

*“The CC’s margin-concentration  
analysis in the UK Groceries Inquiry”*

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# The CC's margin-concentration analysis in the UK Groceries Inquiry

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The UK Competition Commission's recent inquiry into the Groceries sector made the unprecedented recommendation that organic growth by large incumbents in concentrated areas be prohibited. The key support for this recommendation came from an econometric analysis of the relationship between margins and concentration. We describe the analysis and demonstrate that it suffers from material flaws that cast doubt on the validity of the conclusions drawn from it, and so on the remedy itself. We identify issues around the nature of debate between investigated parties and the UK authorities on technical issues and make some suggestions for changes to processes.

The UK Competition Commission (“**CC**”) recently carried out a market investigation into the UK grocery sector (the “**Groceries Inquiry**”). The inquiry took almost two years and covered a wide range of issues, including the relationships between suppliers and retailers, whether there was any evidence of strategic land holdings, the nature and extent of buyer power, the so-called “waterbed” effect and “tipping point” theories, and the impact of supermarkets on the number of convenience stores. The CC's Final Report, and many of the supporting documents and submissions, can be found on the CC's website.<sup>2</sup>

In this article we concentrate on one of the areas explored by the CC – the extent to which there were areas of the country which were less competitive than others, and so where customers suffered detriment. The primary evidence relied on by the CC was an econometric analysis of the relationship between store margins and local concentration. The CC concluded that the analysis showed that in local markets with fewer competitors, existing stores made higher margins. The CC interpreted the econometric findings as evidence that firms deteriorated

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<sup>2</sup> <http://www.competition-commission.org.uk/inquiries/ref2006/grocery/index.htm>

their competitive offer in areas where they faced fewer competitors. While this interpretation may accord with some theoretical models of competition, it is also empirically surprising, because the CC also found that supermarkets in the UK charged “national” prices – the same prices for the same products in every store.

Based on these results, the CC found that there was an “adverse effect on competition” (“*AEC*”) arising from the existence of areas of high concentration. To address this problem, it recommended that organic growth by large firms in highly concentrated areas be prohibited (the so-called “competition test”). Under the competition test a large store in a highly concentrated area could not expand its floor space and enlarge its store. Neither could a large existing supermarket chain construct an additional supermarket in the given market area.

Tesco appealed this recommendation to the Competition Appeals Tribunal (“*CAT*”), who upheld the appeal on the basis that the CC had omitted material considerations from its cost-benefit analysis of the remedy. This decision represented the first time that the CAT had overturned a CC proposal in a market investigation, and was only the second time overall that any CC finding had been successfully challenged.<sup>3</sup>

This article reviews the econometric analysis relied on by the CC for its AEC finding – and thus indirectly for its proposed competition test. (The AEC arguments were not the subject of an Appeal.) We demonstrate that the analysis suffered from important econometric problems, which cast doubt on the robustness of the analysis for the conclusions. Moreover, the interpretation placed by the CC on the econometric results was not supported by other evidence. We conclude that the margin-concentration analysis in the Groceries Inquiry cannot support the heavy burden the CC required of it.

The concern over the merits of this analysis is enhanced by the nature of the review process faced by the CC. The judicial review standard, coupled with a judiciary typically without specific economic training and a general level of deference shown by courts to expert bodies such as the CC, means that technical analyses such as the margin-concentration econometrics appear almost impossible to challenge. Reforms that could improve the nature of debate on technical analyses would include a greater ability to access the CC’s file in relation to its own technical work, and the introduction of “review on the merits” standards of appeal.

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<sup>3</sup> The only previous example related to certain remedy proposals arising in the Bass/Interbrew merger of 2001, as case appealed to the High Court.

## Background – the Groceries Inquiry

Market investigations are a relatively unusual feature of the UK competition regime.<sup>4</sup> The CC has a wide-ranging remit to identify whether there are any features of a referred market that prevent, restrict or distort competition, such as barriers to entry, industry practices, regulatory requirements, or simply the level of concentration. The CC has powers to remedy those features directly, or to make recommendations to government as to appropriate solutions.<sup>5</sup>

The CC cannot initiate market investigations itself, but must wait for a sector to be referred by the Office of Fair Trading (“*OFT*”), the UK’s first-stage competition authority. The Groceries Inquiry arose out of a complaint made by the Association of Convenience Stores (“*ACS*”) to the OFT. The ACS was concerned that the struggles of the convenience sector were the result of anti-competitive actions by or advantages accruing to the major grocery retailers, such as their greater buyer power leading suppliers to raise prices to smaller retailers (the so-called ‘waterbed’ effect). The OFT initially decided not to refer the sector for investigation, but the ACS successfully appealed this decision on the grounds that the OFT had presented insufficient reasoning for its decision.<sup>6</sup>

Having had the matter referred back to it, the OFT decided instead to ask the CC to carry out a market investigation into the Groceries sector in May 2006.<sup>7</sup> It identified that the sector exhibited decreasing prices, with some evidence of increasing choice and improving quality, suggesting that consumers had benefited from competition between supermarkets and from their move into the convenience sector. However, the OFT also identified a number of areas where it had grounds for concern. These included:

- whether the planning regime, and in particular the ‘needs test’ acted as a barrier to entry;<sup>8</sup>

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<sup>4</sup> The EU has started to carry out sector reviews, such as the ongoing pharmaceutical sector review, but it does not have statutory powers to act on findings (although findings of sector reviews might lead to subsequent action under Article 81 EC or Article 82 EC). There is no US equivalent.

<sup>5</sup> Recent market investigations have covered a variety of sectors, including store credit cards, veterinary services, extended warranties, the supply of milk, home credit, and domestic bulk liquefied petroleum gas.

<sup>6</sup> See <http://news.bbc.co.uk/1/hi/business/4401096.stm> (accessed 31 July 2009) for a summary of the issues.

<sup>7</sup> Reasons for referral available at <http://www.offt.gov.uk/news/press/2006/49-06> (accessed 31 July 2009).

<sup>8</sup> The needs test effectively asks whether there is sufficient demand in an area for a new development, typically by comparing a measure of capacity (e.g. total floorspace) with a measure of demand (based typically on population, income, and likely spend).

- whether the significant land holdings of supermarkets acted as a barrier to entry, and whether restrictive covenants attached to the sale of some land sites increased barriers to entry;
- certain aspects of pricing behaviour, including below-cost selling and price flexing (the act of charging different prices in different locations);
- a possible increase in supermarkets' buyer power.

The CC had two years to investigate the market, identify features of concern, and propose remedies to deal with those features. It was not restricted to looking at the areas identified by the OFT, and in practice its investigation roamed widely across these issues and numerous others, although the main focus of the investigation was on those issues raised by the OFT.

As a practical matter, the CC was required to define a market or markets within which grocery competition took place. The CC found that there were three separate markets for grocery stores of different sizes.<sup>9</sup> Large grocery stores (of above 1,000 to 2,000 sq. m in net sales area) formed a separate market<sup>10</sup>; mid-sized grocery stores (of between 280 sq. m and 1,000 to 2,000 sq. m) were constrained by mid-sized and large grocery stores; convenience stores (below 280 sq. m) were constrained by stores of all sizes.<sup>11</sup> The CC found that markets for grocery retailing were local, and the relevant competitive constraints for large grocery stores were captured by a 10 or 15 minute isochrone (which joins points which can be reached in the same time when driving) around each store.<sup>12</sup>

There are five major firms in UK grocery which operate the vast majority of all large stores.<sup>13</sup> The largest firm is Tesco, with around a 28% share. Asda and Sainsbury have shares of around 14% each. Morrisons has a share of around 10%. Waitrose has a share of around 3%.<sup>14</sup> These chains are broadly nationally based, with Sainsbury and Waitrose more prevalent in the south and east of the

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<sup>9</sup> CC, Groceries, Final Report, paragraph 4.135.

<sup>10</sup> The CC did not make an explicit cut-off between large and mid-range grocery stores in its market definition exercise, as it considered that whether a store was large or mid-range could vary somewhat according to the individual circumstances of a local area. However, in practice the CC treated the cut-off as being 1,000 sq. m for the purposes of proposing remedies.

<sup>11</sup> Roughly speaking, a convenience store is the size of a corner shop; mid-sized grocery stores are the smaller of those which can be found in high streets and district centres; large grocery stores include the larger end of high street stores all the way up to huge out of town stores (which can be as large as 10,000 sq. m.).

<sup>12</sup> CC, Groceries, Final Report, paragraph 4.145.

<sup>13</sup> CC, Groceries, Final Report, Table 3.1.

<sup>14</sup> CC, Groceries, Final Report, Figure 3.1. Data for 2007 (estimates) and relates to grocery sales as a whole, rather than sales from large stores only; shares for large stores only would be higher for these 5 firms and substantially lower for other firms).

UK, while Morrison and Asda are somewhat more concentrated in the north and Tesco spread fairly evenly.<sup>15</sup> Waitrose and to a lesser extent Sainsbury pitch themselves as higher quality/higher price offerings, while Asda and Morrison have more of a value-based offering (again Tesco is somewhere between these ends).<sup>16</sup> All typically offer a large range of products sufficient to carry out a weekly shop. There are also two firms which, while relatively large, primarily operate mid-size stores (Co-op/Somerfield at c. 8% and M&S at c. 4%).<sup>17</sup> There are also three discounter firms with a combined share of around 4%, but the CC considers that these do not constrain large or mid-sized grocery stores.

The CC ultimately found there to be certain features of the large stores grocery market which resulted in adverse effects on competition (AECs).<sup>18</sup> These were:

- the existence of a significant number of local markets which had high levels of concentration, which had persisted for many years;
- the existence of barriers to entry sustaining these levels of local concentration, due to the planning regime and, in certain local markets, the existence of parcels of land with restrictive covenants or the subject of exclusivity arrangements;
- the existence of buyer power in favour of large grocery retail chains which allowed them to adopt practices which resulted in excessive risk and uncertainty being passed up the supply chain.

The CC concluded that these features resulted in consumer detriment. In relation to areas of high concentration, it found that stores made higher profit margins, which it concluded was the result of a deterioration in the competitive offer (we return to this issue below).<sup>19</sup> In relation to the supply chain, the CC concluded that it was difficult to put a value on its concerns, but noted that since the supply chain had a large turnover – around £70bn – even a small adverse effect would result in large detriment to customers.<sup>20</sup>

These findings were a subset of the issues explored by the CC during the course of the Inquiry. Many other issues were explored but were not found to raise concerns. In particular, the CC found that in contrast to the OFT's provisional

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<sup>15</sup> The geographical concentration of Morrison has diminished since its acquisition of Safeway, another national grocery retail chain, in 2003.

<sup>16</sup> Waitrose is the highest-quality/highest-price offering, but is not pitched as high as Whole Foods in the US, for example.

<sup>17</sup> Co-op and Somerfield merged in 2008 after the Groceries Inquiry was completed.

<sup>18</sup> CC, Groceries, Final Report, paragraph 10.9.

<sup>19</sup> It also argued that the existence of such areas might result in an increased level of pricing at a national level, although this argument was not developed in any detail.

<sup>20</sup> CC, Groceries, Final Report, paragraph 10.16.

concerns, there was no competition problem resulting from the small amount of below-cost selling it found to exist; that grocery retailers were not holding on to land strategically to deter entry by rivals; and that the major supermarket chains set prices nationally without flexing. In addition, the CC found that there was no evidence for a “waterbed” in supplier pricing; that there was unlikely to be a “tipping point” in UK wholesaling; that supermarkets’ vouchering practices did not appear to be part of any predatory strategy; and that the expansion of two of the major grocery chains (Tesco and Sainsbury) into convenience stores did not result in a loss of choice of grocery stores for consumers.

Having identified its AECs, the CC set out remedies for its concerns.<sup>21</sup> In relation to the supply chain, it proposed a strengthened code of conduct and the establishment of an ombudsman to investigate complaints. In relation to the specific land practices it had identified, it proposed a ban on restrictive covenants and exclusivity arrangements (the latter with a 5 year grace period).

Perhaps the most novel remedy related to its general concerns about the existence of areas of high concentration, caused by the planning system. The CC did not propose any changes to the planning regime, as it argued that the planning regime had other social rationales (such as the internalisation of externalities, the need to protect town centres, and so on) and it did not wish to cut across those goals. Instead, it proposed a new test to be introduced into the planning system: the so-called “competition test”.<sup>22</sup> Under this test, an incumbent in a highly concentrated area seeking to introduce a new store or extend an existing store would be prevented from so doing. The CC’s aim was to prevent the strengthening of existing areas of concentration, or the emergence of new areas of concentration.<sup>23</sup>

This remedy was the subject of an appeal by Tesco to the Competition Appeals Tribunal (“*CAT*”), who argued that the CC’s assessment of whether the remedy was proportionate was insufficient. Tesco’s appeal was upheld on the basis that the CC had not properly identified the benefits or the economic costs of the remedy.<sup>24</sup> At time of writing the CC is reconsidering its decision and is due to publish its revised findings by October 2009.

## Local competition issues

This article explores the CC’s underlying justification for the imposition of the competition test. In particular, we explore the reasoning for the CC’s finding that

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<sup>21</sup> CC, Groceries, Final Report, paragraph 11.437-11.449.

<sup>22</sup> CC, Groceries, Final Report, paragraph 11.437-11.439.

<sup>23</sup> CC, Groceries, Final Report, Paragraph 11.35.

<sup>24</sup> [http://www.catribunal.org.uk/files/Judge\\_1104\\_Tesco\\_04032009.pdf](http://www.catribunal.org.uk/files/Judge_1104_Tesco_04032009.pdf) (accessed at 31 July 2009).

large stores in concentrated markets made higher profit margins *as a result* of a deterioration in the competitive offer at those stores.

As discussed above, the CC identified separate local markets for individual large grocery stores, defined as a 10 or 15 minute isochrone around each store.<sup>25</sup> The CC defined an area to be of “high concentration” where there were three or fewer fascia in the market, and where the centre store had more than 60% of the floorspace. It found that 11% to 27% of local areas, depending on the size of the isochrone employed, were highly concentrated.<sup>26</sup>

Since the 2000 Inquiry into Supermarkets, the CC had been concerned that consumers in different parts of the UK received a different level of retail offer, and that these differences reflected a lack of competition in some areas compared to others.<sup>27</sup> The retail offer in the groceries sector was typically summarised as “PQRS”, standing for Price, Quality, Range and Service, and the CC hypothesised that if there were a greater number of local competitors, this would put pressure on retailers to improve aspects of PQRS. As a result of this decreased competition, the CC expected that there would be a negative relationship between a higher level of local concentration and a lower level of the retail offer.

The CC did not carry out any systematic analysis of the relationship between individual or aggregate measures of PQRS. It commissioned a consultancy, GfK, to survey 351 stores in 44 areas of high, medium and low concentration. Of these stores, 88 were major supermarkets, 18 were major-owned convenience stores such as Sainsbury’s Local and 246 small convenience stores. It explored 18 PQRS measures, including quality (e.g. extent of damaged goods), range (e.g. number of brands, availability), service (e.g. staff acknowledgement and helpfulness), facilities, and time spent queuing.

Of these 18 measures of PQRS, 17 showed no sign of whether there were any indications of deterioration of the offer in areas of high concentration. There were some indications of a deterioration in one measure – the proportion of items stocked of 14 “basket items” – although it was not clear whether this finding was statistically significant.<sup>28</sup> Overall, GfK concluded that “there is very

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<sup>25</sup> A 10-minute isochrone around a store links all points that can be reached in 10 minutes of driving from the store, in any direction.

<sup>26</sup> CC, Groceries, Final Report, paragraph 6.14.

<sup>27</sup> In the Supermarkets Inquiry in 2000 the CC recommended the introduction of a competition test, but this was not taken up by the Secretary of State for Trade and Industry, who at that point was the decision maker.

<sup>28</sup> Given that most stores stock several thousand lines it is hard to know what could be drawn on evidence on just 14 lines in any event even if the relationship had been shown to be statistically significant. Also, with 18 measures each tested at the 0.05 level of significance, we expect on average one significant outcome. If GfK had investigated statistical significance they would have had to control for the fact that they were testing multiple hypotheses.

little difference in the PQRS retail offer of supermarkets according to the degree of supermarket concentration in the location”.<sup>29</sup>

Tesco also provided an econometric analysis of the relationship between over 20 PQRS measures and local concentration. It found no evidence of any deterioration in any of these measures in areas of higher local concentration.

The CC placed only limited weight on these direct analyses of the relationship between PQRS and local concentration. The CC stated that it considered such exercises could never identify all the possible ways that the retail offer could be adjusted in individual stores. The CC thus adopted the “phlogiston theory” of supermarket competition. No evidence of deterioration of PQRS could be found, but the CC knew it must exist.

Instead, the CC relied on evidence from an econometric analysis looking at the relationship between variable profit margins and concentration. It argued that if the retail offer deteriorated, this would feed through into higher profit margins. Consequently, any increase in margins in areas of higher concentration was the result of a deterioration in QRS (but not P, since the CC found that firms had national prices<sup>30</sup>). Even if it were not possible for the CC to identify exactly which aspect of QRS was deteriorating, the CC argued it could be confident, if the margin-concentration econometrics found a relationship, that some deterioration was taking place in highly concentrated areas.<sup>31</sup>

## The CC’s margin-concentration econometrics

### Model Description

As described above, the margin-concentration analysis was the main evidence cited by the CC to support its view that there was a deterioration in the retail offer in high concentration areas. The CC’s analysis is described in Appendix 4(4) of its Final Report (the “*Report*”). The approach is motivated by considering a two-stage entry game. In the first stage, firms decide whether or not to enter. In

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<sup>29</sup> GfK Report into Local Case Studies, p18. [http://www.competition-commission.org.uk/inquiries/ref2006/grocery/pdf/gfk\\_local\\_case\\_studies.pdf](http://www.competition-commission.org.uk/inquiries/ref2006/grocery/pdf/gfk_local_case_studies.pdf)

<sup>30</sup> The exception was for Somerfield and Co-op, where the CC reported that their price policies including an element of response to local competitive conditions. However, Somerfield and Co-op were only fringe firms in the provision of large grocery stores, accounting for less than 5% of all stores and concentrating on operating mid-range and small stores.

<sup>31</sup> The CC had previously explored the relationship between price levels (rather than margins) and concentration in other inquiries, such as in the funeral parlours (1995) and cinemas (2006). See for example Beckert, W., and Mazzorotto, N., “Price-Concentration Analysis in Merger Cases with Differentiated Products”, 2006, CC Working Paper ([http://www.competition-commission.org.uk/our\\_role/analysis/pc\\_analysis\\_merger\\_cases.pdf](http://www.competition-commission.org.uk/our_role/analysis/pc_analysis_merger_cases.pdf)), which contains a summary of academic papers that explore this relationship in a variety of industries.

the second stage, given entry, firms make profits depending on cost and demand factors and the number and type of entrants. In the second stage, firms can decide to adjust most elements of the retail offer, but are assumed to be unable to alter the fascia, size or location of stores.

The CC analysed econometrically the relationship between variable profit margin and concentration, using variable profit margins rather than profit levels because it wished to control for market size effects.<sup>32</sup> It stated that the variable profit margin would capture changes in all aspects of PQRS, through effects on either price or cost levels.<sup>33</sup> This approach gave a baseline specification for the econometric equation of:

$$\pi_i = Z_i\beta + g(MS_i; \theta) + \varepsilon_i$$

where  $\pi_i$  is variable profit margin,  $Z_i$  are control variables with coefficients  $\beta$ ,  $g(\cdot)$  captures the effect of market structure, and  $\varepsilon_i$  are the stochastic disturbances. The CC identified a joint endogeneity issue. Since firms may be attracted to enter areas with higher margins, it employed an instrumental variables approach.<sup>34</sup> The chosen instruments were population measures, as the CC stated that these instruments would be correlated with concentration, but uncorrelated with the error term.

To estimate the regression, the CC employed data on yearly average profit margins from the four largest supermarkets in the UK (Tesco, Asda, Sainsbury and Morrison), covering 1,224 stores in all. Yearly average profit margins, a proxy for the variable profit margin were calculated as (Yearly Revenue – Yearly Direct Costs)/Yearly Revenue. The definition of direct costs varied across stores, but typically included cost of goods sold, shrinkage, wages, salaries, loyalty card costs, and other store-controlled costs. The CC assumed that all these costs, including staff costs, were fully variable, an issue we return to subsequently.

Rival stores were divided into two size bands: between 280 sq. m and 1,400 sq. m, and above 1,400 sq. m. As control variables, the CC employed supermarket brand dummies, a regional dummy designed to capture demographic effects and potentially variations in regional wages, the income of the local population, and

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<sup>32</sup> We shall return to the definition of variable profit margin subsequently.

<sup>33</sup> The CC stated that this effect would take account of changes in range. However, suppose firms sell products with different margins, at the same price in each store, and that all stores sell an identical range of products (and all other aspects of the retail offer were different). If customers purchase products in different proportions across stores, then one would find that the variable profit margin of each store is different – even though the actual offer (in terms of price and range) in any individual store is identical.

<sup>34</sup> Strictly the CC employed a GMM estimator to control also for possible conditional heteroskedasticity.

various store characteristics.<sup>35</sup> The key variable of interest in explaining margin differences across stores was the level of local concentration. The local market was defined as a 10 minute isochrone around a store, i.e. the set of all points which could be reached in 10 minutes of driving from that store. The CC used a variety of different measures of concentration, including number of fascia, number of stores, rival net sales area, and rival share of total net sales area.<sup>36</sup> We report one result, which is broadly representative of the CC's findings, below:

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<sup>35</sup> The store characteristics employed were the size of the store, the presence of a petrol station, and whether the store had a toilet or an ATM machine.

<sup>36</sup> A fascia is a brand such as Tesco or Asda. There may be more than two stores of one fascia in an area.

	(1) <i>Ln(yr) margin,</i>
Constant (includes effect of Asda and of Cities and Services)	-2.3789*** (-43.76)
Tesco Extra	0.0428** (2.53)
Tesco Metro	0.0398 (1.31)
Morrisons	0.2888*** (19.18)
Sainsbury's	0.1541*** (10.40)
Sainsbury's Local	0.4687*** (14.16)
Tesco Superstore	0.1114*** (7.87)
London suburbs	-0.0797*** (-4.02)
London centre	0.0064 (0.40)
London cosmopolitan	-0.1443*** (-2.84)
Prospering UK	-0.0052 (-0.38)
Coastal and countryside	0.0454*** (2.67)
Mining and manufacturing	-0.0284* (-1.86)
Northern Ireland countryside	-0.0004 (-0.00)
Mean income of people living within 10 mins (£'000)	0.0078*** (6.08)
Store size ('000 sq m)	0.0410*** (6.24)
Petrol forecourt	-0.1317*** (-13.36)
Toilets	0.0345 (1.57)
ATM	0.0702*** (3.59)
Number of competitor fascias over 280 sq metres within 10 mins	-0.0096*** (-2.74)
Observations	1476
idstat	180.312
ldp	0.000
J	1.315
Jp	0.252
Instruments	Population and population density in a 10-minute isochrone around all competitors above 280 sq m within 10 minutes

\*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ .  
Note: *t* statistics in parentheses.

**Figure 1.** CC results of regression on stores above 280 sq. m

The key estimated coefficient is the number of competitor fascias over 280 square metres. The coefficient is estimated to be -.0096 with a t-statistic of 2.74. Thus, a new store of above 280 sq. m in an area would reduce store profit margins at the relevant store by 0.96% since the left hand side variable is the logarithm of profit margin, and this result is statistically significant at the 1% level.

Typically, stores will have a yearly average variable profit margin – as defined by the CC – of between 10% and 20%.<sup>37</sup> Using 15% as a mid-point for the CC variable profit margin, we can calibrate this result: an extra store above 280 sq. m in the isochrone reduces profit margins at the centre store by  $15\% \times 0.96\% = 0.015\%$ , or from 15% to 14.86%. We find this predicted reduction in profit margin to be quite small, given the definitional issues in estimating average profit margin to which we turn subsequently. If this profit margin reduction is assumed to be the result of a reduction in price, then it is equivalent to a reduction in price of around 0.2%.<sup>38</sup> However, as we stated earlier, supermarkets in the UK charge national prices so the change would need to be associated with a change in QRS, quality, range or service. Changes in these factors would presumably lead to higher costs and lower profit margins if concentration in a given market decreased.

Other specifications of concentration gave results that were qualitatively similar in nature, but with stronger or weaker relationships in different cases. However, in all model specifications the estimated effect appears quite small.

### Concerns with the CC analysis

A concern that was expressed to the CC was that the instruments may not have been appropriate, and therefore could have resulted in any estimated relationship being a statistical error rather than a genuine finding. As is well known, instruments are valid if a) they are correlated with the variable of interest and b) are uncorrelated with the error term in the equation (so are not introducing any extraneous factor in the analysis but are only capturing the effect of the instrumented variable, in this case concentration). It is plausible that population is correlated with concentration, since areas with greater population will typically have more stores (and hence typically lower concentration). The second condition for the validity of instrumental variables is therefore of greater interest.

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<sup>37</sup> Note that this is not the net profit margin as the industry would recognise it, as it excludes store fixed costs, distribution and overheads. Net profit margins can be 5% or lower.

<sup>38</sup> If sales are originally 100, and costs are 85 (so margin is 15%), and price indexed to be 1, then the reduction in margins of 0.96% is equivalent of a reduction in price from 1 to 0.998 assuming no sales response.

One of the authors, Prof. Hausman, submitted an analysis to the CC which considered the appropriateness of the instruments by splitting the sample into two sub-samples for high and low population stores, and re-running the CC's regression specification on each. The division used was the median of population in a market, which should be exogenous under the CC's assumptions on instruments. The sub-samples thus had equal numbers of observations. If population is uncorrelated with the error term in the original regression, then the coefficient on concentration in each sub-sample should be identical. If the regressions on the sub-samples give very different results, then this outcome demonstrates that population is not a valid instrument or the model is misspecified. The CC had carried out standard statistical tests for instrument validity such as the Sargan-Hansen test of over-identification and found that the instruments did not fail the test. However, these tests may suffer from low power since the two instruments used are highly correlated for a cross-section analysis ( $\rho = 0.7$ ), so that while a failure of the test will definitely indicate a problem, passing the tests may not imply that all is well and further specification analyses – such as the sample splitting approach described above – are also helpful to carry out.<sup>39</sup>

The estimated results for the coefficient of the concentration variable from the two sub-sample regressions are shown below.

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<sup>39</sup> The size of the test of over-identification may be incorrect in the presence of weak instruments. However, the estimated concentration parameter is 296, which is more than large enough to indicate that weak instruments are not a problem. See J. Hahn and J. Hausman, "Weak Instruments: Diagnosis and Cures in Empirical Econometrics", *American Economic Review*, 93, 118-125, 2003, and J. Hausman, et. al., "Many Weak Instruments and Microeconomic Practice", *Journal of Business and Economic Statistics*, 26, 398-422, 2008.

**Table 1. Replication of CC equation 1(1), full sample and sub-samples, Tesco stores only<sup>40</sup>**

	Full sample	Sub-sample 1 - stores in high population areas	Sub-sample 2 - stores in low population areas
<b>Sample size</b>	609	304	305
<b>Coefficient estimate on concentration variable</b>	-0.0035	0.0045	-0.0165
<b>Standard error</b>	(0.0034)	(0.0059)	(0.0049)
<b>t-ratio</b>	1.03	0.76	3.37

Source: Table 1 from Hausman Expert Report submitted on behalf of Tesco, February 2008

The full sample results for Tesco stores find a smaller coefficient than in the CC's sample (and indeed is insignificantly different from zero), but with the anticipated sign.<sup>41</sup> The results for high population areas find a positive coefficient (not the anticipated sign) but again the result is insignificantly different from zero. The results for low population areas have a different character: the coefficient is of the anticipated sign, almost five times large in magnitude than for the full sample, and statistically different from zero.<sup>42</sup> A t-test rejects the hypothesis of equality of the coefficient in the two areas ( $t = 2.74$ ). This finding suggests that population is not a good instrument, but could be generating a false margin-concentration result.

This submission was carried out on Tesco stores only, but the CC replicated the analysis on the whole sample and found the same results.<sup>43</sup> This suggests that if the CC were to rely on the analysis as justification for the competition test, it would not be appropriate to extend the competition test to high population areas, as there is no effect in those areas (which account for 86% of population). In the low population areas where a significant effect of concentration is found,

<sup>40</sup> The CC did not give permission for the full sample of data to be employed by outside experts to the main parties to the Inquiry. We return to this issue subsequently.

<sup>41</sup> Recall that the coefficient in the CC's sample of stores was 0.0096 and was statistically different from zero.

<sup>42</sup> All significance tests evaluated at the 5% level.

<sup>43</sup> CC, Groceries, Final Report, Appendix 4(4), Annex 1, paragraph 63. "We repeated the analysis on the entire sample including all Asda, Morrison, Sainsbury's and Tesco stores and found similar results."

the instruments fail a standard Sargan-Hansen statistical test of over-identification. Thus, standard tests of specification cast significant doubt on the robustness and correctness of the analysis in low population areas. The over-identification test demonstrates that the econometric results are biased and inconsistent in the low population areas where a significant effect of concentration is found. Thus, Prof. Hausman found no effect of concentration in high population areas and a biased and inconsistent estimate of the effect of concentration in low population areas. In neither area does the CC's model find a reliable effect of concentration on margin.

### **A possible explanation**

One explanation for this result is that it relates to measurement error in the definition of margin (although the results above indicate that the analysis is suspect, whatever the explanation). The CC uses “yearly average profit margin” to proxy for the variable profit margin. However, many of the cost elements taken into account in the CC's margin definition – such as staff costs and utility costs – are unlikely to be fully variable with respect to small changes in sales as the CC assumes. It seems unlikely that if sales fell by 10% at a store, for example, that there would be a saving of 10% in the wages of the store manager, or that 10% would be shaved off the electricity bill by raising the temperature of the fridges.<sup>44</sup> If the margin measure contains fixed costs, then stores with higher sales will have higher margins, as these fixed costs will be split over a higher cost base.

If stores in areas of higher concentration areas had higher sales on average, then this may be the explanation for the CC's margin-concentration results, and not any deterioration in the retail offer. Such a correlation may operate as follows. Suppose a store requires a certain minimum level of sales to support it. Entry will occur up to the point that the remaining sales cannot support an extra store. But typically there will be some “surplus” sales over and above the minimum required to support the number of stores in the market. Those stores will share the surplus sales among them. The fewer the number of stores in the local market, the greater each store benefits from these surplus sales, so that a monopoly store would benefit by retaining all the sales, while a stores in a triopoly market would share the surplus three ways. This “integer effect” would lead to stores in areas with low numbers of rivals having on average higher sales and so, in the presence of fixed costs, higher margins, even if all stores had an identical PQRS offer.

This explanation would also be consistent with the absence of direct evidence on any individual element of PQRS that did vary with concentration. As discussed above, the CC argued that many elements of PQRS were intangible and not easy

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<sup>44</sup> The UK OFT found, in a merger involving grocery retail stores, that “it is unrealistic to expect that all staff costs can vary with sales”: [http://www.of.gov.uk/shared\\_of/mergers\\_ea02/2009/Tesco-Brian.pdf](http://www.of.gov.uk/shared_of/mergers_ea02/2009/Tesco-Brian.pdf), paragraph 40.

to measure. But if there was a systematic deterioration in the retail offer in areas of high concentration in the manner anticipated by the CC, it seems surprising that there was no sign of this in any of the analysis carried out by the CC in its Inquiry. The CC's own survey of 18 PQRS variables in a small number of stores in high, medium and low concentration areas, but this did not reveal any evidence of a systematic deterioration of any of these variables in high concentration areas.<sup>45</sup> As such, if the CC is correct that the margin-concentration analysis did show a deterioration in the PQRS offer, then it is unclear what this relates to in actuality.

## The CC's responses

Despite confirming the finding of material differences in the sub-sample regressions and the failure of the test of over-identification<sup>46</sup>, the CC did not believe that this cast doubt on its results. This belief arose from two possible explanations. The first explanation was that the CC believed that there may have been an effect that acted in the opposite direction to the "fixed cost" effect. If variable costs rose with store sales, then stores with higher sales would in fact see lower margins. Population would be correlated with the error term in the original regression, but in an offsetting way.<sup>47</sup>

This explanation is unsatisfactory for at least three reasons. Most importantly, if this effect was present, it would already be captured by the sample splitting approach in addition to any fixed costs effect. Therefore the results above, and as replicated by the CC, demonstrate the existence of a problem which already encompasses and rejects this explanation. Second, from a theoretical perspective there would be no reason to expect that this effect, if present, would have an exactly equal and offsetting impact to any fixed cost effect (and from an empirical perspective the CC's analysis demonstrates it does not). Third, there was no evidence presented to the CC during the Inquiry of which we are aware that would suggest that there were diseconomies of scale in stores, so there does not appear to be any empirical foundation for this hypothesis.<sup>48</sup>

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<sup>45</sup> Tesco also provided evidence that there was no relationship between over 20 PQRS variables and concentration. The CC placed "limited weight" on these studies.

<sup>46</sup> CC, Groceries, Final Report, Appendix 4(4), paragraphs 63.

<sup>47</sup> CC, Groceries, Final Report, Appendix 4(4), paragraphs 69-72.

<sup>48</sup> The CC argued that there was support for this explanation (Appendix 4(4), paragraph 72) by observing that when staff costs were removed from the margin definition the differences in the results for the two samples were lower. However, if the CC's explanation were correct, then the results should be reversed in sign rather than merely reduced. A more likely explanation for this result is that the adjusted margin measure continued to have elements of fixed costs in, such as electricity costs, although not to the same extent as for the original margin definition.

The second explanation advanced by the CC was that grocery stores were able to forecast future sales in an unbiased way and adjust their fixed costs to match their expected sales. However, this explanation assumes away the issue by assuming that fixed costs can be varied in line with sales – in other words, that they are variable costs. The explanation is also inconsistent with academic research which has found repeatedly that labour costs are not entirely variable in the short run nor do they totally adjust with adjustments in output.<sup>49</sup> Again, the CC presented no evidence to support this theoretical argument, and rejected evidence from Tesco and Morrisons that some aspects of store costs (including, but not limited to, staff costs) were fixed. The CC also rejected its previous findings (published in the Supermarkets Inquiry in 2000) that grocery store staff costs, and grocery store non-staff costs, were partly fixed.<sup>50</sup>

## The standard of review

In practice, it appears extremely difficult to appeal successfully a substantive finding of the CC that is based on a complex technical analysis.<sup>51</sup> There are three features of the review process that lead to this view.

1. Reviews of the CC's findings are made on judicial review grounds, rather than on the merits, leading to CC decision only being possible to overturn on the grounds of inadequate process, omission of material considerations, or manifest irrationality. A review on the merits, in contrast, is a full analysis of whether the reviewed body has come to the right answer. Interestingly the OFT, the UK's first stage competition authority, is subject to review on the merits for cases it brings under the Competition Act.
2. The CC is assumed to be an "expert body", meaning that the courts will exhibit deference towards it. In practical terms this means the CC has a wide margin of discretion in making its findings where these are within

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<sup>49</sup> See e.g. Z. Griliches and J. Hausman, "Errors in Variables in Panel Data," *Journal of Econometrics*, 1986.

<sup>50</sup> The CC rejected its previous work on three bases (Appendix 4(4), Supplement 2, paragraphs 10-13). We do not find any of these arguments to be convincing. First, the CC argued that the inclusion of petrol sales in the previous analysis exaggerated any fixed costs. However, in 2000 the CC had carried out the analysis both with and without petrol sales, and came to the same conclusion in each case. Second, the CC found previously that some of the analyses failed a normality test. However, failure of normality only occurred in some regressions (the key conclusions were unchanged whether the normality test was passed or failed), and in any event failure of normality does not mean that the coefficient estimates are biased. The CC argued also that it should have used a different econometric methodology, but did not carry out a more appropriate analysis. Given these points, and in the absence of any detailed analysis on grocery store cost structures in the Groceries Inquiry, it is unclear why the CC decided to reject its previous findings.

<sup>51</sup> Neither of the authors are legally qualified and these comments are made from an informed lay user perspective.

its sphere of expertise (and econometrics appears likely to fall within that sphere).

3. The review body is headed by judges without specific economics training.<sup>52</sup> This means that technical or econometric discussions will be difficult to explain to a judge, leading to the possibility that judges do not try to tackle arguments which are complex and for which they are not trained.

To show to a judge's satisfaction and understanding that there are sufficient flaws in a piece of technical analysis, such that the view taken is manifestly unreasonable, seems to be a very high hurdle.<sup>53</sup> It may be that the CC is effectively "appeal-proof" on such matters. This outcome creates significant concern where a) the disputed analysis is a critical part of the CC's chain of reasoning (in this case, the critical part) and b) the implications for the investigated parties are highly material.

## Discussion

The main substantive evidence for the CC's finding that there was an adverse effect on competition in areas of high concentration was the margin-concentration analysis, and the CC used the results of the analysis to quantify the scale of the detriment. This total detriment provided the justification for the proposed restriction on organic growth. That is, the CC proposed to stop store expansion or building of new stores by chains with a high share of sales in high concentration areas.

Tesco's successful appeal of the proposed organic growth prohibition to the CAT in May 2008, decided in March 2009, was upheld for reasons related to material omissions in the CC's cost-benefit analysis of the remedy, taking the margin-concentration results as given.<sup>54</sup> The CC had not properly estimated the detriment to consumers from restriction on organic growth and from the decreased competition that could occur if rival retailers were not immediately

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<sup>52</sup> There are lay members on the CAT panel who include economists, but our understanding is that the judges are the most influential people in making the decisions.

<sup>53</sup> We understand from conversations with various barristers and solicitors in UK practice that this view is widely shared.

<sup>54</sup> Tesco argued that the CC's assessment that its proposed remedy was reasonable and proportionate was inadequately supported by the reasoning in the report. First, the CC had failed to calculate the benefits of the remedy as it had not considered how effective the remedy would be at resolving the problem, but merely indicated that the scale of the problem was large. Second, the CC had failed to take account of the risk that consumers would suffer economic costs if any blocked developments were not replaced by alternative similar developments in a timely fashion. The CAT upheld both arguments.

ready to step in.<sup>55</sup> The analysis above suggests a further reason for caution.<sup>56</sup> The CC's calculation of the scale of the problem, and the extent of any benefits of the test if properly calculated, both rely almost entirely on the results of the margin-concentration analysis.

Since the concerns we outline above were confirmed by the CC, there is room for significant doubt that the results are a statistical artefact caused by flaws in the analysis, in particular because there is no relationship in high population areas where 86% of the population reside and the results suffer from statistical flaws in low population areas. The CC's reasons for ignoring the flaws in the analysis are in our opinion unconvincing. Reliance on the margin-concentration analysis as sole justification for a significant policy intervention which creates consumer detriment, as well claimed consumer benefits, is therefore troubling.

We suggest that there needs to be a better way of discussing technical econometric issues with the CC during an Inquiry. One possibility would be that an independent Expert is hired by all sides in front of whom the merits of the analyses can be debated, rather than expecting the CC Panel, many of whom are not economists or econometricians, to follow these often technically complex arguments.

An alternative approach is that the CC be required to present its underlying data and results to outside independent experts who can analyse the results as is done in the US, the EU, New Zealand, and Australia. An administrative or judicial body, perhaps with the advice of an outside expert as occurs in New Zealand, would then make the final determination based on the analyses and critiques presented by all parties. One way to promote this outcome would be to change the standard of review faced by the CC to that of review on the merits.

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<sup>55</sup> For example, the CC's own analysis demonstrated that consumers value greater size in a supermarket (up to 3,800 sq. m), presumably because this would allow greater range of products or facilities (Appendix 4.2 of the Groceries Report, paragraph 32). Restricting expansion of a supermarket up to this level would therefore result in consumer detriment.

<sup>56</sup> The margin-concentration results were not the subject of the appeal. The CAT was only able to review the CC's decision on judicial review principles, which focus largely on process issues, rather than on the merits of the case. In any event, these arguments would have been difficult to present to a judge, even if review on the merits was appropriate.