**

Panel B: Number and proportion (beneath) of firms having categorical variables designated as 1 with chi-square tests performed on the difference between proportions			
Variable	(a) Before the merger event (n = 166)	(b) After the merger event (n = 244)	(c) = (a) – (b) Difference between proportions
YE	87 (0.524)	142 (0.582)	-0.058
LOSS	40 (0.241)	80 (0.328)	-0.087*
MODIFY	13 (0.078)	32 (0.131)	-0.053*

*, **, *** designate 2-tailed statistical significance at the 0.10, 0.05 and 0.01 level respectively.
The variables are defined as follows:
LAF = natural logarithm of total audit fees
LTA = natural logarithm of total assets (in thousands)
SUBS = square root of the number of subsidiaries
FOREIGN = proportion of subsidiaries that are foreign
CATA = current assets divided by total assets
QUICK = current assets minus inventories divided by current liabilities
DE = long-term debt divided by total assets
ROI = earnings before interest and taxes divided by total assets
YE = 1 if the firm has non-March 31 fiscal year end, or 0 otherwise
LOSS = 1 if the firm has a reported loss in the current year, or 0 otherwise
MODIFY = 1 if the audit opinion is modified, or 0 otherwise

Table 3
Pearson Correlation Matrix of the Variables of the Sample
(n = 410)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) LAF	1.000										
(2) LTA	0.654***	1.000									
(3) SUBS	0.329***	0.149***	1.000								
(4) FOREIGN	0.214***	0.153***	-0.045	1.000							
(5) CATA	-0.191***	-0.293***	-0.062	-0.036	1.000						
(6) QUICK	-0.098**	0.061	-0.209***	-0.078	0.160***	1.000					
(7) DE	0.198***	0.267***	0.053	0.072	-0.386***	0.005	1.000				
(8) ROI	-0.010	0.125**	-0.049	0.021	0.168***	0.216***	-0.036	1.000			
(9) YE	0.156***	0.244***	-0.261***	0.271***	-0.165***	0.098**	0.100**	-0.080	1.000		
(10) LOSS	-0.035	-0.194***	0.074	-0.072	-0.063	-0.213***	-0.040	-0.593***	0.021	1.000	
(11) MODIFY	-0.005	-0.124**	0.011	-0.001	-0.081	-0.203***	-0.092*	-0.367***	0.076	0.357***	1.000

*, **, *** designate statistical significance at the 0.10, 0.05 and 0.01 level respectively.

The variables are defined as follows:

LAF = natural logarithm of total audit fees

LTA = natural logarithm of total assets (in thousands)

SUBS = square root of the number of subsidiaries

FOREIGN = proportion of subsidiaries that are foreign

CATA = current assets divided by total assets

QUICK = current assets minus inventories divided by current liabilities

DE = long-term debt divided by total assets

ROI = earnings before interest and taxes divided by total assets

YE = 1 if the firm has non-March 31 fiscal year end, or 0 otherwise

LOSS = 1 if the firm has a reported loss in the current year, or 0 otherwise

MODIFY = 1 if the audit opinion is modified, or 0 otherwise

Table 4
Results of Regressions on Audit Fees, LAF

Variable	Predicted Sign	Parameter estimate (p value) Before the merger event (n = 166)		Parameter estimate (p value) After the merger event (n = 244)	
		DTT	EY	DTT	EY
Intercept	not applicable	6.666 (0.000)***	6.830 (0.000)***	9.400 (0.000)***	9.418 (0.000)***
LTA	+	0.470 (0.000)***	0.458 (0.000)***	0.298 (0.000)***	0.297 (0.000)***
SUBS	+	0.105 (0.000)***	0.104 (0.000)***	0.096 (0.000)***	0.096 (0.000)***
FOREIGN	+	0.328 (0.032)**	0.333 (0.031)**	0.275 (0.033)**	0.275 (0.031)**
CATA	+	0.296 (0.205)	0.317 (0.177)	0.145 (0.437)	0.147 (0.432)
QUICK	-	-0.000 (0.999)	0.009 (0.874)	-0.112 (0.012)**	-0.112 (0.011)**
DE	?	0.238 (0.593)	0.408 (0.362)	0.195 (0.677)	0.201 (0.668)
ROI	-	0.042 (0.943)	0.069 (0.907)	-0.139 (0.648)	-0.132 (0.669)
YE	-	-0.022 (0.786)	-0.035 (0.670)	0.107 (0.143)	0.107 (0.142)
LOSS	+	0.168 (0.148)	0.172 (0.142)	0.003 (0.972)	0.004 (0.963)
MODIFY	+	0.249 (0.088)*	0.295 (0.045)**	-0.020 (0.854)	-0.018 (0.863)
DTT	+	0.141 (0.082)*		0.006 (0.932)	
EY	?		0.076 (0.365)		-0.015 (0.835)
F value for the model (p value)		20.710 (0.000)***	20.210 (0.000)***	20.830 (0.000)***	20.840 (0.000)***
Adjusted R ²		0.568	0.562	0.473	0.473

*, **, *** designate 2-tailed statistical significance at the 0.10, 0.05 and 0.01 level respectively.

The variables are defined as follows:

LAF = natural logarithm of total audit fees

LTA = natural logarithm of total assets (in thousands)

SUBS = square root of the number of subsidiaries

FOREIGN = proportion of subsidiaries that are foreign

CATA = current assets divided by total assets

QUICK = current assets minus inventories divided by current liabilities

DE = long-term debt divided by total assets

ROI = earnings before interest and taxes divided by total assets

YE = 1 if the firm has non-March 31 fiscal year end, or 0 otherwise

LOSS = 1 if the firm has a reported loss in the current year, or 0 otherwise

MODIFY = 1 if the audit opinion is modified, or 0 otherwise

DTT = 1 if the firm's auditor is Deloitte & Touche, or 0 otherwise

EY = 1 if the firm's auditor is Ernst & Young, or 0 otherwise

Table 5
Results of Regressions on Audit Fees, LAF After the Merger Event
(n = 244)

Variable	Predicted Sign	Parameter estimate (p value)	Parameter estimate (p value)
Intercept	Not applicable	9.426 (0.000)***	9.406 (0.000)***
LTA	+	0.296 (0.000)***	0.297 (0.000)***
SUBS	+	0.095 (0.000)***	0.096 (0.000)***
FOREIGN	+	0.264 (0.040)**	0.261 (0.043)*
CATA	+	0.131 (0.481)	0.139 (0.457)
QUICK	-	-0.102 (0.020)**	-0.103 (0.021)**
DE	?	0.191 (0.683)	0.200 (0.670)
ROI	-	-0.124 (0.684)	-0.119 (0.696)
YE	-	0.116 (0.112)	0.119 (0.105)
LOSS	+	-0.000 (0.999)	0.001 (0.991)
MODIFY	+	0.010 (0.924)	0.010 (0.924)
OC	?	0.089 (0.269)	0.089 (0.270)
NC	?	-0.093 (0.277)	
FKWTF	?		-0.130 (0.291)
FOTHER	?		-0.068 (0.521)
F value for the model		19.550	18.000
(p value)		(0.000)***	(0.000)***
Adjusted R ²		0.478	0.476

*, **, *** designate 2-tailed statistical significance at the 0.10, 0.05 and 0.01 level respectively.

The variables are defined as follows:

LAF = natural logarithm of total audit fees

LTA = natural logarithm of total assets (in thousands)

SUBS = square root of the number of subsidiaries

FOREIGN = proportion of subsidiaries that are foreign

CATA = current assets divided by total assets

QUICK = current assets minus inventories divided by current liabilities

DE = long-term debt divided by total assets

ROI = earnings before interest and taxes divided by total assets

YE = 1 if the firm has non-March 31 fiscal year end, or 0 otherwise

LOSS = 1 if the firm has a reported loss in the current year, or 0 otherwise

MODIFY = 1 if the audit opinion is modified, or 0 otherwise

OC = 1 if the firm's auditor is Deloitte & Touche before and after the merger, or 0 otherwise

NC = 1 if the firm's auditor is Deloitte & Touche after but not before the merger, or 0 otherwise

FKWTF = 1 if the firm's auditor is Kwan Wong Tan & Fong before the merger and Deloitte & Touche after the merger, or 0 otherwise

FOTHER = 1 if the firm's auditor is not Deloitte & Touche or Kwan Wong Tan & Fong before the merger, and is Deloitte & Touche after the merger, or 0 otherwise

Table 6
Results of Probit Regressions on Auditor Choice, DTT

Variable	Predicted Sign	Parameter estimate	Parameter estimate
		(p value) Before the merger event (n = 166)	(p value) After the merger event (n = 244)
Intercept	Not applicable	3.475 (0.045)**	1.071 (0.307)
LTA	?	-0.322 (0.008)***	-0.086 (0.227)
SUBS	?	0.022 (0.775)	0.075 (0.152)
FOREIGN	?	-0.072 (0.869)	-0.970 (0.003)***
CATA	?	0.202 (0.765)	0.233 (0.635)
QUICK	?	0.111 (0.502)	0.069 (0.535)
DE	?	2.072 (0.103)	0.987 (0.428)
ROI	?	-0.120 (0.944)	-1.197 (0.131)
LOSS	?	0.127 (0.706)	-0.401 (0.071)*
L.R. Chi-square		192.520***	312.798***
Pseudo R-squared		0.071	0.063

*, **, *** designate 2-tailed statistical significance at the 0.10, 0.05 and 0.01 level respectively.

The variables are defined as follows:

DTT = 1 if the firm's auditor is Deloitte & Touche, or 0 otherwise

LTA = natural logarithm of total assets (in thousands)

SUBS = square root of the number of subsidiaries

FOREIGN = proportion of subsidiaries that are foreign

CATA = current assets divided by total assets

QUICK = current assets minus inventories divided by current liabilities

DE = long-term debt divided by total assets

ROI = earnings before interest and taxes divided by total assets

LOSS = 1 if the firm has a reported loss in the current year, or 0 otherwise

Table 7
Results of Regressions on Audit Fees, LAF, by Deloitte & Touche and Other Auditors

Variable	Predicted Sign	Parameter estimate (p value)		Parameter estimate (p value)	
		Before the merger event DTT (n = 51)	Not DTT (n = 115)	After the merger event DTT (n = 98)	Not DTT (n = 146)
Intercept	not applicable	2.443 (0.640)	-0.038 (0.992)	8.567 (0.000)***	3.564 (0.298)
LTA	+	1.214 (0.088)*	0.876 (0.001)***	0.425 (0.029)**	0.464 (0.001)***
SUBS	+	0.056 (0.450)	0.096 (0.011)**	0.031 (0.858)	-0.082 (0.446)
FOREIGN	+	0.511 (0.076)*	0.396 (0.046)**	0.604 (0.785)	2.797 (0.039)**
CATA	+	-0.664 (0.217)	0.560 (0.099)*	0.162 (0.770)	-0.561 (0.167)
QUICK	-	0.281 (0.266)	-0.221 (0.082)*	-0.157 (0.349)	-0.259 (0.029)**
DE	?	-5.454 (0.182)	-1.724 (0.352)	-0.367 (0.867)	-2.398 (0.105)
ROI	-	-1.589 (0.061)*	1.447 (0.080)*	0.024 (0.993)	3.119 (0.083)*
YE	-	0.072 (0.536)	-0.021 (0.842)	-0.034 (0.709)	0.161 (0.145)
LOSS	+	-0.399 (0.211)	0.138 (0.445)	-0.000 (1.000)	1.118 (0.053)*
MODIFY	+	0.124 (0.495)	0.185 (0.400)	0.131 (0.374)	-0.082 (0.582)
Selectivity variable	?	3.760 (0.214)	2.387 (0.153)	0.734 (0.828)	4.654 (0.064)*
F value for the model (p value)		9.110 (0.000)***	14.890 (0.000)***	16.330 (0.000)***	9.420 (0.000)***
Adjusted R ²		0.641	0.573	0.635	0.390

*, **, *** designate 2-tailed statistical significance at the 0.10, 0.05 and 0.01 level respectively.

The variables are defined as follows:

LAF = natural logarithm of total audit fees

LTA = natural logarithm of total assets (in thousands)

SUBS = square root of the number of subsidiaries

FOREIGN = proportion of subsidiaries that are foreign

CATA = current assets divided by total assets

QUICK = current assets minus inventories divided by current liabilities

DE = long-term debt divided by total assets

ROI = earnings before interest and taxes divided by total assets

YE = 1 if the firm has non-March 31 fiscal year end, or 0 otherwise

LOSS = 1 if the firm has a reported loss in the current year, or 0 otherwise

MODIFY = 1 if the audit opinion is modified, or 0 otherwise

Selectivity variable = calculated in accordance with note 22.