Net present value model

Introduction

1. In this appendix we describe how we used an NPV model to combine our quantitative estimates of the costs and benefits of the Test in representative local areas. The aim of modelling the NPV is not to generate a single figure for the quantifiable elements of the costs and benefits, but rather to understand the NPV of the Test under a range of reasonable assumptions.

2. The NPV model estimates the impact of development decisions taken over a period of 25 years. It combines the results derived from our market model with our assessment of the number of developments that would be prevented by the Test annually, a number of other estimates set out in paragraphs 5.43 to 5.55 of the decision, Appendix B and data both from our groceries market investigation and from publicly-available sources. Over each of the 25 years the model calculates the NPV of the costs and benefits of the developments built (or not built) in the year, assuming a 25-year life for each of the developments built and, using an appropriate discount rate, discounts the values back to the present day to reflect the fact that present benefits and costs are considered more significant than those occurring in the future.[1] The model assumes a terminal value from year 25 based on the remaining life of the store developments built over the 25-year life of the model.[2,3]

3. We note that, as set out in the decision, this is only a partial view of the overall value of the Test (see paragraph 5.127). The results of our NPV model are therefore only one element that we use in reaching our view on the effectiveness and proportionality of the Test.

Key inputs

4. We established estimates for:

   (a) the number of developments affected by the Test, their associated market structures, and representative market scenarios;

   (b) the length of delay between when an incumbent development would have opened but for the Test and when we expect a competitor's development to open instead, together with the probability of a competitor's development opening;

   (c) the benefits of a competitor's development and the costs of delay;

   (d) the discount rate; and

   (e) the administrative costs of the Test.

---

[1]Retailers agreed that 25 years was the appropriate period to calculate the NPV of a store development.
[2] The calculation of a terminal value is an approach commonly used in financial modelling and represents the discounted value of future cash flows which are estimated to occur beyond the period of the model.
[3]Using the spreadsheet model we provided with our provisional decision Tesco said that the NPV model in reality operated over a period of 49 years, with £759 million of the discounted value (around 40 per cent of the value quoted in the provisional decision) arising after year 25, and said that the model relied on putative benefits from the distant future. We recognize that, in year 25 of the model, we are modelling investment decisions that a retailer would take based on a store life over the next 25 years. However, as discussed in footnote 2, the assessment of a terminal value is a standard approach to take in financial modelling.

We also set the period of the model. We discuss each of these in turn.

Number of developments, their associated market structures and representative market scenarios

5. Our analysis indicates that 19 extensions and three new stores each year would have been prevented by the Test between 2000 and mid-2006 if the Test had been in operation at the time (see decision, paragraph 5.72).[4]

6. There are several factors that might affect our estimate of the number of developments likely to be prevented by the Test in the future. These might include, for example, the general economic climate or the impact of the exceptional circumstances clause. However, for simplicity our model assumes that the number of developments impacted remains constant over the life of the model. We conducted sensitivities which assume decreases in the number of developments affected by the Test.

7. Tesco said that the CC's new store analysis did not distinguish between off-site replacements and new stores and that when an off-site replacement was blocked, the original store would remain open. It said that this would reduce the level of demand that a new store could serve. Tesco suggested we should therefore treat off-site replacements as extensions. Tesco said that consequently the total capacity following a like-for-like replacement would be substantially less, and there would be a materially lower probability of replacement for off-site replacements (as the original store remains). Tesco believed that off-site replacements are likely to account for the majority of the blocked developments in the CC's 'new stores' category.

8. During 2000 to mid-2006, just over half of the new stores that we identified that would have been prevented by the Test had it been in operation were new stores, with the remainder being off-site replacements. We treat off-site replacements as new stores because an alternative site is available for development by a competitor. If a competitor were to acquire the site that the incumbent had been intending to use for its off-site development, the resulting store would be in a different location to the incumbent's original store and might justify a larger store being built than just the increment in size of the incumbent store prevented by the Test. However, we recognize that off-site rebuilds are neither pure new stores nor extensions. We modelled them as new stores for the reasons set out above but recognize that this may overstate the size of the replacement store that a new entrant decides to build. However, we also modelled sensitivities where offsite rebuilds are treated as large extensions and a second case that recognizes that offsite rebuilds are neither pure new stores nor extensions and therefore assumes 50 per cent of the off site rebuilds are large extensions and 50 per cent are new stores.

9. We estimated the number of developments that would be likely to occur in a range of representative local areas, based on the market structures that we had identified from our analysis of store developments between 2000 and mid-2006. For each type of market structure, we looked at the likely competitor reaction that would occur when an incumbent store was prevented by the Test. This allowed us to vary our assumptions on delays, benefits and costs, depending on the market structure and the likely competitor reaction. We looked separately at new stores and extensions (see paragraphs 5.43 to 5.55 and 5.75 to 5.103 of the decision).

---

[4]These figures are slightly lower than the figures we calculated in our provisional decision (3 new build stores and 26 extensions). This is primarily because we have reduced the figures to account for entry within a few months of a development that would have been prevented by the Test, and routine entry. We also divide the total number of developments that would have been prevented by the Test by 6.5 years to calculate an annual rate rather than the 6 years we had previously used.

New stores

10. The average size of the new stores that would have been prevented by the Test between 2000 and mid-2006 was approximately 3,300 sq metres net sales area (see the decision, Table 2). We assumed that, given the large average size of the new stores and because a site would be available for a competitor to build on (see the decision, paragraph 4.18), all new stores prevented by the Test would be replaced by a competitor development. We discuss our assumptions on possible delays in paragraphs 16 to 21.

Extensions

11. The average size of the extensions that would have been prevented by the Test in the period 2000 to mid-2006 is approximately 1,400 sq metres net sales area, although some extensions were much smaller.[5] We consider it less likely that a new development would be built by another retailer to replace a small extension prevented by the Test. In the decision (paragraphs 5.113 to 5.120), we describe why we consider that we should include a de-minimis threshold of 300 sq metres groceries sales area below which an extension could proceed notwithstanding the operation of the Test. Accordingly the NPV model assumes that all extensions of up to 300 sq metres groceries sales area are allowed to proceed under the Test and therefore attract neither costs nor benefits.

Scenarios

12. We have assessed eight representative market scenarios (three for new stores and five for extensions) that reflect how competitors may react when a strong incumbent's development is prevented by the Test. In many cases we have estimated the number of times the scenario would be likely to occur based on our analysis of the 2000 to mid-2006 data. In some cases, however, we have used our judgement to make an assumption about the number of times a particular scenario would occur. In those cases, we used sensitivities to examine the impact of changing these assumptions.[6] Further discussion on this issue, including an analysis of the effects of changing this assumption, is set out in paragraphs 31 to 44 below.

13. The eight representative market scenarios were:

New builds

(a) *Scenario one:* A new store that would have been built by the only fascia present in an isochrone is prevented by the Test and the store is replaced by a new-entrant store.

- We estimated, based on our analysis of the 2000 to mid-2006 data, that around one-third of new stores prevented by the Test would be in single-fascia areas. This amounts to one store a year.

The remaining new stores that would have been prevented by the Test were in areas with more than one store present and are accounted for by scenarios two and three. We estimated, based on our analysis of the 2000 to mid-2006 data,

[5]We note that, excluding all extensions under 300 sq metres of groceries sales area, the average size of the remaining extensions is 1,500 sq metres.
[6]For the purposes of estimating the number of times each scenario will occur, we have assumed that all extensions prevented by the Test and not subject to the 300 sq metre de minimis will be replaced.

that two-thirds of new stores prevented by the Test would be in areas with more than one fascia. We assumed that half of these would be built by a new fascia and half by a weak incumbent fascia.

(b) *Scenario two:* A new store that would have been built by a strong incumbent fascia, where more than one fascia is present in an area, is prevented by the Test and replaced by a new-entrant store.

- We assumed, as explained above, that one store a year would fall into this category.

(c) *Scenario three:* A new store that would have been built by a strong incumbent fascia, where more than one fascia is present in an area, is prevented by the Test and replaced by a store from a weak incumbent.

- We assumed that one store a year would fall into this category.

As described in paragraph 8, we included two sensitivities in our NPV model which analysed off-site replacements as having some or all of the characteristics of large extensions rather than new stores. This is discussed further in paragraph 43 below.

Extensions

(d) *Scenario four:* An extension to a store has a grocery sales area of less than 300 sq metres and the de-minimis exclusion applies (see paragraph 11).

- We estimate, based on the 2000 to mid-2006 data, that of the 19 extensions that would be prevented by the Test each year, an average of 2.6 extensions each year would fall into this category.

(e) *Scenario five:* A large extension to a store operated by the only fascia present in an area is replaced by a new-entrant store.

- We estimate, based on the 2000 to mid-2006 data, that of the 19 extensions that would be prevented by the Test each year, an average of 6.9 extensions each year would fall into this category and would be replaced by a new-entrant store. We also analysed sensitivities where 50 per cent or all of the new stores that were off-site replacements in single fascia areas were included in this category (see paragraph 8).

- We estimate, based on the 2000 to mid-2006 data, that of the 19 extensions that would be prevented by the Test each year, an average of 9.5 of these extensions would be in areas where more than one fascia was present. Of these 9.5 extensions prevented by the Test, we assumed that competitors build developments in the area as follows: in one-third of cases a new store is built by a weak incumbent; in one-third of cases an extension to a weak incumbent store is built; and in one-third of cases a new-entrant store is built. Accordingly, an average of 3.2 extensions each year would fall into each of these three categories. We did not have any information relevant to assessing the possible reactions of competitors to an extension by a strong incumbent being prevented by the Test. We therefore modelled sensitivities that reflected the impact of assuming changes in the proportions built by new entrants, weak incumbents as extensions and weak incumbents as new stores. We also analysed a sensitivity where new stores that were off-site replacements in

duopoly areas were included in these categories, divided equally into each of the three (see paragraph 8).

(f) Scenario six: A large extension to a store of a strong incumbent, where more than one fascia is present, is replaced by a new store of a weak incumbent (3.2 stores—see above).

(g) Scenario seven: A large extension to a store in an area with more than one fascia is replaced by an extension to a weak incumbent store (3.2 stores—see above).

(h) Scenario eight: A large extension to a store in an area with more than one fascia is replaced by a new-entrant store (3.2 stores—see above).

14. A summary of the number of stores that we estimated or assumed to be in each category is shown in Table 1.

TABLE 1 **Number of stores in each market structure and type of development**

Category of development	*Number of stores each year*
(a) A new store that would have been built by the only fascia present is replaced by new-entrant store	1
(b) A new store that would have been built by the strong-incumbent fascia, where more than one fascia is present, is replaced by a new-entrant store	1
(c) A new store that would have been built by the strong-incumbent fascia, where more than one fascia is present, is replaced by a store from a weak incumbent	1
(d) A small extension to a store is less than 300 sq metres grocery sales area and the de minimis applies	2.6
(e) A large extension to a store operated by the only fascia present is replaced by a new-entrant store	6.9
(f) A large extension to a store of a strong incumbent, where more than one fascia is present, is replaced by a new store of a weak incumbent	3.2
(g) A large extension to a store of a strong incumbent, where more than one fascia is present, is replaced by an extension to a weak incumbent store	3.2
(h) A large extension to a store of a strong incumbent, where more than one fascia is present, is replaced by a new-entrant store	3.2

Source: CC analysis.

15. Overall, we assume that the de-minimis threshold applies to 14 per cent of extensions (an average of 2.6 each year), 17 per cent of extensions prevented by the Test are replaced by extensions by weak incumbents (an average of 3.2 each year) and the remaining 69 per cent of extensions prevented by the Test are replaced by new stores. We modelled sensitivities to changes in these assumptions (see paragraph 42).

Length of delay and the probability of a competitor's development opening

16. In paragraphs 5.75 to 5.103 of the decision we set out our analysis of the likely length of delay for a competitor to enter or expand in a local area if the strong incumbent's development was prevented by the Test. We identified different delay assumptions, depending on the type of development that was prevented and what was developed in its place:

(a) a new store is built instead of the strong incumbent's new store;

(b) a new store is built instead of the strong incumbent's extension; and

(c) an extension by a weak incumbent is built instead of an extension by a strong incumbent.

17. In paragraph 5.77 of the decision we discussed the time retailers would have to adjust their strategies to the introduction of the Test. We found that there would be sufficient time during the introduction of the Test for retailers to adjust their commercial strategies appropriately. Since there is an active real estate market we assume retailers would be able to dispose of sites where they were unable to develop a store because of the Test. Therefore we assumed that, for new stores where there is a discrete site under development, another retailer would be able to acquire that site reasonably quickly in the same state of development and so there would be no delay in the future. However, we recognize that retailers will have a pipeline of sites under development and it will take time to adjust this pipeline to the introduction of the Test. We therefore assumed a one-year delay immediately after the introduction of the Test.

18. However, as discussed in the decision, paragraphs 5.92 to 5.100, the situation for extensions is different. Where an extension prevented by the Test is replaced by an extension to a weak incumbent store, we assume that there would generally be no delay. We recognize, however, that in some cases there may be site-specific issues associated with the weak incumbent's extension and so model sensitivities to look at the impact of introducing a delay (see paragraph 39).

19. Where a new store replaces an extension, a site needs to be identified and acquired. In paragraph 5.77 of the decision we noted that retailers would be able to draw up contingency plans for their investment that would enable them to select the appropriate investment choices depending on whether the Test would be introduced. In paragraph 5.84 of the decision we discussed the information received from retailers about site assembly, together with our own analysis in the report, and concluded that a reasonable average time for a retailer to develop a site and open a store was five years. We subtracted the average time to build a store, which we assessed as one year to arrive at an average site development time of four years. In the NPV model we have assumed, conservatively in our view, that immediately after the introduction of the Test, a retailer will still take an average of four years to develop a site.

20. However, after the Test has been introduced, we expect retailers proactively to seek opportunities to develop in areas where they recognize that the strong incumbent would be prevented from developing by the Test, and to begin developing sites for new stores in those areas. This process of development by a competitor would be independent of whether the strong incumbent retailer seeks to build a development in the area. Therefore we expect that four years after the introduction of the Test there would be no additional delay compared with an extension by a strong incumbent since the competitor retailer will have spent the previous four years developing a site. However, we have, again conservatively in our view, assumed a continuing average delay of one year to allow for the possibility that in some cases there may be difficulties in site assembly to replace extensions or other factors that cause some delay. We have also modelled sensitivities that assume longer delays.[7]

21. The delays are summarized in Table 2.

[7]This is also conservative because it does not allow for redirected investment.

TABLE 2 **Delay assumptions**

Category of development	*Short-term delay*	*Long-term delay*	*Transition period*
			years
New store replaced by another new store	1	0	1
Extension replaced by a weak incumbent extension	1	0	1
Extension replaced by a new store	4	1	4

Source: CC analysis.

22. We also carried out a number of sensitivities to assess the impact of assuming greater delays before a competitor entered or expanded, or to take account of the possibility that a replacement extension or new build may not, in practice, take place (see probability of replacement sensitivities discussed in paragraphs 31 to 38 below). We modelled the impact of there being longer delays to replace any extension prevented by the Test and a probability of replacement below 100 per cent.

Benefits of a competitor's development and the costs of delay

23. Appendix B details how we estimated for a range of scenarios:

- the benefit from the strong incumbent building a grocery retail development (this amounts to the cost of delayed entry for the period from when the strong incumbent's development would have occurred to the time when a competitor development occurs);
- the benefit of another retailer providing the capacity instead and thereby increasing competition; and
- the net benefit due to competition, ie the difference between the two figures.

24. We use the benefits and costs set out in Appendix B for each of the scenarios described in paragraphs 12 to 15. The NPV model calculates the effect of each scenario according to the average size of stores included in the scenario. Table 3 shows the cost and benefit assumptions taken from Appendix B expressed per sq metre of sales area.[8]

[8]In all cases (both for new stores and extensions) the calibrations of the model were based on an average total store size (ie for extensions this was based on the overall size of the store). The average size of stores over 1,400 sq metres was calculated from the store data assembled during the groceries market investigation as 3,038 sq metres, so the costs and benefits described in Appendix B were divided by 3,038 sq metres to calculate the costs and benefits per sq metre.

TABLE 3 **Cost and benefit assumptions for each of the scenarios per sq metre of sales area**

		Gross benefit if built by strong incumbent (delay cost)	*Gross benefit if built by a competitor that increases competition*	*£ per sq metre* *Difference (net benefit due to competition)*
(a)	A new store that would have been built by the only fascia present is replaced by new-entrant store	728	1,732	1,004
(b)	A new store that would have been built by a strong incumbent, where more than one fascia is present, is replaced by a new-entrant store	1,329	2,177	848
(c)	A new store that would have been built by a strong-incumbent fascia, where more than one fascia is present, is replaced by a store from a weak incumbent	1,292	1,665	373
(d)	A small extension to a store is less than 300 sq metres grocery sales area and the de minimis applies	N/A	N/A	N/A
(e)	A large extension to a store operated by the only fascia present is replaced by a new-entrant store	323	403	80
(f)	A large extension to a store of a strong incumbent, where more than one fascia is present, is replaced by a new store of a weak incumbent	584	830	247
(g)	A large extension to a store of a strong incumbent, where more than one fascia is present, is replaced by an extension to a weak incumbent store	584	692	108
(h)	A large extension to a store of a strong incumbent, where more than one fascia is present, is replaced by a new-entrant store	584	928	344

Source: CC analysis.

Discount rate

25. We applied a discount rate to future costs and benefits in order to estimate their NPV. We used a discount rate of 3.5 per cent, in line with the figure specified by HM Treasury in its guidance on economic assessments (the Green Book) as the Social Time Preference Rate (STPR). We consider the STPR to be the appropriate discount rate to use for this exercise since it is defined as the value society attaches to present, as opposed to future, consumption. The STPR is used for discounting future benefits and costs, and is based on comparisons of utility across different points in time or different generations.[9]

[9]The Green Book recommends that the STPR be used as the standard real discount rate. The STPR has two components:

- the rate at which individuals discount future consumption over present consumption, on the assumption that no change in per capita consumption is expected, represented by ρ; and
- an additional element, if per-capita consumption is expected to grow over time, reflecting the fact that these circumstances imply that future consumption will be plentiful relative to the current position and thus have lower marginal utility. This effect is represented by the product of the annual growth in per-capita consumption (g) and the elasticity of marginal utility of consumption (μ) with respect to utility.

The STPR, represented by r, is the sum of these two components, ie $r = \rho + \mu.g$.

Estimates of ρ

This comprises two elements:

- catastrophe risk (L); and
- pure time preference (δ).

The first component, catastrophe risk, is the likelihood that there will be some event so devastating that all returns from policies, programmes or projects are eliminated, or at least radically and unpredictably altered. Examples are technological advancements that lead to premature obsolescence, or natural disasters, major wars etc. The scale of this risk is, by its nature, hard to quantify. The second component, pure time preference, reflects individuals' preference for consumption now, rather than later, with an unchanging level of consumption per capita over time. The evidence suggests that these two components indicate a value for $\rho$of around 1.5 per cent a year for the near future.

Estimates of μ

The available evidence suggests that the elasticity of μ is around 1. This implies that a marginal increment in consumption to a generation that has twice the consumption of the current generation will reduce the utility by half. (*cont)*

Administrative costs

26. In the report we estimated the administrative costs of the Test as £6–£8 million each year.[10] In the NPV model we used a mid-point of our estimate—£7 million each year.

Period of the model

27. As we explain in paragraph 2, we assumed the lifetime of a store as 25 years. Our NPV model also operates over a 25-year period.[11] We considered sensitivities with shorter timescales: 10, 15 or 20 years.

Summary of the results

28. The NPV produced by the model varies between £2.8 billion before any sensitivities are considered to £821 million in the most pessimistic compound downside that we considered. The sensitivities and compound downsides are discussed in paragraphs 31 to 51 below.

29. We used the sensitivity analysis to test the robustness of the Test to varying assumptions in order to form a view of what represented reasonable ranges for the value of the Test.

30. In response to our provisional decision, Tesco analysed the cash flows from the model and said that cumulative net benefits only started to arise after eight years from implementation of the Test. We note that the model before sensitivities shows cumulative net benefits are achieved between years five and six.

Probability of replacement and delay

31. The probability of replacement and delay are two key assumptions that underlie the assessment of our NPV model. The two are also related. In general terms, the probability of replacement is likely to increase if the incumbent continues to be prevented from developing by the Test and there is a continuing need for increased large grocery store sales area in the isochrone. We describe in our decision the reasons why we believe that competitors would have both the incentive and, in many cases, the ability to expand in local areas where the incumbent retailer is prevented from doing so by the Test.

32. There are three additional factors to take into account which reduce the impact of some developments not being replaced in local areas. First, we discuss in our decision (paragraphs 5.18 to 5.23) the likelihood that, if a strong incumbent's investment is prevented in one local area, it is likely to look to invest elsewhere. This may, in some cases, involve entry or expansion in another local area in which another retailer has a concentration of over 60 per cent.[12] Thus, replacement entry or expansion might occur as a retailer reprioritizes its investments as a result of the

---

Estimates of g
Maddison (2001) shows growth per capita in UK to be 2.1 per cent over the period 1950 to 1998. Surveying the evidence, the Treasury paper *Trend Growth: Recent Developments and Prospects* also suggests a figure of 2.1 per cent for output growth to be reasonable. The annual rate of g is therefore put at 2 per cent per year.
The calculated STPR
Taking g = 2 per cent, ρ= 1.5 per cent, μ= 1.0, the STPR to be used as the real discount rate is 0.015 +1.0*0.02 = **3.5 per cent.**
[10]Paragraph 11.382.
[11]In that it models the investment decisions taken over 25 years (see paragraph 7).
[12]To the extent that it does not, there are likely to be additional benefits where the investment is used in some other way (often to the benefit of consumers) that we do not take account of in the NPV model.

Test. Second, as set out in paragraph 4.24 of our decision, we think it likely that, in some cases, 'replacement' developments will, in fact, take place sooner than the incumbent development would have occurred (in which case the delay would be negative). Finally the LPA may decide to utilize the override provision to approve the incumbent's development.

33. Table 4 shows the impact of assuming that not all developments prevented by the Test would result in a competitor development. As set out in our decision we found that if an incumbent is prevented by the Test from building a new store, the store would usually be built by a new entrant. However, Table 4 shows the impact of assuming incomplete replacement of new stores.

34. We thought it more likely that there might not always be a competitor development in the same area as an extension that was prevented by the Test.[13] As we set out in our decision, if an incumbent extension is prevented by the Test in an area where a competitor is present, the competitor could either build a new store or (if it was possible to extend given the site characteristics) seek to extend its existing store. If the incumbent extension that is prevented by the Test is to a store where no other fascias are present in the local area, a competitor would have to build a new store.

35. If an extension that was prevented by the Test did not result in a replacement competitor development, we have assumed that the delay costs of the extension not being built in the local area would remain for that extension over the period of the model. Recognizing the limitations of these modelling assumptions, we performed breakeven calculations to estimate what the proportion of extensions that did not lead to a competitor development would have to be to give a zero NPV across new stores and extensions for those local areas where the Test would bite.

36. We found that, when the proportion of extensions that did not lead to a competitor development fell to 35 per cent, the NPV fell to zero.[14] These figures exclude the de-minimis extensions, where we have assumed no replacement, and hence the incumbent expansion is allowed. However, they assume that the remedy applies across both extensions and new stores.

37. In paragraph 32 we noted that the probability of a competitor development depended on timescale, and that an LPA may apply its override. If, as an illustration, we assumed a maximum delay of ten years on all extensions before the LPA override was applied, the NPV across new stores and extensions would still be positive even with a zero probability of replacing extensions.

38. Where the Test prevents an incumbent monopolist from extending, the extension can only be replaced by a new entrant building a new store. Table 4 analyses the impact on the NPV calculation of assuming that such new entry does not always take place. We found that the NPV across new stores and extensions would remain strongly positive even when none of the single fascia extensions were replaced by new-entrant stores.

---

[13]We have assumed that extensions less than 300 sq metres groceries sales area would not be prevented by the Test (the de minimis). Since the smaller extensions are those where it is least certain that a competitor would wish to develop in response to the extension being prevented, the de minimis should increase the probability of a competitor responding where the incumbent would be prevented from extending by the Test.

[14]We note that the breakeven percentage for extensions alone is ~~78~~79 per cent. However, we did not consider this figure to be the appropriate one to use because we do not think that the Test should apply only to new stores and not to extensions (see decision paragraph 4.22). We therefore thought it appropriate to include the benefits that would arise as a result of new store replacement.

TABLE 4 **Impact of probability of a competitor development and no redirection on NPV**

NPV, £ million

	New build	*Extensions*	*Total**
Replacement of all extensions			
Probability for extensions replacement 100%	1,968	~~931~~919	~~2,782~~2,770
Probability for extensions replacement 90%	1,968	~~501~~490	~~2,351~~2,341
Probability for extensions replacement 80%	1,968	~~71~~61	~~1,921~~1,912
Probability for extensions replacement ~~78~~79%	1,968	0	1,851
Probability for extensions replacement 70%	1,968	~~–359~~ 368	~~1,491~~1,483
Probability for extensions replacement 35%	1,968	–1,851	0
Replacement of monopoly extensions			
75% replaced	1,968	~~662~~650	~~2,512~~2,501
50% replaced	1,968	~~393~~381	~~2,243~~2,231
25% replaced	1,968	~~124~~112	~~1,974~~1,962
~~14~~15% replaced	1,968	0	~~1,850~~1,851
None replaced	1,968	~~–145~~ 157	~~1,705~~1,693
Replacement of new build			
Probability for new build replacement 90%	1,451	~~931~~919	~~2,265~~2,253
Probability for new build replacement 80%	935	~~931~~919	~~1,748~~1,736
Probability for new build replacement 70%	418	~~931~~919	~~1,232~~1,220
Probability for new build replacement 62%	0	~~931~~919	~~813~~802
Probability for new build replacement 60%	–98	~~931~~919	~~715~~703
Probability for new build replacement 46%	~~–813~~ 802	~~931~~919	0

Source: CC analysis.

*All of the total NPVs in the tables include administration costs so the figures do not add across the row.

39. We also looked at sensitivities that reflected the effect of delay. We looked at the impact of assuming that all extensions prevented by the Test are not replaced for an initial four-year period, reducing to one year after four years. To model a more extreme case, we also assumed that there was a permanent four-year delay for all extensions to be replaced. Finally, for all extensions we assessed the impact of a zero delay after the transition period. In addition we examined the impact of assuming a four-year transition period for new stores, with and without a permanent one-year delay.[15] The impact of these assumptions is shown in Table 5. Increased delay for extensions reduces the NPV but in all cases the NPV is still strongly positive. We note, in connection with our comments on the probability of replacement (see paragraph 31 above), that the delay for all extensions would have to increase to over 14 years before the overall NPV became negative.

[15]Note this is discussed in the decision paragraphs 5.83 to 5.91. We did not expect there to be a delay for new stores after a short transition period. However, we have modelled these sensitivities for completeness.

TABLE 5 **Impact of assuming longer delay**

	NPV, £ million		
	New build	*Extensions*	*Total*
New build assumes 1-year delay falling to zero after 1 year; single-fascia store small extension N/A; new store replacements for prevented extensions 4-year delay falling to 1 year after 4 years, extension replacements for prevented extensions 1-year delay falling to zero after 1 year	1,968	~~931~~919	~~2,782~~2,770
Low case 1: all extensions prevented by the Test have a 4-year delay falling to 1 year after 4 years	1,968	848	2,698
Low case 2: all extensions subject to 4-year delay throughout	1,968	183	2,034
High case: zero delay after transition period	1,968	~~1,122~~1,106	~~2,973~~2,957
New stores: assume 4-year transition period	1,853	~~931~~919	~~2,667~~2,655
New stores: assume 4-year transition period and permanent 1-year delay	1,584	~~931~~919	~~2,398~~2,386

Source: CC analysis.

Reduction in the number of developments affected by the Test

40. We looked at sensitivities that reflected reductions in the number of developments affected by the Test. The first concerned an overall reduction in the number of stores affected by the Test. Table 6 shows that the NPV remains strongly positive when the number of stores is reduced significantly.

TABLE 6 **Reduced number of stores affected by the Test**

	NPV, £ million		
	New build	*Extensions*	*Total*
Number of new stores is 3, number of extensions is 19	1,968	~~931~~919	~~2,782~~2,770
Reduction by 10%	1,771	~~838~~827	~~2,492~~2,481
Reduction by 20%	1,574	~~784~~735	~~2,241~~2,192
Reduction by 30%	1,378	~~652~~643	~~1,912~~1,904
Reduction by 40%	1,181	~~559~~551	~~1,622~~1,615
Reduction by 50%	984	~~465~~459	~~1,332~~1,326

Source: CC analysis.

41. The second sensitivity looked at the impact of assuming an annual cumulative decline in the impact of the Test. This would model a situation where the Test cumulatively caused a reduction in the number of highly-concentrated areas. We found that the NPV remains strongly positive with large cumulative reductions in the impact of the Test (see Table 7).

TABLE 7 **Impact of assuming an annual decline in the impact of the Test**

	NPV, £ million		
	New build	*Extensions*	*Total*
No reduction	1,968	~~931~~919	~~2,782~~2,770
Annual reduction of 1%	1,762	~~828~~815	~~2,472~~2,459
Annual reduction of 2%	1,574	~~745~~725	~~2,202~~2,191
Annual reduction of 3%	1,428	~~661~~647	~~1,972~~1,958
Annual reduction of 4%	1,294	~~594~~579	~~1,770~~1,756
Annual reduction of 5%	1,177	~~535~~520	~~1,594~~1,580

Source: CC analysis.

Changes to the number of extensions replaced by weak incumbent extensions and new stores

42. In paragraph 13, we explained our assumption that, for extensions in non-monopoly areas, one-third are replaced by an extension to the weak incumbent, one-third are replaced by a new store built by the weak incumbent and one-third are replaced by a new-entrant store. Table 8 shows the impact of assuming, first, no new-entrant stores replace the prevented extensions and, secondly, only weak incumbent store extensions replace the prevented extensions. The values remain strongly positive in each case.

TABLE 8 **Impact of changing the assumptions for replacement of non-monopoly extensions prevented by the Test**

NPV, £ million

	New build	*Extensions*	*Total*
⅓ are replaced by an extension to the weak incumbent, ⅓ are replaced by a new store built by the weak incumbent and ⅓ are replaced by a new-entrant store	1,968	~~931~~919	~~2,782~~2,770
Assume no new entry stores; weak incumbent builds 50% extensions and 50% new stores	1,968	741	2,592
Assume extensions only replaced by weak incumbent extensions	1,968	581	2,432

Source: CC analysis.

Impact of treating off-site replacements as extensions instead of new stores

43. In paragraph 7, we discussed Tesco's suggestion that we should treat stores which are off-site replacements to an existing store as extensions rather than new stores. While we consider, as we discussed in paragraph 8, that there are reasons why we should treat such stores as new stores we recognized that they are neither pure new stores nor extensions. Table 9 shows the impact of assuming that off-site rebuilds are treated as large extensions and the impact of a second case that recognizes that offsite rebuilds are neither pure new stores nor extensions and therefore assumes 50 per cent of the off site rebuilds are large extensions and 50 per cent are new stores.[16] Overall NPV remains highly positive in both cases.

TABLE 9 **Impact of changing the assumptions for replacement of monopoly extensions prevented by the Test**

NPV, £ million

	New build	*Extensions*	*Total*
Assume off-site rebuilds are new stores	1,968	~~931~~ 919	~~2,782~~2,770
Hybrid case where 50% of the off site rebuilds are large extensions and 50% are new stores	1,509	~~958~~946	~~2,349~~2,337
Treat off-site rebuilds as large extensions	1,050	~~984~~972	~~1,917~~1,904

Source: CC analysis.

Shorter time period for the model

44. We also looked at the impact of shortening the time frame of the model. Table 10 shows the impact of reducing the time period. Using a shorter time period helps to

[16]The average size assumptions for the new stores and extensions were unchanged.

account for the possibility of a significant change in the nature of the market.[17] The NPV is robust to reducing the time period significantly.

TABLE 10 **Impact of reducing the time period**

	NPV, £ million		
	New build	*Extensions*	*Total*
25 years	1,968	~~931~~919	~~2,782~~2,770
20 years	1,695	~~795~~783	~~2,388~~2,376
15 years	1,370	~~633~~621	~~1,920~~1,909
10 years	984	~~440~~428	~~1,365~~1,353

Source: CC analysis.

Combination of sensitivities

45. In order to understand the impacts of particular changes to our assumptions, in paragraphs 31 to 44 we looked at the impact on value of varying individual parameters. However, we also considered the possible impact of a number of factors taking place in combination which could have a compound effect on value. We also recognize that some of the assumptions are related, particularly—as discussed in paragraph 31—the probability of replacement and assumptions about delay.

46. In combining the sensitivities we have used what we consider to be realistic combinations, without being overly optimistic or pessimistic. We considered that the probability of replacement for extensions and length of delay were the most significant factors that we needed to examine. We also looked at the effect on value of treating off-site store rebuilds as extensions instead of new stores. Table 11 shows the impact of the compound scenarios on value.

47. In the first combination, the probability of replacement for extensions is assumed to be 90 per cent. All extensions (including those replaced by competitor extensions) are assumed to be delayed immediately after the introduction of the Test by four years, falling to a delay of one year after a transition period of four years. This would therefore reflect a slower adaptation to the Test than we expect in practice. We note that the value remains positive.[18]

48. In the second combination, we have assumed a longer delay for extensions, with all extensions being delayed by four years. We also assume that the probability of replacement for monopoly extensions is reduced to 50 per cent because, as discussed in the decision (paragraph 5.93), a competitor would have to develop a site for a new store. The scenario shows that the value remains positive.[19]

49. In the third combination, we have made the same assumptions as for the second combination but have also included the effect on value of recognizing that offsite rebuilds are neither pure new stores nor extensions and assuming 50 per cent of the off-site rebuilds are large extensions and 50 per cent are new stores. The scenario shows that the value again remains positive.[20]

[17]For example, if the retailers developed larger stores, but substantially fewer stores overall.
[18]Under this scenario we note that the probability of replacement would have to fall to 36 per cent before reaching zero NPV.
[19]Under this more severe scenario we note that even if the probability of replacement for monopoly extensions was zero, the NPV for the Test would still be positive.
[20]Again we note that under this scenario even if the probability of replacement for monopoly extensions was zero, the NPV for the Test would still be positive.

50. The fourth combination is the same as the third but treats all off-site store rebuilds as pure extensions. The scenario shows that the value again remains positive.[21]

51. Tesco told us that our model did not reliably allow us to conclude that the benefits of the Test outweighed its costs. Tesco used the version of the NPV model made available to retailers with the provisional decision and said that, using the model, if we changed some of the key assumptions[22] the NPV would become negative. Tesco told us this showed the model was fragile and relied on extreme assumptions. However, we note that since the provisional decision we have held a plenary session with six of the largest grocery retailers to discuss their reaction to the provisional decision and taken into account all written and oral submissions (see decision paragraph 3.16). We have developed the market model and in doing so have taken into account comments made by the retailers and have considered further comments about the probability of replacement and delay. We recognize that it would be possible to make some assumptions that, singly or in combination with others, could make the overall NPV negative (without making assumptions for the benefits from redirection, variety and national effects). However, we considered that under a range of reasonable assumptions the model was robust and the NPV was likely to be positive.

TABLE 11 **Compound scenario**

	NPV, £ million		
	New build	*Extensions*	*Total*
1. Probability of competitor development for all extensions 90%; all extensions are delayed for 4 years, falling to 1 year after 4 years	1,968	426	2,277
2. Probability of replacement where a monopoly extension prevented by the test 50%; All extensions replaced by new stores are delayed for 4 years throughout.	1,968	–59	1,791
3. Probability of replacement where a monopoly extension prevented by the test 50%; All extensions replaced by new stores are delayed for 4 years throughout. Off-site rebuilds are treated as hybrid developments with 50% the costs and benefits of large extensions and 50% the costs and benefits of new stores	1,509	–85	1,306
4. Probability of replacement where a monopoly extension prevented by the test 50%; All extensions replaced by new stores are delayed for 4 years throughout. All off-site rebuilds are treated as large extensions.	1,050	–111	821

Source: CC analysis.

[21]Again we note that under this scenario even if the probability of replacement for monopoly extensions was zero, the NPV for the Test would still be positive.
[22]In particular Tesco modelled the impact assuming *(a)* a four-year delay for new stores, together with a 70 per cent probability of replacement; and *(b)* the impact of assuming that extensions prevented by the Test were not replaced by larger competitor developments. In both cases the NPV became negative.