The determinants of the UK Big Six premium

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Abstract

We report results consistent with the existence of a Big Six premium in the UK during the period 1985-1995. We find little evidence that this premium can be attributed to industry specialisation by auditors, no matter how this is specified. We find evidence to suggest that non-audit fees earned by auditors from their audit clients are positively related to the size of the audit fee and vice versa. However, when appropriate allowance is made for endogeneity, by modelling both sources of auditor revenue in a simultaneous equations framework, the Big Six premium is still present. All these results are generated using a conventional audit-pricing model that treats factors such as client size, complexity, risk and non-audit services as additive determinants of the audit fee. We find that when allowance is made for interactions between size, risk and non-audit services the Big Six premium disappears.

Key words: audit fees; brand names; industry specialization; non-audit service fees; deep pockets.

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1. Introduction

The nature of the audit services market is very special. Audits are mandatory in most jurisdictions, creating a compliance demand, but the quality of the product is difficult to ascertain ex ante (DeAngelo 1981a, 186). An audit can be viewed as a type of experience good because the service must be completed before the quality can be appreciated (Nelson, 1970). Financial statement users cannot access audit working papers and have limited knowledge of each company s internal control systems. Moreover, even when the service has been provided, poor audit quality will usually only be discernible by outsiders when some major event occurs, such as bankruptcy of the client. Audit failure will often deem to have occurred when a client files for bankruptcy following an unqualified opinion (type I error) or when a client s financial position and performance improves following a qualified opinion (type II error). While financial distress may be considered as providing the main verification of quality, litigation suits against accounting firms are rare, especially after the Caparo judgement in the UK, and many cases are settled out of court. In such circumstances, the reputation of the auditor might be expected to be of great importance because it provides expectations of quality service.

A number of studies have provided evidence of the existence of a Big Six[1] premium in the US, Australia, Hong Kong and Malaysia.[2] However, the UK evidence is mixed. Studies by Taffler and Ramalinggam (1982), Chan et al. (1993), Pong and Whittington (1994) and Ezzamel et al. (1996) find the premium is significant, whereas Brinn et al. (1994), O Sullivan (1998), Ezzamel et al. (2002) do not.

[1] Accounting firms are codified in the present paper by their name at the time of audit. There were eight international UK firms in 1985 (Arthur Andersen, Arthur Young, Coopers and Lybrand, Ernst and Whinney, Deloitte Haskins and Sells, Peat Marwick, Price Waterhouse and Touche Ross). The UK mergers in 1989 between Ernst and Whinney and Arthur Young and in 1990 between Coopers and Lybrand and Deloitte, Haskins and Sells reduced the number of large firms from eight to six. The term Big Six is used in this paper because most of the observations relate to this period. The merger between Price Waterhouse and Coopers and Lybrand cut this number to five. Following the Enron debacle, four firms dominate the profession.

[2] US studies include Palmrose (1986a,b), Francis and Simon (1987), Baber et al. (1987), Simon and Francis (1988), Turpen (1990), Beatty (1993) and Ward et al. (1994). Work dealing with Australia has been done by Francis (1984) Francis and Stokes, 1986; Butterworth and Houghton, 1995). For similar findings covering Hong Kong and Malaysia, see Simon et al. (1992) and DeFond et al. (2000). For an overall assessment of the international audit pricing literature, see Moizer (1997).

Our results are consistent with much earlier research in finding that the Big Six appear to earn a premium in the UK when due allowance is made for factors like the size, complexity and riskiness of a client s business. The major contribution of the paper is to examine whether this Big Six premium can be attributed to the omission of other factors that might lead to higher audit fees being charged by the large firms. One possibility is that the Big Six premium is attributable to large audit firms devoting resources to developing industry expertise that makes them better auditors in the industries in question. We explore this possibility much more exhaustively than has been done in earlier studies, measuring industry specialisation in a variety of ways, and find that the Big Six premium generally remains intact even when due allowance is made for industry specialisation by auditors.

Another possibility we consider is that the Big Six premium arises from big accounting firms being able to retain knowledge spillovers they obtain from providing consulting services to those clients. We find that when the income an auditor obtains from the provision of non-audit services (NAS) to the client is included in the audit fee model, the Big Six premium disappears in both the annual and pooled OLS regressions. However, the picture changes when allowance is made for the possible endogeneity of audit and NAS by modelling both sources of audit firm revenue in a simultaneous equations framework. We find that NAS is an increasing function of the audit fee and that audit fee is also an increasing in NAS. Moreover, the Big Six premium re-appears when NAS is modelled as part of a simultaneous equations relationship. From this we conclude that the Big Six premium is not due simply to ignoring knowledge spillovers.

We carry out an additional number of tests to throw light on whether the Big Six premium might be attributable to aspects of client size and client risk not captured in the basic audit pricing model. The Big Six has a huge share of the market for companies of above-average size, possibly because large audit firms have a technological advantage in auditing large clients. The large firms might be expected to be particularly well-placed to charge a premium when a large client is also risky since this is a situation which carries with it particularly large deep pocket exposure. This might also be a situation where large audit firms are able to sell more audit services and this factor might influence their pricing of the audit. Consistent with these

conjectures, we find that when allowance is made for these complex interactions, the Big Six premium tends to disappear.

The remainder of this paper is organised in the following manner. Section 2 summarises prior research and identifies the key theoretical issues. The research design used in our study is outlined in section 3. Our empirical results are reported in sections 4. A summary and our conclusions are presented in the final section.

2. Previous Research

The three interrelated sources of demand for quality-differentiated audits are agency demand, information demand and insurance demand (Beattie and Fearnley, 1995). Agency demand, first detailed by Jensen and Meckling (1976), explains the demand for an audit in terms of a bonding mechanism that reduces the agency costs resulting from the self-interested actions of agents. Different levels of audit quality evolve in response to time-series and cross-sectional variations in agency costs (DeAngelo, 1981a). The information demand addresses the circumstances when management might seek to use the selection of particularly creditable auditors in order to signal their own honesty and integrity (Dopuch and Simunic, 1980). The insurance demand for an audit refers to the avenue an audit opens up for investors and creditors to seek redress from the auditor for any losses they might suffer as a result of audit failures, with higher quality auditors having more insurance capacity. Differences in client circumstances lead to a demand for quality-differentiated audits.

The supply of quality-differentiated audits can be motivated by the theory of product differentiation (Simunic and Stein, 1987), where greater expertise implies greater credibility and audit quality. Higher quality firms gain a larger market share by word of mouth advertising (Mercer, 1992; Rogerson, 1983). Consumers use the quality of an earlier product as an indicator of present and future quality (Mercer, 1992; Shapiro, 1983). Firms have no incentive to reduce quality if consumers quickly become aware of the degradation of the product. Audits pose practical problems for the theory of product differentiation because the consumer cannot easily discern product quality, even though consumption is not a one-off event. In which case, audit quality is likely to be judged on the basis of observable supplier characteristics, such as the firm s size and name (Dopuch and Simunic, 1980). Reputable firms will produce high quality

audits because consumers recognise and reward the investment they have made in developing a reputation for quality (Klein and Leffler, 1981; Palmrose, 1986a)[3]. However, such reputation gains will not be forthcoming if the costs of such investments are the same for both high-quality and low-quality auditors, resulting in a market for lemons (Akerlof, 1970). The sheer scale of reputational investments can serve as a costly signal that will prevent such a pooling equilibrium. Rents can arise due to auditor start up costs and client switching costs and these serve as a bond on independence and audit quality (Francis and Wilson, 1988). Reputable firms have more incentive to produce quality audits and maintain independence because they have large market shares (Craswell and Taylor, 1991) and the most specialised intangible assets at risk (Ritson et al., 1997), and they are able to extract economic rents as a result (DeAngelo, 1981a).

Audit firms sometimes promote themselves as specialists in certain industries (Zeff and Fossum, 1967; Rhode et al., 1974; Danos and Eichenseher, 1981, 1982; Eichenseher and Danos, 1981). For example, the Big Six use the popular press and their websites to advertise their expertise in specific industries and to claim to provide a higher quality service and greater value (Berton, 1995; Dunn et al. 2000). DeAngelo (1981a) defines quality as the auditor s ability to discover errors or breaches in the accounting system and withstand client pressures to disclose selectively in the event a breach is discovered . In this context, the quality differentiation claims made by the Big Six can be viewed in terms of the agency and costly contracting theories (Jensen and Meckling, 1976 and Watts and Zimmerman, 1983, 1986) as service differentials that give rise to returns to brand name and industry specialization reputations. Accounting firms provide assurance about the integrity of clients control systems and financial statements. To the extent that their clients systems are industry specific, industry specialization may lead to higher levels of audit performance and expertise beyond the generic level mandated by statute (Shockley and Holt, 1983; Palmrose, 1984; Bonner and Lewis, 1990; Ashton, 1991). Accounting firms might expect positive returns to their investment in specialization (Craswell et al., 1995) if this

[3] Some examples of such investments include Price Waterhouse s Blue Chip Portfolio, the Coopers and Lybrand Audit Support System (CLASS), KPMG s Audit 2000 and Ernst and Young s Audit Innovation.

yields benefits to the market in the form of reductions in industry-specific agency costs.

Theory about the influence of industry specialization on audit fees is inconclusive. Audit firms develop industry specialist reputations by expanding their clienteles. The development of industry-specific expertise will only be worthwhile if it increases the credibility of financial reporting and attracts clients. Industry specialization might do this if it creates knowledge of industry-specific audit risks that can be used on different audit assignments in the industry. One effect of this specialist knowledge may be to introduce production economies of scale into the audit process (O Keefe et al., 1994), transforming the auditors involved into more efficient, lower-cost producers of audits (Eichenseher and Danos, 1981; Danos and Eichenseher, 1986; and Craswell et al., 1995). The resulting production economies of scale are passed on to clients if competitive pressures are such as to induce the industry specialists to charge lower relative audit fees (Palmrose, 1986a). The economies of scale argument may be strongest in the case of non-Big Six firms that are unable to support a claim to industry expertise in excess of the brand name reputation afforded the Big Six firms. If there is a clientele that demands the lowest priced audit available and if non-Big Six firms are lower cost service providers, they may possess a cost advantage in this market sector. Non-Big Six firms might choose to specialise to reduce audit costs and charge lower fees to gain market share (DeFond et al., 2000). This ambiguity may explain why prior research has been inconclusive (Krishnan and Yang, 1998).

Several empirical studies estimate the significance of brand name and industry specialist returns. However, unlike with the big firm effect, the design of appropriate tests for industry specialization is fraught with difficulty. The theoretical rationalisation of the form which specialization is expected to take is undeveloped. Industry specialization is a multi-faceted phenomenon. Industry specialization may take the form of a key individual, a group of people of differing ranks or a set of audit partners that are recognised as industry experts. Expertise arises through focused training and concentrated experiences in the field of interest and significant investments in the study of legal regulations, production processes and market behaviour of key players. Even more important, although the economic importance of industries vary both nationally and internationally, most studies pay little or no

attention to industry size. Audit firms will only be willing to invest capital and labour resources in the creation and maintenance of a reputation for audit expertise in a particular industry if there are sufficient clients willing to pay higher fees that will cover this additional investment. It may be uneconomical for any auditor to develop expertise in small sectors, whereas several firms might find it worthwhile to specialise in large sectors. We build our research design on the notion that industry size matters. We partition our sample across industry sectors before defining specialists.

Most studies assume a simple measure of specialization derived from the audit firm s share of the market in a particular industry (Pearson and Trompeter, 1994; Craswell et al., 1995; Palmrose, 1986a; Lys and Watts, 1994; Craswell and Taylor, 1991). The use of a single market-based measure of industry specialization does not provide for a robust test and introduces a bias towards large accounting firms (Krishnan, 2001). This study extends prior work by testing nine measures of specialization. Specialists are defined using dichotomous and continuous measures of the firm s share in an industry, share of their total portfolio of clients within an industry and their advertised views of sectors of industry specialization.

The results of prior research on the ability of industry specialisation to explain cross-sectional differences in audit fees have been mixed. Australian studies report both significant (Craswell et al., 1995) and insignificant industry specialist returns (Ferguson and Stokes, 2000). US writers find that industry specialization does not have a significant effect on audit fees (Palmrose, 1986a; Pearson and Trompeter, 1994). In Hong Kong, industry specialization has a significant positive impact on the fees charged by the international accounting firms but a significant negative impact on the fees charged by their smaller counterparts (DeFond et al., 2000). These disparate results reflect the inconclusive state of theory, differences in auditing regimes in different countries, unusual descriptive statistics[4] and different research methodologies.

[4] Krishnan (2001) attributes these disparities to, different bases [that] yield different rankings of specialists . The mean acid test ratio found by Craswell et al. 1995 (5.828) and the peculiar mean current and quick ratios reported by DeFond et al. 2000 (0.447 and 2.157) cast doubt about the generalisability of their results.

Big Six returns might also be explained in terms of endogeneities between the fees charged by auditors for audit and non-audit services. One rationale for the joint provision of audit and NAS by accounting firms is the existence of economies of scope generated by the two services in association with knowledge spillovers (Simunic, 1984; Antle et al., 1997; Whisenant et al., 2002). Knowledge spillovers are transfers of knowledge that may occur when other services are provided by the incumbent auditor (Abdel-khalik, 1990). These may be generated if the total costs of one firm jointly performing both non-auditing and auditing services are less than the sum of the costs when each service is performed by a different firm (DeBerg et al., 1991, 20). If NAS can be purchased from the incumbent auditor, a client s search and other transactions costs should also be reduced (Simunic, 1984). While the provision of NAS may threaten audit independence (and hence audit quality), joint provision is likely to be more cost-efficient (Simunic, 1984). Moreover, most of the existing empirical papers, summarized in Table 1, document a positive association between audit and NAS fees when a simple OLS model is used (Simunic, 1984; Simon, 1985; Turpen, 1990; Butterworth and Houghton, 1995; Barkess and Simnett, 1994; Ezzamel et al., 1996; Firth, 1997; Craswell and Francis 1999; O Sullivan and Diacon, 2002). This raises concerns as to whether it is appropriate to treat assurance services and other services provided by audit firms as though they are independent (Simunic, 1984; Beck 1988; Abdel-Khalik, 1990; Bartlett, 1993; Davis et al., 1993; Lowenstein, 2002; Malkiel, 2002).

-Insert Table 1 about here-

A number of explanations have been offered for the observed positive association between audit and NAS fees. Simunic (1984) argues that the joint supply of audit and NAS reduces the price per unit of audit services; so assuming that demand for audit services is price-elastic, clients demand more audit services leading to an increase in total audit fees. This strongly suggests that the relationship between the fees for audit and NAS work should be modelled simultaneously, rather than treating NAS as exogenous, as has been done in prior work. It is important to note in this regard that clients in difficulty might demand more NAS, which might in turn lead to a higher audit fee because of the greater risk or work involved (Simunic, 1984). Furthermore, Solomon (1989) argues that the NAS might lead to a change in the client s

organisation that increases the demand for audit services, the nature of the NAS market may be uncompetitive or audit partners might capture part of the NAS fee for internal profit computations. Finally, concerns have been expressed that the audit service has become increasingly marginalised in the quest for more profitable NAS work, leading to the possibility that the price for audit work declines as NAS business increases (Zeff, 1998 and Jeppesen, 1998). Clearly, the measurement of the Big Six premium needs to take account of the potential endogeneity of NAS. Whisenant et al. (2002) argue that to the extent that audit and NAS fees are jointly determined, the residuals will be correlated and single-equation estimations violate the independent error term assumption of OLS. However, although there are clear a priori reasons to expect audit and NAS fees to be endogenous and the literature on audit and NAS pricing suggests that the services are interrelated, we are unaware of any published study that incorporates simultaneous equation models into the pricing of accounting services.[5] We remedy this deficiency by testing for endogeneity and investigating the extent any simultaneous equation bias affects inferences by estimating the fee relationship using both OLS and simultaneous equation models.

Returning to the central concern of our study, the Big Six premium can also be rationalised by the insurance hypothesis (Wallace, 1987) because the global firms have deeper pockets than their smaller counterparts due to their greater size and resources. Traditionally, audit firms were organised as unlimited liability partnerships in the UK, which exposed audit partners to joint and several liability for deficient audits anywhere in the firm. The value of this insurance option is therefore an increasing function of the wealth and number of partners in the audit firm. A portion of the risk can be transferred via professional indemnity insurance, but moral hazard considerations mandate that the partners must shoulder part of it as well. The big audit firms should be better candidates for insurance, be more capable of carrying an otherwise uninsurable risk and have more wealth at risk from litigation.[6] These factors

[5] Simultaneous equations have been used to explain complex relationships in other areas of accounting and finance, e.g. the information content of earnings (Beaver et al., 1999), forecast accuracy and analyst following (Alford and Berger, 1999) and takeover defences (Rose, 2002).

[6] In recent years, audit firms have increasingly been changing their legal form in order to minimise their exposures to litigation. This may have the effect of reducing the *absolute exposure* facing all audit firms, big and small. However, it is doubtful that such measures will reduce the *relative* exposure of big firms compared to their smaller brethren. The large firms are still likely to carry more indemnity insurance, the individual partners to have more (financial and human) capital at risk and the insurance option to be worth more because of the greater number and size of their audit client portfolios.

suggest the Big Six therefore have greater incentives to provide better audits than their smaller rivals (Dye, 1991; Freedman and Finch, 1997; Lennox, 1999a). The Financial Times (4 July 1996) summarizes: The big audit firms can find themselves targeted for lawsuits because of their deep pockets — including their statutory insurance cover . Similarly, the Economist (7 October 1995) states:

> As partnerships, the large accountancies operate under the legal principle of joint and several liability. This means that when a company collapses, its auditors who not only have deep pockets, but may be hit for the entire bill if they were negligent, even if other parties were careless too.

If the big firms are providing insurance over and beyond that provided by auditors in general, this additional service should command a price.

The insurance hypothesis states that any Big Six premium is due to their providing a service over and beyond the generic audit mandated by company law. An audit firm has to be large in order to provide such a service. A contrary view is that the Big Six have used their dominant market position to create entry barriers and thereby charge excessive fees. For example, Gist and Michaels (1995) call for a change in the structure of the market, stating: it is obvious that some form of intervention is necessary as the market and free enterprise system cannot be relied upon to remedy the oligopolistic or monopolistic abuses in the profession . These calls have grown more strident in the light of the Enron debacle and the resultant reduction to a Big Four. Although concentration ratios have increased (e.g. Eichenseher and Danos, 1981; McConnell, 1984; Danos and Eichenseher, 1986; Hogan and Jeter, 1999; and Wolk et al., 2001), no systematic evidence of market abuse has appeared in the literature. Consistent with this, the Monopolies and Mergers Commission and the Office of Fair Trading in the UK and the Department of Justice in the USA did not oppose the recent mergers of major accounting firms. The American evidence is that competition was largely unaffected by the mergers in 1989-1990 (Minyard and Tabor, 1991; Tonge and Wootton, 1991) and there has been no evidence of anti-competitive behaviour (Simunic, 1980; Lee, 1996; and Sullivan, 2000). The Office of Fair Trading (2001) appointed an independent body - the Law and Economics Consultant Group (LECG) - to assess competition in the architecture, law and accountancy professions. Their survey noted the high concentration levels but stated: LECG have not found evidence of cartel activity among the professions examined. Likewise, academic

research has not uncovered evidence of an anticompetitive market (DeAngelo, 1981a; Francis and Simon, 1987; Simon and Francis, 1988; Roberts et al., 1990; Turpen, 1990; Pearson and Trompeter, 1994 and Craswell and Francis, 1999). The high concentration ratios are usually explained as a form of product differentiation and concerns over market power should be treated with scepticism (Craswell and Taylor, 1991, 74). Given this weight of opinion and evidence, we do not test for oligopoly pricing in the present study.

3. Research Design and Data Collection Procedures

The approach we have followed can be summarised as follows. The paper first replicates the prior literature by testing for a Big Six premium (model 1). Next, we extend Palmrose (1986a) by testing for returns to brand name (hypothesis H1), non-Big Six industry specialization (hypothesis H2) and Big Six industry specialization reputations (hypothesis H3) in a single OLS regression (model 2). We follow this by replicating the basic design used by Craswell et al. (1995) by creating sub-samples of specialist and non-specialist industries (models 3 and 4). Model 3 estimates brand name returns in non-specialist industries (hypothesis H4) and by removing the specialist auditors in specialist industries (hypothesis H5). Model 4 computes industry specialization returns by excluding the non-Big Six non-specialists and comparing specialist fees with Big Six non-specialist fees (hypothesis H6). Model 4 also compares the difference between specialist Big Six audit fees and non-Big Six audit fees in specialist industries against the brand name premium of H5 (hypothesis H7). We test for knowledge spillovers (hypothesis H8) in the OLS regression (model 5) and simultaneous equation estimations (models 5 and 6). Finally, we estimate whether the general model fully captures the effects of size (hypothesis H9), risk (hypothesis H10), complexity (hypothesis H11) and NAS (hypothesis H12) by including a series of interaction variables (model 7). These steps are summarised formally below.

We start by considering whether possession of a Big Six brand is a source of enhanced revenue in the audit market:[7]

H1 Ceteris paribus, Big Six auditors have larger audit fees than non-Big Six auditors.

$$LAF = \alpha_0 + \beta_1 (C\text{ontrols}) + \beta_2 \text{ Brand} + \varepsilon . \quad (1)$$

[7] Variable definitions are given after the various statistical models and hypotheses have been described.

The significance of brand name and industry specialization is first examined using the Palmrose (1986a) methodology. Apart from a brand name, industry specialization might be a source of enhanced revenue in the audit market:

H2 Ceteris paribus, non-Big Six industry specialist auditors will have higher audit fees than non-Big Six non-specialist auditors.

We then consider whether firms with a brand name can also enhance their audit revenues through industry specialization:

H3 Ceteris paribus, Big Six industry specialist auditors will have higher audit fees than Big Six non-specialist auditors.

By expanding model (1) to form model (2), we can jointly test H2 and H3:

$$LAF = \alpha_0 + \beta_1(\text{Controls}) + \beta_2\ \text{Brand} + \beta_3\ \text{NB6Spec} + \beta_4\ \text{B6 Spec} + \varepsilon. \qquad (2)$$

Brand name and industry specialist returns are also estimated using the Craswell et al. (1995) methodology. For non-specialist industries, the brand name is conjectured to be a source of enhanced revenue:

H4 Ceteris paribus, in industries not having specialist auditors, Big Six auditors will have larger audit fees than non-Big Six non-specialist auditors.

In industries where firms have staked a claim to possess specialist knowledge, brand name may be expected to be the main source of enhanced audit revenue:

H5 Ceteris paribus, in industries with specialist auditors, non-specialist Big Six auditors will have larger audit fees than non-Big Six auditors.

To test this, we employ model (1), but cutting the sample down to comprise only those industries with and without specialist auditors.

We conjecture that industry specialization is a bigger source of revenue than is brand name:

H6 Ceteris paribus, in the industries having specialists, the specialist auditors will have larger audit fees than the non-specialist Big Six auditors.

We further conjecture that industry specialization and brand names are together bigger sources of revenue than is brand name only:

H7 Ceteris paribus, in those industries with specialists, the specialist Big Six auditors will have larger audit fees than non-Big Six non-specialist auditors, by an amount exceeding the brand name premium in hypothesis H5.

$$LAF = \alpha_0 + \beta_1\ (\text{Controls}) + \beta_2\ \text{Specialist} + \varepsilon. \qquad (3)$$

Our earlier discussion of the relationship between audit and NAS work suggested that while the relationship is likely to be very complicated, the joint provision of such services might be expected to offer more revenue than would providing either service alone:

H8 Ceteris paribus, auditors that provide NAS to their clients have larger audit fees than auditors that do not provide NAS.

This can be modelled in a single equation framework with NAS treated as exogenous.

$$LAF = \alpha_0 + \beta_1 (\text{Controls}) + \beta_2 \text{Brand} + \beta_3 \text{LNAS} + \varepsilon. \quad (4)$$

In addition, any two-way interdependencies in the determination of audit and NAS fees can be estimated by fitting equation (4) simultaneously with (5):

$$LNAS = \alpha_0 + \beta_1 (\text{Controls}) + \beta_2 \text{LAF} + \varepsilon. \quad (5)$$

Large clients need large auditors. This feature of the demand for audit services might lead to large audit firms extracting rents:

H9 Ceteris paribus, the audit fees charged to large clients will be greater for Big Six auditors than non-Big Six auditors.

The decisions of clients to seek the services of large audit firms could be a function of their need for enhanced credibility in otherwise difficult circumstances. In particular, high-risk clients might seek to assure creditors and others of the probity of their financial reports:

H10 Ceteris paribus, after controlling for known fee determinants, the audit fees charged to risky clients will be greater for Big Six auditors than non-Big Six auditors.

Complex clients provide a greater source of revenue to firms with brand names than generic firms:

H11 Ceteris paribus, after controlling for known fee determinants, the audit fees charged to complex clients will be greater for Big Six auditors than non-Big Six auditors.

Firms capable of providing NAS as well as audit might have a marketing advantage over other auditors:

H12 Ceteris paribus, after controlling for known fee determinants, the Big Six auditors will charge larger audit fees for joint service provision than non-Big Six auditors.

Hypotheses H9-H12 all identify additional factors that might enable firms to charge higher prices for audit services than would otherwise be the case. Model (6) incorporates the relevant exogenous variables:

$$LAF = \alpha_0 + \beta_1 \text{(Controls)} + \beta_2 \text{Brand} + \beta_3 \text{Beta} + \beta_4 \text{SizeB6} + \beta_5 \text{CurtB6} + \beta_6 \text{BetaB6} + \beta_7 \text{LNAS} + \beta_8 \text{NASB6} + \beta_9 \text{SizeRisk} + \beta_{10} \text{SizeNAS} + \beta_{11} \text{RiskNAS} + \beta_{12} \text{All} + \varepsilon. \quad (6)$$

The variables used in models (1)-(6) to test the various hypotheses are set out below:

Dependent Variables

LAF = natural logarithm of audit fees (£ 000),

LNAS = natural logarithm of NAS fees (£ 000),

Experimental (Test) Variables

Brand = auditor indicator variable, 1 indicates a Big Six auditor, 0 otherwise,

NB6Spec = auditor indicator variable, 1 indicates a Non-Big Six specialist, 0 otherwise,

B6Spec = auditor indicator variable, 1 indicates a Big Six specialist, 0 otherwise,

Specialist = auditor indicator variable, 1 indicates an industry specialist, 0 otherwise,

NASB6 = interaction variable, Big Six dummy x NAS fees,

Beta = measure of company s beta risk,

SizeB6 = interaction variable, Big Six dummy x log of total assets,

CurtB6 = interaction variable, Big Six dummy x Current Ratio,

BetaB6 = interaction variable, Big Six dummy x Beta coefficient,

SizeRisk = log assets x Current Ratio,

SizeNAS = log assets x NAS fees,

RiskNAS = Current Ratio x NAS fees,

All = log assets x Current Ratio x NAS fees.

The prior literature defines industry specialization using a dichotomous measure of the auditors sales or fees in an industry, hereinafter DAI (Palmrose, 1986a; Craswell et al., 1995 and DeFond et al., 2000). The present study extends this prior work in three ways. First, we compute continuous and dichotomous measures of specialization to try to capture complexities stemming from firms choosing to invest different amounts in the development of specialist expertise (Krishnan and Yang, 1998). Second, since small firms might devote significant amounts of their resources to one particular industry, we define specialization in terms of the audit firm s share of their

portfolio in an industry, hereinafter AFSI, and the audit firm s perceived areas of industry specialization (as advertised on websites and in corporate literature), hereinafter AFP. Finally, for robustness we estimate three (10%, 20% and 30%) hurdle rates of specialization. In total, we use nine specialist measures. These measures are derived from the following variables:

$SALES_{jik}$ = sales of company j in industry i audited by firm k,

$FEES_{jik}$ = audit fees of auditor k from company j in industry I,

$CLIENT_{jik}$ = 1 if company j is in industry i and is audited by auditor k; 0 otherwise

K_i = number of (listed) companies in industry i.

Five of the specialist measures are dichotomous indicator variables:

1. A DAI specialist variable, DDR, that takes the value of 1 if the following two conditions hold: (i) the industry contains at least 30 clients and (ii) the aggregate share number of the sales of the audit firm s clients in an industry exceed α = 10% (20%) of the industry s sales revenue. Otherwise DDR is set equal to zero. More precisely:

   If $\{(K_i \text{ ? } 30) \quad (SALESSHARE_{ik} > \alpha)\}, DDR_{ik} = 1$; otherwise $DDR_{ik} = 0$,

   where K_i is the number of companies in industry i and

$$SALESSHARE_{ik} = \sqrt{\frac{SALES_{jik}}{\sum_{k=1}^{K}\sum_{j=1}^{J} SALES_{jik}}}.$$

   DDR is intended to capture settings where becoming an industry specialist might be a rational goal for an audit firm (condition one) and where the audit firm s clients have a significant share of the economic activity in that industry (condition two).

2. A fee-based DAI specialist variable, DDF, that takes the value of 1 if the following two conditions hold: (i) the industry contains at least 30 clients and (ii) the audit firm s share of the audit fees paid by the industry exceeds α = 10% (20%). DDF = 0 otherwise. More precisely

If $\{(K_i \ ? \ 30) \quad (FEESSHARE_{ik} > \alpha)\}, DFR_{ik} = 1$; otherwise $DFR_{ik} = 0$,

where: $FEESSHARE_{ik} = \overline{\prod_{j=1}^{J} \frac{FEES_{jik}}{\sum_{k=1}^{K}\sum_{j=1}^{J} FEES_{jik}}}$.

DDF is intended to capture settings where becoming an industry specialist might be a rational goal for an audit firm (condition one) and where the auditor has a substantial share of the audit income generated by the industry (condition two).

3. A revenue-based AFSI specialist variable, DAR, that takes a value of 1 if the following two conditions hold: (i) at least α = 20% (30%) of the number of the firm s clients and (ii) α = 20% (30%) of the value of the auditors clients revenue is from the industry. DAR = 0 otherwise. More precisely:

   If $\{(\%CLIENT_{ik} \ ? \ \alpha) \quad (\%SALESCLIENT_{ik} > \alpha)\}, DAR_{jk} = 1$; otherwise $DAR_j = 0$, where

$$\%CLIENT_{ik} = \overline{\prod_{j=1}^{J} \frac{CLIENT_{jik}}{\sum_{i=1}^{I}\sum_{j=1}^{J} CLIENT_{jik}}}.$$

$$\%SALESCLIENT_{ik} = \overline{\prod_{j=1}^{J} \frac{SALES_{jik}}{\sum_{i=1}^{I}\sum_{j=1}^{J} SALES_{jik}}}.$$

   DAR is intended to capture settings where the auditor has a large share of its clients from the industry (condition one) and the clients are economically significant (condition two).

4. A fee-based AFSI specialist variable, DAF, that takes a value of 1 if the following two conditions hold: (i) at least α = 20% (30%) of the number of the firm s clients and (ii) α = 20% (30%) of the value of the firm s fees are from the industry. DAF = 0 otherwise. More precisely:

   If $\{(\%CLIENT_{ik} \ ? \ \alpha) \quad (\%FEESCLIENT_{ik} > \alpha)\}, DAR_{jk} = 1$; otherwise $DAR_j = 0$, where

$$\%SALES_{ik} = \sum_{j=1}^{J} \frac{SALES_{jik}}{\sum_{i=1}^{I}\sum_{j=1}^{J} SALES_{jik}}.$$

$$\%FEESCLIENT_{ik} = \sum_{j=1}^{J} \frac{FEES_{jik}}{\sum_{i=1}^{I}\sum_{j=1}^{J} FEES_{jik}}.$$

DAR is intended to capture settings where the auditor has a large share of both its clients (condition one) and its audit fee income (condition two) from the industry.

5. An AFP specialist variable, DFP, that takes a value of 1 if the firm promotes itself as a specialist in this industry. DFP = 0 otherwise.

We also use four corresponding continuous variables of industry specialism:

1. A revenue-based measure of DAI specialist, CDR: the ratio of the accounting firm s revenue within an industry to the total amount of revenue earned by firms in that industry. CDR is a continuous measure based on the share of the total sales revenue of that industry attributable to the auditor s clients:

$$SALESSHARE_{ik} = \sum_{j=1}^{J} \frac{SALES_{jik}}{\sum_{k=1}^{K}\sum_{j=1}^{J} SALES_{jik}}.$$

2. A fee-based measure of DAI specialist, CDF: the ratio of the accounting firm s audit fees within an industry to the total amount of audit fees paid by firms in that industry. CDF is a continuous measure based on the auditor s share of the total audit fees paid by companies in that industry:

$$FEESSHARE_{ik} = \sum_{j=1}^{J} \frac{FEES_{jik}}{\sum_{k=1}^{K}\sum_{j=1}^{J} FEES_{jik}}.$$

3. A revenue-based measure of AFSI specialist, CAR: the ratio of the accounting firm s revenue within an industry to the total amount of revenue earned by the firm s portfolio of clients. CAR is a continuous measure based on the share of the total sales revenue of that industry attributable to the auditor s clients:

$$SALESCLIENT_{ik} = \sum_{j=1}^{J} \frac{SALES_{jik}}{\sum_{i=1}^{I}\sum_{j=1}^{J} SALES_{jik}}.$$

4. A revenue-based measure of AFSI specialist, CAF: the ratio of the accounting firm s audit fees within an industry to the total amount of audit fees paid by firms in their total portfolio of clients. CAF is a continuous measure based on the proportion of its fees that are derived from the industry:

$$FEESCLIENT_{ik} = \sum_{j=1}^{J} \frac{FEES_{jik}}{\sum_{i=1}^{I}\sum_{j=1}^{J} FEES_{jik}}.$$

We include in our models a number of control variables that have been used in other studies to capture other aspects of the pricing of audit services. The audit pricing literature explains the majority of the variation of audit fees using proxies for client size (assets or revenue), litigation risk (long term debt to assets, return on investment, current and quick ratios) and complexity (domestic and foreign subsidiaries ratios). We collected total assets, debt, earnings before interest and tax, financial year end, quick ratio, current ratio, operating profit, share issue and industry listing code data from the Standard and Poor s Global Vantage database. At the time of data retrieval, this database covered most of the major global and local market indices for fifty-four listed countries. UK clients have been required to report audit fee levels in their financial statements for many years. The disclosure of payments for NAS was mandated by the Companies Act 1989 for years ending on or after 30 September 1992 and was supported by the Cadbury Committee Report. On cross-examination with the hard copies of financial statements, we found a number of errors on the Global Vantage database, resulting in a downward bias on the NAS fee. We therefore collected audit and NAS fee data from the Datastream International and Extel Company Research databases. These databases do not contain subsidiary information and there are a number of other missing values. Fee, subsidiary and auditor identity data were collated by hand from hard copies of the published financial statements and the International Stock Exchange yearbook.

The final sample was constructed by removing any missing or repeat observations, financial clients and outlier observations.[8] Sixty-five investment trusts are incorrectly included in the industrial database and have been removed, for two reasons. First, the nature of their business is very different to other companies, making interpretation of their financial statements and ratios problematic. Second, financial institutions operate in widely different regulatory environments than industrials that might result in different costs for their auditors. In addition, we trimmed the sample to get rid of outlier observations beyond the 1% level in order to reduce the skewness of key variables.[9] These procedures produced a final sample of 4,638 firm-year observations covering the period 1985-1995.

Consistent with other studies, logarithmic and square root transformations of the audit fee and NAS variables were made in order to prevent the largest clients from unduly influencing the results. The extent of the skewness of our distribution can be assessed by comparing the mean and median values of the audit fee (£335,351 and £120,000) against the mean and median logarithm of audit fees (4.971 and 4.787) in Table 2. As can be seen, these variables are well behaved after transformation. The mean and median Current and Quick ratios are similar to the figures the financial statement literature might lead one to expect, unlike the mean acid test ratio (5.828) found by Craswell et al. (1995) and the mean current and quick ratios (0.447 and 2.157) quoted by DeFond et al. (2000). The concentration ratio over the period 1992-1995 (79%) is higher than that of the period 1985-1995 (73%) indicating a trend to upgrade to a Big Six firm.

Untabulated results indicate that multicolinearity is not likely to be a problem. The only correlations of any magnitude are between the current and quick ratios (0.72) and between the logarithm of total assets (LTA) and the square root of the number of subsidiaries (Sub) (0.57), and these are well below conventional cut-off points.

- Insert Table 2 about here-

[8] Global Vantage recorded financial information by type of share; hence clients with multiple share issues are recorded several times.
[9] Very similar results were documented when the data were windsorised.

4. Results

The variety of models and alternative proxies needed in this study resulted in our running a large number of regressions. We also ran regressions separately for each year, as well as on a pooled basis, increasing the number of regressions yet further. To make the results section concise and interpretable, we provide summary statistics in the form of average parameter estimates and t-statistics, together with the number of statistically significant coefficients obtained in the individual-year regressions. We also provide pooled regression results that combine all the firm-year observations. Since there is some evidence of heteroskedasticity, the findings are presented using the White (1980) procedure. However, although most of the audit fee variability is explained, the R^2 explanatory power proxy does not exceed the generally recognised critical value of 0.9 that would indicate a possible multicollinearity problem (Kennedy, 1992). Coefficients that are significant at the five percent level or better are shown in bold type.

The results of the Big Six premium estimation (model 1) are documented in panel A of Table 3. All of the control variables possess the anticipated sign, with LTA, Sub, Current and Foreign provide most explanatory power. Consistent with hypothesis H1, the results indicate a significant coefficient on the Brand variable in eight out of eleven years. The Brand coefficient averages 0.136 in the annual regressions and is 0.148 in the pooled regression, indicating a Big Six premium of about 15%[10]. This finding is consistent with those of many prior studies.

The combined brand name and dichotomous industry specialization estimates (models 2-3) appear in panel B of Table 3. The variable Spec refers to whether or not the auditor meets our definition of being a specialist in the client s industry. In the case of the DDF and DDR definitions of industry specialisation, the industry must pass a size criterion (contain at least 30 firms) and be important to the firm in terms of its share of industry audit fees or the extent to which it is reliant on the industry for revenue, respectively. The DAR and DAF definitions focus on how concentrated the auditor s business comes from the client s industry. These are researcher-derived measures of

[10] The Big Six premium is computed by inverting the exponential function. The results are not sensitive to the precise way in which major control variables are defined, e.g. using the logarithm of sales revenue or the square root of total assets to proxy for size.

industry specialisation. In contrast, DFP refers to whether the auditor promotes itself as a specialist in that particular industry. Finally, the B6Spec variable covers the sub-set of DFP auditors who are members of the Big Six.[11] Control variables are included in the regressions but are not reported in panel B since the coefficients are not dissimilar to those reported in panel A. Likewise, we obtain very similar (untabulated) results when continuous measures of industry specialization are employed.

The results in panel B indicate that industry specialist returns are not significant, no matter how industry specialisation is defined. While we get a significant result in the pooled regression when specialisation is defined by reference to a firm s share of clients in the industry and its importance to the firm s revenues (i.e., the DAR Spec variable), the regression is insignificant in ten out of eleven years. The other ways of defining specialisation all fail to yield significant results in the pooled regressions. When B6spec is included in the model, its coefficient is invariably insignificant. In any event, the coefficient on Brand is significant in all the pooled regressions, in both panels A and B, suggesting that it is not simply a return to industry specialisation earned by the Big Six.[12] Against this must be set the fact that the results for the individual year regressions are more sensitive, with fewer number of significant Brand coefficients than was obtained when industry specialisation was ignored.

-Insert Table 3 about here -

We have checked whether these findings are sensitive to the way industry has been defined by re-running the table 3 regressions using two-digit SIC listings and a sample of finer industries one would expect would be prime candidates for audit specialisation. Motivated by prior work, the sectors chosen in the present study are agricultural products, mineral extraction, utilities, and leisure and other service industries. The results are reported in table 4. The picture is broadly the same as

[11] All the regressions include Brand, which is the Big Six indicator variable, and one of five ways of defining an industry (DDF, DAF, DDR, DAR and DFP). Both Big Six and non-Big Six firms register DDF, DAF and DAR industry specialisations throughout the period but non-Big Six firms fail to meet the DDR and DFP criteria in a number of years. To avoid colinearity problems and to facilitate consistent comparison of the results across time, B6spec is included in all of the DDF, DAF and DAR regressions but is not reported for the DDR and DFP estimations. However, the results in the years that non-Big Six firms meet the DDR and DFP criteria are not dissimilar to those reported.

[12] Untabulated analysis reveals that Big Six firms develop the greatest number of specialists in the consumer goods, general industrials and wholesale and merchandising sectors.

before. Brand is highly significant in all the pooled regressions, regardless of whether and how industry specialization is controlled. While the B6spec variable is always insignificant, its inclusion in the year regressions has a dampening effect on Brand. For example, the number of years when Brand was significant falls when B6spec is included in the model. However, a comparison of tables 3 and 4 suggests that Brand is significant in more years when industry is defined more closely. If Brand was just a proxy for industry specialisation, we might expect the opposite result.

- Insert Table 4 about here —

The implications of our findings are that the Big Six premium may be attributed to brand names but cannot be credited to industry specialist returns. These insignificant results are not surprising in the light of our discussion in section 2, where we point out that competitive pressures might force firms to pass on at least part of the benefits of specialisation to clients in the form of lower order charges. Whatever the explanation, it seems unlikely that industry specialisation can be regarded as the source of the Big Six premium.

Another possible explanation for the Big Six premium is that it stems from big accounting firms being able to retain knowledge spillovers. This might arise if the Big Six are able to generate more audit revenue, after controlling for the costs of providing the service, because of operational audit efficiencies they obtain from providing consulting services to those clients. Preliminary evidence indicating that this might be happening is provided by an untabulated univariate analysis of the data that shows that a larger amount (in terms of money value) of NAS fees is generated by Big Six firms when the clients are complex and diversified in their operations than is obtained by non-Big Six firms from simple, undiversified clients. We therefore fit both OLS and two-stage simultaneous equation regressions (models 4 and 5) for both individual years[13] and on a pooled basis. The OLS model treats NAS as an exogenous determinant of audit fees whereas the simultaneous equations model allows us to explore whether the endogeneity of NAS is an issue that has to be taken into account in determining the impact of NAS on audit fees.

[13] As explained previously, information about the NAS fees generated by auditors was not publicly available in the early years of our sample.

The results of the relationships between audit fees, brand name and NAS are presented in table 5. The same control variables were included in both the OLS and the 2SLS specifications as were employed in the table 3 regressions. We predict that very similar factors that explain the magnitude of audit fees will also drive NAS - namely, client size, risk, profitability and complexity. However, while there is plenty of reason to believe that clients with financial year-ends that fall within the peak period December-March impose greater marginal costs on auditors than those with other year-ends, the same does not seem likely to be the case with non-audit assignments. Since the demand for NAS seems unlikely to be heavily influenced by the client s financial reporting cycle, we include the same exogenous variables in the LNAS 2SLS equation except we exclude the YE variable. In each panel, the OLS results indicate that there is a significant positive association between audit and NAS fees. However, we find convincing evidence (at the $p<4\%$ and $p<3\%$ levels, respectively) that audit and NAS fees are interrelated using the Hausman (1978) exogeneity test, suggesting these OLS results need to be treated with caution. When LNAS is made endogenous by fitting a simultaneous equations model, it ceases to be a significant factor in explaining audit fees in three out of the four individual years, though there is a significant positive relationship in the pooled model (panel E). The conflict between the pooled and annual results make it difficult to draw firm conclusions about whether the provision of non-audit services has a positive influence on the size of the audit fee. If we focus on the pooled results, the OLS regression implies the audit revenue elasticity with respect to non-audit revenue is 0.183; in other words, an increase in NAS fees of one pound will generate extra audit fees of less than twenty pence. The effect is markedly smaller when we look at the two-stage pooled regression. In this model, audit revenue elasticity is only 0.052, suggesting an extra pound of NAS generates only five pence of extra audit fee income.

The relationship is much stronger when we consider the impact of audit fee income on non-audit fee revenue. There is clear evidence in all the two-stage regressions (both in the year-by-year and the pooled results) to suggest that NAS revenue is a positive function of the level of audit fee income. The size of the LAF coefficient is stable across years. Moreover, the quantitative impact is much greater, the elasticity being not far short of unity: an increase in audit revenue from a client of one pound generates additional non-audit income of about 90 pence, on average.

- Insert Table 5 about here -

The table 5 results indicate that the Big Six premium is not statistically significant in any of the annual OLS regressions when LNAS is also included as an explanatory variable. In contrast, the picture provided by the pooled regressions is conflicting, with an insignificant Brand coefficient in the OLS specification but a significant coefficient in the two-stage regression. When due allowance is made for the logarithmic specification, the two-stage regression Brand coefficient of 0.138 implies a Big Six premium of about 15% of the price charged by a small audit firm. This is about the same as that obtained in table 3, when no control was included for NAS. Taken together, these results imply that the Big Six premium is not simply an artefact attributable to failure to control for NAS. When allowance is made for the endogeneity of NAS, the Big Six premium re-appears.

Our models contain control variables for the size and riskiness of a client, two factors that theoretical considerations suggest should be prime factors in the determination of the price of an audit. However, size and risk might affect audit fee income in more complex ways than is captured by the simple linear specification in this and earlier studies. For example, Big Six firms might be able to charge more than their smaller brethren for auditing a large client. Risky clients have a special need to signal the trustworthiness of their financial statements, which might enable large auditors to charge them more for their services. Big Six firms might be able to charge a further premium, over and above the premia they can extract for size and risk, when a large client is also risky since this is a situation which carries with it particularly large deep pocket exposure.

We address this possibility by re-running model 1 for sub-samples partitioned according to the size of the clients and for riskiness of the clients. The results appear in table 6. In panel A we report estimates for the sub-sample where the auditees have total assets above the median and for the sub-sample with total assets below the median. The brand name premium is greater for clients from the smaller half of the sample, implying a larger demand for the services of a reputable accounting firm by small clients. Mean values of the Big Six market share (and total assets) are 73% (and

£475,871,000) for the full sample, 80% (and £911,022,000) for the large sub-sample and 66% (and £40,740,000) for the small sub-sample. However, for the smallest quartile of clients, the returns to brand name reputations are significant in only one year. The lack of a Big Six effect amongst the smallest clients could be due to a number of factors. The audit market might be more competitive in this sector. Alternatively, the demand for a quality firm might bottom out because clients have restricted resources to purchase audit services or the price of a quality audit is high relative to the expected benefits. While these findings are consistent with product differentiation in the market for audit services, they need to be treated with caution in the light of the huge share the Big Six has of above-average sized audit clients. The weaker results for larger clients might simply be due to lack of variation in the brand indicator variable.

We report estimates for the low- and high-risk sub-samples in panel B of table 6. Estimates of the brand name coefficients are similar, implying that the results are not sensitive to client risk. A Chow test shows that the parameters are not dissimilar, implying that the model is structurally consistent.

- Insert Table 6 about here -

Finally, we consider the possibility that brand name, size, risk and NAS might interact in complex ways. Audit firms might be able to generate more NAS business when the client is particularly large or risky. Big Six firms might be particularly well placed to provide NAS and their ability to provide such additional services might lead to larger audit fees. We therefore augment the regressions by including various two-way interactions of auditor type, client size, client risk and NAS revenue. The results are reported in table 7. The regression estimates for the interactions of size and risk with auditor type appear in panel A. The results are not consistent with hypotheses H9 and H10. Indeed, the SizeB6 variable is only significant when both the risk interaction variables are also included; in which case, it has the wrong sign. Likewise, contrary to H10, CurtB6 is negative in all three regressions. These results do not support the view that the Big Six firms charge more the greater the size or risk of the client. However, it should be noted that the inclusion of these complex interactions is associated with the coefficient on Brand often becoming insignificant, which is consistent with the

Big Six premium being a statistical artefact arising from failure to control for complexities associated with the size and risk of audit clients.

The estimates for interactions of auditor type with NAS appear in panel B. The coefficient of the main effect variable LNAS is always positive, regardless of the inclusion of further interactions. This result needs to be treated with caution, given our earlier finding about the endogeneity of NAS, a factor not reflected in these OLS models. The relationship is evidently complex since including a two-way interaction of LNAS with firm type makes no difference, unless client size is also interacted with risk. In this latter case, the coefficient on LNASB6 is negative (-0.185), suggesting that Big Six firms are more inclined to trade lower audit fees for more NAS than are smaller firms — but only when allowance is made for the interaction between client risk and NAS (greater risk tempers the audit-NAS trade-off).

Further evidence of the complexity of the audit pricing relationship is provided in panel C. When the interactions of firm type with client size, client risk and non-audit services are all included in one regression, along with two- and three-way interactions of size, risk and LNAS, only the coefficient on the main NAS variable is significant. However, we caution against reading too much into this result, given our earlier findings about the need to control for the endogeneity of NAS.

-Insert Table 7 about here -

The sensitivity of the results reported in tables 3-7 have been tested in a variety of ways. Various checks suggest the models are well specified from an econometric perspective. There is no evidence that hetroskedasticity is a problem. Likewise, variable exclusion, consideration of a different model and prior beliefs about variable estimates (Gujarati 1999) suggest that the results are not contaminated by multicollinearity.

Since the pooled regression results in Table 3 could be sensitive to client, firm or year specific events not captured by our control variables, we also estimated fixed effects versions of the pooled regressions with dummies for clients, audit firms and years. An important feature of this procedure is that the Brand variable is supplemented with

separate variables for each Big Six and non-Big Six firm. Consistent with the Big Six premium evidence reported in this paper, we find that the coefficients on the non-Big Six firms are significantly lower than the Big Six coefficients. We find no evidence to suggest that any one particular Big Six firm is driving the findings reported in this paper. Consistent with fee inflation, we find that the calendar dummy coefficients are negative in the early years but significant and positive towards the end of the period we examine. Not surprisingly, we observe an insignificant Big Six coefficient but both significant positive and negative coefficients for the audit client fixed effect terms. We extend this analysis by examining the influence of client size on the coefficients but although the findings are spread over a large number of clients, the results are inconclusive. Large clients will pay premium fees for the range of services offered by large auditors, but some small clients purchase premium services for the reputation afforded by the international firms.

In addition to the steps outlined in above, model structure has been further assessed by using different proxies for client size, complexity, risk, brand name and industry specialization, without the results being materially affected. We sensitise for industry specialization definition using steeper 20% and 30% hurdle rates but although there are fewer specialists, the unreported results are not materially different. Likewise, we testing the sensitivity of the results reported in table 4 by excluding each firm and industry sequentially to see if any were driving the results. The results were qualitatively unchanged.

5. Summary and Conclusions

Prior research on audit pricing has found evidence consistent with the audit firms charging a premium for their services in a number of countries. However, the evidence concerning the UK has been mixed, with some studies reporting a premium and others failing to do so. Our study has two distinguishing features. We start by finding that the Big Six appear to earn a premium in the UK when due allowance is made for factors like the size, complexity and riskiness of a client s business. The major contribution of the paper is to examine whether this Big Six premium can be attributed to the omission of other factors that might lead to higher audit fees being charged by the large firms. We use a greater variety of measures of industry specialisation than have been employed in previous studies and find the Big Six

premium cannot be attributed to this factor. We also find that the Big Six premium cannot be attributed to the provision of NAS to an audit client, when proper allowance is for the fact that the pricing of an audit can be affected by non-audit services, and vice versa. Finally we consider whether a large audit firm is able to charge a premium when a large client is also risky since this is a situation which carries with it particularly large deep pocket exposure. This might also be a situation where large audit firms are able to sell more audit services and this factor might influence their pricing of the audit. Consistent with these conjectures, we find that when allowance is made for these complex interactions, the Big Six premium tends to disappear.

Our study has a number of limitations. The UK is an excellent test site for examining the relationship between the pricing of audit and non-audit services provided to audit clients because both amounts have had to be publicly disclosed for some time. However, the amount the auditor receives for non-audit services is a single number, lumping fees relating to audit-related work, such as special investigations and tax advice, compliance, in with other management advisory services. Changes in various countries concerning the non-audit work that auditors can do for their audit clients may make it possible to narrow down the focus in future investigations.

Another weakness is the essentially ad hoc nature of the audit pricing model used in this and other studies. A better theoretical understanding of the audit production function may enable sharper tests to be made by researchers. Our finding that the existent of a Big Six premium is sensitive to how interactions between client size, risk and NAS are modelled suggests that functional form is important in understanding audit pricing.

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Table 1 Summary of the results of the prior literature.

Paper	Industry Specialist Definition	Name Premium (Brand)	Industry Premium (B6)	Industry Premium (NB6)	Paper	NAS fee
Palmrose 1986 a	1-3 market leader(s) of sales revenue	*		N/A	Simunic 1984	
Etteredge and Greenburg 1990	Change in industry share and clients perception of auditor expertise.				Simon 1985	*
Craswell and Taylor 1991	10% of the industry s clients, audit and/or NAS fees	N/A	N/A	N/A	Abdel-khalik 1990	
Carcello et al. 1992	Questionnaire about knowledge of partner/manager/senior manager				Turpen 1990	*
Lys and Watts 1994	Firm has largest share in the industry (% of 2 digit SIC audited)	N/A	N/A	N/A	Barefield et al. 1993	
Pearson and Trompeter 1994	Market leader of square root of assets	N/A		N/A	Davis et al. 1993	*
Craswell et al. 1995	10% of clients or audit fees in the industry	*	*	N/A	O Keefe et al. 1994	
Ritson et al. 1997	20% of total fees in the industry	N/A	N/A	N/A	Craswell and Francis 1995	*
Matthews et al. 1997	2 client and 20% of fees if large or 2(3) clients and 60% (20%) of fees if small industry	N/A	N/A	*	Butterworth and Houghton 1995	*
Francis et al. 1999	Industry market leader	N/A	N/A	N/A	Ezzamel et al. 1996	*
Krishnan and Yang 1999	Dichotomous and continuous measures of sales.	N/A	N/A	N/A	Firth 1997	*
DeFond et al. 2000	Top 3 share of audit fees	*	*	*	Ezzamel et al. 2002	*
Culvenor and Godfrey 2000	Proportion of firms work in industry c.f. their share of the market	N/A	N/A	N/A	O Sullivan and Diacon 2002	*
Krishnan 2000	Auditor s industry share, market leadership, 10% market share, share of each industry in the auditors client portfolio	N/A	N/A	N/A		
Dunn et al. 2000	Continuous rank of % industry sales audited. Dichotomous % sales	N/A	N/A	N/A		

* statistically significant, N/A not applicable.

Table 2 Descriptive Statistics for the sample of UK clients

Variable	Mean	St. Dev.	Min	Q1	Median	Q3	Max
Audit fee	335.351	528.412	10.67	56	120	344	3800
Remuneration	503.239	3558.118	0	40	104	285	7000
LAF	4.971	1.272	2.267	4.025	4.787	5.841	8.243
NAS	260.468	2892.809	0	12	40	116	4000
LNAS	3.713	1.752	0	2.485	3.688	4.753	8.294
Brand	0.733	0.442	0	0	1	1	1
Total assets	475.871	1345.313	0.355	35.329	98.055	325.288	22565
LTA	11.655	1.616	5.872	10.472	11.493	12.692	16.932
Capital	491.194	1689.531	0.107	29.794	88.346	281.198	27367.71
Subsidiaries	16.290	17.872	0	5	11	21	196
Sub	3.562	1.897	0	2.236	3.316	4.583	14
Total debt	110.328	383.652	0	3.42	14.442	59.6	8898.752
Op. profit	52.128	184.259	-235.9	3.243	9.502	31.999	3531
EBIT	56.975	195.452	-235.9	3.413	10.425	35.113	3670
Revenue	529.212	1256.835	0	45.14	119.376	352.681	13893
LREV	4.908	1.625	-3.863	3.814	4.783	5.869	9.578
Loss	0.150	0.357	0	0	0	0	1
Current	1.569	0.720	0.015	1.158	1.437	1.832	7.708
Quick	0.937	0.585	0.012	0.631	0.861	1.121	7.575
CATA	0.587	0.208	0.017	0.47	0.619	0.733	0.997
DTA	0.098	0.125	0	0.014	0.070	0.149	3.612
ROI	0.107	0.108	-1.345	0.077	0.116	0.156	0.692
Foreign	0.236	0.267	0	0	0.158	0.412	1
YE	0.682	0.466	0	0	1	1	1

Audit Fee = Fee relating to the audit (£ 000); Remuneration = total auditors remuneration; LAF = natural logarithm of the audit fee (£ 000); NAS= Non-audit fee (£ 000); LNAS = natural logarithm of non-audit service fee; Brand = 1 if Big 6 Auditor,0 otherwise; Total Assets = Total assets (£ M); LTA = natural logarithm of total assets (£ 000); Capital = market value of client in £ M at 31/12/1995; Subsidiaries = Number of domestic subsidiaries; Sub = square root of the number of subsidiaries; Total Debt = Total debt (£ M); Op.profit = Profit (£ M); EBIT = Earnings before interest and tax (£ M); Loss = 1 if operating loss reported in prior 3 years, 0 otherwise; Revenue = Total revenue (£ 000); LREV = natural logarithm of total revenue (£ 000); Current = ratio of current assets to current liabilities; Quick = ratio of current assets less stock to current liabilities; CATA = ratio of current assets to total assets; .DTA= ratio of long-term debt to total assets; ROI = ratio of earnings before interest and tax to total assets; Foreign = proportion of subsidiaries that are foreign operations; YE = fiscal year end between December and March.

Table 3 Big Six premium, brand name and dichotomous industry specialization regressions

Panel A

	Intercep	**LTA**	**Sub**	**Current**	**Quick**	**DTA**	**ROI**	**Foreign**	**YE**	**Loss**	**Brand**	**N**	**F**	**R^2**
	?	+	+	-	+	+	-	+	+	+	+			
Average	**-1.721**	**0.482**	0.233	**-0.068**	0.081	0.180	-0.029	**0.439**	0.049	0.029	**0.136**	464	197.51	0.89
1985-95	(6.44)	(21.19)	(13.05)	(2.14)	(1.22)	(1.02)	(1.51)	(4.05)	(0.99)	(0.75)	(2.12)			
# 5%	11	11	11	7	1	1	3	10	1	0	8			
Pool	**-1.425**	**0.465**	0.234	**-0.112**	**0.081**	**0.171**	**-0.336**	0.489	**0.054**	0.023	**0.148**	4638	1884.6	0.803
	(19.93)	(70.09)	(43.13)	(6.66)	(3.87)	(2.45)	(5.78)	(14.38)	(2.98)	(0.91)	(7.70)			

Panel B

	----------DDF----------			**----------DAF----------**			**-------DDR------**		**----------DAR----------**			**--------DFP-------**	
Year	**Brand**	**Spec**	**B6spec**	**Brand**	**Spec**	**B6spec**	**Brand**	**Spec**	**Brand**	**Spec**	**B6spec**	**Brand**	**Spec**
Average	0.046	0.114		**0.138**	0.055		**0.153**	-0.037	**0.130**	0.061		**0.138**	-0.011
1985-95	(1.72)	(1.08)		(2.11)	(0.61)		(2.16)	(0.52)	(2.02)	(0.99)		(2.13)	(0.07)
# 5%	3	1		6	0		3	0	3	1		5	0
F, R^2	168.63	0.81		162.21	0.81		167.63	0.78	170.23	0.80		159.36	0.79
Average	0.112	0.080	-0.011	**0.137**	0.003	-0.004			0.123	0.078	-0.024		
1985-95	(1.60)	(0.74)	(0.78)	(2.13)	(0.64)	(0.86)			(1.70)	(0.57)	(0.18)		
# 5%	3	0	1	4	0	0			3	0	0		
F, R^2	160.52	0.81		155.32	0.81				169.89	0.80			
Pool	**0.127**	0.059		**0.147**	0.031		**0.158**	-0.022	**0.138**	**0.060**		**0.151**	-0.020
	(6.08)	(3.12)		(7.41)	(0.88)		(7.12)	(1.09)	(6.86)	(3.20)		(7.75)	(0.46)
F, R^2	1633.191	0.81		1629.004	0.80		1689.2	0.80	1702.1	0.81		1632.5	0.80
Pool	**0.128**	0.066	-0.008	**0.153**	0.106	-0.100			**0.144**	0.084	-0.029		
	(5.67)	(1.22)	(0.14)	(7.48)	(1.50)	(1.22)			(6.36)	(1.93)	(0.60)		
F, R^2	1496.754	0.81		1493.547	0.80				1700.1	0.80			

Table 3 continued

The coefficients shown in bold are significant at the 5% level or lower.
The dependent variable is the natural logarithm of audit fees.
LTA= natural logarithm of total assets (£ 000); Sub = square root of the number of subsidiaries; Current = ratio of current assets to current liabilities; Loss = dummy variable, operating loss reported in prior 3 years; Quick = ratio of current assets less stock to current liabilities; DTA = ratio of long-term debt to total assets; ROI = ratio of earnings before interest and tax to total assets; Brand = 1 if Big Six auditor = 1, 0 otherwise; Foreign = proportion of subsidiaries that are foreign operations; YE = dummy variable, fiscal year end between December and March inclusive = 1; Spec = dichotomous industry specialization variable; B6Spec= Big Six dichotomous industry specialist variable. DDR takes the value of 1 if: (i) the industry contains at least 30 clients and (ii) the number of clients in an industry and the firm s share of the revenue both exceed 10% (20%), 0 otherwise. DDF takes the value of 1 if: (i) the industry contains at least 30 clients and (ii) the number of clients in an industry and the firm s share of the fees both exceed 10% (20%), 0 otherwise. DAR takes a value of 1 if: (i) at least 20% (30%) of the number of the firm s clients and (ii) 20% (30%) of the value of the firm s revenue is from the industry, 0 otherwise. DAF takes a value of 1 if: (i) at least 20% (30%) of the number of the firm s clients and (ii) 20% (30%) of the value of the firm s fees are from the industry, 0 otherwise. DFP takes a value of 1 if the firm promotes itself as a specialist in this industry 0 otherwise.

Table 4 Two digit SIC and finer industry regressions

	Year	Brand +	Spec +	B6spec	N	F	R sq.
2 digit SIC	Average 1985-95	**0.144**	0.455		422	162.84	0.81
		(2.23)	(1.19)				
	# 5%	9	0				
	Average 1985,6,8	0.137	0.266	-0.160	314	115.87	0.82
		(1.86)	(1.23)	(0.73)			
	# 5%	1	0	0			
	Pool	**0.155**	**0.320**		4638	1715.202	0.81
		(7.99)	(3.60)				
	Pool	**0.158**	**0.441**	-0.274	4638	1572.931	0.81
		(8.11)	(3.71)	(1.53)			
Finer industries	Average 1985-95	**0.138**	0.055		422	162.40	0.81
		(2.14)	(0.84)				
	# 5%	6	0				
	Average 1985-88	**0.152**	0.071	-0.375	325	115.28	0.81
		(2.09)	(0.34)	(0.70)			
	# 5%	2	0	0			
	Pool	**0.147**	**-0.068**		4638	1629.024	0.80
		(7.39)	(2.99)				
	Pool	**0.148**	-0.014	-0.078	4638	1493.030	0.80
		(7.39)	(0.11)	(0.49)			

The same control variables as appear in table 3 are included in the regressions, but for conciseness are not reported.
The coefficients shown in bold are significant at the 5% level or lower.
The first row shows the parameter estimate and the second row the t statistic for each variable.
Brand = dummy variable, Big Six auditor = 1; Spec = continuous measure of industry specialization;
B6Spec = dummy variable, Big Six industry specialist =1.

Table 5 Brand name and knowledge spillovers OLS and simultaneous equations models

		Dependent variable	Brand	LNAS	LAF	N	F	R^2
Panel A								
OLS	1992	LAF	0.116	**0.150**		488	90.113	0.82
			(1.35)	(3.93)				
2 stage	1992	LAF	0.201	0.044		488	79.842	0.80
			(1.79)	(1.29)				
2 stage	1992	LNAS			**0.926**	488	11.198	0.37
					(7.87)			
Panel B								
OLS	1993	LAF	0.029	**0.222**		488	124.924	0.83
			(0.39)	(6.31)				
2 stage	1993	LAF	0.144	0.013		488	95.407	0.83
			(1.40)	(0.40)				
2 stage	1993	LNAS			**0.909**	488	11.573	0.37
					(7.47)			
Panel C								
OLS	1994	LAF	0.082	**0.216**		461	112.891	0.83
			(1.08)	(6.38)				
2 stage	1994	LAF	0.129	0.059		461	53.105	0.77
			(0.86)	(1.11)				
2 stage	1994	LNAS			**0.871**	461	16.054	0.50
					(7.85)			
Panel D								
OLS	1995	LAF	0.087	**0.159**		485	122.335	0.82
			(1.14)	(5.00)				
2 stage	1995	LAF	0.147	**0.076**		485	107.288	0.79
			(1.24)	(2.32)				
2 stage	1995	LNAS			**0.987**	485	24.246	0.47
					(10.65)			

Table 5 continued

		Dependent variable	Brand	LNAS	LAF	N	F	R^2
Panel E								
OLS	POOL	LAF	0.068	**0.183**		1922	519.143	0.84
			(1.87)	(11.28)				
2 stage	POOL	LAF	**0.138**	**0.052**		1922	402.121	0.77
			(2.67)	(3.21)				
2 stage	POOL	LNAS			**0.928**	1922	61.321	0.42
					(19.12)			

The coefficients shown in bold are significant at the 5% level or lower.
The same control variables as appear in table 3 are included in the LAF regressions, but for conciseness are not reported.
The first row in each panel shows the parameter estimate and the second row the t statistic for each variable.
LAF = natural logarithm of audit fees. LNAS = natural logarithm of non-audit service fees. Brand = dummy variable, Big Six auditor = 1, 0 otherwise.

Table 6 Brand name regressions controlling for client size and risk

	Brand +	N	F	R^2
Panel A: Partitioned by Client Size				
Largest 50%				
Pooled	**0.148**	2319	426.207	0.65
	(4.27)			
Average 1985-95	0.144	209	39.91	0.65
	(1.33)			
# sig. 5%	1			
Smallest 50%				
Pooled	**0.168**	2319	378.519	0.62
	(8.10)			
Average 1985-95	**0.144**	212	39.86	0.64
	(2.09)			
# sig. 5%	6			
Smallest 25%				
Pooled	**0.107**	1113	125.006	0.55
	(3.75)			
Average 1985-1995	0.073	106	13.01	0.54
	(0.76)			
# sig. 5%	1			
Panel B: Partitioned by Client Risk				
Most risky 50%				
Pooled	**0.137**	2322	1106.309	0.83
	(5.03)			
Average 1985-95	0.152	215	85.21	0.79
	(1.62)			
# sig. 5%	4			
Least risky 50%				
Pooled	**0.171**	2316	820.223	0.78
	(6.30)			
Average 1985-95	0.124	220	96.34	0.80
	(1.36)			
# sig. 5%	2			

The coefficients shown in bold are significant at the 5% level or lower.
The same control variables as appear in table 3 are included in the regressions, but for conciseness are not reported.
Brand = I if Big Six auditor = 1, 0 otherwise.

Table 7 Pooled audit fee OLS regressions estimates with size, risk, and NAS fee interaction terms

nteractions vith Brand[a]	Brand	Size B6	Curt B6	Size risk	LNAS	LNAS B6	Size lnas	Risk nas	All	N	F	R^2
anel A												
Size	0.054	0.010								4638	1623.072	0.79
	(0.37)	(0.74)										
Risk	**0.300**		**-0.089**							4638	1627.112	0.79
	(6.19)		(3.11)									
Size+ Risk	0.237	0.005	**-0.088**							4638	1491.267	0.79
	(1.50)	(0.42)	(3.05)									
Size+ risk	**0.912**	**-0.053**	**-0.518**	**0.037**						4638	1383.430	0.79
	(4.13)	(2.84)	(5.06)	(4.38)								
anel B												
Size+NAS	**-0.607**	0.057			**0.175**	0.013				1134	446.615	0.84
	(2.05)	(1.71)			(5.63)	(0.35)						
Size+ NAS	0.359	-0.028			**0.174**	**-0.185**	**0.017**			1134	417.568	0.84
	(0.77)	(0.61)			(5.62)	(2.28)	(2.70)					
Risk+NAS	0.034		-0.106		**0.145**	0.052				1134	447.012	0.84
	(0.24)		(1.94)		(5.71)	(1.93)						
Risk+NAS	-0.151		0.004		**0.145**	**0.098**		-0.028		1134	415.878	0.84
	(0.84)		(0.05)		(5.69)	(2.51)		(1.63)				
Panel C												
Size+risk+	-0.235	0.022	0.318	-0.026	**0.177**	0.049	0.001	-0.147	0.010	1134	404.329	0.84
NAS	(0.27)	(0.27)	(0.71)	(0.62)	(5.73)	(0.27)	(0.07)	(1.48)	(1.14)			

[a] All the variables listed are interacted with Brand (B6).
The coefficients shown in bold are significant at the 5% level or lower.
The same control variables as appear in table 3 are included in the regressions, but for conciseness are not reported.
Brand = if Big Six auditor = 1, 0 otherwise; SizeB6 = logarithm of total assets x Brand; CurtB6 = Current Ratio x Brand; Sizerisk = Size x CurtB6; LNAS = logarithm of NAS fees (£ 000); LNASB6 = LNAS x Brand; Sizelnas = logarithm of total assets x LNAS; Risknas = Curtbr x LNAS; All = log total assets x Current Ratio x LNAS.