NOTE

Assessing the Impacts of Alternative 'Opt-out' Formats in Choice Experiment Studies: Consumer Preferences for Genetically Modified Content and Production Information in Food

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SUMMARY An important aspect of the design of stated preference choice experiments concerns the inclusion and format of an opt-out option in the hypothetical choice set(s) presented to the respondent. This paper assessed the implications from using alternative 'opt-out' formats in choice experiment studies. Two alternative opt-out formats have been widely used, the 'do not buy' format and the 'buy/choose my current brand' format. The decision of which format to use in different cases may have a substantial impact on the estimated parameters and welfare measures derived from choice experiment data. These impacts are examined in a data set from a choice experiment study on consumer resistance to genetically modified content in foods. A split sample design was used in which the first treatment was provided with the option of 'not buying' the good at all while the second with an option of 'buying their usual brand'. Information over the actual purchasing habits of this latter group was collected and was incorporated into the estimation processes.

The results from each treatment were separately analyzed and the impact of alternative opt-out formats on response patterns and on the significance and stability of coefficients across treatment groups was examined. In addition, using findings from the experimental psychology literature the possible behavioral and psychological forces that are at work under each treatment were assessed. Finally, certain methodological implications for the design of choice experiment studies are drawn.

1. Introduction

A key methodological issue in the design of choice experiment studies concerns the decision of whether and in what format should an 'opt-out' alternative be included in the experimental design (Adamowicz and Boxall, 2001; Carson, *et al.* 1994). The opt-out alternative is in essence an option that competes with the other alternatives in the choice set. In demand choice experiment (CE) applications, it is usually framed either as a 'no purchase' option or in terms of choosing an 'alternative option' or one's 'customary or favourite brand' (Tversky and Shafir, 1992; Dhar, 1997).[1] The use of an opt-out alternative has been recommended by recent state-of-the-art CE design guidelines (e.g. Bateman *et al.,* 2003; Adamowicz and Boxall, 2001; Bennett and Blamey, 2001; Louviere *et al.,* 2000). The arguments behind this recommendation include increasing the realism of the exercise (Batsell and Louviere, 1991; Carson *et al.,* 1994), enhancing the theoretical validity of the welfare estimates (Bateman *et al.,* forthcoming 2003; Adamowicz and Boxall, 2001) and improving the statistical efficiency of the estimated choice parameters (Louviere *et al.,* 2000; Anderson and Wiley, 1992). As a result, an increasing number of marketing and non-market valuation CE studies are incorporating an opt-out alternative in their experimental design. However, little attention has been given to the effects on choice experiment responses

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from the use of *alternative* opt-out formats. Yet, it is likely that the format of the opt-out alternative presented to respondents may impact on how they perceive the choice task. This in turn may have a considerable impact on the resulting choice shares as well as on attribute weights of the estimated multinomial choice model. It has been acknowledged, however, that the decision over *which* opt-out format to use under different situations is not an easy task (Adamowicz and Boxall, 2001; Carson *et al.,* 1994). The aim of this paper, therefore, is to contribute to this discussion by assessing the impacts of alternative 'opt-out' formats in choice experiment studies.[2]

This issue is examined in a choice experiment study that sought to ascertain the preferences of the UK public over alternative brands of one commonly consumed food, namely eggs. The aim was to investigate whether decision-making processes over alternative egg brands are invariant with respect to the format of the opt-out alternative provided to the respondent. A split sample design was used in which two groups of respondents were provided with a choice experiment questionnaire that differed only with respect to the opt-out alternative used in the choice sets. The first treatment received a questionnaire that included a 'no-purchase' opt-out alternative while the second a 'buy-my own brand' alternative. In the latter case revealed preference information of one's customary brand was also collected and incorporated into the estimation process. The results from each treatment were separately analysed and the impact of alternative opt-out formats on response patterns and on the significance and stability of coefficients across treatment groups was examined. In addition the possible behavioural and psychological forces that are at work under each treatment were assessed. Finally, certain methodological implications for the design of CE studies are drawn.

2. Opt-out alternatives and choice experiment studies: Advantages and complications

The main argument for the inclusion of an opt-out alternative in CE studies has been that of realism enhancement and avoidance of a forced choice (e.g. Batsell and Louviere, 1991). Refusing, avoiding or delaying choice as well as choosing an alternative option or brand to those offered is an integral parts of almost all every day market transactions.[3] Normative theories of rational choice have incorporated the decision 'not to choose' as simply another option in the individual's choice set (e.g. Huber and Pinnell, 1994a). For example, in the random utility framework the probability of observing an opt-out response would be inversely related to the quality of the choice set.[4] That is, an individual would opt-out if the quality level of the options in the choice set did not surpass a subjective threshold (reservation) utility level.

The immediate implication of disallowing the possibility of choice deferral is that this may induce individuals to make forced and biased choices. Several studies from the experimental psychology and marketing literatures have shown that respondents faced with a forced choice tend to choose certain options in the choice set on the basis of simplifying and compromising heuristics that mask 'true' individual preference revelation (e.g. Dhar and Simonson, 2001; Dhar, 1997; Huber and Pinnell, 1994a; 1994b; Olsen and Swait, 1998; Tversky and Shafir, 1992). These biases could lead to an overstatement of the likelihood that the individual would actually choose one of the hypothetical alternatives if choosing to purchase nothing or an alternative brand is preferred over the hypothetical alternatives as well as to biased estimates of the importance of the relevant weights of the choice attributes (Banzhaf *et al.,* 2001).[5]

In cases where the analyst is examining demand behaviour (such as recreational site choice, market purchases of alternative product brands etc.) the inclusion of some 'opt-out' option in the choice set is *necessary* if the estimated welfare measures results are to be consistent with demand theory. This is so because demand effects (non-purchase options) can *only* be identified if the possibility of opting out is provided (Bateman *et al.,* 2003; Adamowicz and Boxall, 2001; Bennett and Blamey, 2001; Batsell and Louviere, 1991). Hence, not incorporating a default or no choice alternative in a CE renders the resulting estimated models inconsistent with demand theory and makes difficult the interpretation of welfare measures such as willingness to pay (WTP).[6,7]

Finally, there are other practical advantages of including an opt-out alternative in the choice sets of CE studies such as aggregating date sets that use the same opt-out alternative (e.g. Haab and McConnell, 2002; Louviere and Woodworth, 1983) as well as enhancing the efficiency of the experimental choice set design (e.g. Haaijer *et al.,* 2001; Louviere *et al.,* 2000; Anderson and Wiley, 1992).[8]

The introduction of an opt-out alternative, however, may also generate complications in the analysis of CE data sets. These concern both various behavioural implications as well various econometric challenges that emerge from the inclusion of such an alternative.

Regarding the former, the opt-out option may distort the incentives for 'true' preference revelation as predicted by rational choice theory (Carson, Groves and Machina, 1999). The main source of distortion is that it provides an 'easy way out' to respondents faced with a 'difficult' choice situation (Huber and Pinnell, 1994a; Dhar and Simonson, 2001; Luce, 1998). Numerous experimental psychology studies have questioned the conviction of many normative choice theories (such as random utility theory) that the decision to opt-out is a reaction to poor choice-set quality or attractiveness. Instead they have interpreted opting out as means of coping with decision difficulty. The implication from this body of work is that when faced with a difficult choice, individuals may be induced to employ decision-making processes that may invalidate or bias the predictions of normative choice models.[9]

Early psychological work has analysed choice difficulty and conflict as the result of lack of respondent 'experience' or 'confidence' as well as 'trade-off difficulty' (e.g. Berlyne, 1960; Tyebjee, 1979; Janis and Mann, 1977; Shepard, 1964; Kiesler, 1966). Other studies have argued that individuals prefer consequences that arise of inaction over those arising from action since the decision to stay within a status quo has certain psychological advantages (e.g. Haaijen, 1999; Baron and Ritov, 1994; Ritov and Baron, 1990). Moreover, other theories have viewed choice difficulty and conflict as stemming from low 'affective differences' within the choice set. These theories predict that the individual will choose to opt-out if a threshold level of within set 'heterogeneity' is not available (e.g. Bockenholt *et al.,* 1991; Busemeyer and Rapoport, 1988). In fact, the majority of the experimental psychology literature works on this premise, namely that individuals tend to choose the opt-out alternative when faced with a choice set that contains relatively homogeneous options (e.g. Huber and Pinnell, 1994a; Tversky, Sattath and Slovic, 1988; Dhar and Glazer, 1996; Shafir, 1993). Choice set homogeneity would increases decision difficulty and conflict leading to a higher tendency to defer choice.[10] The motives for opting out under decision difficulty have been explained in terms a 'cost' that the individual is willing to accept in return for the ability of continuing the search for more (and better) alternatives or for more information as well as a means for reducing the risk of making a 'wrong' decision (Huber and Pinnell, 1994a).

Along these lines, Dhar (1997) has shown that adding an attractive alternative to an already attractive choice set increases the preference of the no-choice option. This finding has been generalised to more complex choice sets involving more dimensions and more choice alternatives in field studies (e.g. Huber and Pinnell, 1994a) controlled laboratory studies (e.g. Tversky and Shaffir, 1992) as well in studies involving real decisions and pay-offs (e.g. Dahr, 1997).

Regarding the types of options that individuals select when encountered with a difficult choice *and* are forced to choose (i.e. when opt-out is not available) these have been found to be (a) base-line options that represent 'average', generic or 'compromise' options (e.g. Simonson, 1989), (b) asymmetrically dominating alternatives (i.e. alternatives that have one dominating dimension) (e.g. Montgomery, 1989; Tversky, Sattath and Slovic, 1988; Slovic, 1975) and (c) high quality high price alternatives (e.g. Simonson, 1992; Simonson and Tversky, 1992). In all cases, experimental psychologists contend that the individual selects such alternatives since they are easier to justify, less susceptible to criticism and are associated with a lower likelihood of error and regret.

Recently Dhar and Simonson (2001) have confirmed these findings using a series of laboratory experiments involving real pay-offs. The authors

present empirical evidence that question the implicit assumption made in the choice experiment literature that the inclusion of a no-choice option only draws proportionately from the various available alternatives, such that the qualitative conclusions are unaffected. They show that the no-choice option directly competes with alternatives that individuals tend to select when they are faced with a difficult choice and forced to choose. The implication of these findings is that compromise, asymmetrically dominating and high quality/price options are most vulnerable to competition from the no-choice option. Conversely, they show that options that appear to be selected because of the decision maker's underlying preferences are affected to a much lesser degree by the introduction of the no-choice option.[11]

In addition to these behavioural implications, the use of opt-out alternative also bears certain econometric challenges. First, in many cases the no-choice alternative provides no information about the individual's relative preferences for attributes of the hypothetical alternatives - one of the main aims for undertaking a choice experiment in the first place. Secondly, the opt-out alternative may perplex the analysis of CE data since in many cases it is not apparent what attribute levels are associated with the opt-out option. For example, in many recreation studies it is not clear what respondents are selecting when they do not choose any of the offered recreation packages (choose another package, choose a substitute good etc.). One way around this difficulty is to construct and include a fixed alternative with non-zero attribute levels that serves as a baseline option. Though, the inclusion of such an option may enhance the efficiency of the experimental design (Louviere *et al.*, 2000) it does not avoid the issue of inducing a forced choice since the individual may still prefer his/her current brand over the alternatives offered in the choice set (Banzhaf *et al.,* 2001).

Thirdly, an implicit assumption in the choice experiment studies is that the opt-out choice would take share proportionately from the various available alternatives, consistent with the assumption of independence of irrelevant alternatives (IIA). This implies that the qualitative conclusions in understanding the tradeoffs consumers make among options should be (according to the IIA property) unaffected from the inclusion or not of the opt-out alternative. However, the IIA assumption tends to be violated when the opt-out alternative is introduced since it tends to take away greater share from certain options rather than others that individuals tend to select under forced choice (Dhar and Simonson, 2001). This is so because the reasons to choose the no-choice option may differ from those governing the choice of any of the other profiles in a choice experiment and hence the 'no-choice' option cannot be seen as just another choice alternative, leading to potential violations of IIA (Haaijen, 1999). The violation of the IIA assumption implies that any experimental findings may be systematically biased and lead to incorrect predictions about relative shares and attribute weights when consumers have the option not to choose. This poses added econometric challenges to the researcher of detecting and solving possible IIA violations.

Finally, some have pointed out that the opt-out alternative may not be desirable and should not be used in certain cases. Dhar and Simonson (2001) point out under certain conditions if consumers believe that choice must be made sooner or later or that procrastination is damaging, they might prefer not to have the no-choice option.[12] In practice, CE practitioners have justified the decision not to include an opt-out alternative along these lines. For example, Blamey and Bennett (2001) in a study on environmental friendly toilet paper claim that the exclusion of the no-choice option would introduce only a small bias in market share estimates. They argue that this bias is worth accepting in order to avoid the potentially greater 'easy way out' bias that may arise if the opt-out alternative is offered. Implicit in the reasoning utilised by such studies is that the opt-out alternative is framed in terms of 'no-purchase'. However, the opt-out option can be framed in terms of 'choose an alternative brand' and this would retain the theoretical validity of the study as well as the realism of the exercise. The realities of choice are such that the individual has the discretionary ability to avoid or delay choice or purchase a substitute good. Hence, allowing respondents that participate in CE studies the possibility of opting out appears to be warranted in virtually all cases. The following

section argues that whilst the decision to include the opt-out alternative seems relatively unambiguous, the decision over *which* opt-out format to employ is neither innocuous nor easy to determine.

3. Choosing between alternative opt-out formats

The general conclusion from the preceding discussion is that despite the potential distortions and complications from using the opt-out alternative it should be routinely included in CE designs (under some format) since it enhances both the realism of the experiment and the statistical robustness of the estimated results (Olsen and Swait, 1998).[13] The most commonly used opt-out formats are "I would not choose any of theses alternatives" and "I would choose my favourite /customary brand". However, leading CE practitioners have come to acknowledge that 'the form of the opt-out alternative is not easy to identify' (Adamowicz and Boxall, 2001).

Several *a priori* recommendations as to which of these formats to use have been proposed. For example, Batsell and Louviere (1991) suggest that we use the format that most "closely approximates the choice setting experienced by individuals in real market conditions". Further, Carson *et al.* (1994) have suggested that the no-purchase option may be more useful in cases that seek to investigate market share, market penetration and participation. Alternatively the 'own brand' format may be more suitable for situations that seek to investigate which attributes or what levels of attributes a new product or good must have in order to attract new consumers. (Carson *et al.,* 1994). Finally, others have suggested (Dhar and Simonson, 2001; Blamey and Bennett, 2001) that the 'no-choice' format should not be used when the individual cannot realistically avoid making some choice. Prolonged holding out from choosing basic goods with no close substitutes, such as basic foods, may seem unrealistic.

Yet, such recommendations are quite vague and inconclusive while they have yet to be empirically examined. Determining which opt-out format closest approximates real market transaction is not always evident by virtue of the complexity of many everyday decisions. Further, research studies often involve overlapping goals and objectives (e.g. studies may be interested in both determining market participation as well as the affective level of new attributes). Finally, choosing 'not to choose' is an integral part of almost all decisions, including decision over basic (inelastic) goods. For example, decisions over basic foods often include considerations over food safety levels that may induce individuals to hold-out for prolonged periods of time.[14]

The difficulty in choosing the format of the opt-out alternative is evident in the marketing literature where both the no purchase and the own brand format have been used but no evident and consistent pattern of which format is more suitable under different situations is discernable.[15] The situation is even less clear in the non-market valuation literature where CE practitioners have almost exclusively used the 'no-choice' opt-out option even in cases where the 'choose an alternative brand' would seemed more reasonable.[16] A tacit assumption made in these studies is that the individual's decision-making process is invariant with respect to the opt-out format offered to the respondent. A corollary of this assumption is that the probability of choosing a particular option (or its choice share) is probabilistically independent of the opt-out format faced by the decision maker. Although this is an empirical issue, CE analysis have come to acknowledged that it is reasonable to expect that different opt-out alternatives would imply different behavioural implications and would be associated with different choice shares and attribute weights (e.g. Olsen and Swait, 1998; Adamowicz and Boxall, 2001).

Despite reaching this realisation, the CE literature is almost entirely void of any comparative studies examining the effects from the use of alternative opt-out formats as well no attempts to corroborate the *a priori* recommendations mentioned above. The only exception can be found in the work by Banzhaf *et al.* (2001).[17] The authors use the choice modelling approach to investigate the effects of alternative opt-out options on the preferences of anglers over alternative fishing sites. The authors do in fact find that the choice of the opt-out format has serious implications for choice model parameter salience. Yet, contrary to their *a priori* expectations they find that the 'choose

my usual fishing site' format outperformed (on both behavioural and statistical grounds) the 'choose neither site' option. This highlights the claim made about the vagueness of *a priori* recommendations over which opt-out format to use and the need for further research in this field. This is so, because the objectives of CE studies and the nature of the 'goods' being investigated are often multifaceted and thus it is by no means apparent which option is most appropriate to use. Hence, further empirical investigation on the impacts of alternative opt-out formats is warranted.[18] The next section describes the issues and hypotheses that will be explored while Section 5 presents the details of the experiment used to examine these hypotheses.

4. Assessing the impacts of alternative opt-out formats

As explained above it is likely that alternative opt-out formats may have differential impacts on both relative choice shares as well as the estimated parameter results. This was attributed to the possibility that different opt-out formats may induce respondents to evaluate the choice sets in different ways (Banzhaf *et al.,* 2001). The possible differential impacts from alternative opt-out formats were explored in a CE case study. The overall purpose of the study was to explore the impact on individual purchasing decisions from introducing various levels of genetically modified content in one commonly consumed food, namely eggs. Most of the food studies from the marking literature (e.g. Olsen and Swait, 1998 on orange juice consumption) and *all* of the food-safety studies from the non-market valuation literature (e.g. Kuperis *et al.,* 1999 on chemicals in milk) have used the 'no purchase' opt-out format. Yet, intuition suggests that such an opt-out format may bias the results of the study in that it may be interpreted by some respondents as an unrealistic forced choice. Confronted with such a choice situation the individual may be compelled to choose one of the hypothetical brands offered instead of going without the good. Yet, the individual may, in fact, have preferred another alternative brand (such as their customary brand) and hence the forced choices would lead to an overstating of the likelihood of selecting a particular brand with the hypothesised characteristics. Conversely, if individuals that choose not to purchase any of the hypothetical alternatives when in fact they preferred their customary brand, then the resulting CE data would underestimate the likelihood of consuming the good. An alternative format that has not been explored by the valuation literature and may avoid this bias is the 'choose my own brand option'. Since the determination of the most appropriate opt-out format has not been fully explored by the CE literature, both formats were examined in a split sample design. The study examined the possible impacts from alternative opt-out formats on choice shares as well as attribute weights. The study also tried to understand the nature of the differential impacts as well to try to assess which format would be most suitable for the specific case study. Finally, the study aimed at drawing some more general methodological conclusions for the use of the opt-out alternative in CE studies. More specifically, five four possible differences that may emerge as the result of using one of these two opt-out formats will be explored. The first hypothesis that is explored states that:

> H_1: The relative share of the opt-out alternative is higher when this is framed in terms of choosing one's 'own brand' as opposed to the case where it is framed in terms of a 'no purchase' alternative.

Various possible explanations lie behind this proposition. As mentioned above, the frequently used 'no purchase' option may induce some respondents to respond as if faced with a forced choice. This may be the case when prolonged holding out is perceived as unattainable, pointless or undesirable. This may lead individuals to select choices that they would not have chosen had they been provided with the option to select an alternative brand. Hence, the no purchase option may be systematically avoided and this may possibly overstate the likelihood of certain of the other choices. Moreover, as mentioned in Section 2, introducing an inferior option into the choice set usually induces respondents to favour *not* to opt-out (e.g. Dhar and Simonson, 2001). To the degree that

the no purchase alternative is seen as an undesirable alternative, its inclusion in the choice set would yield less opt-out decisions. Further, it was also stated in Section 2 that the inclusion of the opt-out alternative may provide an avenue for resolving difficult choices and induce people to opt-out (e.g. Huber and Pinnell, 1994a). One could reasonable expect that this effect may be more prevalent in cases where individuals are offered the option to choose. Following the discussion of Section 2, this could be argued on the basis of regret, risk aversion, 'default bias' as well as complacency to retain the status quo. Adamowicz and Boxall (2001) point out that to the degree that such effects are observed in the real world then there is little to be concerned. What is important to keep in mind, is that CE studies should include the opt-out format that best approximates real market transactions even if that induces relatively more choice deferral than an alternative opt-out format.[19]

Turning to the second hypothesis to be tested, it is important to examine whether the different shares of the opt-out alternative generated under the two alternative formats would *disproportionately* take from the shares of *specific* options in the choice set. Many CE studies imply that the use of any opt-out format would draw proportionately from all the other alternatives in the choice set. Yet, it may be the case that some opt-out formats induce respondents to systematically favour some alternatives over others. This implies that different opt-out formats may compete with some options more than they do with others. More specifically, the 'no purchase' format used in most CE studies may be perceived by some respondents as a form of forced choice. Section 2 described how decision making processes under forced choice has been found to be influenced by simplifying heuristics that tend to select options that are perceived as having the lowest likelihood of error or regret, are easy to justify (to themselves and others) or appear to be the best possible compromise. Such options include generic brand, asymmetrically dominating and high price and quality alternatives. Systemic favouring of these options may overstate their choice share as well as the salience of the attributes that characterise these options.

In contrast, the 'own brand' format may dampen the effects of such simplifying heuristics since individuals may feel free to select their usual brand if none of the alternatives in the choice set yield utility beyond their reservation level. Further, extending the reasoning of Dhar and Simonson (2001) the choice share of the opt-out option under the 'own brand' format would take from the share of that alternative that may be associated with a lower level of criticism and regret but not with strong preference. In other words, the opt-out alternative under the 'own brand' format would compete more directly with options that are selected when individuals feel that they are forced to choose, as may be the case in the 'no purchase' format. These alternatives have been found to be high-price quality options, generic brand options as well as asymmetrically dominating options. The study presented in the next section included in the choice sets certain fixed (baseline) options that processed these characteristics. The inclusion of such alternatives allowed the examination of the following hypothesis:

> H_2: The relative share of a generic, asymmetrically dominating or high price-high quality option that is included as a fixed alternative in the choice set will be higher when the set includes a 'no purchase' opt-out alternative compared to when it includes the option of choosing one's 'own brand'.

The third hypothesis involves the effects of alternative opt-out formats on respondent fatigue. Typically, choice experiment studies present respondents with multiple choice sets and request that the individual provide a response in each case. This is necessary so that enough choice variability is attained which is required for estimating multinomial discrete choice models. The optimal number of choice sets presented to each individual varies depending on the complexity of the choice task, the conditions under which the experiment is conducted and the incentives provided to respondents. Any number between four and sixteen choice sets are usually used (Louviere *et al.,* 2000). The phenomenon of respondent fatigue refers to cases where the individual's mental capacity (or simply patience!) may be exhausted after the first few

rounds of choice sets. The phenomenon of fatigue is one of the main design issues that is still under great scrutiny (e.g. Alpizar and Carlsson, 2001; Louviere *et al.,* 2000; Adamowicz and Boxall, 2001; Bradley and Daly, 1994). Respondent fatigue could result in various 'atypical' response patterns. For example, fatigue may be manifested as an enhanced occurrence of the default or the opt-out option after a few rounds. It is plausible that the degree of respondent fatigue may differ across alternative opt-out formats. The direction of this difference is not clear *a priori* and hence we will investigate the two-way hypothesis that:

> H_3: Respondent fatigue rates differ across choice settings that use alternative opt-out formats.

The fourth hypothesis concerns differences in choice model parameter salience as the result from using alternative opt-out formats. As mentioned above, it is likely that the two opt-out formats may induce individuals to evaluate the chose sets differently (Banzhaf *et al.,* 2001). For example, the no-purchase format may be perceived as entailing a forced choice. It is, thus, reasonable to expect that under forced choice the individual may utilise a different decision making rule than would be used under free choice or when they could choose their 'own brand'.[20] Regardless of the exact decision mechanisms followed under each condition, changes in decision rules should induce different weights for one or more attributes (Olsen and Swait, 1998). Hence, we should expect a change in the estimated attribute weights between conditions in which the opt-out alternative is framed as a no-purchase option and cases in which it is posed in terms of an 'own brand' choice.[21] The hypothesis to be tested is thus:

> H_4: Attribute weights will differ across choice settings that use alternative opt-out formats.

Olsen and Swait (1998, pp. 3–4) provide some guidance as to the nature of the differences in attribute weights. Research from consumer behaviour and experimental psychology literatures has been providing increasing evidence that individuals resort to cost or effort minimising decision making processes as a means of overcoming their limited information processing capabilities (Bettman *et al.,* 1991; Bettman *et al.,* 1998). Individuals seem to be trading off between the costs (in terms of mental effort) of reaching a decision and the accuracy of the decision reached. A 'good' decisions is reached without expending inordinate amounts of mental and other resources in the process (Shugan, 1980; Karni and Schwarz, 1977; Stigler, 1961). Based on this reasoning it can be argued that individuals that are faced with the more restrictive choice setting that includes a no-purchase alternative will tend to adopt simpler heuristics than they would under a 'choose their own brand' setting. For example, individuals faced with a forced choice may choose a decision protocol that minimizes the likelihood of error or regret. It is reasonable to expect that individuals will more easily avoid expending greater effort if their goal changes from selecting the 'best' alternative (when the option to choose their own brand is available), to minimizing the consequences of having to choose among alternatives that might all be inferior (when faced with the restrictive no-purchase opt-out format). To the extent that this is true (i.e. decision makers try to reduce the 'costs' of having to choose unacceptable options and therefore appeal to simplified secondary choice rules when faced with a forced choice), it is likely that preference models will indicate the existence of *fewer* non-linear relationships compared to when the 'own brand' option is available (Olsen and Swait, 1998).[22] Such non-linear relationships or conjunctive decision making processes will be captured by significant attribute interactions terms. Hence, the final hypothesis that we will be testing is:

> H_5: A choice setting using the 'no purchase' opt-out format would identify less interaction effects than one using the 'buy my own brand' format.

5. Experimental design and survey development

These hypotheses were examined in a CE case study investigated the preferences of UK consumers

over alternative egg brands or profiles. Although the particular good is frequently consumed by most UK households, the specificities of the study suggested that including an opt-out alternative is warranted. More specifically, the overall objective of the study aimed at examining the impact on individual food purchasing decisions from the introduction of percentages of genetically modified content into food products. Individuals may, thus, decide to stop or delay consuming a particular good if informed that it was genetically modified or that genetically modified 'inputs' were used for its production. For example, if informed that the chicken feed used for egg production contained a specific amount of GM content (that exceeded his/her subjective reservation level of 'GM-acceptance'), the individual may stop purchasing the specific good. Alternatively, some individuals may have strict *a priori* egg brand requirements (e.g. they only buy free range and organic) while others may overwhelmingly prefer their usual brand of eggs irrespective of the characteristics of the hypothetical brands offered. For these reasons the use of an opt-out alternative was deemed reasonable yet it was by no means clear which opt-out format to use. Would it be more suitable to use a no-purchase opt-put format (as used in all of the food-safety CE studies undertaken to date) or should we allow individuals the possibility to choose their usual brand? Therefore, the study was viewed as a suitable opportunity to examine the impacts on choice shares and attribute weights from the use of these two alternative opt-out formats. This was achieved by using of a split sample experimental design described in the subsections below. Note that, it was decided from the outset to administer the survey via post. Hence, the design efforts summarised below were undertaken with the specificities of such a survey mode in mind.

5. 1 Consultations, focus groups, and pilot studies

The survey design processes began in February 2001 with a series of consultations with scientists from the genetic food industry (Dr. Pablo Eyzaguirre from the International Plant Genetic Resources Institute (Rome, Italy) and Dr. Tim Soellick from the Max-Planck-Institute (Cologne, Germany)[23] as well as with managers from two leading food retailers in the UK (Tescos and Sainsubury's) as well as the sales manager from a food retailer specialising in health and organic foods (Planet Earth). Additional meetings were held in other stages of the survey design process. The aim of these consultations were to determine (i) an appropriate good for examining trade-offs between GM content and other attributes (such as prices), (ii) the attributes and levels that should be used to design the choice profiles and (iii) the level of information that should be provided to respondents.

At the same time an extensive review of the literature on the economics of GM foods and food safety was conducted. This consisted of reviewing mostly applied work examining issues of market segregation, labelling and certification. One of the most prominent aspects of these issues that has concerned both the academic and policy journals has to do with the determination of the maximum GM content that would be allowed for a specific crop or food product to be granting GM-free certification. This percentage varies across the different countries with a range between 1% and 10%. The current threshold for all foods circulating in the EU is 1%. Yet, the importance of setting such unilateral thresholds is undermined by the influx of imported foods that originate from counties that follow considerably different GM food polices. In light of these problems, the EU is currently reviewing its own GM policy including ongoing discussions for raising the GM-free content level to 5%. Further, the majority of work on the issue of changing GM content threshold levels has been mainly preoccupied with the cost side of this change (e.g. Bullock *et al.,* 2000; European Commission, 2000; Mooney and Klein, 1999; Franks, 1999; Nelson *et al.,* 1999). Moreover, considerable work has been undertaken on consumer attitudes and perceptions for alternative levels of GM content in foods.[24] Yet, very little work has been undertaken on the benefit side of the issue of affective GM content threshold levels. Hence, the CE experiment presented here aimed at providing a contribution to this neglected area of the GM policy debate. Finally, the literature review also extended into the valuation literature examining food safety issues. Valuation

studies on GM foods are just starting to emerge and were virtually absent at the time the study was being developed.[25] In contrast there are quite a few contingent valuation (CV) and CE studies on various other food safety issues which provided useful insights on various design and administration procedures.[26]

On the basis of these consultations and the review of the literature on the economics of GM food and food safety a focus group protocol was designed. The protocol aimed at identifying the quality and quantity of knowledge that individuals had over biotechnology in general and genetically modified foods in particular. In addition perceptions and attitudes towards GM foods were also ascertained as well as a first indication of how decisions over food products would be altered as the result of introducing various levels of GM content into foods. Finally, the good to be used as well as its scope was investigated. In total, three focus groups session were conducted in April and May 2001. Twelve individuals participated in these sessions. The sessions lasted approximately 2.5 hours each and monetary compensation was provided to participants. Recruitment was undertaken in the central London area with most focus group participants originating from the University of London staff body. Both gender groups were included in the sessions while the mean age was thirty-eight years.

These initial design efforts confirmed the finding encountered in attitudinal studies (e.g. Verdurme and Viaene, 2002; Veeman, 2001; Heiman *et al.,* 2000) that the public has a varied and often erroneous understanding of biotechnology and GM foods. Hence, it was decided to present a common (benchmark) information level to each respondent. Further, it was decided that it would be considerably less complex to design and administer a study that examined decisions with respect to one food product as opposed to decisions over food consumption in general.[27] The specific food product that was chosen was a box of six eggs. The CE study would examine the impacts on egg consumption decisions resulting from the use of chicken feed that contained various levels of genetically modified content.[28] This particular good was chosen mainly on the basis of its widespread familiarity and consumption across UK consumers. Also, the good has several well known and understood attributes compared say to a particular vegetable or fruit. Further, the selection of this particular good permitted investigation of consumer decisions over goods that have been produced with GM 'inputs' (e.g. live stock products) as opposed to examining decisions concerning GM crops themselves (e.g. soya, rice, and corn). This makes the study particularly policy relevant since the designation of food products that contain GM inputs still remains an open issue.[29, 30]

The survey design process concluded with a series of pilot studies that addressed issues of wording, framing, attribute level determination, information level and quality assessment, survey length, administration method and sampling procedures. A first pilot was undertaken in June 2001 consisting of a convenience sample of 35 respondents recruited from the congregation of a central London church. Willingness to pay for particular egg brands was ascertained using a CV payment-card while the drop off method was used to administer the pilot survey. A second pilot was conducted in July 2001 consisting of 123 university students. The pilot offered the chance to test a draft version of the CE survey. The pilot was administered in groups of students (with no between subject interaction) that received a common presentation. A final pilot was conducted in August-September 2001 in which we tested the questionnaire that was to be used for the final survey. Finally, since the final survey was to be administration via mail the last pilot also provided a test of the administration and sampling strategy that would be used. In total 1000 survey packets were sent out. The response rate was a modest 13% that may be explained by the unfortunate timing of the pilot (many respondents were away on holiday) as well as the absence any of incentives commonly used in mail surveys.[31] The overall results of the pilot, however, suggested that the questionnaire performed well in the field and that the variability in the choice sets permitted satisfactory estimation of the effects of egg attributes on individual utility.

5. 2 Choice set and experimental design

The final set of attributes and levels was deter-

mined from the consultations, focus groups, and pilot studies mentioned above. The number of levels chosen aimed at achieving a balance between choice set efficiency, correspondence to market realism and enhancement of the variability of each attribute.[32] In total five attributes were selected, three of which were binary while the remaining two took on four values. The set of attributes and levels is listed directly below:

1) Living condition of hens: free range Vs cage
2) Use of agricultural chemicals and fertilizers in the production of chicken feed: no use (organic) Vs use (non-organic)
3) Certification of health standards and quality of eggs (e.g. the 'Lion Quality' mark on egg shells and egg boxes): included Vs not included
4) GM content in chicken feed: 0%, 5%, 1%, and 30%
5) Price: £0.38, £0.68, £0.98, and £1.28

The characteristics of 'box size' and 'egg size' were held constant. Hence each profile consisting of a box of six medium-sized eggs. A fractional factorial design prescribed in Louviere *et al.* (2000, pp. 111–120 and 131–137) and Louviere (1998) was used to create 32 choice sets that contrasted two different egg profiles. One of the characteristics of this particular design is that it allows for the independent estimation of all main-effects and two-way interactions. In order to reduce task complexity it was decided to present each individual with only eight choice sets or occasions. Hence, the set of 32 choice sets were randomly blocked into four versions (i.e. of eight choice sets each). The sample was then randomly divided into four groups with each sub-sample receiving one version. To increase the efficiency of the resulting choice model a third fixed option was added to each chose set (Louviere *et al.,* 2000, ch. 5). This option was held constant *within* each version but varied *across* versions. In total three such fixed options were used. The first represented a high price-quality alternative that dominated all other alternatives. It consisted of the characteristics of 'free range', organic, 0% GM content, certification mark included on box and a price of 136 pence. The second represented a 'generic' brand of eggs that was constructed on the basis of the initial market research efforts mentioned in the previous section. It consisted of the characteristics of 'free range', non-organic, 5% GM content, certification mark included on box and a price of 78 pence. The third also represented a generic brand but consisted of eggs from hens that are kept in battery cages (instead of coming from free range hens). The introduction of these particular fixed options would allow for the testing of the second hypothesis presented in Section 4.

Finally, the choice set included a forth option, D, which allowed individuals to opt-out. A split sample design was used such that each treatment would receive a different opt-out alternative. The first treatment (TA) would receive a 'no purchase' alternative while the second (TB) a 'buy my regular brand' alternative. The choice sets across treatments were identical apart from the format of the opt-out alternative. The respondents in the former treatment were informed that the options included in each choice occasion were the only ones available and that choosing D implied that they would not purchase any eggs when faced with these alternatives. Respondents in TB were informed that choosing option D amounted to selecting their own brand. Moreover, revealed preference information on the characteristics of respondent's own brand of eggs was collected. The information on egg characteristics provided in the revealed preference section corresponded to the attributes included in the hypothetical choice sets. Note that the choosing the 'my own brand' option requires modelling of the characteristics of the favourite brand as well as developing a link between the stated preference model and a revealed preference model (Adamowicz and Boxall, 2001).

6. Questionnaire material and survey administration

The final questionnaire consisted of four sections: (a) a section that obtained revealed preference egg consumption data; (b) a section explaining the choice experiment exercise in terms of an imaginary shopping trip. This included explanation of the attributes and levels of the egg profiles as well as a

diagrammatic 'simulation' of how to complete the choice sets; (c) the section with the eight choice set questions. This was the only section that differed across the four questionnaire versions; and (d) a section with questions on individual attitudinal and demographic characteristics. A copy of the survey can be provided by the authors. The 'Total Design Method' of Dillman (2000) and the prescriptions of Mangione (1999) for administrating a postal survey were closely adhered to in order to maximise response rates, minimise item non-response and enhance sample representativeness.[33]

First, a pre-notification letter was sent out explaining the aims of the study, the institution undertaking the exercise, the means by which their household was sampled, and the importance of completing and returning the questionnaire.[34] Approximately two weeks after the pre-notification letter had been dispatched the 'questionnaire packet' was sent out. This consisted of (i) a cover letter that re-iterated the points made in the pre-notification letter but also explained the procedure for completing and retuning the survey; (ii) an information booklet that provided a brief, balanced and non-emotive exposition of the possible benefits and risks to humans and the environment from cultivating and consuming genetically modified foods; (iii) a copy of one of the four questionnaire versions together with self addressed envelope with prepaid postage; (iv) two 'incentives' prescribed by Dillman (2000) and Mangione (1999) to enhance response rates. These consisted of a complementary pen with university logo and a lottery post card that allowed those that completed the survey to enter a draw for a gift voucher worth £50.[35] Finally, two reminder packets were sent out at two-week intervals after the first round had been dispatched. These packets only included a reminder cover letter and one of the four questionnaire versions (together with self addressed return envelope with prepaid postage).

7. Sampling strategy

The sampling strategy that was followed was based on the multi-stage procedure suggested by Lynn and Lievesley (1991). This approach is tailor made for drawing samples in Great Britain. The first step of the sampling strategy involved selection of seven sampling locations. Four of these were urban and three rural areas (see Table 1). Secondly, these locations were divided into primary sampling units (PSUs) on the basis the number of post-code areas they included. In total, these seven locations contained 418 PSUs. This corresponds to the sampling universe. Thirdly, a total of 80 PSUs were randomly sampled. The number of PSUs selected from each sampling location was determined on the basis of its relative weight (determined by its relative

Table 1. Sampling strategy

Location	Total number of PSUs in location[a]	Related weight from PSUs	Population[b]	Relative weight from population	Total relative weight	Randomly selected number of PSUs	Number of households selected
	A	B=A/Total A	C	D=C/Total C	E=(B+D)/2	C	D=C×25
Aberystwyth	43	0.10	61,109	0.02	0.064	4	100
Birmingham	75	0.18	1,013,400	0.40	0.291	22	550
Cardiff	56	0.13	268,934	0.11	0.120	10	250
Dorset	23	0.06	692,540	0.27	0.165	14	350
Aberdeen	38	0.09	212,650	0.08	0.088	6	150
Inverness	60	0.14	208,700	0.08	0.113	10	250
Nottingham	123	0.29	63,000	0.02	0.160	14	350
Total	418	1	2,520,333	1	1	80	2,000

Notes: [a] Source: UK-Info Disk 2001.05 Pro CD ROM and http://freepages.education.rootsweb.com/~wakefield/postcodes/b.html (access at 20.07.2001).
[b] Source: UK National Statistics at http://www.statsbase.gov.uk/ (access at 20.07.2001).

PSU and relative population weights).[36] Finally, 25 households were randomly selected from each of these 80 PSUs. The final list of addresses was extracted from the UK Info-Disk Professional (2000 edition). This process generated a sample of 2000 households (1000 for each opt-out treatment). The four questionnaire versions were randomly assigned to each household such that 250 households from each treatment received one survey version.

8. Response rates, sample composition and representativeness

The response rates from the two treatments were 33 and 31% respectively. These rates are more than double than that obtained in the pilot (i.e. 13%), which suggests that the inducements and reminder letters used for the final survey did in fact increase the response rate. Still, the overall final response rates remain relatively low compared to other CE studies. Yet, the only other known CE postal study on GM foods also had a modest response rate of 18% (James and Burton, 2001). Hence, provided that there is no methodological shortcoming in the design of the study or some other sampling or administrative flaw, then the modest response rates may be attributed to limited interest in the issue of GM foods.

Moreover, the sample composition in terms of socio-demographic and attitudinal characteristics was virtually identical across samples (see Table 2). Hence, we can reasonably conclude that the two samples are identical in terms of their socio-economic and attitudinal make up.

In addition the overall representativeness of the two treatment groups (i.e. compared to the overall population) seemed very satisfactory. The data received for age, education, family size, number of children, and income are quite representative (see Table 2). Yet, some deviations from national figures must be highlighted. Notice first that the sample is over-represented (compared to national census figures) by females as well as individuals between 40 and 70 years of age. This is expected since we had asked for the main grocery 'shopper' to complete the survey. Also, notice that the sample mean and education levels are somewhat higher than national figures. Also, the data on revealed egg consumption patterns is highly representative as compared from the data published by the British Egg Information Service (see Table 3). Finally, there is a credible indication that the attitudes towards GM foods held by these two treatment groups are closely aligned with those of the general population. The CE survey included five attitudinal questions that were taken from a recent Euro-Barometer questionnaire that sought to examine European perceptions and attitudes towards GM foods (EuroBarometer, 2000). By incorporated these questions in the CE survey it was able to externally validate, to some degree, the attitudes towards GM foods held by the individuals in the sample (see Table 2).[37] We can conclude that overall the sample is quite representative with respect to demographic, attitudinal and egg consumption characteristics. The sample, however, somewhat is over-representative of higher income/education individuals, which should be taken under account when using the study results for drawing policy implications.

With respect to item non-response we see that around 6.5% of the sample did not complete the CE questions while the missing data on socio-economic variables was quite low (between 1% and 6% on key variables; see Table 2 and Table 3). Observations with missing data were excluded from the sample. The final number of usable questionnaires in each treatment (after accounting for missing data) was 312 for TA and 270 for TB.

9. Response patterns and choice shares

We now turn to examine the first three propositions set out in Section 4 (H_1 to H_3), on the possible differences in choice shares across opt-out treatments. Looking first at the last column of Table 4 we can see that the second treatment returned nearly double the proportion of opt-out responses compared to the first treatment (47% compared to 27% respectively).[38] Further, looking at Table 5 we can see that the proportion of respondents that chose the opt-out alternative in *each* of the eight choice set questions is more than three times higher in TB than in TA (23% and 6% respectively).[39] Such a pattern across treatments does not appear to exist for the other options.[40] These

Table 2. Socio-economic characteristics across treatments

	No purchase treatment	Own brand treatment	2001 UK census data	Euro-barometer
Sex				–
Non-response (%)	2.24	2.22	–	
Female	41.03	37.04	51	
Male	56.73	60.74	49	
Age				–
Non-response (%)	1.60	1.48	–	
18–24	3.21	5.19	15.33	
25–34	7.05	10.00	17.78	
35–44	24.36	19.63	18.66	
45–54	16.35	16.30	16.54	
55–64	19.55	21.11	13.23	
65–74	13.78	17.04	10.50	
75–84	11.22	7.04	6.98	
85–94	2.24	1.85	1.60	
95+	0.64	0.37	0.79	
Household members				–
Mean	2.53	2.58	2.50	
St. Deviation	1.41	1.48	–	
Number of children				–
Mean	0.61	0.58	–	
St. Deviation	1.16	0.92		
Education				–
Non-response (%)	5.45	2.96	–	
Primary school (up to 10 years)	1.92	3.33	1.23	
Secondary school (up to 16 years)	29.81	28.52	36.20	
Upper secondary school (up to 18 years)	14.10	16.67	27.89	
Professional qualification	29.49	26.67	19.25	
University degree	19.23	21.85	15.43	
Household income (in £)				–
Mean	3066	2686	2372	
St. Deviation	3373	2912	944	
Median	2000	1750	1584	
Non-response (%)	7.26	8.48	–	
Attitudes towards GM foods[a]			–	–
How willing would your household be to buy GM foods?	3.51	3.61	–	–
If they were cheaper than Non-GM foods	3.22	3.23	–	
If they were sold at the same price as regular foods but were much more nutritious or contained more vitamins	2.98	3.06	–	–
If they were sold at the same price as regular foods but were produced with less pesticides and artificial fertilizers	3.14	3.23	–	–
If they were sold at the same price as regular foods but tasted better	3.51	3.60	–	–
Of all the risks we have to face at the moment, that of food safety is rather insignificant	3.57	3.39	–	3.50
If a majority of people were in favour of GM food, it should be permitted	3.44	3.50	–	3.40
Even if GM food has advantages, it is basically against nature	3.33	3.25	–	2.50
Whatever the risks involved in GM food, we can avoid them if we really want to	3.11	3.00	–	3.00
If something went wrong with GM food, it would be a global disaster	3.28	3.21	–	2.80

Notes: [a] Answered on a 1–5 Likert scale. Average values reported.
UK Census data from National Statistics at http: //www.statistics.gov.uk/ (access at 22. 07. 2003).

Table 3. Comparison of revealed egg consumption data obtained from sample with UK egg consumption figures

	No purchase treatment	Own brand treatment	UK data[a]
Box size usually purchased (%)			
Box of 6	56.09	54.44	–
Box of 10	5.13	7.41	–
Box of 12	21.15	19.63	–
Box of 15	5.13	7.04	–
Box of 18	3.53	3.70	–
Box of 24	5.12	3.71	–
Type of eggs usually purchased (%)			
Battery cage	52.19	58.03	72
Free range	27.75	23.90	23
Organic	20.11	18.15	5
Egg size usually consumed (%)			
Small	3.02	2.73	–
Medium	40.60	39.45	–
Large	49.33	53.52	–
Very large	7.05	4.30	–
Number of eggs consumption (weekly per household)			
Mean	7.13	7.50	7.15
St. Deviation	4.68	5.54	–
Median	6.00	6.00	–
Price (box of 6 medium eggs in Pence)			
Battery cage eggs	45	42	39
Free rang	79	76	84
Organic	129	119	125
Eggs usually purchased at (%):			
Major supermarket chains	68.75	73.88	74.80
Other (farmers, butcher, milkmen etc.)	31.25	26.12	25.20

Note: [a] Sources: DEFRA and TNS from British Egg Information Service at http://www.britegg.co.uk/ (access at 11. 10. 2002).

Table 4. Choice shares and response patterns across treatments

(Unit: %)

	Responses to eight choice set question								
Responses for no purchase treatment	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	TOTAL
Non-response	8.75	5.37	9.68	16.67	16.98	17.63	17.25	14.02	13.58
Option A	9.29	24.36	16.99	8.33	9.94	8.33	12.18	7.37	12.10
Option B	31.73	16.03	12.50	8.01	11.54	15.06	10.90	13.14	14.86
Option C	33.56	34.69	33.59	29.81	28.21	28.53	26.98	32.78	32.68
Option D (No purchase)	16.67	19.55	27.24	37.18	33.33	30.45	32.69	32.69	26.78
	100	100	100	100	100	100	100	100	100

Responses for own brand treatment	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	TOTAL
Non-response	11.18	16.15	11.32	13.34	17.04	10.58	12.97	15.51	12.45
Option A	7.04	15.63	14.44	5.56	6.30	8.15	10.26	7.12	10.09
Option B	28.52	13.70	10.23	4.81	6.30	18.63	10.73	8.125	12.56
Option C	16.59	17.11	16.23	21.85	19.25	15.23	17.26	19.59	17.49
Option D(Own brand)	36.67	37.41	47.78	54.44	51.11	47.41	48.69	49.98	47.41
	100	100	100	100	100	100	100	100	100

Table 5. Response patterns in *each* of the eight choice questions

(Unit: %)

	No purchase treatment	Own brand treatment
Individual responded with A's in all eight CE questions	0.00	0.00
Individual responded with B's in all eight CE questions	0.64	0.00
Individual responded with C's in all eight CE questions	14.78	8.15
Individual responded with D's in all eight CE questions	6.41	22.59
Individual responded with all non-responses (blanks)	6.41	6.67

Note: Excluding those with all A's, B's, C's.

results provide initial indication that the 'no-purchase' format may have been perceived as a forced choice and thus may have induced respondents to choose one of the other hypothetical alternatives A, B, or C. Hence, it appears that there is support for the first proposition stated in Section 4.

We now turn to examine whether the use of alternative opt-out formats induces a *systematic* favouring of some options at the expense of others. That is, we examine from which options does the opt-out alternative in TB draw its relatively high share and to what other option(s) does the opt-out alternative in TA loose its relatively low share. An implicit assumption made in most applied choice experiment work is that alternative opt-out formats will draw proportionately from all options. Yet, if this is not the case (and some alternatives are systematically favoured over others when a particular opt-out format is used), it is vital to understand why this may be so as well as the direction of the bias. Going back to the last column of Table 4 we see there is a 21% difference across treatments in the share of the Opt-out alternative ('No purchase', 'Own Brand'). We see, however, that the respondents in TA have allocated 15% of this percentage difference to option C (the fixed alternative option) and merely the remaining 6 % proportionately to the (variable) options A and B. Moreover, Table 5 shows that the proportion of individuals that chose option C in *each* of the eight CE questions was substantially higher in TA compared to TB (15% Vs 8% respectively). There is, thus clear evidence that there is a systematic gravitation towards the fixed choice alternative when individual's are provided with the 'no-purchase' option compared to those offered the 'own-brand' opt out alternative.

The experimental psychology literature briefly reviewed in Section 2 provides some insights as to why this may be the case. As explained, when individuals perceive the choice setting as involving a forced choice, they tend to adopt simplifying heuristics (e.g. compromising behaviour) that aim at minimizing adverse and unpleasant psychological effects such as 'regret'. The results from this particular decision making processes is that options that are perceived as being 'generic', or high-price high quality or asymmetrically dominating in one dimension are systematically favoured at the expense of other alternatives. In the current study we used three types of fixed alternatives: a generic brand of free range eggs, a generic brand of battery cage eggs, and a high quality and price brand. The aim of using three different fixed choice alternatives was to be able to examine the extent the findings from the psychology literature mentioned above are relevant for the comparison between opt-out alternatives. Table 6 presents the choice shares across treatments broken down with respect to the type of fixed alternative included in the choice set. Starting with the first column we see that the high price high quality option draws the highest share in both treatments (compared to the other fixed alternatives). Though this share is considerably higher in TA than TB (45% Vs 29%), we see that the choice share of C in TB is significantly higher than the corresponding share in the overall sample (17%). This signifies that the effect of introducing a high price/high quality alternative may provide respondents with an attractive outlet for both treatments. Further it is clear that the high share of C mainly draws from option D (i.e. the opt-out alternative) in both treatments. Yet, this effect is consider-

Table 6. Choice shares across version with different specification for the fixed alternative C

(Unit: %)

Responses for no purchase treatment	C is high quality/price brand	C is generic brand	C is generic brand and contains "Free range"	C is generic brand and contains "Cage"
Non-response	13.78	17.35	14.37	20.83
Option A	8.65	10.82	10.73	22.74
Option B	17.99	7.46	22.41	15.10
Option C	45.16	34.89	31.23	9.55
Option D (No purchase)	14.42	29.48	21.26	31.77
	100	100	100	100

Responses for own brand treatment	C is high quality/price brand	C is generic brand	C is generic brand and contains "Free range"	C is generic brand and contains "Cage"
Non-response	12.14	14.57	13.75	15.52
Option A	6.25	10.45	9.50	18.95
Option B	15.47	7.21	17.25	12.30
Option C	29.23	18.54	23.25	8.67
Option D (Own brand)	36.91	49.23	36.25	44.56
	100	100	100	100

ably smaller in TB than in TA suggesting that the psychological inducements that are responsible for this bias are weaker in the second treatment.

Moving on to columns two and three in Table 6 we can examine the effect of introducing a generic fixed brand alternative. Interestingly, we see that the patterns of systematic bias in favour of the fixed alternative are only present when this contains the 'free range' characteristic. That is, when the fixed alternative is generic but includes the battery cage characteristic, the share of the opt-out alternative in TA drops by 23 percentage points compared to the total sample figure (31% Vs 10%). Similar patterns are witnessed in TB. The 'loss' in the share of C is spread mainly to option A and to no-response. When the generic fixed alternative, however, includes the free-range characteristic the overall pattern of systematic preference for option C in TA remerges (i.e. the choice shares when C contains the free range characteristics are equivalent to those observed in the entire sample). It appears, therefore, that individuals faced with a forced choice (i.e. under TA) tend to anchor on the 'free range' characteristic. This is compatible with the finding from experimental psychology literature that asymmetrically dominating alternatives are chosen when the individuals are uncertain about their preferences *and* are forced to choose. Such a bias does not appear to be present in the 'own-brand' treatment.[41] We can, thus, conclude that the second proposition of Section 4 cannot be rejected.

Lastly, the patterns in the percentages of opt-out responses as we move from the first to the eighth choice set question suggests that respondent fatigue is present in both treatments.[42] However, we can see that the presence of fatigue effects (defined as an increasing share of the opt-out alternative as individuals answer repeated chose set questions) is considerably weaker in the TB compared to TA. The percentage of D responses in TA for the first two CE questions is on average 18% while that for the remaining six CE questions is 32% (a 77% increase). Conversely, the percentage of D responses in TB for the first two CE questions is on average 37% while that for the remaining six CE questions is 49% (a 32 % increase). This confirms the third proposition of Section 4 that respondent fatigue may differ across samples presented with alternative opt-out formats. Moreover, the results suggest that respondents in the 'own brand' treatment exhibit higher response consistency and respondent endurance than those faced with the no-choice option. This may be due to the more realistic and less restrictive choice setting provided by the 'own brand' option.

10. Estimation of multinomial models

We now turn to examining the last two propositions stated in Section 4 on the effects of using alternative opt-out formats on the estimated parameters of the multinomial choice model derived from the CE data. The first subsection below presents the estimation procedure that was followed while the second discusses the obtained results.

10. 1 Estimation procedure

Two separate multinomial models were estimated for each treatment group. In order to avoid the danger of the IIA violations cuased by the introduction of the opt-out alternative a random parameter logit model was employed (Revelt and Train, 1998).[43] The random utility function with random parameters is give by:

$$U_j^n = V_j + \varepsilon_j^n \equiv X_j(\beta + \eta^n) + \varepsilon_j^n \qquad (1)$$

Where individual n $(n=1...N)$ obtains utility U from choosing alternative j ($j=A, B, C$ or D) in each of the eight choice occasions. The utility is decomposed into a non-random component (V) and a stochastic term (ε). In its most simplest form the non-random component is assumed to be a function of the choice attributes X with parameters β which due to preference heterogeneity may vary across respondents in accordance to some random component η. By specifying the distributions of ε and β (or η) the probability of choosing the option j in each of the eight choice occasions can be derived (Revelt and Train, 1998). The estimation procedure was programmed in LIMDEP. The programme code is available from the authors. In order to identify the parameters the scale parameter, μ^n, was normalised to equal one. Moreover, the β random parameters were assumed to be independently normally distributed and distribution simulations to derive the moments of the distribution were based on 500 draws.

A simple specification was used that models the probability of selecting a particular alternative as a function of choice-specific attributes (which may be random) and a non-random alternative specific constant (ASC). Since the choice experiment involves 'no name brand' options the ASC is not choice specific but equals '1' when either A, B, or C are chosen and '0' when D (i.e. the opt-out alternative) is selected. This constant would account for the proportion of choices A, B, or C relative to D not otherwise explained by the data. Also note that a relatively more negative and significant ASC across treatments would indicate a higher propensity to choose the opt-out option in that treatment.

Turning to the issue of coding the data, the attributes that had two levels entered the utility function as binary variables but were effects coded, that is: 'Living conditions' (free range=1, cage=−1), 'Use of agricultural chemicals and fertilizers' (non use=1, use=−1), and 'Certification' (yes=1, no=−1).[44] The levels used for the 'price' and 'GM content' attributes were entered in a cardinal-linear form. The price attribute took the values (in pence) 38, 68, 98, 128, and 136 while the GM attribute the values (in percentages) 0, 1, 5, and 30 (see Table 7).[45] Further, whilst the attributes for the opt-out option in TA were simply coded with zero values, the attributes for opt-out option in TB were coded with the actual product characteristics specified by each individual in there responses to the revealed preference questions.[46]

Table 7. Description of attributes and levels

Living Conditions	Living condition of hens: free range (1) Vs cage (−1)
Pesticides	Use of pesticides in chicken feed: no use (1) Vs use (−1)
Information	Quality information/Certification on box: included (1) Vs not included (−1)
GM content	GM content in chicken feed: 0%, 5%, 1%, and 30%
Price	Price of box of six medium eggs: £0.38, £0.68, £0.98, and £1.28
ASC	Alternative specific constant such that ASC=1 if individual chose A, B, or C and ASC=0 if individual chose D

Finally, in order to facilitate comparison of models across treatments the parameter estimates had to be re-scaled by a common coefficient (Swait and Louviere, 1993). This is so because the scale parameters across each sample may differ and hence comparisons of raw parameter estimates may be misleading. To re-rescale the parameters and compare coefficients from different samples we follow the approach of Swait and Louviere (1993). One of the attributes in each model, price, is retained fixed (while the rest are allowed to be random) and is used to re-scale the other parameters. The significance of the difference between attributes parameters can be assed by a t-statistic. The standard error required for its estimation was obtained from 1000 draws on each multivariate normal parameter distribution.

10. 2 Estimation results

Table 8 presents the results from the two estimated random parameter models. Examining first the overall fit of the two models, the TB model outperforms the TA both model in terms of McFadden's and Madalla's pseudo R^2 criterion.[47] The poor overall fit of the TA relative to the TB model is consistent with the observation that the former model exhibits fewer significant main effects variables at the level of 1%. More specifically, the parameters on 'Information' and 'Pesticides' are both highly insignificant under TA while under TB model only the 'Information' attribute is insignificant.[48]

Further, the signs of the significant main effect variables in both models have the desired direction. The effect on utility from choosing a box of eggs that is 'free range' and 'organic' is positive while that of rising GM content and price is negative. Also, note that in both treatments the price attribute has the largest utility weight while the GM content attribute the lowest.[49, 50]

In addition, we can see that the ASC parameter in the TA model is insignificant (and positive) while the same parameter in the TB model is highly significant at the 1% level and negative. This suggests that there is a higher likelihood that people would opt-out in TB than in TA, thus confirming the patterns of opt-out shares discussed in Section 9. More importantly, the results on the ASC parameter can be interpreted as implying that the decision making process of individuals in TB is more aligned with rational choice theory that followed in TA. The structure of the multinomial choice random utility model implies that the probability of opting-out is inversely related with choice set quality. The latter is captured by the utility scores associated with each alternative. Hence, a negative and significant ASC implies that individuals are highly responsive to changes in choice set quality and are thus making decision that are closer both to rational choice theory and to behaviour observed in real markets (Dhar, 1997; Huber and Pinnell, 1994a).

A more valid comparison of the estimated parameters of the main effect attributes across the two models can be observed in Table 9 that presents the re-scaled parameters and the significance level of their differences. The rescaling was performed with respect to the price attribute and nullifies the potential differences in the scale parameters across models. It can be seen from Table 9 that the differences between the parameters on 'living conditions' and 'pesticides' obtained from the two models are significantly different from zero at the 1% level. This suggests that when respondents are given the choice of specifying an alternative brand (i.e. when allowed to choose their own brand) they are more likely to specify a brand with these characteristics, thus increasing the salience of these attributes. If, for example, consumers prefer organic eggs, then it is most likely that they will choose hypothetical brands that are organic. Yet, presented with a CE question that describes hypothetical alternative brands that do not include this characteristic, they may opt-out and specify their own brand which is known to have the desired characteristic. This increases the salience of the 'pesticide' attribute (which is coded with '1' when organic). Hence, when given a choice of specifying an existing brand, respondents tend to choose brands that are free-range and organic. Moreover, we see that the parameters of 'GM content' and 'information' are *not* significantly different across treatments. We have noticed, however, that the size of the 'GM content' parameter is the smallest compared to all other attri-

Table 8. Random parameter logit models for each treatment

	No purchase treatment				Own brand treatment			
Variable	Coefficient	Standard error	t-stat	P-value	Coefficient	Standard error	t-stat	P-value
Random parameters in utility functions								
Living Conditions	0.4812	0.1467	3.2812	0.0010	0.5046	0.1361	3.7067	0.0002
Pesticides	−0.0731	0.1375	−0.5314	0.5951	0.4877	0.1293	3.7726	0.0002
Information	−0.0347	0.1305	−0.2655	0.7906	−0.0504	0.1269	−0.3976	0.6909
GM content	−0.0204	0.0048	−4.2658	0.0000	−0.0113	0.0043	−2.6410	0.0083
Non-random main effects parameters in utility function								
ASC	0.1822	0.1558	1.1691	0.2424	−0.9481	0.1031	−9.1993	0.0000
Price	−0.9392	0.1731	−5.4261	0.0000	−0.5759	0.1555	−3.7036	0.0002
Non-random two-way interaction parameters in utility function								
(LC) * (Pest)	0.0096	0.0529	0.1810	0.8564	0.0005	0.0522	0.0096	0.9923
(LC) * (GMcont)	−0.0039	0.0050	−0.7778	0.4367	−0.0095	0.0033	−2.8470	0.0044
(LC) * (Inform)	0.0812	0.0711	1.1415	0.2956	0.1219	0.0461	2.6429	0.0082
(LC) * (Price)	0.2611	0.2686	0.9720	0.1215	0.1991	0.1113	1.7891	0.1671
(Pest) * (GMcont)	−0.0088	0.0045	−1.9407	0.0523	−0.0312	0.0042	−7.4292	0.0000
(Pest) * (Inform)	0.0332	0.0424	0.7836	0.4333	−0.0165	0.0501	−0.3292	0.7420
(Pest) * (Price)	0.5594	0.1405	3.9821	0.0001	0.1954	0.0991	1.9711	0.0455
(GMcont) * (Inform)	−0.0108	0.0040	−2.7231	0.0065	−0.0067	0.0034	−2.0041	0.0451
(GMcont) * (Price)	0.2037	0.1413	1.4421	0.1378	0.2317	0.1133	2.0442	0.0423
Derived standard deviations of parameter distributions								
S_LC	0.0078	0.0374	0.2093	0.8342	0.0004	0.0381	0.0102	0.9918
S_PEST	0.0061	0.0353	0.1731	0.8625	0.0066	0.0330	0.2014	0.8404
S_IMFORM	0.0011	0.0340	0.0325	0.9740	0.0049	0.0316	0.1545	0.8772
S_NONGM	0.0003	0.0034	0.0812	0.9353	0.0004	0.0021	0.1947	0.8456
S_GMCONT	0.0078	0.0374	0.2093	0.8342	0.0004	0.0381	0.0102	0.9918
Log-Likelihood	−2101.241				−1683.844			
McFadden's pseudo R^2	0.1321				0.2235			
Madalla's pseudo R^2	0.2668				0.4692			
Chi-square statistic	657.8655				932.5981			
Replications for simulated probabilities	500				500			
Sample size	1753				1551			

Note: Sample size is determined by number of questionnaires times number of choice occasion responses.

butes while the 'information' parameter is insignificant in both treatments. We can, thus, conclude that the choice of the format of the opt-out alternative does in fact affect parameter salience for attributes that are relatively more important while does not affect parameter salience for attributes that are of relatively less importance to consumers.[51] This lends support to the fourth proposition in Section 4 that there is good reason to expect that the choice model parameters across opt-out treatments would differ.

Table 9. Comparison of rescaled random parameter coefficients

	No choice treatment (1)	Own brand treatment (2)	Difference (2)−(1)	| t | ratio of difference
Living conditions	0.5123	0.8762	0.3638	3.786***
Pesticides	−0.0778	0.8470	0.9248	4.235***
Information	−0.0369	−0.0876	−0.0507	0.250
GM content	−0.0217	−0.0196	0.0021	0.012
ASC	0.1939	−1.6464	−1.8403	3.690***
Price	−1.0000	−1.0000	0.0000	—

Notes: coefficients were scaled by: −(attribute/price).
*** significant at the 1% level.

Finally, we can further corroborated the finding that the individuals in TB seem to be more aligned with conjunctive decision making strategies by examining the estimated coefficients of the two-way interactions. Looking again at Table 8 we see that the TB model exhibits six significant two-way interaction terms (out of a total of nice) at the 10% significant level while the TA model exhibits merely three.[52] Hence, the richness of information contained in these extra interaction effects is not conveyed in the model derived from the treatment with the 'no purchase' opt-out format. Moreover, the presence of a higher number of significant two-way interactions (or non-linearities) in the utility function of TB suggests that individuals in this treatment are to a larger degree (compared to those in TA) relying on conjunctive decision making rules and to a lesser extent on simplifying heuristics. The opposite implication can be drawn for subjects in TA where individuals faced with an apparent contrived and restrictive choice setting (akin to a forced choice setting) resort to compromising heurists (such as the anchoring on the free range dimension discussed in Section 9). Hence, the fifth proposition of Section 4 that the 'no purchase' format would identify less interaction effects than the 'buy my own brand' format seems to be confirmed.

11. Discussion and concluding remarks

The decision 'not to choose' is an integral part of almost all forms of transactions. This decision can assume various formats, the two most common being the decision not to purchase any of the available alternatives and the decision to purchase an alternative or one's own brand. In the pursuit of enhancing the realism and theoretical credibility of choice experiment studies, non-market valuation practitioners have increasingly included an opt-out alternative in the experimental design of their choice sets. Moreover, almost all such CE applications have used the no-purchase format, implicitly assuming that the decision over which opt-out format to use has little bearing on the estimated choice shares and attribute weights. Yet, there are theoretical reasons (both from rational choice theory used by economists but also from other theories used mostly by experimental psychologists such as constructive preference theory) of why the introduction of different opt-out formats may affect how individuals perceive the choice set. This in turn may impact both on the estimated choice shares and the attributes weights. It is thus crucial that CE practitioners gain an enhanced understanding of these effects as well as the circumstances that are more appropriates for the use of each format. This need has been acknowledged to be an important yet neglected methodological design issue (e.g. Adamowicz and Boxall, 2001). The current paper aimed at addressing this issue by assessing the impacts on CE data when alternative opt-out formats are used. More specifically, a split sample experimental design was used in a CE study on the consumption of alternative brands of eggs. The choice sets presented to respondents included two varying eggs profiles, A and B, as well as a fixed third alternative, C. These choice sets were identical across treatments except for the format of the opt-out alternative (option D). The first treatment received the no-purchase opt-out

format while the second the buy my own brand format.

The results from the analysis of the data showed that the relative choice share of the opt-out alternative was higher in the 'own brand' treatment as opposed to the treatment that received the 'no purchase' treatment. One of the reasons behind this finding is that the no-purchase format appeared to be perceived by some individuals as entailing a more restrictive or forced choice setting. This was found to systematically bias respondents to select certain types of responses from the choice set at the expense of others. More specifically, respondents in the no-purchase treatment were found to systematically favour the fixed option over the opt-out alternative. This was the case when the fixed alternative was either a high price-high quality alternative or a generic brand that asymmetrically dominated the other options with respect to one characteristic/dimension. It was shown that the introduction of the own brand opt-out alternative took disproportionately greater share from options that individuals tended to select under the no-purchase alternative.[53] These findings are consistent with numerous robust results derived from the experimental psychology literature that have found that options selected under a contrived and forced choice setting (as may be the case in the no-purchase treatment) tend to be those that are 'safer' and help alleviate decision conflict, discomfort, and potential regret associated with making a choice. In other words, such options are not primarily selected because of the utility embedded in their attribute values, but rather, because they help the consumer make a decision under preference uncertainty to comply with a forced choice task (e.g. Dhar and Simonson, 2001; Bettman *et al.,* 1998).[54]

Moreover, respondent fatigue (defined as an increasing share of the opt-out alternative as individuals answer repeated chose set questions) was found to be most prevalent in the no-purchase treatment while respondents in the 'own brand' treatment exhibit higher response consistency and respondent endurance. In addition, parameter attributes obtained from estimating separate random parameter logit models for each treatment appeared to vary significantly across treatments. It was found that the type of opt-out alternative that is used affects parameter salience for attributes that are relatively more important while does not affect parameter salience for attributes that are of relatively less importance to consumers. This finding is also supported by the work of Banzhaf *et al.* (2001), Olsen and Swait (1998) and Dhar (1997). Finally, the estimation of the choice model for the own brand treatment revealed a considerable higher number of significant non-linearities (such as attribute interaction terms) in the utility function compared to the no-purchase opt-out treatment. This suggests that individuals in the no-purchase treatment resort less to conjunctive decision making rules and more to compromising and simplistic heurists. This finding is compatible with those in Olsen and Swait (1998) and Huber and Pinnell (1994a and 1994b).

It must be acknowledged that these findings are subject to the limitations of the specific study. These are primarily related to the possible biases from the low response rate as well as the over-representation of high income and highly educated individuals in the sample. Despite these limitations the results from this particular study may also have some broader implications for the design of choice experiment studies. First, amounting evidence from this and other studies suggest that, contrary to the implicit assumption made in many CE studies, the choice of the format of the opt-out alternative does matter. Both choice shares and attribute weights have consistently been found to be affected. Secondly, the findings from the study presented here and the conclusions reached by Banzhaf *et al.* (2001) and Olsen and Swait (1998) seem to suggest that the 'own brand' format provides a 'better fit' to the data than the more frequently used 'no-purchase' format. Moreover, this result seems to be confirmed for goods with different price and income elasticises, with different degrees of substitutability, and with different purchasing frequencies (e.g. recreation sites, eggs, and orange juice). This suggests that the own-brand alternative may be suitable for more cases than initially thought. This may be attributed to the fact that in most choice situations the no-purchase format would be perceived as entailing an unrealistic, contrived or forced choice which causes individuals to adopt different decision

making rules than they would have if faced with a more free and realistic choice. Also, using the no-purchase format conceals and looses potentially important information as to what exactly individuals prefer when they choose to opt-out. The study presented here has shown that we can include such information by directly modelling the characteristics of one's favourite brand in the estimation processes.

Ultimately the choice over the format of the opt-out alternative in CE studies should aim at enhancing the realism of the exercise and at capturing as much information as possible about the preferences of the respondents. Accumulating evidence suggests that this can be best achieved by using the own-brand opt-out format, at least in studies where respondents have a high level of familiarity with the good. This would seem to include most consumer good, recreational and health studies as well as studies concerning a broad range of mixed and local public goods (e.g. waste disposal, recycling, water treatment, local day care centres etc.). Exceptions to this recommendation may perhaps include choice situations in which the individual is not familiar with an own brand option such as in the case of the purchase of durable goods or choices over pure public goods. Yet, even in these cases, a design format that uses the 'choose another alternative option' and that collects and models the data from the characteristics if this alternative may still outperform a design that uses a no-choice format. The generality of these conclusions still need to be further explored with similar comparative studies involving choices over public goods.

Notes

1 In other cases (such as 'sate of the world' studies) the opt-out alternative can consist of a regular profile whose attribute levels are held constant over all choice sets (such as a baseline or status quo scenario).

2 This paper focuses on the impact of alternative opt-out formats on choice experiments studies. The implications for contingent ranking, contingent rating, and paired comparisons studies are beyond the aims of this chapter but consist an important direction for future research.

3 For example, Adamowicz *et al.* (1998) make the point that "one should design stated choice experiments to allow one to observe and model non-choice because its such an obvious element of real market behaviour".

4 For example, the multinomial logit model defines the probability of choosing the default as:

$$\Pr(default) = U_D / (U_D + \sum_{k=1} U_K)$$

A subtle characteristic of this model is that it accounts for the quality of the choice set through the magnitude of the utility scores (the U_K's). Hence, as choice set quality increases, the probability of choosing the default decreases. This property has been explicitly explored in a study by Huber and Pinnell (1994a) who find that one is more likely to make a choice (and not go for the opt-out alternative) from a more attractive choice set and argue that this is consistent with most normative models of choice.

5 Put differently, in the absence of the opt-out alternative a nonzero value is implied in the estimated likelihood function for people who would not choose one of the alternatives.

6 At best, WTP measures from such studies are conditional on making a choice, which begs the question of how to identify choosers in the first place (Bennett and Blamey, 2001, p. 26). However if such identification of choosers and non-choosers were *a priori* possible, the very reason for conducting a choice experiment would be in doubt. Hence, any meaningful demand analysis that employs the CE approach must include an opt-out alternative. The interpretation of this alternative in applied work is that of an efficient proxy for the likelihood that the respondent will leave the market (Olsen and Swait, 1998). This will allow for the estimated discrete choice model to reflect not only shifts in market share due to differences among alternatives, but also to be responsive to shifts in *total* demand due to the general quality of these alternatives (Huber and Pinnell, 1994a, p. 4).

7 Similar reasons for including an opt-out alternative also hold for cases dealing with 'state of the world choices' or choice experiments that offer respondents alternative policy options. In these cases the opt-out option may be a status quo or some baseline scenario. For example, Bateman *et al.* (2003) make the point that "it is necessary to include a status quo option in the choice set in order to achieve welfare measures that are consistent with demand theory. This is, because, if a status quo alternative is not included in the choice set, respondents are effectively being 'forced' to choose one of the alternatives presented, which they may not desire at all. If for some respondents the most preferred option is the current baseline situation, then any model based on a design in which the baseline is not present will yield inaccurate estimates of consumer welfare." In general, the effect of the absence of the baseline alternative on the estimation of Hicksian surplus is to bias the estimates upward (Boyle *et al.,* 2001). Further, Adamowicz and Boxall (2001) stress that in cases involving 'state of the world choices' the context of the choice may be very important. If the choice context is a referendum then respondents may expect that the opportunity to make no changes should be available. If a policy change is inevitable, then the inclusion of an opt-out alternative is not necessary. Note

that there have been concerns with over the possibility of 'status quo bias' as the result of including a default alternative. (e.g. Bennet and Blamey, 2001). However, Adamowicz and Boxall (2001) point out that if such behaviour is to be expected in real referendum situations, then the analyst should provide the opt-out options in hypothetical referenda. The biases that may occur with the inclusion of a status quo alternative in 'state of the world' studies are discussed in Bennett and Blamey (2001).

8 See Huber and Pinnell (1994a, 1994b), Banzhaf *et al.* (2001) and Olsen and Swait (1998) for a more thorough discussion of these points.

9 Many economists that have recommended the use of the opt-out alternative have acknowledged this danger and recommend that appropriate design efforts should be employed to reduce such a bias. For example, Olsen and Swait (1998) point out that "...one of the concerns with the inclusion of the no-purchase alternative in a choice task is that respondents may use it as an easy in a difficult or long task. In years of using the [no-purchase alternative] (as well as other fixed alternatives) in academic and other studies, however, we have yet to see strong evidence of such behaviour. Nonetheless, the possibility of this calls for care in task design, instrument pretesting, careful respondent recruitment and respondent motivation (through task relevance, as well as financial incentives). These same cares are called for anyway so as to enhance or preserve data quality, so no real additional work is called for." Though we agree with the call for the need to follow appropriate design guidelines to minimise a systematic bias for the opt-out alternative the danger from status quo or opt-out bias still remains. Yet, if this behaviour is to be expected in the real world then the opt-out alternative should be included irrespective of its consequences (Adamowicz and Boxall, 2001, p. 21). There is due cause for alarm, however, when the opt-out bias is the product of the design of the study. Hence, We would add to the prescription of Olsen and Swait (1998) that opt-out bias can be minimized by obtaining a better understanding of the impacts from introducing an opt-out alternative in the choice set provided by the experimental psychology literature. This point highlights the need for the valuation literature to attain a multidisciplinary orientation.

10 This general finding is also predicted by the experimental psychologists that view choice as a constructive process (e.g. Tversky *et al.,* 1988; Payne, *et al.,* 1992 and 1988; Slovic, 1995) as well as others that have stressed the importance of 'justification' in choice (Tetlock, 1985; Newell and Herbert, 1972).

11 Though the aforementioned experimental work has established that the opt-out option does affect individual behaviour in experimental/hypothetical settings (in both desirable and non undesirable directions) it has not investigated how these findings impact on the parameters of a preference model obtained from a standard conjoint or experimental choice study. A recent study by Olsen and Swait (1998) has examined this issue using a split sample CE setting on the consumption of alternative orange juice brands. Each treatment received the same choice set design but differed only in the presence/absence of the opt-out alternative. The authors find that the absence of the opt-out alternative leads to significantly different coefficients, compared to those obtained when the alternative is present. This implies that the probability of choice is *not* independent of the presence of the opt-out alternative, which is a commonly made assumption in academic and commercial research. Also, they find that in aggregate, consumers seem to exhibit more nonlinearities in preferences (reflecting application of conjunctive decision rules, or other heuristics) when the opt-out option is present, compared to that option being absent. Furthermore, their work suggests that depending upon the types of decision rules used by consumers when the opt-out is absent, important attributes can either become inflated (if they lend greater importance to primary conjunctive attributes) or deflated (due to the use of attributes other than primary conjunctive ones to resolve preference ambiguities) compared to the opt-out present case. This deflation or inflation may have a consequent impact on attributes of secondary importance, by respectively, inflating or deflating them. (Olsen and Swait, 1998).

12 Furthermore, some psychological parameters such as the need for 'closure' (e.g. Webster and Kruglanski, 1994), may necessitate the absence of an opt-out alternative.

13 Note however that in practice not CE studies have used an opt-out alternative. See Olsen and Swait (1998) for references of numerous consumer demand studies Boyle *et al.* (2001) for non-market valuation studies that have not used opt-out alternative. The number of these applications is surprising considering that not including such an option yields inaccurate estimates of consumer welfare that are not consistent with demand theory! Moreover, when an opt-out alternative has been used in non-market valuation applications it has almost uniformly been of the no-choice format.

14 Various food scare incidents crisis are such as the BSE and GM food crises are examples in support of this point. Also, the food safety non-market valuation literature that has examined decision patterns over basic goods (e.g. Kuperis *et al.,* 1999; Henson, 1996; Van Ravensway and Hoehn, 1991) appears to adhere to this view and has included the opt-out option. A case for not including an opt-out option may be made in studies involving 'goods' that have no substitutes of any kind. Very few goods, however, would fit this description. Moreover, techniques that involve trade-offs should not generally be used for such goods in the first place so the issue of whether to use an opt-out alternative in these cases is immaterial.

15 For example, Louviere and Woodworth (1983), Huber and Pinnell (1994a, 1994b), Olsen and Swait (1998) have used the 'no-choice' format while Elrod *et al.* (1992) and Swait (1994) provide illustrations of the 'buy my usual brand' opt-out format.

16 For example the no purchase format is used by Kuperis *et al.* (1999) in a study on individual preference for milk while Adamowicz *et al.* (1994) in a study on angler preferences over alternative fishing sites. In both cases the 'choose my

usual brand/site' format may have been more realistic.

17 The work of Banzhaf *et al.* (2001) was developed concurrently but independently from the research presented in this chapter. Our work differs from that of Banzhaf *et al.* (2001) in that (a) we explore the impact of different opt-out formats on the decisions over an everyday food product and not on a more elastic good such as recreation, (b) we examine the effects on the choice shares from the use of alternative opt-out formats and (c) explore the reasons *why* there are differences in parameter salience across opt-out treatments.

18 The study developed here is akin to the body of CV literature that examined the impacts from allowing the option to defer in dichotomous choice CV studies as well as the studies that examined various framing issues with respect to eliciting WTP values (see Bateman and Willis (2000) for a review). It is only natural that the CE literature (being relatively a new method compared to CV) follows similar paths of methodological inquiry.

19 Of course due design care must be taken so that the systematic preference for the opt-out is not an artefact of the study itself.

20 Bettman, Johnson and Payne (1991) provide a discussion of alternative decision making rules under various choice circumstances and settings.

21 Note that whilst there are no *a priori* predictions regarding the relative importance of specific attribute weights (i.e. marginal WTP values) under alternative opt-out formats, we can generally expect that the WTP value for the product *profiles* as a whole would tend to be lower under a choose my own brand option. This follows from the expectations that the 'no purchase' option would induce less opting out and thus yield higher WTP values for the hypothetical profiles. Recent support to this claim is provided in Boyle *et al.* (2001). The current chapter focuses on effects on choice shares and attribute weights and hence welfare measures are not discussed.

22 For example, we can extend the reasoning of Olsen and Swait (1998) and argue that if a compensatory choice rule is followed under the own brand format and a satisficing rule is employed under the 'no purchase' format, one would expect more non-linearities in the preference function measured with the 'own brand' than with the no purchase option.

23 Also the work by Wolfenbarger and Phifer (2000) provided further insights into the ecological risk and benefits of the GM foods.

24 The GM attitudinal studies that were consulted were Lusk *et al.* (2002), Hossain *et al.* (2002a, 2002b, 2002c), Hallman (2000), Consumers' Union Report (2000), Veeman (2001), Heiman *et al.* (2000), Verdurme and Viaene (2000), Isaacs (2000), Sadler (2000), Kamaldeen and Powell (2000), ESRC (1999), EuroBarometer (2000) and Hamstra (1998).

25 There are various studies that examine individual *intentions* to purchase GM foods (e.g. Hossain *et al.,* 2002b; Verdurme and Viaene, 2002). A thorough review of these is provided by Wier and Anderson (2001). Yet *valuation* studies on GM foods are still in their embryonic stage with no clear results being published in peered review journals. The agricultural economics literature has recently acknowledged the need for valuation work in order to facilitate the GM foods debate (e.g. Lusk and Hudson, forthcoming 2003). Also, the conference organized by the International Consortium on Agricultural Biotechnology Research (ICABR) in Ravelo Italy for the past six years has revealed that numerous CV and CE applications on GM foods are in the pipe-line (e.g. Moon and Balasubramanian, 2001; James and Burton, 2001).

26 Food safety, organic foods, and food labelling valuation studies that were consulted included those by Loureiro *et al.* (2001), Cason and Gangadharan (2000), Teisl *et al.* (2000), Latvala and Kola (2000), Huang *et al.* (1999), Kuperis *et al.* (1999), Caswell (1998), Ready *et al.* (1996), Huang *et al.* (1999), Chern *et al.* (1995), Lin and Milon (1993), Eom (1994), Buzby *et al.* (1995), Elnagheeb *et al.* (1992), Grobe *et al.* (1996), and van Ranvenswaay (1995). Also, the design of the experiment benefited from the review and assessment of food safety studies summarised in Wier and Anderson (2001).

27 Note that most studies on 'food safety issues' have also focused on specific goods rather that on broad range of goods. For example, Kuperis *et al.* (1999) on hormones in milk, Cicia *et al.* (2001) on pesticides in olive oil, Moon and Balasubramanian (2001) on GM content in breakfast cereals.

28 So-called 'organic' eggs are produced with certified GM-free chicken feed (i.e. feed that contains between 1–5% of GM content). All other eggs (including free range eggs) are produced with chicken feed that has a GM content of 30 %.

29 Recent EU legislation treats livestock products (e.g. cheese, eggs etc.) that have been produced from GM feed (or other inputs) as GM free. Yet, this has been called into question by many consumer, environmental and scientific groups (Isaacs, 2000; Kamaldeen and Powell, 2000; ESRC, 1999). Hence it is relevant to examine the degree to which individuals would also be WTP to avoid the use of GM cops even if used as an input. Resting GM crops even as inputs would be compatible with sentiments of mistrust to authorities, risk aversion, as well as environment and ethical concerns.

30 Further the specific good provided the opportunity to explore the impact of animal welfare concerns (in addition to health, environmental, and moral concerns) on decisions over GM foods. This could not have been investigated if the study used a vegetable or fruit. Finally, the use of eggs allowed comparison with the results from other valuation studies on egg consumption (Rolfe, 1999; Bennett, 1995, 1997, 1998; Bennett and Larson, 1996; Wang *et al.,* 1996).

31 The survey budget only permitted the use of such incentives for the final survey.

32 See Louviere *et al.* (2000, ch. 5) and Louviere (1988) for a discussion on optimal level determination.

33 For example, pre-notification and cover letters were printed on correspondence paper using official University letter

head and were individually signed by the institute's director (i.e. CSERGE-UCL, Prof. David. W. Pearce). Also, the questionnaire was printed on coloured paper using appropriate font size and spacing (Dillman, 2000; Mangione, 1999).

34 Undeliverable pre-notification letters revealed wrong addresses which were replaced with another household.

35 It was made clear to respondents that four such prizes would be awarded. Also, the lottery post card (that included name and address) was to be returned separately from the completed questionnaire. This preserved the anonymity of their survey responses. There is always the possibility that some people return the lottery post card but do not complete and return the questionnaire. Yet, this is not usually encountered in most postal surveys (Mangione, 1999) and was not observed in this study either.

36 Lynn and Lievesley (1991) recommend using a minimum of 50 PSUs for social surveys in Great Britain in order to increase the sample precision.

37 This is, of course, a rough form of external validation since the Euro-barometer is a survey itself with its own degree of sampling error. Yet, the Euro-barometer sample was considerably larger and even more representative than the one used in this study and, hence, provides a credible bench mark for comparison.

38 A one sided test of proportions (independent samples) cannot reject the null hypothesis at the 1% level.

39 Again a one sided test rejects the null that 'the percentage of all D responses in TB is grater than percentage of all D responses in TA' at the 5% level.

40 That is, the percentages of respondents that choose either a non response, A's, B's, and C's in *each* chose set are similar across treatments.

41 The anchoring on free-range characteristics could also be due to the position it had (it was first) in the exposition of the various profiles. Further research is required on the relationship between the positioning of vital characteristics within profiles and the impact of asymmetrically dominating alternative across opt-out treatments.

42 The patterns of all other choice shares across the series of eight choice set questions suggests that shares remain relatively constant.

43 Our main concern in selecting a particular multinomial model is to avoid problems from violations of the IIA property. The results from the previous section showed that the relative shares of the various alternatives were not invariant with respect to the opt-out format that was introduced. Hence, it is likely that the IIA property does not hold. This was in fact confirmed by using a standard IIA test on the results of the standard multinomial logit model. Hence, we used the RP logit model that does not evoke the IIA property.

44 See Louviere *et al.* (2000, p. 267) for a discussion of the relative benefits of effects coding.

45 Alternative functional forms for these two attributes (e.g. quadratic, logarithmic, mixed distribution etc) were also explored and are discussed in the next chapter.

46 The ubiquity of this good was one of the main reasons for choosing it for this particular comparative study since it would be likely that individuals were highly familiar with the characteristics of the egg brands they commonly bought. This in fact was confirmed in both the focus groups and pilot studies where individuals gave remarkable accurate price and other attribute descriptions of their egg brands. The completeness and accuracy of the revealed preference data was enhanced in the final survey by the fact that the vast majority of the people that completed the questionnaire were the members of the household that performed the weekly shopping. Finally, the accuracy of the egg characteristics that respondents claimed to prefer was externally validated by asking respondents to state the supermarket chain they regularly purchased eggs. The vast majority of the sample (94%) purchased eggs in the UK's leading supermarket chains (namely, Asda, Iceland, Marks & Spencer, Safeway, Sainsbury, Somerfield, Tesco, and Waitrose). Comparison of the data provided by the survey on egg characteristics with the characteristics of the eggs sold in the above food retailers suggests that individuals had a highly accurate awareness of the type of eggs they purchased. There were two issues however that had to be dealt with in coding the data for the opt-out alternative in TA. First, many respondents were not certain of the GM content used in chicken feed. This is to be expected considering that the issue of GM content in foods is not as familiar as that of, say, pesticide content or salmonella-free certification. The missing revealed preference data on GM content were coded as follows: those who stated that they purchase 'organic' eggs were coded as choosing ages with 0% GM content while the others were assigned a 30% GM content level since this is the level that is estimated to exist in non-organic chicken feed used in the UK. In fact, individuals were informed through their information packet that non-organic chicken feed in the UK has a 30% GM content. Hence, the consequences of buying one's own brand (with respect to GM content) was made explicit. Secondly, since respondents provided price data for different box sizes, it was necessary to convert all price data into prices for a box of six eggs (the unit of scope used in hypothetical egg profiles).

47 The R^2 measures of goodness of fit are not very reliable for non-linear discrete choice models (see Ben Akiva and Lerman (1985) and Amemiya (1981) for a discussion of goodness to fit measures for multinomial choice models). Yet, what is important here that the differences in the pseudo R^2 between the two models is significant.

48 Note that alternative econometric specifications (such as a RP logit *without* two-way interactions) exhibit a significant parameter for the 'Information' attribute. Yet, even in these cases, the parameter on 'Information' was considerably *less* significant than the other parameter attributes.

49 The estimated coefficients of a multinomial logit model incorporate an unidentifiable multiplicative scale factor that is inversely related to the variance of the error term. This makes it difficult to directly compare multinomial logit

coefficients estimated from different data sources, since differences in parameters can be attributable to scale factor differences and/or to true parameter differences. That is the 'raw' coefficients for the two treatments will be $\mu^i_{TA}\beta^i_{TA}$ and $\mu^i_{TB}\beta^i_{TB}$ and it be improper to make any comparisons without knowing the ratio of the two scale factors, μ_{TA} and μ_{TB}. However, using the procedure outlined by Swait and Louviere (1993) it is possible to test for overall parameter equality across treatments while controlling for differential error variances. The test indicates that the coefficient vectors in the two models *differ* at the 95% confidence level (the test statistic of 34.69 is asymptotically chi-squared distributed with 20 degrees of freedom, for which the critical value is about 31.41). This supports the inference that the attribute weights across treatments differ more than can be explained due to error variance differences between the two conditions.

50 Note also that the derived standard deviations of the random parameters are not significant in both treatments which indicates that preference heterogeneity may not be accounted at the individual level. Yet, for the purposes of comparing opt-out treatments we will retain the RP logit model since it avoids possible IIA violations associated with the basic multinomial logit model.

51 This finding is also confirmed in the work by Banzhaf *et al.* (2001). It is also consistent with the results presented in Olsen and Swait (1998) that support the idea that, depending upon the types of decision rules used by consumers when faced with a forced choice, important attributes (i.e. under free choice) can either become inflated (if they lend greater importance to primary conjunctive attributes) or deflated (due to the use of attributes other than primary conjunctive ones to resolve preference ambiguities) compared to the NPA present case. This deflation or inflation may have a consequent impact on attributes of secondary importance, by respectively, inflating or deflating them.

52 Two-way interaction effect of 'inform*price' was held constant for estimation purposes and then omitted at Table 8.

53 This bias may have significant policy implications. For example, in cases where the policy analyst is interested in examining the impact of introducing a high quality alternative on the share of existing low quality options, she may overestimate that impact if a no-purchase format is used. Also, these results are equally relevant for studies examining voting intentions (as opposed to preferences over consumer goods). Krosnick (2000) has shown that surveys with and without the opt-out alternative can result in significant differences in voter intentions. In many cases the use of the own brand format (e.g. choose my usual option that is not offered in the choice set) is not conceptually appealing. Yet, there are other numerous cases (e.g. voting over local public goods) that the own brand format may be relevant. Hence, it remains to be seen how alternative opt-out formats affect the results from opinion polls and voting studies.

54 Hence, the study also confirms that the non-market valuation literature can gain very useful insights from exploring research undertaken in other fields, primarily from experimental psychology. This underlines the need expressed by many leading valuation practitioners to pursue a multi-disciplinary approach (e.g. Bateman and Willis, 2000; Hanley, 1998; Mitchell and Carson, 1995).

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Appendix 1–Questionnaire and survey material[a)]

C|S|E|R|G|E

Consumer Food Survey: Genetically Modified Products

Thank you in advance for completing this questionnaire
YOUR ANSWERS WILL BE TREATED IN THE STRICTEST CONFIDENCE
HOW TO COMPLETE THIS QUESTIONNAIRE
Most questions simply require a tick in the appropriate box ☑ to indicate your answers.
There are a few questions that require a short written answer in the space provided. The majority of questions ask you to circle the appropriate number in order of preference: **1 2 3 ④ 5**

Food purchasing

In this section we would like some information about your purchasing habits and your views on genetically modified (GM) Foods.

Q 1 Please tick the first and second most important of the following food characteristics:

	Taste	*Price*	*Nutrition*	*Safety*
First	☐1	☐2	☐3	☐4
Second	☐1	☐2	☐3	☐4

Q 2 What is your approximate weekly expenditure on food at the grocery store/supermarket?

I spend roughly £ _____ **per week on food**

Q 3 How ***willing*** would your household be to buy GM foods? Please rate each one from 1–5, where 1 is ***not willing at all*** and 5 is ***very willing.***

If they were cheaper than Non-GM foods

Not willing at all ***Very willing***

1 2 3 4 5

If they were sold at the same price as regular foods but were much more nutritious or contained more vitamins

1 2 3 4 5

If they were sold at the same price as regular foods but were produced with less pesticides and artificial fertilisers

1 2 3 4 5

If they were sold at the same price as regular foods but tasted better

1 2 3 4 5

a) The final qustionnaire was printed on A5 appear and hence it had a different layout than the one presented here.

Egg purchasing

To better understanding your views on GM food in general we will focus on asking you questions about one commonly purchased food, namely *eggs.*
Currently, not all chicken feed is separated into GM and Non-GM and not all egg boxes clearly state their GM content.
This means that unless the eggs we buy are labelled as Non-GM or Organic, we may in fact be consuming eggs that come from hens that have been fed with GM crops.

Q 4 What effect do you think eating eggs has to your health? Please rate from 1–5, where 1 is ***very bad*** and 5 is ***very beneficial.***

Very bad				*Very beneficial*
1	**2**	**3**	**4**	**5**

Q 5 Which store/supermarket do you usually buy eggs?

Please *tick only one.*

☐1 **TESCO** ☐6 **MARKS & SPENCER**
☐2 **SAINSBURY** ☐7 **ASDA**
☐3 **SAFEWAY** ☐8 **ICELAND**
☐4 **WAITROSE** ☐9 **SOMERFIELD**
☐5 **CO-OP** ☐10 **Other.....**

Q 6 What ***size box*** of eggs do you usually buy?

☐1 **6 eggs box** ☐4 **15 eggs box**
☐2 **10 eggs box** ☐5 **18 eggs box**
☐3 **12 eggs box** ☐6 **Other.....**

Q 7 What ***size of eggs*** do you usually buy?

☐1 **Small or Mix** ☐3 **Large**
☐2 **Medium** ☐4 **Very Large**

Q 8 How ***often*** do you buy eggs with the following characteristics?

	Never	*Not often*	*50–50 chance*	*Very often*	*Always*	*Don't know*
Free Range	**1**	**2**	**3**	**4**	**5**	**99**
Barn	**1**	**2**	**3**	**4**	**5**	**99**
Organic	**1**	**2**	**3**	**4**	**5**	**99**
Non-GM	**1**	**2**	**3**	**4**	**5**	**99**
Eggs with detailed information or certification of their animal welfare and quality standards	**1**	**2**	**3**	**4**	**5**	**99**

Q 9 What is the average price of the box you typically buy?

☐1 £**0.30**–£**0.49** ☐7 £**1.50**–£**1.69**
☐2 £**0.50**–£**0.69** ☐8 £**1.70**–£**1.89**
☐3 £**0.70**–£**0.89** ☐9 £**1.90**–£**2.09**
☐4 £**0.90**–£**1.09** ☐10 £**2.10**–£**2.29**
☐5 £**1.10**–£**1.29** ☐11 £**2.30**–£**2.59**
☐6 £**1.30**–£**1.49** ☐12 £**2.60**+

Q 10 How many eggs does your household usually consume per week?

☐ **eggs per week**

Imaginary Shopping

We would like you to consider your usual visit to the grocery store/supermarket intended to buy eggs. In such a shopping trip we are faced with various brands of eggs that differ in quality, price, animal welfare and health standards.

Similarly, in the questions below we would like you to compare the brand of eggs you typically buy against other options we will be describing to you. Each brand of eggs differs in some or all of the following characteristics.

Living conditions of hen: This refers to the living conditions or animal welfare standards provided to each hen, e.g., *free-range hens or hens raised in usual 'battery' cages.*

Pesticides: This refers to the amount of artificial pesticides and fertilisers used in the production of the crops fed to hens. These amounts may vary across brands, e.g., *used or non-used.*

GM content: This refers to the amount (percentage) of GM content in chicken feed. This percentage may differ across brands, e.g., *Non-GM diet* (*0% GM content in the chicken feed*).

Information: This refers to whether a box of eggs has detailed information or certification on quality, living conditions, safety and nutrition.

Price: This represents the total amount of money that you would have to spend to buy a box of **6** ***Medium*** sized eggs, e.g., *for £0.89.*

The imaginary shopping trip for eggs is presented directly below from Q16 to Q23. The table presents ***different brands*** *of* ***Medium*** *sized eggs and describes* ***THREE STEPS*** *to choosing your preferred brand.*

Step 1: *Compare the features offered by each of three options of eggs*

Q 16

	Option A	**Option B**	**Option C**	**Option D**
Living conditions	Cage	Free Range	Cage	I would buy my usual brand of eggs[b)]
Pesticides	No Use	Use	Use	
GM content	30%	30%	0%	
Information	Yes	Yes	Yes	
Price of 6 eggs	£0.38	£0.38	£0.78	
one of these	☐1	☐2	☐3	☐4
How many eggs do you consume weekly	Eggs	Eggs	Eggs	

b) This choice set referred to the own brand version. The no purchase version only differed in the format/wording of the opt-out alternative ("I would not buy any eggs"). Also respondents received a total of eight such choice sets.

Step 2: *Tick which option you would choose*

Step 3: *write how many eggs of your selected option you would consume weekly*

Environmental Concern

Q 25 Please indicate your strength of agreement or disagreement for each of the following statements from 1- 5, where 1 means ***strongly agree*** and 5 means ***strongly disagree.***

The earth is like a spaceship with very limited room and resources

Strongly agree ***Strongly disagree***

1 2 3 4 5

The balance of nature is very delicate and easily upset

1 2 3 4 5

The so-called 'ecological crisis' facing human kind has been greatly exaggerated

1 2 3 4 5

The welfare of animals produced for human consumption is as good as can be expected

1 2 3 4 5

I am satisfied that the additives in food today are not harmful to my health

1 2 3 4 5

Restaurants do not take enough care when handling foods

1 2 3 4 5

Of all the risks we have to face at the moment, that of food safety is rather insignificant

1 2 3 4 5

The use of GM in food production offers a solution for the world food problem

1 2 3 4 5

Government should spend more money on increasing food safety

1 2 3 4 5

Humans have the right to modify the natural environment to suit their needs

1 2 3 4 5

If a majority of people were in favour of GM food, it should be permitted

1 2 3 4 5

Even if GM food has advantages, it is basically against nature

1 2 3 4 5

GM technology should not be used even for medicinal purposes

1 2 3 4 5

Information about food safety and nutrition on food labels can be trusted

1 2 3 4 5

The public can avoid eating GM foods if they want to

1 2 3 4 5

Whatever the risks involved in GM food, we can avoid them if we really want to

1 2 3 4 5

If something went wrong with GM food, it would be a global disaster

1 2 3 4 5

Any adverse effects from GM foods are only likely to emerge in the distant future

1 2 3 4 5

The government carefully monitors the correct use of GM in the medical, agricultural and food sectors

1 2 3 4 5

Scientists are responsible when working with GM technology

1 2 3 4 5

Producers of GM crops take potentially harmful consequences to human health and the environment into account

1 2 3 4 5

Information about food safety and nutrition on food labels can be trusted

1 2 3 4 5

Humans are severely abusing the environment

1 2 3 4 5

When humans interfere with nature, it often produces disastrous consequences

1 2 3 4 5

Background Information

It would help us even further if you would tell us something about your self, so that we can see if we have interviewed a broad range of people. This information will remain strictly anonymous and confidential and will be used for statistical analysis only.

Q 26 Your sex

☐1 **Male** ☐2 **Female**

Q 27 Your age

☐1	**18–24**	☐4	**45–54**	☐7	**75–84**
☐2	**25–34**	☐5	**55–64**	☐8	**85–94**
☐3	**35–44**	☐6	**65–74**	☐9	**95+**

Q 28 How many people are there in your household, including yourself?

☐

Q 29 Of them, how many are 16 years of age or younger?

☐

Q 30 What are the *first four* digits of your post-code?

☐☐☐☐

Q 31 How often does your household do the following?

Make a detailed shopping list before going grocery shopping

Never		***Sometimes***		***Always***
1	**2**	**3**	**4**	**5**

Use a water purifier or buy bottled water

1	**2**	**3**	**4**	**5**

Buy organic food

1	**2**	**3**	**4**	**5**

Eat fast foods or ready-made meals

1	**2**	**3**	**4**	**5**

Take dietary supplements

1	**2**	**3**	**4**	**5**

Look at the labels on food packaging for information on nutrition and ingredients

1	**2**	**3**	**4**	**5**

Look at the labels on food packaging for information on food safety

1	**2**	**3**	**4**	**5**

Use coupons or special offers when buying food

1	**2**	**3**	**4**	**5**

Stock up on food items when they are on sale

1	**2**	**3**	**4**	**5**

Go to many stores to search for the best bargain when going grocery shopping

1	**2**	**3**	**4**	**5**

Q 32 Which of these educational levels have you completed?

- ☐1 **Primary School (up to 10 years)**
- ☐2 **Secondary School (up to 16 years)**
- ☐3 **Upper Secondary School (up to 18 years)**
- ☐4 **Professional qualification**
- ☐5 **University degree**

Q 33 Please indicate which income group best approximates your household income before tax.

	Per month	(Per year)		**Per month**	(Per year)
☐1	**Up to £499**	(Up to £5,999)	☐8	**£3,500–£3,999**	(£42,000–)
☐2	**£500–£999**	(£6,000–)	☐9	**£4,000–£4,499**	(£48,000–)
☐3	**£1,000–£1,499**	(£12,000–)	☐10	**£4,500–£4,999**	(£54,000–)
☐4	**£1,500–£1,999**	(£18,000–)	☐11	**£5,000–£6,999**	(£60,000–)
☐5	**£2,000–£2,499**	(£24,000–)	☐12	**£7,000–£8,999**	(£84,000–)
☐6	**£2,500–£2,999**	(£30,000–)	☐13	**£9,000–£14,999**	(£108,000–)
☐7	**£3,000–£3,499**	(£36,000–)	☐14	**Over £15,000**	(Over £180,000–)

Simply post your completed survey in the freepost envelope and separately post your confirmation postcard (no stamps needed) and have a chance of winning a

GIFT VOUCHER WORTH £50

Enter date ___/___/___ (dd/mm/yy)

Appendix 2–Survey material

The Possible Positive and Negative Sides of GM Foods

Genetically Modified (GM) foods come from crops whose DNA has been modified. This DNA modification usually involves the transfer of genes between species in order to create a 'better' plant or animal species.
Genetic engineering even allows the transfer of genes from animals to plants and vice versa. The first genetically modified plants were produced in 1983 and the first modified whole food entered the market in 1994.




PERCEIVED POSITIVE SIDE OF GM FOODS

The nutrition in food can be improved
This means that
GM foods may have more vitamins and minerals.
GM foods may benefit undernourished people in poor countries.

Food may contain less fat
For example, GM potatoes may absorb less oil.

Food may become come more tasty
For example, GM strawberries may be much tastier than regular strawberries.

Farmers may have higher yields
This means that
The cost of GM-foods may be lower.
More food may reach people in poor countries.

Less pesticides required to grow crops
This means that food safety and the environment may be improved.

More profits for farmers and agriculture industry
Food variety will increase since genetic engineering offers endless possibilities for new crops

Concerns about food safety and health
This means that cultivating and consuming GM crops may imply
risk of developing new allergies.
risk of developing resistance to antibiotics.
risk of new viruses and mutations.
risk of creation of 'super-weeds' that can't be easily controlled.
risk that genetically modified species will prevail over non-GM species. This may lead to the extinction of non-GM species.
Some people believe the growing GM crops are ethically wrong because humans are "Playing God".

Food taste may become worse
For example, GM strawberries may loose their flavour or taste differently from non-GM strawberries.

Food variety may decrease since all food may become uniform
For example, all varieties of apples may look and taste the same.

Gift voucher post-card

WIN a £50 gift voucher

Your answers to this survey will be anonymous since there is no name or identification number on the questionnaire. After you return your questionnaire to us, please send separately this positive-card. That will tell us that you don't need any further reminders and at the same time you will be maintaining your anonymity. Your name will be included in a lottery with the chance of winning **£50 gift voucher*.** Thank you for your co-operation.

Name _____

Address _____

Postcode _____

Please tick the box ☐ if you would like us to send you the results of this study.

☐ ☐ ☐ ☐ (FOR OFFICE USE ONLY)

* One in every 100 participants is a winner! Winners will be notified by CSERGE administration by the 20th of December 2001.

Cover letter for first wave:

Dear Friend,

I am pleased to inform you that your household has been selected to participate in a national study that seeks to obtain ***people's opinions on genetically modified foods.***

In the past few years there has been considerable discussion about food safety in general and about genetically modified (GM) foods in particular. GM foods come from crops whose DNA has been modified. Both the public authorities and consumers have been concerned with the possible consequences (both positive and negative) of GM foods on food safety, taste, and nutrition as well as on human health and on the environment. The UK parliament along with all local governments are currently reconsidering the nation's policy on whether to allow such foods to be sold in this country. ***Hence, it is very important that the public's views and concerns about such foods are made known to the authorities before they make any decisions.***

The aim of the study is exactly, this, namely to inform the government on people's opinions about GM foods. This study is conducted by the Centre for Social and Economic Research on the Global Environment (CSERGE). The centre is an independent institution based in the University College London and is the UK's leading research centre on environmental and health issues.

Your household is one of a small number in which people are being asked to express their views on GM foods. It was drawn as part of a random sample of the entire country. ***By completing and returning this survey you have the chance to voice your opinion about the use of GM foods.*** In order that the results will truly represent the thinking of the UK people, it is important that each questionnaire be completed and returned. We would like the questionnaire to be completed by the member of your household that usually does the grocery shopping. Please use the self-addressed envelope included in this pack to return the completed questionnaire. No return postage is required.

You may be assured of **complete anonymity** and **confidentiality** since your name and address are not to be put on the questionnaire or the return envelope.

Together with this questionnaire we have included a **gift-pen** as a small token of our appreciation. We have also included a post-card which allows you to participate in a lottery to win a **gift voucher worth £50.** To participate in this draw simply complete the details on the post-card and post it separately from the questionnaire (no return postage or envelope required). That will tell us that you don't need any further reminders and at the same time you will be maintaining your anonymity. You may also indicate on the post-card if you would like us to send you the results of this national study.

Please try to **respond within the next week** so we won't have to send you any reminders.

I would be most happy to answer any questions you might have. My contact details are provided below.
Thank you for your assistance.
Yours sincerely,

Professor David W. Pearce, O.B.E, D.Sc, M.A., PhD.
Project Director

UCL C|S|E|R|G|E

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Reminder letter:

Dear Friend,

Last week a questionnaire seeking your opinion genetically modified (GM) foods was mailed to you. Your name was drawn in random from a random sample of households in the UK. If you have already completed and returned it to us please accept our sincere thanks. If not, please do so today. Because it has been sent to only a small, but representative, sample of UK households it is extremely important that yours also be included in the study if the results are to accurately represent the opinions of the UK public. We would like the questionnaire to be completed by the member of your household that usually does the grocery shopping.

Yours Sincerely,

Professor David W. Pearce, O.B.E, D.Sc, M.A., PhD.
Project Director

Appendix 3–LIMDEP code developed for programming RP logit

```
READ; File=C: \***.xls
        ; Nvar=35  ; Nobs=8640  ; Format=xls  ; Names $
?? Set up data
?? Define variables
?? Exclude missing data

        ?=================================?
        ?              MNL Model            ?
        ?=================================?

NLOGIT
        ; Lhs=Choice,NIJ ,ALTij
        ; Choices=opt1, opt2, opt3, opt4
        ; Model:
        U (opt1, opt2, opt3)=ASC+BLC*LC+BPEST*PEST+BGMCONT*GMCONT
                             +BIMFORM*INFORM+BPRICE*PRICE/
        U(opt 4)=BLC*LC+BPEST*PEST+BGMCONT*GMCONT
                             +BIMFORM*INFORM+BPRICE*PRICE$
        ?=================================?
        ?              RPL Model            ?
        ?=================================?

DISCREETE CHOICE
        ; Lhs=Choice, NIJ, ALTij
        ; Choices=opt1, opt2, opt3, opt4
        ; RPL=BLC,BPEST,BIMFORM,BGMCONT
                        ? excluding ASC1,BPRICE from RM
        ; Pts=500
        ; Fcn=BLC (N), BPEST (N), BIMFORM (N), BGMCONT (N)
                        ? excluding ASC1 (N), BPRICE (N)
        ; Model:
        U (opt1, opt2, opt3)=ASC+BLC*LC+BPEST*PEST+BGMCONT*GMCONT
                             +BIMFORM*INFORM+BPRICE*PRICE
                             +BINT1*INT1+BINT2*INT2+BINT3*INT3
                             +BINT4*INT4+BINT5*INT5+BINT6*INT6
                             +BINT7*INT7+BINT8*INT8+BINT9*INT9/

        U (opt 4)=BLC*LC+BPEST*PEST+BGMCONT*GMCONT
                             +BIMFORM*INFORM+BPRICE*PRICE
                             +BINT1*INT1+BINT2*INT2+BINT3*INT3
                             +BINT4*INT4+BINT5*INT5+BINT6*INT6
                             +BINT7*INT7+BINT8*INT8+BINT9*INT9$
STOP$
END$
```

選択実験における「選択外」オプション形式の影響評価

―― 食品における遺伝子組換え飼料含有率と生産情報に対する消費者選好 ――

アンドレアス・コントレオン*　　矢部光保

要　　旨

表明選好法による選択実験では，属性の異なる商品や選択肢から回答者が最も望ましいと思うものを選択するか，順序をつける。そのため，注目する属性とその水準の設計がこれまでの主たる研究課題であった。他方，提示された商品群から「選ばない」というような選択外オプション（opt-out）もまた，計測結果に相当の影響を与えることが，近年，知られるようになり，新たな研究課題となってきている。

代表的な選択外オプションとしては「買わない」と「いつものものを買う」の二つが挙げられる。本研究では，鶏卵の飼料に含まれる GMO 含有率や生産情報を商品属性とし，サンプルを 2 分して，この 2 種類の選択外オプションの影響を比較分析する。なお，「いつものものを買う」という設問のあるサンプルでは，回答者が日常的に購入している鶏卵の情報を収集してコード化し，効用水準の推計に使用した。調査対象は英国消費者 2000 世帯であり，2001 年 11 月～12 月にかけて調査を実施したものである。

分析結果として，①仮想的な属性の卵，②代表的な属性の卵，さらに選択外オプションとして，③「買わない」と ④「いつもの卵を買う」を比較した場合，消費者は ④「いつもの卵を買う」というオプションを最もよく選び，次いで②実際の卵のオプションを選んだ。また，ランダムパラメータ・ロジットモデルの推計結果から，「いつもの卵を買う」方が，「買わない」というオプションを含むデータセットよりも，統計的に有意なパラメータの数が 2 倍程度多く推計された。したがって，これらのことから，プロファイルデザインの設計において，顕示選好データと現実的選択肢の利用の重要性が示唆された。

計測結果の政策的含意については，遺伝子組換え飼料による卵は回避される傾向のあること，また，認証等の生産情報については，高付加価値の卵では評価されるが，低付加価値の卵ではあまり評価されないことが明らかになった。特に，後者については，価値の低い食品の場合，認証等の生産情報もあまり価値が無いことを意味しており，現在検討が進められているトレーサビリティの導入において，その費用対効果や商品選択の議論に対し，有益な視点を提供するものと思われる。

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