Oxera

Comments on the PwC submission: 'An econometric analysis of the prices of large company audits'

Note prepared for BDO and Grant Thornton

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Non-confidential

1 Introduction

1.1 This note comments on PwC's paper 'An econometric analysis of the prices of large company audits', published on December 19th 2012.[1] Whereas the Competition Commission (CC) has not carried out a price-concentration analysis (PCA), nor econometric analysis of the price effects of switching and tendering, PwC has done so.

1.2 PwC concludes that it can establish no link between higher concentration and higher prices, and it finds that companies that have switched or tendered did not, in the long term, obtain lower prices than companies that did not switch or tender. As such, this note addresses two questions:[2]

– does PwC's paper establish that econometric analysis (which the CC has not performed) can be carried out to a reliable standard and deliver meaningful results for the CC's investigation?

– given that PwC has done this analysis, could the CC rely on PwC's results rather than undertaking its own econometric analysis?

[1] Available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/pwc_an_econometric_analysis_of_the_prices_of_large_company_audits.pdf.
[2] Oxera has benefited from the support of Dr Walter Beckert, Oxera Associate, in answering these questions. Dr Beckert is an academic econometrician and member of the academic panel of the UK Competition Commission.

1.3 Oxera considers that PwC's paper is supportive of the view that the CC could, and should, have carried out further econometric analysis as part of its investigation. It is notable that PwC's paper finds that tendering or switching auditor leads to short-run and (albeit not reported by PwC) long-run price benefits for the largest UK companies—around a 9% saving in the short run, and 11% in the long run. PwC has not distinguished between tendering and switching in its econometric analysis, so the effects are not separable from reading the PwC paper.[3,4] Given the shortcomings of PwC's work outlined in this note, it remains essential that econometric evidence be produced by the CC, rather than by the main parties to the CC's inquiry.[5]

2 The feasibility of econometric analysis of audit prices

2.1 Oxera has held two technical meetings with the CC regarding the feasibility of econometric analysis in the reference market.[6] The view expressed by Oxera has been that, notwithstanding the empirical challenges, econometric analysis of price-concentration and switching relationships would probably deliver significant benefit to the CC's investigation.

2.2 The CC has explained its reasons for not carrying out PCA,[7] and to our knowledge has not attempted econometric analysis of the effects of switching or tendering on audit prices (although it has looked at such effects using descriptive statistics).

Price-concentration analysis

2.3 The main reasons for not undertaking PCA have been:

a) a lack of variation in the explanatory variation of market concentration;
b) endogeneity of variables that measure market concentration;
c) inappropriately defined distinct markets; and
d) incomplete and/or unreliable data.

2.4 Thanks to the efforts put into creating a new dataset for the CC's inquiry, problem (d) appears to be resolved—although see comments in section 3 below regarding the size of the panel dataset required for a successful PCA.

2.5 As to problem (a), Oxera's understanding from the last CC technical meeting on 19th December 2012 is that the CC would, if attempting a PCA, be using a dataset that contains information on FTSE 350 and Top Track 100 companies for the period 2006–11. It is clear

[3] Moreover, PwC notes at footnote 26 that: 'There may have been a number of tenders that took place without switches that we have not identified.' This may lead to underestimation of the effects of tendering, since the 'control group' of non-tendering companies may in fact contain a number of companies that have undertaken a tender.
[4] PricewaterhouseCoopers (2012), 'An econometric analysis of the prices of large company audits', December 19th. Available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/pwc_an_econometric_analysis_of_the_prices_of_large_company_audits.pdf, para 3.10.
[5] Note that various econometric studies of the audit market have been produced outside the context of the CC's investigation. PwC is therefore wrong to claim at footnote 33 that 'there is no a priori evidence or theory' to link concentration and price. Indeed, PwC refers to some of these studies in Appendix A to its paper.
[6] Oxera (2012), 'Methodologies for audit market investigation: lessons from Oxera's 2006 and 2007 studies', prepared for Competition Commission, January 17th, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/oxera_presentation_17_january_2012.pdf; Oxera (2012), 'Price-concentration analysis in the audit market investigation', prepared for Competition Commission, December 19th, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/oxera_pca_presentation.pptx.
[7] Competition Commission (2012), 'Audit Market Investigation. Price concentration analysis', available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/price_concentration_analysis_wp.pdf.

that market concentration for this set of companies has been extremely stable in the given time period, and therefore a PCA is unlikely to be successful.

2.6 The notable feature of PwC's paper is that it employs a much longer dataset, covering at least the period 2000–10.[8] This appears to give a greater chance of being able to observe some variation in concentration, as it includes the 2001–02 period when Andersen exited the market. Whether PwC's dataset is sufficient for a robust PCA is addressed in section 3 below.

2.7 Oxera has commented elsewhere on how to resolve the other empirical challenges, (b) and (c), facing a PCA.[9] These views were expressed with caution as Oxera does not have access to all the data held by the CC. PwC's paper, which was not published at the time of Oxera's previous remarks, adds weight to our previous view that undertaking a PCA is worthwhile, and that if the CC does not do this, it should at least derive a view based on the extensive existing literature examining the price-concentration relationship in audit markets.

Price effects of switching/tendering

2.8 Apart from the limitations identified in section 3 below, PwC's paper establishes that an econometric approach to price effects of switching/tendering is feasible and produces useful results for the CC's inquiry. This adds weight to Oxera's previous view that the CC could exploit its dataset to produce meaningful econometric analysis for the audit market inquiry. Specifically, Oxera said:

> whether or not PCA in the traditional sense is carried out, the CC may also want to consider alternative econometric approaches, given the richness of the dataset that has been created, and the exogenous identifying variation that institutional changes may provide;
>
> at a minimum, analysis drawing on the best of the existing literature, and on feasible exercises with the rich dataset, would add value to this inquiry.[10]

2.9 However, at a high level the picture emerging from PwC's analysis is not substantially different from the CC's descriptive statistics, except in the magnitude of the price effects (which is muted by the inclusion of PwC's control variables). Specifically, both PwC's econometrics and the CC's descriptive statistics have found that companies do obtain lower prices after switching, at least in the short run. (Note that PwC has not distinguished between tendering and switching in its econometric analysis, so the effects are not separable from reading the PwC paper.[11]) However, PwC's finding applies to tenders/switches involving the Big Four only—in the CC's public dataset, switches from the Big Four to the mid-tier induce long-run lower prices. PwC's analysis does not appear to address switching from the Big Four to the mid-tier, and nor does it analyse the effect of mid-tier presence in audit tenders.

[8] PricewaterhouseCoopers (2012), 'An econometric analysis of the prices of large company audits', December 19th, para 3.1 to 3.2, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/pwc_an_econometric_analysis_of_the_prices_of_large_company_audits.pdf.
[9] Oxera (2012), 'Price-concentration analysis in the Audit Market Investigation', prepared for Competition Commission, October 12th, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/pca_oxera.pdf; Oxera (2012), 'Price-concentration analysis in the audit market investigation', prepared for Competition Commission, December 19th, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/oxera_pca_presentation.pptx.
[10] Oxera (2012), 'Price-concentration analysis in the audit market investigation', prepared for Competition Commission, December 19th, slide 12, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/oxera_pca_presentation.pptx.
[11] PricewaterhouseCoopers (2012), 'An econometric analysis of the prices of large company audits', December 19th, para 3.10, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/pwc_an_econometric_analysis_of_the_prices_of_large_company_audits.pdf.

The CC does not yet appear to have carried out quantitative analysis of the effect of audit tenders on price.[12]

2.10 PwC's interpretation of whether companies obtain long-run price savings from switching is, however, flawed, as discussed in section 3 below. Oxera's reading of PwC's results is that switching/tendering does result in long-run price savings.

3 The reliability of PwC's econometric analysis

3.1 Oxera's comments on PwC's analysis fall into three categories:

1. generic comments on the limitations of interpretation given the available data (these would tend to apply to any analysis based on the same dataset);
2. specific comments on PwC's interpretation of its econometric results; and
3. issues with PwC's modelling approach, which ought to be addressed if the CC undertakes its own econometric analysis.

Limitations induced by the dataset

3.2 The Big Four firms' collective market share in the FTSE 350 has not dropped below 95% over the last ten years.[13] In order to conduct a robust analysis of PCA or the effects of tendering/switching, it is appropriate to have a dataset that includes, for comparison purposes, less-concentrated market segments in which the mid-tier firms have a meaningful market share. Without this, neither PCA nor analysis of tendering/switching can analyse whether having more than four firms participating in the market delivers benefits to consumers.

3.3 Observing variation in concentration, and the competitive effects of participation of firms other than the Big Four, can come from a longer time-series (ie, including the 6-to-5 effect of the PwC merger and/or the 5-to-4 effect of the Andersen exit), and/or from a wider cross-section of audit engagements (ie, including audit markets in which the Big Four do not have a collective near-monopoly market share).

3.4 As Oxera has previously discussed with the CC, the benefit of looking at the existing econometric literature is that other studies have used broader or longer datasets, in which greater variation in concentration can be found. Oxera's recommendation has therefore been that 'the CC ought to draw conclusions from the existing PCA literature in audit'.[14]

3.5 While PwC's dataset is long enough to include the Andersen exit, companies that were audited by Andersen are eliminated from the PwC analysis (see PwC Appendix A, paragraph A.18), meaning that this potential opportunity to examine the price-concentration relationship has been inappropriately eliminated. A similar comment applies to PwC's exclusion of the banking and financial services sector (see PwC paragraph 3.12), since this sector is one that

[12] In its working paper on descriptive statistics, the CC said: 'Instances where a company held a tender and retained the incumbent auditor were not considered in the analysis as this information was not contained in the public data set.' Competition Commission (2012), 'Statutory Audit Market Services Investigation. Descriptive Statistics', para 16, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/descriptive_statistics.pdf.
[13] Public data descriptive statistics, tab: Market shares.
[14] Oxera (2012), 'Price-concentration analysis in the audit market investigation', prepared for Competition Commission, December 19th, slide 12, available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/2011/statutory-audit-services/oxera_pca_presentation.pptx.

appears to differ from the rest of the FTSE 350 in terms of market concentration and regulatory specificities.[15]

Inaccuracies in interpretation of the results

Long-run price effects

3.6 The PwC paper interprets the coefficient estimates of the preferred company-specific effects model on the dated direct tender switching variables as temporary (paragraphs 4.12–4.13). However, the initial effect of switching in the model (a 9% reduction in price) induces a knock-on effect in subsequent years since PwC's dynamic model establishes a serial dependence in audit fees across different time periods. In addition, the model finds a separate (downward) effect of 6% for the second year after the switch, which induces a further effect on fees in the following years.

3.7 In a dynamic model such as that employed by PwC it is important to distinguish between year-on-year changes and cumulative changes. The PwC submission focuses mainly on year-on-year changes. For example, the price reduction stated in footnote 39 is a year-on-year effect accruing from year 1 to year 2. Similarly, Figure 1 of the PwC submission should be interpreted as the year-on-year changes that PwC obtained for years 1 to 4 following the switch. The cumulative effect on audit fees is obtained by putting together all the year-on-year changes.

3.8 Hence the estimated coefficient on the dated direct tender switching variable of –0.09 is only an estimated short-run effect of switching on audit fees. The estimated long-run effect, which the analysis never seems to compute or report, is –0.09/(1 – 0.19) = –0.11, ie, an 11% reduction in price.[16] Moreover, this long-run estimate will tend to understate the total price reduction because it omits the year 2 price change of –0.06.

3.9 The interpretation of the estimated coefficients offered in the PwC analysis is therefore misleading, and the correct interpretation of PwC's results is that the long-run effect of switching/tendering is to lower prices relative to the average price paid by companies which do not switch/tender.

Interpretation of industry and index effects models

3.10 The interpretation of the estimates of the industry and index effects models is unreliable, although the PwC report itself advises considering these results with caution (eg, Appendix A, paragraph 8). This model must be estimated using the random effects estimator because the industry classification dummies do not vary over time and, therefore, their effects on audit fees are not identified within the fixed effects modelling framework. The discrepancy of random effects and between effects estimators (eg, paragraph 4.21) suggests that the model is mis-specified and the estimates therefore ought to be considered unreliable.

Confidence intervals

3.11 Further inaccuracies in the interpretation of results, albeit substantively inconsequential, are given in paragraphs 4.7 and 4.14 and relate to the interpretation of confidence intervals. It is incorrect to state that, with a certain probability, the true coefficient lies within the associated confidence interval, because this suggests that the coefficient is random and the interval is

[15] Bank audit appears to be subject to specific regulatory requirements. See, for example, http://www.bba.org.uk/policy/article/practice-note-16-bank-reports-for-audit-purposes-in-the-united-kingdom-revi/eu-regulation-and-legislation/.

[16] To be very precise, all coefficients could be refined using the Kennedy adjustment. This would not substantially change the results. See Kennedy, P.E. (1981), 'Estimation with correctly interpreted dummy variables in semilogarithmic equations', *American Economic Review*, **71**, p. 801.

fixed. In fact the opposite is true: because the interval is random and the coefficient is fixed, the correct interpretation is that, with a given coverage probability, the confidence interval covers the true coefficient.

Recommended changes in the modelling approach

Banks and financial services companies should be included

3.12 It is understandable that banks and financial services (BFS) companies have no inventories, meaning that the inventory/asset ratio for these companies is zero or unavailable. It is, however, surprising that these firms are eliminated from the main analysis (paragraph 3.12), especially in light of the potential for regulatory changes of auditing of BFS firms to provide a natural experiment. It appears, however, that their inclusion does not substantively alter the results, although no account seems to be taken of the relevance of changes in regulation (Appendix E).

Andersen should be included

3.13 It is inappropriate that companies that were audited by Andersen are eliminated from the analysis (Appendix A, paragraph 18). Ensuing 'forced switches' might also constitute a natural experiment. It would have been interesting to see how the results change if data pertaining to these firms were included, as the Andersen exit is the only significant market-level change in concentration contained in the PwC dataset.

The effects of long auditor tenure should be estimated

3.14 Footnotes 17 and 36 of PwC's paper make it clear that 33% of companies are excluded from the estimation of the 'long tenure' coefficient because the initial year of auditor engagement has been erroneously coded as year 2000. Since those companies with the longest auditor tenure are excluded from PwC's model, it is not possible to use the model to estimate the true impact of long tenure, and the finding that 'our central estimate is for tenure to have a zero effect on audit prices'[17] should not be regarded as a reliable indication.

Further clarity is required on model diagnostic checks

3.15 It is not correct to say that the inclusion of the lagged dependent variable among the regressors in the dynamic model specification fully ensures that no bias due to unobserved audit fee determinants arises (Appendix A, paragraph 4). If such unobserved determinant series are serially correlated, then this requires extra care to credibly argue that the instruments used by the Arellano–Bond (AB) estimator are correlated with the lagged dependent variable, but uncorrelated with the regression residuals.

3.16 Under standard assumptions, these residuals are taken to be serially independent so that lags of the dependent variable can serve as instruments for the lagged differences among the regressors of the AB estimating equations (which is specified in differences); these may not be valid instruments (at short lags) when the unobservable determinants as part of the regression residual are serially correlated. The exposition of the relevant diagnostic tests (in Appendix B) is not sufficiently clear to allow an unambiguous assessment.

3.17 The serial correlation tests for the preferred model (reported in Appendix B, paragraphs B.2–B.3) are not presented with sufficient clarity to determine whether this is a problem; B.3 seems to suggest that the null hypothesis of no first-order serial correlation in the differenced residuals is rejected, which would suggest that the level residuals are correlated with their first and second lags. On the other hand, the Sargan–Hansen test of over-identifying restrictions (B.4) is supportive of the model, failing to reject the validity of the restrictions.

[17] PricewaterhouseCoopers (2012), op. cit., para 4.9.