Analysis of the Tesco SSNIP simulation model

Introduction

1. Tesco's quantitative model of a simulated SSNIP test was submitted 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 have also submitted views on the Tesco model, notably RBB Economics in its capacity as adviser to Sainsbury's. We have 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 simplified assumptions. We consider that the predictions of the Tesco model are unrealistic and improbable, and that this seriously undermines the credibility of the model. Moreover, the factors that render the Tesco model's predictions improbable are inherent in the basic structure of the model and so cannot be addressed through the modifications of a few of the model's assumptions.

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[1] A copy of this submission is on the CC website at:
www.competition-commission.org.uk/inquiries/ref2006/grocery/main_party_submissions.htm.

[2] This appendix refers to the size of local markets in terms of drive-time minutes, and all references to 'minutes' should be read as a reference to drive-times. Further discussion regarding the use of drive-times in geographic market definition is provided in paragraph 4.103 of the provisional findings.

[3] Although 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.

3. In the process of sensitivity testing, we changed some of the assumptions of the model. When altering these assumptions, we find that the Tesco model predicted local markets with maximum drive-times between stores lying within a 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, 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 suppliers, and ensures the tractability of the modelling exercise. In this section, we describe these assumptions.

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[4]See *Market Investigation References: Competition Commission Guidelines, CC3*, June 2003, paragraphs 2.4 to 2.8.
[5]Supply-side substitution is unlikely to be relevant since new retailers would need to acquire planning consent for grocery retail, and a large site of land in order to offer a competitive constraint.

Customers

7. In the Tesco model, customers are assumed to shop at their closest store. That is, 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 only 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. In its 5 April letter to the CC, 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, 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

[6]That 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).

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. There is no loyalty to a particular store or any other cost to the consumer of switching between stores.

Retailers

12. The Tesco model considers grocery stores with a net sales area greater than 1,400 sq metres. It uses only the effective competitor set defined by the CC in the 2000 investigation.[7] Each of these stores is assumed to be an equal substitute for any of the others. This implies 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

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

changes on profit is calculated using the average gross margin across all Tesco stores, with a net sales area larger than 1,400 sq metres.[8]

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 then 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, and a local market is defined.

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.[9] Tesco also reported that the results were not significantly impacted by the adoption of a lower store margin ([✂] 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 [✂] 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.

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[8]We note that the average gross margin used in the model for this purpose ([✂] 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. This is a further simplifying assumption that may, or may not, be significant in its effect.

[9]Tesco 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 (that we later describe), Tesco estimates ranged from £7.20 to £45 per hour.

Testing the robustness of the Tesco model

17. We altered three key assumptions of the model to check the robustness of Tesco's results. We discuss each of these assumptions in further detail and the results of our analysis in Annex 1.

18. However, this is not to suggest that we accept the other assumptions of the model. In fact, we find that the model has a number of problems which, when taken together, mean that this simulation of consumer switching behaviour is uninformative on actual consumer switching behaviour and, as such, adds little to our understanding of geographic market definition.

19. 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 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 problems that we have 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;[10] and

        (ii) is unreliable because it is of a uniform low value that biases the results towards a broader geographic market definition.[11]

[10]This is a result of the Decision Technology model that Professors Slade and Cotterill have noted is inadequate in their expert opinions.

[11]Decision Technology themselves, as well as Professors Cotterill and Slade, have 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).

(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 61).

(f) We also note the Sainsbury's and Asda analysis 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.

20. For all these reasons, we find the Tesco model is not appropriate to assist in defining a relevant geographic market for grocery retail. As such, we do not place weight on the results obtained from the modelling exercise.

21. 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. We consider that demonstrated bias is unrelated to the weight we attach to the results of the model.[12]

How realistic is the Tesco model in its predictions?

22. 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

[12]Consider the following example which Professor Cotterill uses 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.

section we examine how realistic we find the predictions of the Tesco model regarding consumer switching behaviour.

23. 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 of the areas we have analysed (Ashford, Southampton and Maidstone). The gains and losses to the store operator, implied by Tesco's model, are presented for both the homogenous and differentiated store variations of the model. 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.

24. For example, 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).[13] 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.[14] We believe that similarly dramatic results would be replicated in most markets across the UK under the Tesco model.

[13]Tesco submitted that this was an extreme case. However, we note that in the Maidstone example the two stores are more than 5 minutes apart. This therefore does not appear to constitute an extreme, or particularly unusual, example of store locations in the UK.

[14]We note that although these results are here presented 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 the customers at the slightly cheaper store.

25. We find these results to be highly unrealistic.[15] 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.[16]

26. 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 numbers of infra-marginal customers increasing the likelihood of a profitable price increase. All in all, 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. The fact that the Tesco model produces an excessively high level of customer switching is therefore not innocuous. It attenuates the effect of being able to price flex and reduces the difference between the results obtained from price flexing and uniform pricing assumptions. Removing the bias generated by such extreme switching results would therefore give rise to a narrower geographic market definition.

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[15] In 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.

[16] Tesco 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 where customers prefer to pay the SSNIP and therefore cease to switch away).

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

27. Tesco criticized our sensitivity testing of its model. It maintained that price flexing was not observed in the grocery market and hence to allow its use by a hypothetical monopolist in the SSNIP test was excessively hypothetical. Secondly, it 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, the CC testing was biased towards finding markets smaller than 30 minutes wide.[17]

28. We note first that neither Tesco's nor our analysis included COAs further than 30 minutes from the initial store in either the construction of the model or its testing. This did not prevent Tesco's analysis finding the vast majority of markets to be more than 30 minutes wide.

29. We included stores up to 30 minutes away from the initial store in our analysis. This allowed us to consider all stores in an area that takes an hour to cross by car. The Tesco model requires that the COAs whose switching options are considered relevant[18] have the option of switching to the next nearest store not operated by the hypothetical monopolist. Since, under our testing, each of the results stands at well within 30 minutes, it should be clear that the marginal COAs have the option of switching to stores within 30 minutes but 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. However, what matters in the Tesco model is that

[17]Tesco submissions of 10 September 2007 and 31 August 2007.
[18]The relevant customers in the simulation are those whose closest store is operated by the hypothetical monopolist.

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.

30. Nevertheless, 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 that 30 minutes from the central store. If there were sufficient numbers of such customers, the result from that local market might be affected, in that the central store would be somewhat 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.

31. Tesco highlighted the specific case of Taunton in Somerset in which it believed this 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 the CC testing. We reran our testing of Tesco's model as it related to 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.[19]

[19]This 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. As with Taunton, we found the same result when we repeated this process in Doncaster, which was the second example cited by Tesco.

32. 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.[20]

Further iterations of the Tesco model

33. 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 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).

34. We considered this assumption to be an important sensitivity test of the Tesco model for a number of reasons. First, as noted in paragraphs 17 to 21, 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.[21] As such, we might expect a significant delay in any response from customers that switch in response to 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

[20]Supporting this view is the Sainsbury's analysis which considers store up to 45 minutes away from the target store. While this analysis considers only the homogenous store variant of the model, the conclusions nevertheless reflect those of the CC. Sainsbury's then stated that including store differentiation would, all else being equal, result in a narrower geographic market.
[21]See the expert opinion of Professor Ronald Cotterill for further discussion of this issue. [✂]

that store than others, and, as a result, less price sensitive. For that reason, as Tesco said, these customers would not switch, but would remain inert despite the price change that was simulated as part of the Tesco model.

35. Tesco submitted a revised assumption, which it believed better modelled store differentiation, on 10 September 2007. With this revised assumption, this new version of the model lacks a number of features that its initial assumption 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.

36. Secondly, the revised assumption appears to make no allowance for customer loyalty. Based on the results of their 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 fascia. 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.

37. On average, Tesco told us that 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 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 £[✂] difference in average preference between Asda and Sainsbury's, and a £[✂] difference between Asda and M&S. Tesco estimated the cost of travel time as £[✂] 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, it 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.

38. Tesco told us that customer preference at the average level was not key to the issue of market definition, which was concerned instead 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.

39. 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.

40. Furthermore it is not clear that this model captures the possibility that some customers are less price sensitive than others. That is to say that 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.

41. Finally, we also emphasize three important elements of this new model. First, this new version of the Tesco model 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'.

42. Second, there is no theoretical basis for Tesco's assertion that product differentiation makes price flexing *less* profitable. In fact, any acknowledgement that many customers 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.

43. Third, and following on from the previous point, 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. To be clear, however, the same price (or offer) is still available to all customers of that store. 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. 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.

44. 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.

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.

Assumption of uniform price increases by the hypothetical monopolist

5. 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).

6. 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.

7. 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.[1]

[1]Sainsbury'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.

8. 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.

9. 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.

10. 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 price files that reflect different fascias, store formats and, in some cases, competitive conditions.[2]

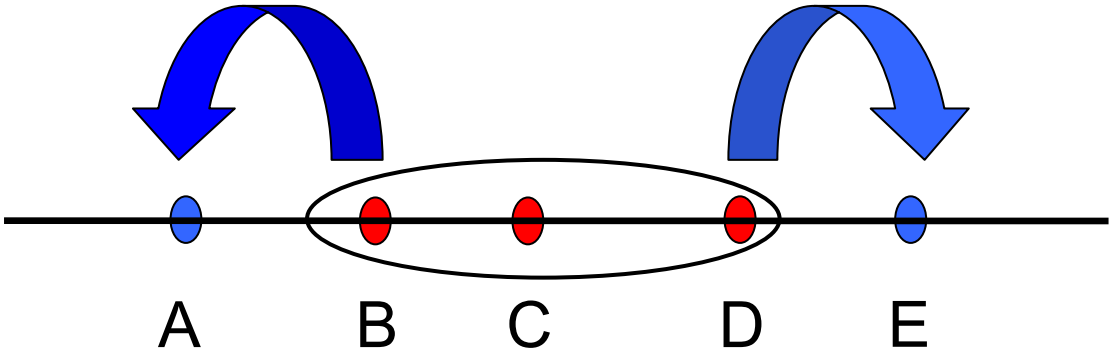
11. Further, a price increase is only one means by which the hypothetical monopolist seeks to maximize profits across a candidate market. If there were logistical issues with varying prices locally, a hypothetical monopolist could, in principle, vary aspects of its retail offer other than prices to achieve the same outcome.

12. 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

[2]See Section 5 of the main report.

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.

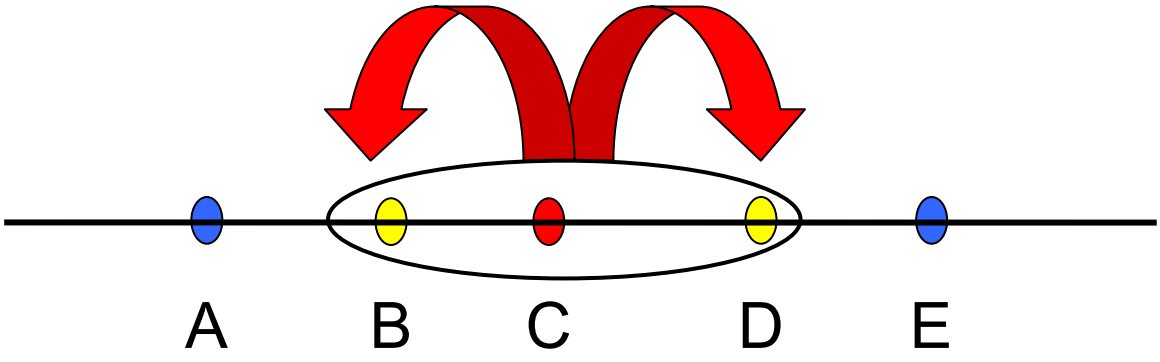
FIGURE 1



Source: CC.

13. 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.

Assumption that stores only vary in their prices and location

14. 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 purely driven 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.

15. 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 16 to 19. 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 (scenario A), and a second result that reflects a relaxation of both the uniform price increase assumption and the homogenous store assumption (scenario B). We consider that it is appropriate to relax both assumptions.

Results of our analysis

16. Based on an analysis of 20 geographic areas,[3] 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

[3]The 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 our sample is biased towards defining overly broad local markets.

local market is more than 30 minutes wide (the exception being Swansea which Tesco defines as a 25-minute isochrone).

17. 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 better represent 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.

18. In regard to the level of the SSNIP itself, the CC guidelines state that 5 per cent may be an inappropriate level at which to conduct the SSNIP test. In such cases, the CC will use a more suitable figure given the nature of the market in question.[4] 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.[5]

19. 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 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.

[4]See *Market Investigation References: Competition Commission Guidelines*, *CC3*, June 2003, p11, paragraph 2.8.
[5]This approach is consistent with a submission from Sainsbury's and the expert opinions of Professors Cotterill and Slade.

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%**

	Homogenous stores		*Differentiated stores*		*Households pre-SSNIP*	*Households post-SSNIP*
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%**

	Homogenous stores		*Differentiated stores*		*Households pre-SSNIP*	*Households post-SSNIP*
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%**

	Homogenous stores		*Differentiated stores*		*Households pre-SSNIP*	*Households post-SSNIP*
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%**

	Homogenous stores		*Differentiated stores*		*Households pre-SSNIP*	*Households post-SSNIP*
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%**

	Homogenous stores		*Differentiated stores*		*Households pre-SSNIP*	*Households post-SSNIP*
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%**

	Homogenous stores		*Differentiated stores*		*Households pre-SSNIP*	*Households post-SSNIP*
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.