

Analysis of the Tesco SSNIP simulation model

Introduction

1. Tesco submitted a quantitative model of a simulated SSNIP test to the Groceries market investigation in December 2006.¹ On the basis of this model, Tesco submitted that almost 90 per cent of its stores with a net sales area above 1,400 sq metres were in markets that were at least 30 minutes' drive-time wide.² This appendix describes Tesco's SSNIP simulation model (the Tesco model) and our testing of the sensitivity of this model to three critical assumptions.³
2. The Tesco model has been the subject of substantial discussion and correspondence between the CC, and Tesco and its advisers. Other parties also submitted views on the Tesco model, notably RBB Economics in its capacity as adviser to Sainsbury's. We considered the Tesco model carefully. As part of our analysis of the Tesco model, we ran sensitivity testing on important assumptions underlying the model, and the results of this testing are set out in Annex 2. In summary, we have significant concerns regarding the usefulness of the Tesco model. The extent of customer switching is not estimated from actual consumer behaviour but it is instead the result of simplifying assumptions. We consider that the predictions of the Tesco model are unrealistic and improbable, and that this undermines the results suggested by the model. Moreover, the factors that render the predictions of the Tesco model improbable are inherent in its basic structure and so cannot be addressed through modifying some of the model's assumptions.
3. In the process of sensitivity testing we changed some of the assumptions of the model. When altering these assumptions, we found that the Tesco model predicted local markets with maximum drive-times between stores in the range of 5 to 24 minutes (and maximum drive-times under an assumption that stores are differentiated are between 5 and 17 minutes). Our detailed analysis of these assumptions and our results from the SSNIP test are in sharp contrast with Tesco's own results.

Background on the SSNIP test

4. The generally accepted *conceptual* approach to market definition is the SSNIP test (also known as the hypothetical monopolist test). The principle behind the test is that a market is defined as a product, or collection of products, the supply of which can, hypothetically, be monopolized profitably.⁴
5. In conducting a SSNIP test, an initial candidate market, which should be the smallest market possible, is defined. If a hypothetical monopolist of that candidate market could not profitably impose a SSNIP due to customers switching to other products,

¹A copy of this submission is on the CC website at:

www.competition-commission.org.uk/inquiries/ref2006/grocery/main_party_submissions.htm.

²This appendix refers to the size of local markets in terms of drive-time minutes and for the purposes of the SSNIP simulation model the relevant product market was limited to stores greater than 1,400 sq metres. All references to 'minutes' should be read as a reference to drive-times; further discussion regarding the use of drive-times in the geographic market definition is provided in Section 4 of the main report, and an explanation of drive-times generally is contained in Appendix 3.2. In Section 4, our finding on the product market defines larger stores as those stores larger than 1,000 to 2,000 sq metres.

³Although we focus on three critical assumptions of the Tesco model, we also consider other problems and assumptions that we have identified in the Tesco model.

⁴See *Market Investigation References: Competition Commission Guidelines*, CC3, June 2003, paragraphs 2.4 to 2.8.

then the candidate market needs to be expanded.⁵ The process is repeated until a market is found in which a SSNIP could be profitably imposed.

Tesco's simulated SSNIP model

6. As with any quantitative model, the Tesco model makes a number of simplifying assumptions to approximate the behaviour of customers and retailers, and ensure the tractability of the modelling exercise. In this section, we describe these assumptions.

Customers

7. In the Tesco model, customers are assumed to shop at their closest store. Using census data, Tesco assumes that the population located in a Census Output Area (COA) within the isochrone will do its grocery shopping at the nearest store.
8. In the Tesco model, the cost to customers of switching outside the candidate market is assumed to be proportionate to the extra distance they must travel. Tesco said that this captured the difference between stores inside and outside the candidate geographic market. It said that there was no evidence to suggest that customers faced other significant costs in switching between stores. Tesco said that it had tested the sensitivity of this assumption on switching costs by assuming that 30 per cent of its customers remained loyal following a price increase (see paragraph 16). It said that this had a limited effect on its results.⁶
9. All customers are therefore assumed to incur the same travel cost, estimated at £6.10 per hour,⁷ regardless of income, household size, social group, location, and the size of the basket.
10. The grocery expenditure that accounts for 60 per cent of a household's weekly shop is defined in the Tesco model as the household's 'one-stop-shop expenditure'. This 60 per cent amounts to a larger absolute figure for those households with larger weekly grocery expenditure. As such, the Tesco model uses a distribution of observed weekly grocery expenditure in the UK to capture the possibility that different types of customers might make different switching decisions. For example, a consumer spending £100 a week and a consumer spending £20 might reach different conclusions when choosing between a proportionate increase in price and an extra 2 minutes travelling to an alternative store. However, this distribution of expenditure is assumed to be the same across the UK. For example, 7.2 per cent of every COA in the UK will spend £45 to £50 weekly on 60 per cent of their groceries.
11. The Tesco model assumes that a price increase is imposed equally across all products at the relevant store. When customers face a price increase, they are assumed to switch without delay to another store if the increase in the cost of their grocery basket is greater than the additional cost of travelling to their next closest store. In addition, it is assumed that there is no loyalty to a particular store or any other cost to the consumer of switching between stores.

⁵With regard to supply-side switching, as stated in Section 4 of the main report, there are a number of obstacles that a retailer would need to overcome if it was to start supplying the market at short notice following a worsening of price and/or non-price factors. These obstacles might have both a product and a geographic dimension. We consider that it is likely to be costly and time-consuming to overcome these obstacles, and as a result, do not consider supply-side substitution likely to take place.

⁶That is, 81 per cent of urban markets (and 71 per cent of rural markets) are wider than 30 minutes in this sensitivity test. We repeat this sensitivity test as part of our analysis (see paragraphs 28 to 30 and the results section).

⁷This figure is the estimate derived by Decision Technology in its paper 'Total Customer Cost: Superpanel Models Decision Technology April 2006'.

Retailers

12. The Tesco model considers grocery stores with a net sales area greater than 1,400 sq metres. It uses the effective competitor set defined by the CC in the 2000 investigation.⁸ Each of these stores is assumed to be an equal substitute for any of the others, implying that they all provide an identical retail offer.

Simulating the SSNIP test

13. The model assesses the impact of a 5 per cent price increase at all stores owned by the hypothetical monopolist, and shows the effect on profitability of a hypothetical price increase at the store (or group of stores) as a result of a price increase. The store will gain revenue from customers that do not switch (infra-marginal customers), but will lose revenue from those customers that switch to stores outside the control of the hypothetical monopolist (marginal customers). The impact of these revenue changes on profit is calculated using the average gross margin across all Tesco stores that have a net sales area larger than 1,400 sq metres.⁹
14. The Tesco model starts with a 5 per cent price increase at all the stores within a 10-minute isochrone drawn around a Tesco store. Where the SSNIP test fails in this candidate market, the isochrone is extended to 15 minutes and the test is repeated on the expanded set of stores. This process is repeated with the candidate market expanding in 5-minute intervals until the test is passed.

Tesco's sensitivity checks

15. Tesco has tested the sensitivity of its model to different travel costs, and reported that its results are not significantly impacted by the adoption of a substantially higher travel cost assumption.¹⁰ Tesco also reported that the results were not significantly impacted by the adoption of a lower store margin ([X] per cent) which was chosen on the basis that it was two percentage points below Tesco's average gross margin across its stores, over 1,400 sq metres, of [X] per cent).
16. By assuming that 30 per cent of the customers at each store remain loyal after a price increase, Tesco was able to test the sensitivity of its model to the assumption that all stores are equal and immediate substitutes in the eyes of customers. It reported that the relaxation of this assumption did not significantly affect the results of the model.

Our testing of the robustness of the Tesco model

17. We altered three key assumptions of the model to check the robustness of Tesco's results. In Annex 1 we discuss our key concerns with (a) the methodology employed in the Tesco model, (b) the absence of price flexing in the Tesco model, and (c) the

⁸That is, it excludes the LADs (Lidl, Aldi and Netto), Iceland and M&S.

⁹We note that the average gross margin used in the model for this purpose ([X] per cent) is an average over all Tesco stores with a net sales area larger than 1,400 sq metres. In practice, the average gross margin of the stores in a particular geographic locality may vary substantially from this figure. This is because not all supermarkets larger than 1,400 sq metres are owned by Tesco, and there is substantial variation in the gross profit margin earned by both Tesco and other grocery retailers at these stores.

¹⁰Tesco tested the sensitivity of its travel cost estimate by originally using both £6.73 (which was later revised downwards to £6.10) and £10.76. At £10.76 Tesco found that 51 per cent of stores in urban areas were defined as being in markets with a wider-than-30-minute isochrone. The figure for rural areas was 36 per cent. Tesco also calculated the travel cost that would be required in order to define a market at 10 minutes or 15 in rural areas, at 20 of its stores. Under the assumptions of homogenous stores and an inability to price flex (see paragraphs 6 to 12 in Annex 1), Tesco estimates ranged from £7.20 to £45 per hour.

absence of customer loyalty, switching costs or imperfect information in the Tesco model. In addition to these concerns, we also note the following list of issues that we identified in the Tesco model:

- (a) The assumption that customers shop at their closest store is an unreliable abstraction from the actual conduct of consumers.
 - (b) The travel cost estimate used:
 - (i) does not adequately approximate travel costs;¹¹ and
 - (ii) is unreliable because it is of a uniform low value that biases the results towards a broader geographic market definition.¹²
 - (c) The gross margin adopted is biased towards finding broader markets in that it considerably overstates the appropriate margin earned at the vast majority of stores in the UK.
 - (d) We consider the assumption of a uniform distribution of weekly grocery expenditure across the country to be unreliable for use within a simulation.
 - (e) We consider that a SSNIP of less than 5 per cent is sufficient to define a relevant market for groceries (see paragraph 25 of Annex 1).
 - (f) We also note analysis by Sainsbury's and Asda of the academic literature and regulatory guidelines which suggests that an average SSNIP, at the appropriate level, is not required in order to define a relevant market. Instead a profitable SSNIP imposed upon a subset of the hypothetical monopolist's customers is sufficient to define a relevant geographic market.
18. For all these reasons, we find that the Tesco model does not help us to define a relevant geographic market for grocery retail. As such, we do not place weight on the results obtained from the modelling exercise.
19. We do not agree with the contention in Tesco's submissions that the inaccuracies of the model (as described in this appendix) should be ignored because a bias is not, in every case, demonstrated.¹³

How realistic is the Tesco model in its predictions?

20. Any model is based on a set of simplifying assumptions. To determine whether a model is sufficiently close to the real world, we can check its predictions. In this section we examine how realistic we find the predictions of the Tesco model regarding consumer switching behaviour.
21. In Annex 2 we present the results of our simulated price changes. Our results illustrate a 5 per cent and a 1 per cent price increase at a single Tesco store in three

¹¹In their expert opinions, Professors Slade and Cotterill have noted that this result is inadequate.

¹²Decision Technology, the author of the paper which derives this estimate, as well as Professors Cotterill and Slade, has noted that the estimate of the travel cost is lower than most customers' wages and the costs of travel. Furthermore, Sainsbury's referred to an estimate from the Department for Transport which puts the cost of car travel at around twice the value used by Tesco (Transport analysis guidance, DfT, 2007).

¹³Professor Cotterill uses the following example to illustrate the problem of a focus on *unbiased* as opposed to *accurate* models. A farmer asks the ferryman how deep the river is. The ferryman answers that it is on average 3 feet. The farmer steps in and promptly drowns because of a 10-foot hole. Thereafter, the river is 1 foot deep. The average is an unbiased but not very accurate estimate because of great variation in river depth.

of the areas we analysed (Ashford, Southampton and Maidstone). The gains and losses to the store operator, implied by Tesco's model, are presented for both variations of the model that have been provided by Tesco. Alongside this we provide the number of households that shop at both the Tesco store and the closest competing store. We separate the households into those that shopped at the store before the price increase, and those that shopped there afterwards.

22. In Ashford we see that a 5 per cent increase in price at the Tesco store causes all but four households to switch away from the store (0.05 per cent of the original number of shoppers at the store).¹⁴ The vast majority of these shoppers relocate to the nearby Asda which approximately doubles the number of customers that it serves as a result of the price increase at Tesco. We also present the results of a 1 per cent price increase at the Tesco store. The results again show that more than 90 per cent of the shoppers at the Tesco store abandon it in favour of the nearby Asda store.¹⁵ We believe that similarly dramatic results would be replicated in most markets across the UK under the Tesco model.
23. We find these results to be highly unrealistic.¹⁶ The two predictions—first, that almost the entire customer base of a store leaves when it increases its price by a small percentage, and second, that the Asda store can accommodate a doubling of its customer base (given capacity constraints)—are so improbable as to undermine the credibility of the Tesco model. In our view, this casts considerable doubt on the results of the Tesco model.¹⁷
24. These predictions of extreme levels of switching introduce a bias in the model towards defining overly broad markets. This is achieved by reducing the profitability of a price-flexing SSNIP. Indeed, an excessively high level of customer switching results in an extremely large loss in revenues. In this context, even a small price increase would not be profitable. Alternatively, if more realistic switching levels were assumed, there would be a higher number of infra-marginal customers, increasing the likelihood of a profitable price increase. In summary, in the Tesco simulation model, an extremely small price increase results in excessively high levels of customer switching. Therefore, the ability of the hypothetical monopolist to flex its prices at different stores has little impact on the results as even a very small price increase induces an excessively large number of customers to switch to rival stores. Removing the bias generated by such extreme switching results would therefore give rise to a narrower geographic market definition.

Tesco's response to our sensitivity testing of the Tesco model

25. Tesco criticized our sensitivity testing of its model. It maintained that price-flexing was not observed in the grocery market and hence to allow a hypothetical monopolist

¹⁴Tesco submitted that this was an extreme case. However, in another example, Maidstone, the two stores are more than 5 minutes apart. Therefore, our examples do not appear to constitute an extreme, or particularly unusual, example of store locations in the UK.

¹⁵We note that although these results are presented here in terms of dynamic responses to price changes, the model can be interpreted as reflecting existing price differentials between stores. As such, under the assumptions of the Tesco model, if prices differ by as much as 1 per cent, the slightly more expensive of two stores will have just 5 per cent of customers and the slightly cheaper store will have 95 per cent.

¹⁶In Stoke, we find a Morrisons store which, under the assumptions of the Tesco model, would have no customers whatsoever if it charged identical prices to all its competitors.

¹⁷Tesco submitted that the failure of the Tesco model accurately to predict customer behaviour in these cases was not material to the outcome of a properly applied SSNIP test. We disagree; in the absence of real data the reliability of a simulation can only be judged on the accuracy of its predictions. In this respect, the Tesco model has been demonstrated to be inadequate. Tesco also argued that capacity constraints on stores would only come into effect where the SSNIP test had already failed and large numbers of customers had switched. This ignores the effect of switching between stores operated by the hypothetical monopolist. It also ignores the possibility that the SSNIP test may have failed because of the lack of capacity constraints on switching (ie store congestion would reach a point at which customers prefer to pay the SSNIP and therefore cease to switch away).

to flex its prices in the SSNIP test was excessively hypothetical. Secondly, Tesco rejected the sensitivity test for differentiated stores in which 30 per cent of customers remain loyal to a store after a price increase, despite the fact that it had initially proposed this assumption to us. Finally, it contended that our testing of its model was flawed. It submitted that by considering stores within 30 minutes of the initial store as a COA's potential choice set, our testing was biased towards finding markets smaller than 30 minutes wide.¹⁸ We address each of these three assumptions in Annex 1 where we set out the operation of the SSNIP test.

Further iterations of the Tesco model (1)

26. Tesco had originally stated that its assumption that 30 per cent of customers remained loyal to their existing store captured the delay that might occur in customers finding out about, or responding to, a price change. It also suggested that this assumption might be interpreted as capturing the other reasons why customers might not switch stores; for example, learning the layout of the new store or a strong preference for a particular store (which we consider might be a result of specific consumer preference for a certain fascia or format).
27. We considered this assumption to be an important sensitivity test of the Tesco model for a number of reasons. First, as noted in paragraphs 20 to 24, the Tesco model resulted in highly unrealistic predictions of consumer switching behaviour—this assumption appeared to test the impact of such predictions on the market that was defined. Secondly, we have been told that customers find it difficult to compare repeatedly the offers of different stores.¹⁹ As such, we might expect a significant delay in any response from customers that switch because of a change in the price or offer of a store. Thirdly, as Tesco pointed out, customers might not switch for other reasons, such as preference for a particular store. We considered that the differentiation observed in a store's offer would make some customers more loyal to that store than others, and, as a result, less price sensitive. For that reason, as Tesco said, these customers would not switch, despite the price change that was simulated as part of the Tesco model.
28. After we provided Tesco with the results of our sensitivity testing of the Tesco model (which pointed towards considerably narrower geographic markets), Tesco withdrew its assumption of store differentiation. Tesco submitted a revised model, which it believed better modelled store differentiation.²⁰ This new version of the model lacks a number of features that the original model appeared to capture. First, it ignores any delay in customers responding to a price increase and thus fails to reflect the costs that customers would incur in finding out about, comparing the offers of, and switching between, differentiated stores selling thousands of SKUs whose prices change from day to day.
29. Second, the revised model appears to make no allowance for customer loyalty. Based on the results of its simple conditional logit model, Tesco told us that observable heterogeneity suggested that customers on average preferred some fascias to others. Tesco interpreted its model as showing that there were broadly two groups of fascias. It said that the first group of fascias contained Tesco, Asda, Morrisons and Sainsbury's, and there was a second group of fascias, including the LADs, Waitrose, M&S and Somerfield, which Tesco told us were slightly less preferred to the first group of fascias.

¹⁸Tesco submissions of 10 September 2007 and 31 August 2007.

¹⁹See the expert opinion of Professor Ronald Cotterill for further discussion of this issue. [§<].

²⁰Submission received 10 September 2007.

30. On average, Tesco told us, stores in the first group were preferred to stores in the second group by around 5 to 6 'minute equivalents'—so that customers would be indifferent between a first group store 5 to 6 minutes away and a second group store being on their doorstep. Tesco said that within groups the stores were of fairly similar preference. Tesco considered that its estimates of difference in customer preferences between Asda, Tesco, Sainsbury's and Morrisons were small, the equivalent of around 1 to 2 minutes' drive-time. Tesco stated that these average results reflected a combination of different factors (including the PQRS offer, store size and store location) which, according to Tesco, it was not possible to identify separately. However, we note that Tesco reported a simulated price difference of £[~~3~~] in average preference between Asda and Sainsbury's, and a £[~~3~~] difference between Asda and M&S. Tesco estimated the cost of travel time as £[~~3~~] per hour. This therefore implies a 3-minute difference between Asda and Sainsbury's and a 7-minute difference between Asda and M&S. While we recognize that Tesco stated that these estimates of fascia preferences represented the average level of fascia preference across customers, this average has, like grocery expenditure and the cost of travel time, been imposed on all customers in the observable heterogeneity model. Therefore, in applying these estimates to the model, customers are assumed systematically to prefer some fascias to others. In particular, Tesco suggested that there existed an absolute ranking of fascias such that all customers favoured Asda over Tesco, and in turn, Tesco to Morrisons, Morrisons to Sainsbury's, Sainsbury's to Waitrose, and Waitrose to M&S. The preference for Asda is so strong that customers would consider an M&S on their doorstep as less preferable than an Asda 7 minutes away, all else being equal.
31. Tesco told us that customer preference at the average level was not key to the issue of market definition, which is concerned more with the behaviour of marginal rather than average customers. Moreover, Tesco submitted that whilst average differences were a relevant consideration for modelling heterogeneity, they fell well below the threshold that would suggest that the second group formed a separate product market. Tesco told us that these systematic differences between fascias were relatively small, and as such, it was important to capture non-systematic, or customer-specific, variation as modelled in Tesco's 'unobservable heterogeneity' variant of its SSNIP model.
32. We note the role of unobserved heterogeneity in this new model. However, observed store characteristics (store size, car parks and other services) that would affect consumer preference ordering have not been included in the model. This casts doubt on the model specification.
33. Furthermore, it is not clear that this model captures the possibility that some customers are less price sensitive than others. That is to say, each store will have some customers whose loyalty cannot be entirely explained by the assumption that they have selected the store that offers the lowest combination of basket price and cost of travel to that store.
34. Finally, we also emphasize three important elements of this new model. First, it shares many of the deficiencies of the Decision Technology model which have been identified by Professors Cotterill and Slade in their expert opinions. Professor Slade labels the Decision Technology model biased and flawed whilst Professor Cotterill considers it to have serious deficiencies which contribute to the 'irregular, inadequate, inaccurate and unreliable analysis of geographic market definition that Tesco has submitted to the CC'.
35. Second, there is no theoretical basis for Tesco's assertion that product differentiation makes price flexing *less* profitable. In fact, any acknowledgement that many cus-

tomers have some preference for some stores over others will necessarily make them less sensitive to price changes. As such, the profitability of flexing the store's price is likely to increase, since the custom of these loyal customers (who are less sensitive to changes in price) is more secure. As discussed above, Tesco has addressed this conclusion (that follows from one of its model's assumptions) by removing the possibility of customers remaining loyal to a fascia.

36. Third, there is no contradiction between some customers having preferences for particular fascias and a hypothetical monopolist's *ability* to flex its price across its stores. This follows from the fact that prices can be set differently at different stores. These customers will have selected a preferred store based on that offer and their proximity to the store; they will not have received any discounts targeted specifically at them. Therefore, price flexing across stores does not involve targeting individual customers with different offers as Tesco suggested. The same price (or offer) is still available to all customers of that store. As we can see from our sensitivity testing results, the inclusion of some customers with inelastic preferences may in fact make price flexing easier and more profitable.
37. Tesco stated that this new version of the SSNIP model, when analysed either with or without price discrimination, continued to point towards the same broad findings of the original model—that local markets must be of different sizes in different areas; a substantial majority of local markets were wider than a 10-minute drive-time; and that at least some local markets were wider than a 30-minute drive-time.

Further iterations of the Tesco model (2)

38. In its response to the provisional findings, Tesco submitted further analysis (the estimation results model) which, in its view, would make a formal SSNIP test operational. In this analysis, Tesco used inputs from our demand estimation analysis rather than its own estimation analysis, which Tesco had previously employed in the heterogeneity model (see paragraphs 28 to 37). Tesco told us that both the heterogeneity model and the estimation results model were drawn from actual customer behaviour as captured in TNS data. In the estimation results model, Tesco used inputs drawn from our demand estimation analysis (see Appendix 4.2), rather than from its own analysis of a slightly different TNS dataset. Tesco told us that the results of its heterogeneity model and its estimation results model were similar, and that both led to accurate predictions of the geographic distribution of trade around stores. Tesco told us that this suggested that both models captured actual customer behaviour well. Tesco suggested that this was evidence that a formal SSNIP test was feasible, and it told us that this analysis pointed to a conclusion that the vast majority of markets were wider than 10 minutes' drive-time.
39. In paragraph 7 of our demand estimation analysis (Appendix 4.2 to the provisional findings), we explicitly cautioned against the approach adopted here by Tesco. We explained that the results of the demand estimation analysis could not be readily used in a formal SSNIP test. In our revised demand estimation analysis (Appendix 4.2) we have further developed and tested our model. Based on a sensitivity analysis, we decided against including a price variable in the demand estimation model on the basis that it was not possible to disaggregate a price effect from a fascia effect, even when using prices net of discounts and other promotional offers. Instead of using price, the demand estimation model relies on variations in non-price elements of the store's retail offer, such as the levels of quality and service, in order to determine the household's reaction to a small but significant change in the retail offer.

40. In the absence of any price variable, we believe that the estimates from the demand estimation model cannot be used in a formal SSNIP test. Further, we consider that undertaking a SSNIP test using inputs obtained from the demand model, which relies on a non-price element, is, on the basis of present techniques, impracticable.

Operation of the SSNIP test

1. The Tesco model begins with all the stores that lie within a 10-minute drive-time (or isochrone) of a Tesco store. For each iteration of the test Tesco expands the geographic market in 5-minute increments to include additional stores larger than 1,400 sq metres in the candidate market.
2. In our test of the Tesco model, rather than expanding the market in 5-minute increments, we add one store at a time to the candidate market. Each time the SSNIP test fails, we expand the candidate market by including the closest substitute store to those controlled by the hypothetical monopolist. We consider this to be a closer approximation of the SSNIP test.
3. The initial candidate market is made up of two stores: the original Tesco store and its closest competitor. To determine the closest competitor, in the absence of demand elasticity estimates, we assume that the Tesco store will raise its price by 5 per cent. We then record the diversion ratios to neighbouring stores that are predicted by the model. The store that benefits the most from the price increase is identified as the closest competitor. This procedure accounts solely for geographic distance, but is in line with the Tesco model's assumptions about consumer demand.
4. Once we have identified the closest competitor to the Tesco store, we then conduct the SSNIP test on these two stores. If the test fails, we determine the next closest competing store using the same procedure. That is, we take the stores under the control of the hypothetical monopolist and impose a 5 per cent price increase. We observe which outside store benefits most from the price increase. We then include that store in the candidate market and repeat the SSNIP test until a profit-maximizing hypothetical monopolist can successfully increase prices by 5 per cent.
5. We next consider the three criticisms that Tesco has made of our sensitivity analysis in paragraph 25 of the appendix.

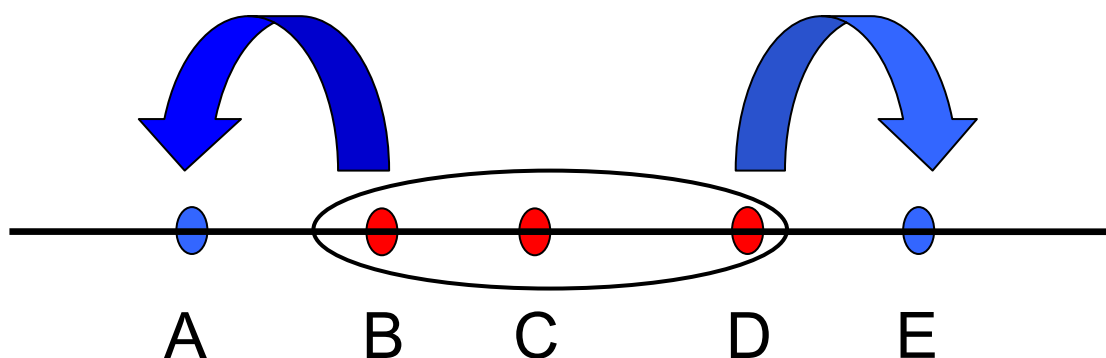
(i) Assumption of uniform price increases by the hypothetical monopolist

6. As we set out above, the Tesco model, when implementing a price increase as part of the SSNIP test, assumes that the hypothetical monopolist increases prices by 5 per cent at each of the stores under its control. However, the hypothetical monopolist could increase prices by 5 per cent, on average, by increasing prices at some stores by more than 5 per cent and in other stores by less than 5 per cent (a practice often referred to as price flexing).
7. Price flexing increases the likelihood of a hypothetical monopolist being able successfully to increase prices (and thus increase profits) over a smaller number of stores. This is because the hypothetical monopolist increases prices at stores at which customers have fewer outside alternatives, whilst raising prices by less at those stores at which customers are more likely to switch to other alternatives. For the purposes of the SSNIP test, we consider it appropriate to assume that a hypothetical monopolist would engage in price flexing, as this is the strategy that would allow it to maximize profits.
8. The expert opinions from Professors Cotterill and Slade both supported our view that a hypothetical monopolist would engage in price flexing. Similarly Sainsbury's

submitted that allowing for price flexing was the correct approach to defining the market.²¹

9. Tesco has submitted that, as grocery retailers have uniform national pricing, we should not consider the possibility of price flexing as part of our testing of the Tesco model. We do not agree with this view. First, the SSNIP test is a hypothetical exercise. As a result, it is by no means clear that the current pricing practices of grocery retailers, which could in practice be changed, should be used as part of the test.
10. Second, the hypothetical monopolist, by increasing prices in the candidate market, is engaging in price flexing relative to stores that it controls outside the candidate market. As a result, we do not see that a distinction should be drawn between the stores that the hypothetical monopolist controls inside the candidate market, and any stores that it controls outside the candidate market.
11. Finally, the real-world pricing practices of grocery retailers are not as clear-cut as suggested by the arguments that have been put to us. While many grocery retailers have a degree of uniformity in their pricing, most grocery retailers operate multiple prices that reflect different fascias, store formats and, in some cases, competitive conditions.²²
12. Further, a price increase is only one means by which the hypothetical monopolist seeks to maximize profits across a candidate market. If there were logistical issues with varying prices locally, a hypothetical monopolist could, in principle, vary aspects of its retail offer other than prices to achieve the same outcome.
13. Prior to considering the impact of changing the uniform price increase assumption on the Tesco model, we first illustrate, in the figures below, a simple example of the effect of relaxing this assumption. In Figure 1, all stores are located on a line. The candidate market is made up of stores B, C and D. A uniform price rise at stores B, C and D will lead some customers located between A and B to switch to store A, and some customers located between stores D and E to switch to E. Consumer switching to outside stores (A and E), means that the price increase is unlikely to be profitable.

FIGURE 1



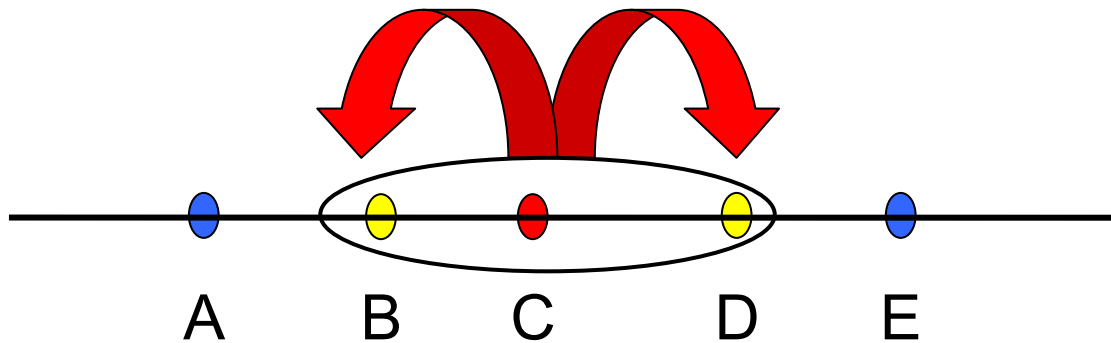
Source: CC.

²¹Sainsbury's and Asda also submitted that there was no requirement in either the CC or US guidelines for an average SSNIP across the entire geographically defined area to be profitable. Instead, it contended that a profitable SSNIP targeted at particular customers would be sufficient to define a relevant geographic market.

²²See Section 5 of the main report.

14. Alternatively, consider the situation when only store C increases its prices, while stores B and D do not, as illustrated in Figure 2. In this case, many customers located between B and C, and C and D, will switch to stores B and D that are under the control of the hypothetical monopolist. In this case, the price increase is much more likely to be profitable as the hypothetical monopolist will capture the sales lost from store C at stores B and D.

FIGURE 2



Source: CC.

(ii) Assumption that stores only vary in their prices and location

15. The starting point for the Tesco model is an assumption that all stores are equal substitutes. That is, all stores are equivalent in the eyes of customers and their choice between them will be driven purely by the price they charge and their location. In subsequent submissions, Tesco has tested the sensitivity of this assumption by allowing 30 per cent of customers to remain loyal and not switch away from their local store even after a price increase. Tesco reported that adopting this revised assumption resulted in 81 per cent of urban stores and 71 per cent of rural stores failing the SSNIP test at 30 minutes.
16. We have also relaxed the homogeneity assumption, using Tesco's own sensitivity test (ie 30 per cent of customers remain loyal following a price increase), and combined this with a relaxation of the uniform price increase assumption. The results are detailed in paragraphs 23 to 26 of the appendix. Specifically, in each area where we have measured the local geographic market using the Tesco model, we have generated one result that reflects a relaxation of the uniform price increase assumption (we can call this scenario A), and a second result that reflects a relaxation of both the uniform price increase assumption and the homogenous store assumption (we can call this scenario B). We consider that it is appropriate to relax both assumptions.

(iii) Assumption that stores are within a 30-minute COA

17. Tesco also stated that our sensitivity testing was biased towards finding markets less than 30 minutes wide because we included stores within 30 minutes of the initial store as a COA's potential choice set.
18. As a preliminary point, we note that *neither* Tesco's nor our analysis included COAs that were *further* than 30 minutes from the initial store in either the construction of the model or in its testing. This is because, in general, the outer qualifying limit for stores that are included within a COA is unrelated to the output of the Tesco model, but simply reduces the amount of data surplus data in the model.

19. Both Tesco's and our analysis includes stores up to 30 minutes away from the initial store. This allows all stores in an area that take an hour to cross by car to be considered. The COAs whose switching options are considered relevant therefore have the option of switching to the next nearest store not operated by the hypothetical monopolist.²³ Since, under our testing, each of the results are within 30 minutes, our results show that the marginal COAs have the option of switching to stores within 30 minutes that are not under the control of the hypothetical monopolist. For example, in our Brixton analysis, we considered 45 stores as possible options: the SSNIP test is passed with eight of them operated by a hypothetical monopolist. In the model, customers switch only to the nearest store; thus, the number of alternatives is irrelevant to a COA's decision, since it will only consider the closest one.
20. As an exception to this general statement, in rare cases, likely to be rural in nature where COAs lack a choice of store, the geographic arrangement of stores might create a small minority of customers whose second closest store is more than 30 minutes from the central store. If there were sufficient numbers of such customers, the result from that local market might be affected because the central store would be more constrained in its ability to increase its own price. However, it does not follow that the store more than 30 minutes away would then be included in the defined market. Instead, the prices at the stores controlled by the hypothetical monopolist might be rearranged to reflect the switching options of these customers. Alternatively, another closer store might be included in the monopolist's portfolio of stores in order to allow it to impose a profitable SSNIP.
21. Tesco highlighted the specific case of Taunton in Somerset in which it believed this exception applied. It pointed to stores in Minehead (35 minutes away), Tiverton (32 minutes), Collumpton (32 minutes) and Honiton (35 minutes away), which it believed to be relevant to the analysis but which had not been considered as possible options for the relevant customers in our testing of Tesco's model. We reran our testing of Tesco's model for Taunton, and after including the stores that Tesco suggested in the differentiated analysis, we continued to find that a SSNIP is profitable given the prices described for Taunton in Table 2.²⁴
22. In general, we do not consider that these cases would systematically affect the results as a whole or the conclusions that we draw from the sensitivity tests of the model.²⁵

Results of our analysis

23. Based on an analysis of 20 geographic areas,²⁶ an application of the Tesco model, under the altered assumptions discussed above, leads to a local market size of 7 to 25 minutes under scenario A and 5 to 17 minutes under scenario B (see Table 1). This can be contrasted with the results using Tesco's assumptions whereby each local market is more than 30 minutes wide (the exception being Swansea which Tesco defines as a 25-minute isochrone).

²³The relevant customers in the simulation are those whose closest store is operated by the hypothetical monopolist.

²⁴This is unsurprising since Minehead, for example, is 35 minutes away and therefore is a very poor alternative for the vast majority of the relevant COAs. However, it does serve to illustrate that this issue will in most cases be simply a theoretical curiosity rather than a major flaw as Tesco believed. We found the same result when we repeated this process in Doncaster, which was the second example cited by Tesco.

²⁵Supporting this view is the Sainsbury's analysis which considers stores up to 45 minutes away from the target store. While this analysis considers only the homogenous store variant of the model, the conclusions reached are consistent with ours. Sainsbury's then stated that including store differentiation would, all else being equal, result in a narrower geographic market.

²⁶The 20 sample stores were selected to cover different areas of the country with different population densities. Only stores that Tesco estimated as being in markets of 25 minutes or more were selected. Therefore, in comparison our sample is biased towards defining overly broad local markets.

24. Using data from 26 locations, Sainsbury's reported the results of sensitivity tests on the Tesco SSNIP model. These sensitivity tests consisted of allowing the hypothetical monopolist to flex prices of stores. Sainsbury's found that on average these 26 stores were constrained by stores less than 18 minutes away. This result contrasted with an average of 44 minutes when price flexing is not allowed. We note that Sainsbury's average drive-time of less than 18 minutes is very similar to our findings of just over 16 minutes as presented in Table 1. These two sets of results are derived under the assumption that all stores are equivalent in the eyes of consumers. Sainsbury's also noted that removing the store homogeneity assumption would represent better the realities of the grocery industry. It submitted that in a more realistic scenario in which consumers do not view the retail offer of each grocery store as equivalent, an application of the SSNIP test would tend to reduce further the size of the geographic markets found in the simulation. After applying Tesco's own assumption for store differentiation and consumer switching costs, we find an average drive-time of less than 10 minutes for the 20 stores analysed in Table 1. These results confirm that allowing for product differentiation would further reduce the size of the geographic market.

TABLE 1 Drive-times and store numbers in market defined by a price-flexing SSNIP test

	Scenario A		Scenario B	
	Max drive-time between stores in the defined market (mins)	No of stores in the defined market	Max drive-time between stores in the defined market (mins)	No of stores in the defined market
Brixton	15.3	13	10.67	8
Taunton	7.13	4	7.13	4
Southampton	14.18	10	10.76	5
Llanelli	24.7	8	5.04	2
Exeter Vale	22.71	7	9.76	5
Lincoln	10.43	6	7.12	4
Maidstone	20.24	7	9.41	3
Milton Keynes	13.78	9	10.99	8
Derby	14.73	7	12.09	5
Norwich	19.87	11	12.02	6
Lunsford Park	22.82	12	16.97	4
Slough	22.58	14	10.61	4
Doncaster	13.58	8	5.44	2
Swansea	13.17	7	6.26	2
York	11.73	6	7.98	4
Ashford	21.14	7	6.84	4
Basingstoke	15.31	5	12.33	4
Leicester	10.39	6	10.39	5
Chester	17.28	6	17.28	6
Stoke	10.13	11	6.36	5

Source: CC analysis.

25. With regard to the level of the SSNIP itself, our guidelines state that 5 per cent may be an inappropriate level at which to conduct the SSNIP test. In such cases, we will use a more suitable figure given the nature of the market in question.²⁷ In this case, we consider that a 5 per cent price increase might be excessive given the nature of the market(s) for groceries in the UK.²⁸
26. In Table 2, for each area considered in Table 1, we report the different store level price increase assumption, for each store under the control of the hypothetical monopolist. These are presented in terms of an average 5 per cent store price increase across the hypothetical monopolist's portfolio of stores. We note that the

²⁷See *Market Investigation References: Competition Commission Guidelines, CC3*, June 2003, p11, paragraph 2.8.

²⁸This approach is consistent with a submission from Sainsbury's and the expert opinions of Professors Cotterill and Slade.

adoption of a smaller estimate of what constitutes a SSNIP would, all else being equal, suggest a narrower geographic market than the results in Table 1.

TABLE 2 Price increase employed at each store in the CC's relaxation of the uniform price increase assumption

Mins	0	5.38	9.41	14.81	13.71	20.12	13.38	Continued...			
Maidstone	Tesco	Sainsbury's	Morrisons	Sainsbury's	Asda	Tesco	Sainsbury's				
Homogenous	10%	10%	3%	8%	1%	1%	8%				
Differentiated	10%	0%	5%								
Mins	17.17	17.33	17.77	19.48	19.58	19.98	20.24				
Maidstone	Morrisons	Asda	Tesco	Sainsbury's	Sainsbury's	Asda	Tesco				
Homogenous	8%	7%	7%	6%	1%	0%	0%				
Mins	0	2.76	3	8.44	9.87	9.87	10.78	10.99	13.78		
Milton Keynes	Tesco	Sainsbury's	Asda	Morrisons	Tesco	Sainsbury's	Waitrose	M&S	Tesco		
Homogenous	9%	0%	9%	2%	0%	9%	8%	8%	0%		
Differentiated	7%	7%	7%	7%	0%	6%	6%	0%			
Mins	0	5.84	9.79	9	12.09	10.9	14.73				
Derby	Tesco	Sainsbury's	Sainsbury's	Sainsbury's	Asda	M&S	Morrisons				
Homogenous	1%	10%	0%	10%	0%	10%	4%				
Differentiated	10%	0%	0%	10%	9%	1%					
Mins	0	8.49	12.02	11.79	10.17	7.55	17.07	15.95	9.87	16.88	19.87
Norwich	Tesco	Asda	M&S	Sainsbury's	Morrisons	Sainsbury's	Tesco	Waitrose	Ind	Ind	Sainsbury's
Homogenous	9%	9%	8%	8%	8%	2%	1%	7%	1%	2%	0%
Differentiated	10%	0%	0%	10%	9%	1%					
Mins	0	13.59	7.55	16.97	18.93	22.82	15.51	Continued...			
Lunsford Park	Tesco	Asda	Sainsbury's	Sainsbury's	Tesco	Morrisons	Asda				
Homogenous	10%	0%	10%	9%	9%	1%	10%				
Differentiated	10%	0%	10%	0%							
Mins	15.7	17.76	18.86	21.17	21.27						
Lunsford Park	Tesco	Morrisons	Sainsbury's	Morrisons	Sainsbury's						
Homogenous	10%	1%	0%	0%	0%						
Mins	0	6.16	6.73	10.61	16.1	10.44	18.28	Continued...			
Slough	Tesco	Sainsbury's	Asda	Sainsbury's	Waitrose	Tesco	Tesco				
Homogenous	3%	2%	10%	10%	9%	9%	9%				
Differentiated	0%	10%	9%	1%							
Mins	16.65	17.77	13.46	14.5	22.58	21.4	18.44				
Slough	Tesco	Sainsbury's	Tesco	Sainsbury's	Tesco	Tesco	Co-op				
Homogenous	9%	0%	0%	9%	0%	0%	0%				
Mins	0	4.58	5.74	7.6	10.67	9.97	12.72	10.58	10.58	Continued...	
Brixton	Tesco	M&S	Sainsbury's	Tesco	Sainsbury's	Sainsbury's	Asda	Tesco	Sainsbury's		
Homogenous	1%	10%	10%	5%	0%	10%	0%	0%	10%		
Differentiated	10%	2%	10%	9%	0%	9%	0%	0%			
Mins	13.68	13.68	14.72	15.3							
Brixton	Somerfield	M&S	Morrisons	Sainsbury's							
Homogenous	10%	10%	0%	0%							

Mins	0	3.18	4.92	7.13						
Taunton	Tesco	Sainsbury's	Morrisons	Asda						
Homogenous	7%	7%	6%	0%						
Differentiated	7%	7%	6%	0%						
Mins	0	3.91	5.27	10.76	10.41	14.18	14.18	8.11	8.66	12.47
Southampton	Tesco	Sainsbury's	Sainsbury's	Waitrose	Waitrose	Sainsbury's	Sainsbury's	Asda	Asda	Waitrose
Homogenous	10%	10%	1%	0%	10%	10%	0%	10%	0%	0%
Differentiated	9%	9%	0%	0%	7%					
Mins	0	5.04	10.73	13.68	18.89	24.7	18.05	20.9		
Llanelli	Tesco	Asda	Somerfield	Tesco	Morrisons	Sainsbury's	Co-op	Tesco		
Homogenous	10%	1%	10%	0%	0%	10%	10%	0%		
Differentiated	1%	9%								
Mins	0	5.25	7.84	7.05	9.76	9.08	22.71			
Exeter Vale	Tesco	Sainsbury's	Co-op	Sainsbury's	Sainsbury's	Somerfield	Somerfield			
Homogenous	0%	10%	0%	5%	10%	0%	10%			
Differentiated	0%	7%	6%	6%	6%					
Mins	0	3.28	6.41	7.12	10.43	8.72				
Lincoln	Tesco	Co-op	Morrisons	Tesco	Waitrose	Co-op				
Homogenous	0%	6%	6%	6%	6%	6%				
Differentiated	0%	10%	10%	0%						
Mins	0	5.44	6.14	13.58	9.74	10.84	11.07	12.13		
Doncaster	Tesco	Morrisons	Sainsbury's	Asda	Asda	Sainsbury's	Tesco	Tesco		
Homogenous	7%	7%	7%	0%	7%	6%	0%	6%		
Differentiated	0%	10%								
Mins	0	6.26	6.56	12.36	10.6	13.17	11.78			
Swansea	Tesco	Somerfield	Morrisons	Sainsbury's	Tesco	Asda	Tesco			
Homogenous	7%	0%	7%	7%	7%	0%	7%			
Differentiated	0%	10%								
Mins	0	7.98	7.98	7.96	8.12	11.73				
York	Tesco	Asda	Sainsbury's	Sainsbury's	Morrisons	Tesco				
Homogenous	8%	8%	7%	6%	0%	0%				
Differentiated	6%	7%	7%	0%						
Mins	0	2.62	5.33	6.84	21.05	20.56	21.14			
Ashford	Tesco	Asda	Tesco	Sainsbury's	Tesco	Waitrose	Tesco			
Homogenous	10%	10%	3%	10%	0%	0%	1%			
Differentiated	6%	7%	7%	0%						
Mins	0	7.38	9.32	12.33	15.31					
Basingstoke	Tesco	Sainsbury's	Morrisons	Asda	Sainsbury's					
Homogenous	0%	8%	7%	3%	7%					
Differentiated	0%	10%	10%	0%						

Mins	0	5.56	10.32	9.8	10.39	8.41					
Leicester	Tesco	Sainsbury's	Asda	Sainsbury's	Morrisons	Sainsbury's					
Homogenous	10%	10%	1%	9%	0%	0%					
Differentiated	0%	10%	5%	10%	0%						
Mins	0	6.36	9.68	8.89	8.89	17.28					
Chester	Tesco	Morrisons	Sainsbury's	Morrisons	Co-op	Tesco					
Homogenous	10%	10%	1%	5%	9%	1%					
Differentiated	10%	0%	0%	10%	10%	0%					
Mins	0	2.96	4.33	6.36	5.06	9.28	9.62	8.83	9.84	10.13	10.07
Stoke	Tesco	Morrisons	Sainsbury's	Morrisons	Sainsbury's	Sainsbury's	Asda	Morrisons	Tesco	Tesco	Somerfield
Homogenous	2%	2%	10%	0%	10%	10%	0%	10%	0%	10%	0%
Differentiated	9%	8%	8%	0%	0%						

Source: CC analysis.

Results of our analysis of simulated price changes

TABLE 1 Results of simulated price changes

5% SSNIP at Tesco store: Ashford						
SSNIP price increase assumption		5%				
	<i>Homogenous stores</i>	<i>Differentiated stores</i>		<i>Households pre-SSNIP</i>	<i>Households post-SSNIP</i>	
Gain	£0.48	Gain £4,821.60	Tesco	7,400	4	
Loss	£67,270.62	Loss £47,089.44	Asda	7,482	14,340	
Net gain	-£67,270.14	Net gain -£42,267.84				
1% SSNIP at Tesco store: Ashford						
SSNIP price increase assumption		1%				
	<i>Homogenous stores</i>	<i>Differentiated stores</i>		<i>Households pre-SSNIP</i>	<i>Households post-SSNIP</i>	
Gain	£112.36	Gain £1,042.90	Tesco	7,400	718	
Loss	£64,920.92	Loss £45,444.64	Asda	7,482	13,635	
Net gain	-£64,808.55	Net gain -£44,401.74				
5% SSNIP at Tesco store: Southampton						
SSNIP price increase assumption		5%				
	<i>Homogenous stores</i>	<i>Differentiated stores</i>		<i>Households pre-SSNIP</i>	<i>Households post-SSNIP</i>	
Gain	£7.04	Gain £4,337.55	Tesco	6,650	23	
Loss	£60,425.00	Loss £42,297.50	Sainsbury's	15,552	20,789	
Net gain	-£60,417.96	Net gain -£37,959.96				
1% SSNIP at Tesco store: Southampton						
SSNIP price increase assumption		1%				
	<i>Homogenous stores</i>	<i>Differentiated stores</i>		<i>Households pre-SSNIP</i>	<i>Households post-SSNIP</i>	
Gain	£377.08	Gain £1,130.48	Tesco	6,650	1,693	
Loss	£52,562.28	Loss £36,793.59	Sainsbury's	15,552	19,423	
Net gain	-£52,185.20	Net gain -£35,663.12				
5% SSNIP at Tesco store: Maidstone						
SSNIP price increase assumption		5%				
	<i>Homogenous stores</i>	<i>Differentiated stores</i>		<i>Households pre-SSNIP</i>	<i>Households post-SSNIP</i>	
Gain	£1,806.12	Gain £262,464.04	Tesco	13,879	1,013	
Loss	£118,612.15	Loss £2,103,949.90	Sainsbury's	12,786	23,969	
Net gain	-£116,806.04	Net gain -£1,841,485.86				
5% SSNIP at Tesco store: Maidstone						
SSNIP price increase assumption		1%				
	<i>Homogenous stores</i>	<i>Differentiated stores</i>		<i>Households pre-SSNIP</i>	<i>Households post-SSNIP</i>	
Gain	£1,941.99	Gain £70,514.50	Tesco	13,879	6,272	
Loss	£85,526.71	Loss £1,726,755.87	Sainsbury's	12,786	19,072	
Net gain	-£83,584.72	Net gain -£1,656,241.37				

Source: CC.