RAND EUROPE

Consumers' Responsiveness to Alcohol Multi-buy Sales Promotions

Results from a Stated Preference Choice Experiment

Charlene Rohr, Jennifer Rubin, Eleanor Winpenny,
Andrew Daly, Hui Lu, Stephane Hess, Peter Burge

HM Revenue & Customs Research Report 263

The research described in this report was prepared for HM Revenue & Customs. The views in this report are the authors' own and do not necessarily reflect those of HM Revenue & Customs.

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Preface

RAND Europe, in collaboration with Research Now, was commissioned by HMRC to undertake a stated preference choice experiment to gain a better understanding of how the presence of multi-buy sales promotions affects consumers' purchasing behaviour of alcohol products. Alcohol pricing is considered by some to be a potential means of influencing levels of alcohol consumption. However, alcohol pricing is a sensitive policy issue, with those in favour of price regulation arguing that it has the potential to reduce harms from overconsumption of alcohol, and those against emphasising the need to limit the impact on those who drink alcohol in moderation. In this project we do not undertake a policy assessment of the range of options available for alcohol pricing, other forms of alcohol regulation or other possible levers for influencing the purchasing or consumption of alcohol. Instead, the scope of the project is specifically to examine the impact of multi-buy promotions on consumers' purchasing behaviour.

RAND Europe led the project, designed the surveys and analysed the results. Research Now managed the data collection, using their online survey panel. The study was conducted between September 2012 and January 2013.

This report describes the key aspects of the study – the survey development, including the design of the choice experiments, the data collection methodology and the model analysis and findings. A key challenge for the model analysis was taking account of competition between different alcohol products as well as reflecting purchased amounts. We developed Tobit and Heckman regression models and more complex multiple discrete-continuous extreme value (MDCEV) models to quantify the impact of pricing changes and promotions on consumers' stated alcohol purchases. We then used these models to produce alcohol price elasticities and measures of the impact of multi-buy promotions.

The report may be of interest to policymakers or researchers who are interested in pricing impacts on alcohol purchasing and the use of choice modelling methods.

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Summary

The objective of this study was to gain a better understanding of how the presence of multi-buy sales promotions affects consumers' purchasing behaviour. The focus of the research is off-trade alcohol purchases, that is purchases of alcohol made for consumption off the premises where the purchase has been made, i.e. supermarkets, off-licences, online, etc., as opposed to restaurants, pubs and clubs, for example. The research will contribute towards assessing the impact of removing alcohol promotions on the volume of alcohol purchased, and this will be used to help estimate Exchequer impacts.

Because of the time constraints of the study, we have relied on stated preference choice experiments[1] to measure consumers' responses to pricing and promotions. Ideally this work would be checked and calibrated against revealed choice behaviour[2], for example through examination of detailed market data of observed choices.

We developed a survey and choice experiment to test the impact of alcohol pricing and promotions on respondents' alcohol purchasing decisions. The requirement for 300 interviews for each of four alcohol consumption segments led to a two-stage recruitment methodology, whereby a screener survey was undertaken with a large online panel of respondents representing the age, gender, socio-economic group and regional distributions of the national population to identify potential respondents in each consumption segment. Respondents were then drawn from each consumption segment to participate in the main survey.

A number of important assumptions were necessarily made during the development of the choice experiments and a number of these have implications for the findings:

- For realism, we asked respondents to consider purchases that they made themselves (for themselves and their household where relevant)
- We asked respondents to consider a four-week purchase period

[1] In stated preference choice experiments survey respondents are asked to choose products in a series of hypothetical scenarios. Each product in the choice scenario is described by a set of attributes and levels, for example the price of the specific product and whether it is on promotion. Principles of experimental design are used to define the combinations of attribute levels to present within the survey such that the resulting data can quantify the impact of these attributes and levels from the (stated) choices made by respondents.

[2] Revealed choice behaviour is choice behaviour made by consumers in a real-world setting, for example, detailed purchase data of alcohol products, in which they reveal their preference by their purchasing behaviour.

- We tested purchasing for three types of wine and two types of beer in the experiments, as well as for spirits, i.e.:
    - Wine A: Less expensive wine (less than £5.00), 750ml bottle
    - Wine B: Mid-price wine (between £5.00 and £10.00), 750ml bottle
    - Wine C: More expensive wine (more than £10.00), 750ml bottle
    - Beer A: Beer/ale/bitter/cider, per can
    - Beer B: Premium beer/ale/cider, per bottle
    - Spirits, 750 ml bottle.

The presentation of the choice experiments drew on the visual presentation of two supermarket shelves. On one shelf were the six types of (generic) alcohol products, none of which were on promotion. Each was described by the type of alcohol and a price. The second shelf contained promotion items. Each promotion was described by the type of promotion, the total cost and the amount saved for each offer. The order of the shelf presentation was randomly varied across respondents.

Given the sample sizes and requirements for robust modelling, we judged that it was feasible to test a maximum of three promotions for each type of alcohol. In order to reduce the complexity of the choice scenarios for respondents, we never tested more than three promotions in a specific choice scenario, which means that individual respondents were never presented with all promotion types simultaneously.

From the data collected from the choice experiments, we developed a number of different models to explain the importance of multibuy promotions on alcohol purchasing behaviour as measured in the stated preference choice experiments – these models treated competition between products differently. Specifically we tested Tobit and Heckman regression models for each alcohol type separately and multiple discrete-continuous extreme value (MDCEV) models that include all choices – discrete and continuous – simultaneously, to quantify the importance of price and multi-buy promotions on respondents' stated purchases.[3] We then applied these models to the weighted survey sample to reflect a nationally representative sample across consumption, age, gender and region and produced price elasticities and quantified the impacts of promotions tested in the experiments.

Key findings

Promotions have a large impact on which alcohol products consumers purchase, but the overall impact on all alcohol purchases is smaller

We have quantified the impacts of a number of different promotion types tested in the choice experiments on purchasing. Most of these tests reflect the impact of the introduction of a single promotion, for example the impact of a 3-for-2 promotion on a specific type of wine. When measuring the impact of the promotion, we measure the

[3] The main report contains detailed descriptions of the assumptions and characteristics of the Tobit, Heckman and MDCEV models. Please see page 22 onwards, Chapter Three.

impact as a result of the reduction in price as a result of the promotion and the "psychological" impact of the promotion (measured in the models through price sensitivity terms and constants reflecting the impact of the different promotion types, respectively). All tests reflect the impact of multi-buy promotions relative to a baseline at full (non-promotion) prices.

We see from these tests that the impact of individual promotions, particularly on the demand for the specific alcohol product, is large, i.e. that if there is a 3-for-2 promotion for a specific type of wine, more consumers will purchase that type of wine. However, because consumers switch between different products, the impact on the total number of alcohol units purchased across all products is less. That is, if consumers purchase more wine because of a promotion, they will purchase fewer other products.

From the MDCEV model results, we see that individual promotions on less expensive wine and less expensive beer tend to lead to an increase in the total units purchased, while individual promotions on expensive wine and beer lead to more purchases of these items at the expense of cheaper counterparts and therefore a smaller increase (or even a small reduction) in total units purchased. For spirits, the application of individual promotions always led to an increase in the total units purchased because of the high number of units per bottle.

However, real-world markets reflect a number of different competing promotions at the same time, and the single product tests may overstate the impact of a promotion. We have therefore also undertaken a scenario test to examine the impact of removing a package of promotions, specifically promotions for all wine ('3 for 2') and beer ('8 for 6') options (but not spirits), broadly reflecting the types of promotions currently available in the market. However, we caution that these tests may also overstate the impact of promotions, because it is not known to what extent all promotions would be presented simultaneously in the market place.

The following table summarises the predicted impacts of removing these promotions. We emphasise that these are estimates of the impacts and the values themselves should not be taken as accurate "point" predictions, but rather an estimate of the approximate size of the expected impacts, given the caveats noted. Moreover, the results reflect those produced from the MDCEV models, which are judged to best represent potential switching across products, but which may overestimate the impacts for reasons discussed below. In the main body of the report, we also present results from Tobit and Heckman models, which have more limited representation of competition, and could be considered as lower-bound estimates.

The results show the impact of removing promotions on each specific alcohol type, the general alcohol category (wine, beer or spirits) and overall across all alcohol purchases. The reported figures reflect the proportional change on demand, i.e. measured as the 'change in demand / demand with promotions'.

Table S.1 Impacts of removing packages of beer and wine promotions (proportion reduction relative to situation with promotions)

	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
MDCEV						
Wine A – 3 for 2	-0.58	-0.42				
Wine B – 3 for 2	-0.75	-0.64	-0.63	-0.53		
Wine C – 3 for 2	-0.93	-0.89			-0.48	-0.37
Beer A – 8 for 6	-0.61	-0.44	-0.62	-0.47		
Beer B – 8 for 6	-0.67	-0.52				
Spirits – 2 for 90%	2.33	2.33	2.33	2.33		

Source: Based on MDCEV model results

With the removal of beer and wine promotions, reductions in purchasing are predicted for all wine markets – the smallest reduction in the cheapest wine category (Wine A), followed by medium-priced and more expensive wine (Wine B and Wine C, respectively) – and also both beer markets. The models predict an increase in the purchasing of spirits, as a result of the relative increase in price of all other items when promotions are removed (the price of spirits remains unchanged because they were not assumed to be on promotion in the scenario test). The models predict a larger reduction in units purchased compared to expenditure (because the price of each unit is higher as a result of the removal of promotions).

Overall, when the package of promotions for wine and beer products is removed the MDCEV models predict a 48 percent reduction in purchasing of alcohol units and a 37 percent reduction in expenditure.

We caution that the predicted impacts are likely to be an overestimate of real-world impacts for a number of reasons, including that:

- The models are based on stated responses, specifically on stated preference choice experiments where the focus was on promotions, whereas in real-world shopping environments consumers will be subject to many different promotions and stimuli. Moreover, these responses are likely to reflect short-term choices, and it is not clear how behaviour over the longer term would develop (e.g. changes in consumer behaviour and / or retailer behaviour).
- The surveys were undertaken close to the Christmas period, when multi-buy alcohol promotions may have been more attractive to respondents – although it is noteworthy that the reported spending in the choice experiments was very similar to that reported for the four weeks previous to the survey.
- In the stated preference choice experiments we presented generic (unbranded) alcohol products and this may have had an impact on some respondents' decisionmaking, since these would be unfamiliar when compared with the brands generally purchased.
- Because of the technical properties of the MDCEV model, specifically assumptions about cross-elasticities between products in the multinomial model assumptions (as a result of the independent and identically distributed (IID)

property of the models), it is likely to overestimate the impacts of promotions[4]. The Tobit and Heckman models may be less likely to lead to overestimates of impacts, as a result of their model structure, but the predicted impacts from these models are still subject to the points raised above.

- As noted above, the single-product promotion tests are likely to overestimate the impacts of these promotions on individual products, because they do not reflect real-world market conditions which may include a number of different competing promotions at the same time. Moreover, the package tests may also overstate the impact of promotions because it is not known to what extent all promotions would be presented simultaneously in the market place.

Background evidence also collected in the survey supports that respondents thought that multi-buy promotions were important. We emphasise that these findings cannot be considered as robust representations of wider population behaviours, because of the nature of the sampling method (relying on internet panel data and the data reflecting quota-based sampling), and thus they should only be treated as indicative. However, they provide some interesting insights for this sample of individuals. Across all respondents nearly 25 percent indicated that they always buy more if there is a multi-buy discount offer, with a further half indicating that they occasionally buy more if there is a multi-buy offer. Harmful drinkers were more likely to report that they buy more with the presence of a multi-buy offer. Furthermore, nearly half of the consumers in this study agreed or strongly agreed that it was worth waiting for or shopping around for multi-buy offers on alcohol drinks, and that they frequently did so.

Review of the background questions after the experiments suggested that respondents treated the experiments seriously and with due consideration. Moreover, the resulting price elasticities seem to be, generally, of the same order of magnitude as other reported values, although it is difficult to make direct comparisons because of differences in study scope (on-trade vs. off-trade) and lack of clarity of output measures (units, monetary expenditure, consumption, etc.) in other studies.

Finally, we note that the model results tend to show higher price elasticities and relative impacts for moderate drinkers compared to hazardous and harmful drinkers (and this is

[4] For this study we only tested multinomial model structures, where promotion and non-promotion items are represented as separate alternatives, equally competitive with each other and other types of alcohol. A key property of multinomial models is that the unexplained model error across alternatives in the model is independent and identically distributed (IID). Practically, this means that for any two alternatives, the ratio of their choice probabilities in the model is unaffected by the presence or absence of any other alternatives in the choice set. In practice, however, we find that some alternatives are more 'similar' and therefore are closer substitutes than others (not IID). For example, we hypothesise that this is probably true for promotion and non-promotion options of a specific type of alcohol, where we would expect higher cross-elasticities (i.e. higher levels of switching), for example between a promotion and non-promotion product of the same type of alcohol product. By elasticity we mean the amount that demand changes (in this case amount of alcohol units) as a result of a change in a variable, e.g. how the amount of beer purchased is impacted by the price of beer. By cross-elasticity we mean the amount that demand changes (in this case amount of alcohol units) as a result of a change in price for another product, e.g. how the amount of beer purchased is impacted by the price of wine.

consistent with the findings of others, e.g. Fogerty (2004)).[5] However, because hazardous and harmful drinkers purchase much higher volumes of alcohol, the absolute impact on these groups will be higher.

Different model assumptions lead to different estimates of the impact of promotions

The MDCEV models allow for better representation of the competition between alcohol products, which is not measured as well in the single-product regression models, i.e. Tobit and Heckman models. Thus we get a better representation of how multi-buy promotions impact on the purchasing of other alcohol products and total alcohol purchases. Moreover, the MDCEV models better represent choices where multiple options are chosen – and in the stated preference experiments around 42 percent of respondents made purchase choices that included more than one alcohol type within a specific choice scenario. Furthermore, the MDCEV models also explicitly consider the impact of an available maximum budget for purchases, so that competition between products is again better represented. And because the MDCEV models explicitly represent promotion choices, they accurately reflect the pricing of promotions in estimates of the impact on expenditure. Lastly, the MDCEV models additionally represent the effect of satiation, i.e. that the marginal utility of additional purchases declines as more of a given product is purchased.

However, within the timescale of the study, it was feasible to develop models with multinomial structures only, with promotion and non-promotion items being represented as separate alternatives, equally competitive with each other and other types of alcohol. A key property of multinomial models is that the unexplained model error across alternatives in the model is IID, and this property means that the impact of introducing promotions is likely to be overstated. Without undertaking further modelling work, it is difficult to say by how much.

On the other hand, the Tobit and Heckman models are likely to underestimate the impact of promotions, because of the limited representation of competition in these models.

For these reasons we recommend that the results from the MDCEV models be treated as maximum estimates of the impacts of promotions on alcohol purchasing, and that sensitivity tests be undertaken using the lower values provided by the Tobit and Heckman models.

Key points for interpretation of results

Below we clarify some important points regarding interpretation of results from the study.

Quantifying the impacts of promotions

The choice experiments tested the impact of changes in prices (increases and reductions) and the presence of promotions (some choices had promotions, others did not) on purchasing behaviour. This presentation reflects what happens in reality – sometimes there are promotions on items at supermarkets and sometimes there are not. Thus, we measure the impact of a promotion on purchasing behaviour generally, with no specific directional effects, e.g. by introducing or banning promotions.

[5] Moderate drinkers are defined as men who on average consume up to 21 units per week and women who on average consume up to 14 units per week. Hazardous and harmful drinkers are defined as those who on average consume more than these levels.

Household versus individual elasticities

During the design of the experiments much thought was given to whether to ask individuals to consider their own alcohol purchases or whether to ask them to estimate purchases for the household. Given that the survey for this study was undertaken with one individual in the household, it was felt that it was unrealistic to ask respondents to report purchasing by all members of the household. We also considered focusing on only those who were the main household purchasers; however, since this study was intended to examine the purchasing behaviour of different groups of people in the population, this could have led to sample biases, for example towards women or away from young people or those drinkers with hazardous or harmful consumption levels. For these reasons, we interviewed adults about their own purchases only (although these may have included purchases for others in the household). The resulting models therefore reflect the influence of prices and promotions as well as the socio-economic characteristics of the individual and household on individuals' alcohol purchases.

Extrapolating what we know about purchasing to consumption

In this study the primary outcome assessed was alcohol purchasing. The quantity of alcohol purchased varied with the price of alcohol and the discounts offered. However, the data available from the choice experiments do not tell us directly what effect changes in purchasing will have on alcohol consumption.

The linkage between purchasing and consumption is not well reported in the literature. Purshouse et al. (2010) in their work estimating the effect of alcohol pricing policies equated purchasing and consumption. In an earlier paper this assumption was tested by comparing beverage preferences between subgroups in each survey. This comparison showed a good match overall, although they found that older females purchased a greater proportion of beer and spirits (in the Expenditure and Food Survey (EFS)) than they consumed (measured in the General Lifestyle Survey (GLF)), probably because they were purchasing for the household, rather than for themselves (Meier et al., 2009).

In our survey we also included qualitative questions on the likely impacts of changes in purchasing on consumption. In particular we presented respondents who indicated that their alcohol purchasing was influenced by multi-buy promotions (n = 932, 73.7 percent of the sample) with five statements about alcohol purchasing and consumption and asked whether any of these applied to them. Whilst we would recommend that these statements should be interpreted with caution because they rely on self-reported behaviour, we observed that in general respondents stated that purchasing more alcohol as a result of a multi-buy offer would cause them to purchase less in the future, leave a longer time period until the next shop and that the purchase would last longer. However, harmful drinkers were significantly more likely than others to state that purchasing more alcohol would increase the amount they drank, and less likely than others to state that the purchase would last longer or that there would be a longer time period before the next shop.

Abbreviations

ABV	Alcohol By Volume
EFS	Expenditure and Food Survey
EV	Extreme Value
GLF	General Lifestyle Survey
H&H	Hazardous and Harmful drinkers
HMRC	Her Majesty's Revenue and Customs
IID	Independent and Identically Distributed
MDC	Multiple Discrete-Continuous
MDCEV	Multiple Discrete-Continuous extreme value
NGO	Non-Governmental Organisation
ONS	Office for National Statistics (UK)
RTD	Ready-To-Drink
SDS	Supply Distribution System (survey responses)
SEG	Socio-Economic Groups
SP	Stated Preference

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CHAPTER 1 Background

The objective of this study was to gain a better understanding of how the presence of multi-buy sales promotions affects consumers' purchasing behaviour. Alcohol pricing is considered by some to be a potential means of influencing levels of alcohol consumption (Anderson et al., 2009; Purshouse et al., 2010). However, alcohol pricing is a sensitive policy issue, with those in favour of price regulation arguing that it has the potential to reduce harms from overconsumption of alcohol, and those against emphasising the need to limit the impact on those who drink alcohol in moderation. In this project we do not undertake a policy assessment of the range of options available for alcohol pricing, other forms of alcohol regulation or other possible levers for influencing the purchasing or consumption of alcohol. Instead, the scope of the project is specifically to examine the impact of multi-buy promotions on consumers' purchasing behaviour. By multi-buy promotions we refer specifically to promotions where there is a link between the number of products purchased and the price of the product, for example 'two for the price of one', 'three for the price of two' or the purchase of more than one item for a fixed price discount.

The focus of the research is off-trade alcohol purchases, that is purchases of alcohol made for consumption off the premises where the purchase has been made, i.e. supermarkets, off-licences, online, etc., as opposed to restaurants, bars and clubs, for example. The research will contribute towards assessing the impact of removing alcohol promotions on the volume of alcohol purchased, and this will be used to help estimate Exchequer impacts.The effect of banning multi-buy promotions is of primary importance, although we also incorporate simple price effects to allow us to check that the model is performing satisfactorily. The design of the experiment was influenced by previous econometric modelling research conducted by HMRC (see Collis et al., 2010, briefly described in Box 1.1).

Box 1.1: Econometric Analysis of Alcohol Consumption in the UK (Collis et al., 2010)

This study produced price elasticities for on-trade (purchases in pubs, hotels and restaurants) and off-trade (purchases from supermarkets and off-licences) alcohol purchasing across five major product categories: Beer, Wine, Cider, Spirits and Ready-to-drink drinks. Tobit models are used to estimate models of purchasing behaviour using data from the Expenditure and Food Survey. The motivation for using Tobit models was because of the large numbers of zero consumption observations reported in the survey.

Two dependent variables were tested in the modelling: the volume of each type of alcohol purchased and the expenditure share of each. The models with expenditure share performed better (in terms of model fit), and these were judged to give marginally more sensible results. Both linear and logarithmic formulations were tested, with logarithmic formulations performing better. Explanatory variables included in the model included prices (own prices and cross-prices for other alcohol categories), income levels and other socio-demographic variables.

A full set of elasticities are reported in Collis et al. (2010). The own-price elasticities are all negative and are highly significant. The income elasticities also appear to be sound.

These models do not, however, incorporate any information on promotions (the prices in the models reflect average prices by product). Thus the current study will provide information on the specific impact of promotions.

For the current study, we rely on stated preference choice experiments to quantify people's responses to pricing and promotions rather than on observed (or reported) purchases, because analysis of the latter, through data commercially available from information and measurement companies such as Nielsen or Kantar, was not feasible within the short timescale for the study. It is also unclear to what extent these data sources contain the necessary information on promotions, or the detailed information about those making the purchases, for example their alcohol consumption levels, that was required for this study. We note that analysis of reported alcohol purchases has been undertaken by HMRC using data from the Expenditure and Food Survey (Collis et al., 2010), and although their models are able to quantify the impact of price on alcohol purchasing, they cannot quantify the additional impact of promotions because no information on whether the purchases were on promotion is available in the data.

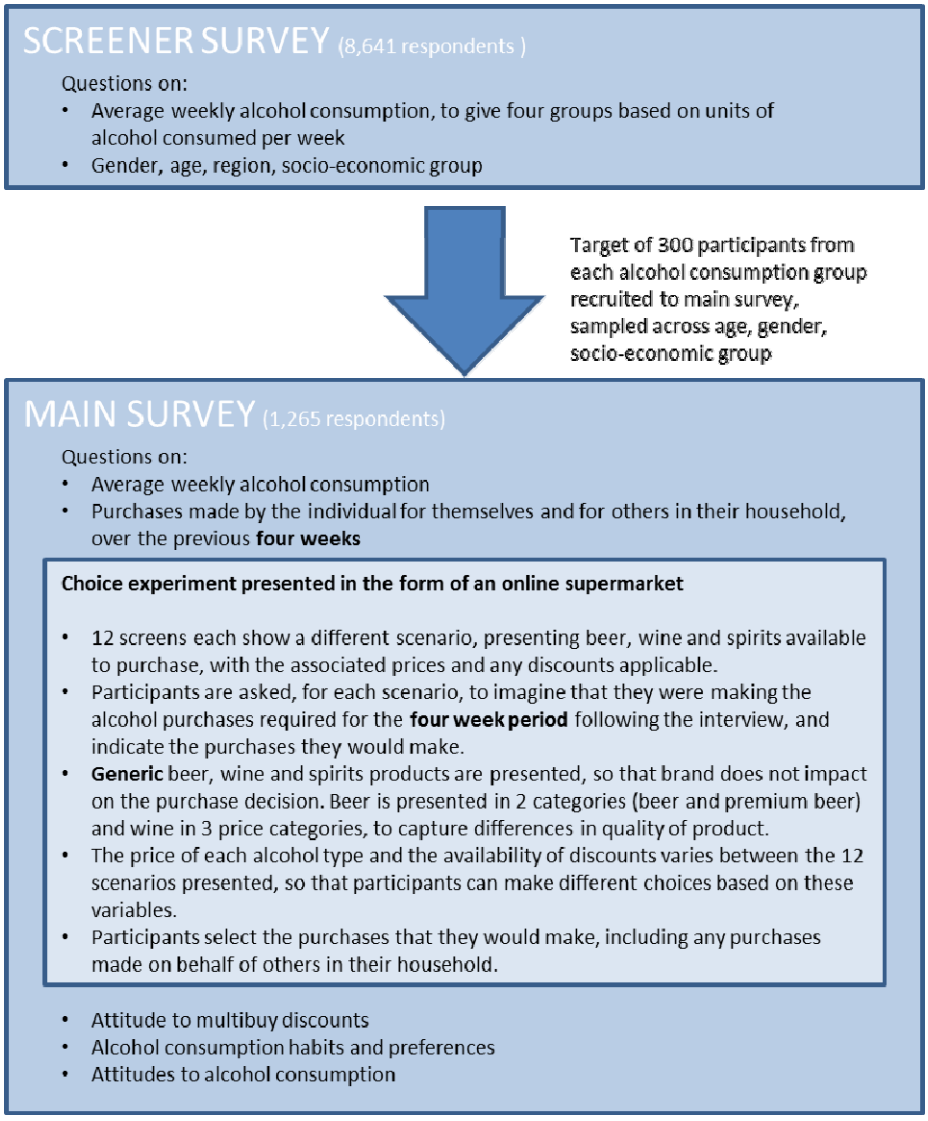
Therefore, in order to address HMRC's questions for this study, we undertook an online survey, collecting self-reported information on existing patterns of alcohol consumption and purchasing, and on response to multi-buy items. The survey also contained a stated preference choice experiment to examine potential responses to alcohol promotions. Within this experiment, respondents were presented with a number of hypothetical scenarios, with differing alcohol prices and multi-buy promotions, and asked to indicate what purchases they would make (and how many they would purchase).

The key aim of the study is to gain insight into how consumers' purchasing behaviour responds to multi-buy alcohol promotions. In the following chapters we describe the design and execution of the survey and experiments, the development of models to analyse the results, and the use of these models to quantify the impacts of multi-buy promotions on consumer purchasing of alcohol products. We conclude with key observations and conclusions from this work.

CHAPTER 2 Design of the survey and experiments

In this chapter we describe the structure of the survey and the choice experiments, and how they were implemented for this study.

Figure 2.1 Online survey approach



2.1 Survey sampling and methodology

The self-completion survey was undertaken with an online panel of respondents provided by Research Now.[6] The Research Now panel is a large on-line survey panel, which means that samples can be drawn from the panel which are representative of age, gender, socio-economic group and regional location at the national level. The size of the panel also allows sampling of low incidence and hard to reach groups. The sample will not, however, reflect a truly randomly drawn sample. Moreover, by the nature of online survey panels there will be a lack of representation of the population that is not online, which will mean that the study is unlikely to include some hard-to-reach groups. Thus, the results of the study will reflect purchasing behaviour from the panel sample, which broadly reflects the age, gender, social grade and regional characteristics of the nation, but the results will not necessarily reflect the behaviour of those underrepresented in the survey, for example within specific religious or ethnicity groups, or those without fixed abodes or internet access. Since purchasing behaviour is likely to be different across such groups, it is difficult to say how the exclusion of such groups would affect the study results.

In order to ensure that the survey sample for this study reflected consumers with differing levels of alcohol consumption, the study brief requested 300 interviews for four different consumption segments, reflecting Moderate A (low moderate), Moderate B (high moderate), Hazardous and Harmful consumption levels. These are defined in Table 2.1 below.

Table 2.1 Alcohol consumption quota categories and their distribution in England

Consumption group	Men		Women	
	Mean weekly units consumed	% in population	Mean weekly units consumed	% in population
Non-drinker		13		19
Moderate A	0-10 units	40	0-7 units	49
Moderate B	11-21 units	20	8-14 units	14
Hazardous	22-50 units	20	15-35 units	14
Harmful	51 units or over	6	36 units or more	3

Source: General Lifestyle Survey (2010), Office for National Statistics (ONS)

Because of the low prevalence of harmful drinkers in the population, a two-stage recruitment methodology was employed for the study. First, a screener survey was undertaken with a sample of respondents from the Research Now online panel, to identify

[6] Research Now has been providing high quality, proprietary, research-only online panels since 2001. The panels are used for market research purposes, and have been built through e-mail recruitment and online marketing to ensure that they are responsive, balanced and reliable. Panel participants are recruited through e-mail and on-line resources, with supplemental targeted ads and websites to ensure that the panel includes enough members from hard to reach populations, such as younger age groups. The panel is constantly being refreshed and extended, and has an attrition rate between 10% and 50% per annum (the attrition rate is defined as the percentage of panellists who voluntarily unsubscribe or who are unsubscribed by the panel team). Panellists are rewarded for taking part in surveys with a structured incentive scheme. A panel support team maintains the quality of the panel, ensuring that the panels comply with or exceed country-specific standards.

respondents in each consumption segment. A quota-based approach was used to obtain a sample that had similar age, gender and socio-economic group characteristics of the national population, and with the same regional distribution of the national population. In the second stage, respondents were drawn from each consumption segment to participate in the main surveys.

Because of limitations on the number of questions that could be included in the screener questionnaire, self-reported information on the respondent's consumption (in the previous week) was used to estimate their weekly consumption level. In the main survey, the more detailed Quantity-Frequency method was used to compute consumption levels (Goddard, 2007). The Quantity-Frequency method is the approach that is used for computing alcohol consumption levels in the General Lifestyle Survey (GLF).

During the screening procedure, we found survey response rates to be lower than expected, perhaps because the screening procedure was undertaken during the October half-term week, a week of school holiday in the UK (the screener survey was launched on Friday 26 October, 2012). Because of time pressures to complete the survey work, it was decided after 5 days of the screener survey being in the field that respondents who had indicated willingness to participate in other surveys being undertaken by Research Now but who were out of scope for those surveys would also be invited to participate in the screener survey (in addition to the Research Now panellists directly invited to participate in the screener survey). These respondents are referred to as 'SDS' ('Supply Distribution System') responses in this report. These responses were not included in the computation of incidence rates,[7] but were considered for participation in the main survey, depending on the sample sizes produced via the quota-based panel sampling approach. It is emphasised that the sampling in the main survey focused on the use of respondents recruited directly through the quota-based sampling approach (and 87.5% of respondents in the final sample were recruited via the initial quota-based invitations to the online panel as opposed to SDS participants, as is discussed below).

The screener survey was closed on Friday 2 November 2012. In total, 30,010 people from the panel sample were invited to participate in the screener survey. 4,399 (14.7 percent of those invited) individuals clicked on the link to respond to the survey, and 3,381 respondents (12.8 percent of those invited) completed the screener survey. 5,841 SDS respondents were also directed to the survey. Of those, 5,210 (89.2 percent) completed the screener survey. After data cleaning, 8,641 responses were provided to RAND Europe: 3,664 responses came from invites from the panel, 4,977 were SDS responses.

Incidence rates from the screener surveys recruited from the panel were compared with incidence rates obtained from the GLF for England. We found that the screener survey under-represented non-drinkers and over-represented Moderate B, Hazardous drinkers and Harmful drinkers when compared with the GLF. We also found that the screener survey under-represented young people and men more generally, which means that they will be less well represented in the model analysis.

[7] By incidence rates we mean the fraction of the sample within each alcohol consumption group.

In order to ensure that the main survey contained a large enough sample of respondents across different age, gender and socio-economic groups to allow testing of whether alcohol purchasing behaviour differed between these groups in each consumption category, respondents from the screener survey were sampled within four age categories (18–24, 25–44, 45–64 and 65+ years) and two gender segments, for each of the Moderate (A&B) and Hazardous consumption categories. Quotas were specified for each age and gender category for each alcohol consumption category (38 respondents for each age and gender segment, giving 304 respondents for each consumption category).We did not have enough respondents in the harmful drinkers category to allow sampling of respondents for the main survey, and therefore all were invited to participate in the main survey, as discussed below.

There was a delay in starting the main surveys because of the need to clarify definitions - specifically that we would focus on individuals' purchases rather than household purchases, as discussed in Section 2.2.1. This meant that the main survey work commenced on 22 November 2012 and that the main surveys were undertaken close to the Christmas period. This may have had an impact on purchasing decisions, since respondents may have been more likely to purchase alcohol products and have been more sensitive to multi-buy promotions.

Because of delays in launching the main survey, we assumed a 50 percent response rate for the main surveys, meaning that we were aiming for 600 respondents for each of the Moderate (A&B) and Hazardous consumption segments. For these segments, respondents from the screener survey in each of the age and gender categories were sampled to participate in the main surveys, giving priority to those respondents recruited through the quota-based invitations (as opposed to the SDS participants), and reflecting national SEG and regional distribution properties. For cells where there were too few respondents recruited through the quota-based invitations, SDS participants were also included. In cases where there were too few respondents obtained from both the quota-based sampling and including the SDS respondents, for example young men across a number of consumption segments, then all participants in the cells were invited to participate in the survey and the numbers invited for other cells were increased to ensure that the total number of surveys collected met the required number.

In total, 2,653 respondents were invited to participate in the main survey. As noted above, the sampling methodology prioritised respondents drawn from the panel sample in the screener survey (85.7 percent of observations were drawn from the panel sample as opposed to SDS respondents), but this was not possible for all age and gender segments. For example, SDS surveys were required to obtain as many young men as possible, although it was still not possible to obtain the numbers sought in the main survey (38 responses for each age, gender and consumption combination). This meant that it might be difficult to identify behavioural differences for these segments in the model development.

1,265 completed surveys were obtained, reflecting an overall response rate of 47.7 percent. The number of surveys in each age and gender segment for each consumption category is shown in Table 2.2.

Table 2.2 Number of observations by consumption and crossed age and gender segments

		18–24	25–44	45–64	65 plus	Total
Male	Moderate A	17	50	59	40	166
		(31.5%)	(25.0%)	(26.0%)	(26.7%)	(26.3%)
	Moderate B	5	33	48	45	131
		(9.3%)	(16.5%)	(21.1%)	(30.0%)	(20.8%)
	Hazardous	15	43	54	39	151
		(27.8%)	(21.5%)	(23.8%)	(26.0%)	(23.9%)
	Harmful	17	74	66	26	183
		(31.5%)	(37.0%)	(29.1%)	(17.3%)	(29.0%)
	Total	54	200	227	150	631
		(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
Female	Moderate A	38	40	53	51	182
		(33.3%)	(25.0%)	(24.8%)	(34.9%)	(28.7%)
	Moderate B	32	30	45	42	149
		(28.1%)	(18.8%)	(21.0%)	(28.8%)	(23.5%)
	Hazardous	26	41	70	33	170
		(22.8%)	(25.6%)	(32.7%)	(22.6%)	(26.8%)
	Harmful	18	49	46	20	133
		(15.8%)	(30.6%)	(21.5%)	(13.7%)	(21.0%)
	Total	114	160	214	146	634
		(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
Total	Moderate A	55	90	112	91	348
		(32.7%)	(25.0%)	(25.4%)	(30.7%)	(27.5%)
	Moderate B	37	63	93	87	280
		(22.0%)	(17.5%)	(21.1%)	(29.4%)	(22.1%)
	Hazardous	41	84	124	72	321
		(24.4%)	(23.3%)	(28.1%)	(24.3%)	(25.4%)
	Harmful	35	123	112	46	316
		(20.8%)	(34.2%)	(25.4%)	(15.5%)	(25.0%)
	Total	168	360	441	296	1265
		(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

* Percentages reflect column percentages

Because the main survey sample was selected to include a minimum number of participants from each consumption category rather than to be nationally representative across consumption or population characteristics, so that in the modelling we could test for behavioural differences across population segments, the survey responses were re-weighted in the computation of impacts of promotions, such that average characteristics across the population were replicated (see Appendix E for a detailed description of the weighting procedure).

For the main survey, respondents who did not consume alcohol, but who made purchases for others in the household, were included in the survey. Respondents who did not consume alcohol and who lived in households in which no alcohol was consumed were excluded from the main survey on the basis that the project budget was constrained and it was assumed that they would not be affected by promotions. Thus it could be argued that the research might understate the impacts of promotions on those who might be induced to start purchasing alcohol with more generous promotions.

2.2 Key assumptions in designing the choice experiments

Below we set out some of the key assumptions that were made whilst developing the choice experiments for this study.

2.2.1 Defining the decisionmaker

The experiment choices were presented in the form of an online supermarket. Respondents were asked to consider the purchases that they would make for themselves and others in their household for whom they would usually make alcohol purchases. We recognise that this is inconsistent with the structure of the HMRC model (Collis et al., 2010), which reflects purchases made by all individuals in the household, i.e. total household purchases. However, we note that the HMRC model uses detailed expenditure data from the Expenditure and Food Survey, which is usually undertaken as a face-to-face survey and uses a diary to collect purchases made by all adults in the household.[8] Given that the survey for this study was undertaken with one individual participant from the household, it was felt that it was unrealistic to ask respondents to report purchasing by all members of the household. This was decided on the grounds that in many households some household members would not know what other household members were purchasing. We also considered focusing on only those who were the main household purchasers; however, since this study was intended to examine the purchasing behaviour of different groups of people in the population, this could have led to biases, for example towards those who tend to be the most frequent household shoppers. Specifically, this could potentially bias the survey towards women or away from young people, or away from hazardous and harmful drinkers, for example.

For these reasons, we decided to interview adults about their own purchases only, but including purchases for others in the household if they usually made these. However, for households with multiple adults, we asked respondents to make an estimate of the proportion of the total household alcohol expenditure that they purchased, and we collected general information on other adults in the household, e.g. age, gender and approximate consumption level, to give us the option of approximating household purchasing if necessary.

2.2.2 Defining the period of purchase

Respondents were asked to imagine that they were making alcohol purchases for a fixed period following the interview.

We considered both two- and four-week periods, but judged that a four-week period was more appropriate for reasons set out below. First, the Expenditure and Food Survey (EFS) records volumes purchased and expenditure over a two-week period (Collis et al., 2010), and in that survey just over 30 percent of the sample indicated that they did not purchase any alcohol in the survey period. Although the EFS includes non-drinkers, estimated to be between 13 percent and 19 percent of the population, and the survey for this study would not include non-drinkers from non-drinking households, this still leaves a reasonably large proportion of respondents who would not be expected to make a purchase in a two-week period. This raised the concern that the combination of having a substantial number of respondents who would not consider making purchases in the stated period, with the limited sample sizes of the study, would lead to a reduction in the significance of the model parameters. To reduce this risk a longer purchasing period was considered

[8] Economic and Social Data Service (2012). Guide to Expenditure and Food survey [Online]. Available at http://www.esds.ac.uk/support/g33334.asp (Accessed on 4 June 2013).

preferable. Second, given that the aim of the study was to explore the impact of multi-buy offers on purchasing, we also felt that it was important to examine the importance of cross-product substitution, so it was important that respondents were able to imagine a situation in which they were making a number of purchases (and ideally multiple purchases). This requirement also suggested a longer purchasing period would be preferable.

On the other hand, we recognise that longer periods are likely to increase uncertainty about a respondent's ability to estimate what would be purchased. Therefore, to help respondents think realistically about their purchasing habits, we asked a number of detailed questions about their purchasing habits, in terms of volumes purchased, locations of purchases, etc., prior to the choice exercises.

On balance we felt that the arguments favoured the longer time period and thus opted for a four-week purchase period for the experiments.

2.2.3 Types of alcohol presented in the choice scenarios

The experiments were required to quantify the impact of multi-buy promotions on the purchasing of different alcohol products. The HMRC model reflects purchasing behaviour for five categories of alcohol: beer, wine, cider, spirits and ready-to-drink (RTD) drinks (Collis et al., 2010). We excluded RTD drinks from the experiment, on the basis that they account for a small proportion of the off-trade market (both in terms of volume and expenditure).[9] Moreover, the number of observations of RTD purchases in the much-larger EFS was small (4 percent of off-trade observations were RTDs). We also combined cider with beer, again on the basis that cider is a small proportion of the market, by expenditure, and that the number of observations in the EFS was small (5 percent of off-trade observations).

We judged that it was not feasible within the scope of this experiment to differentiate between alcohol brands, and we were concerned to avoid focusing on respondents' favoured brands only, on the basis that this would likely overstate the impact of promotions (for example, if only the respondents' favourite brands were presented as promotions). We therefore opted to present generic types of alcohol, although we recognise that while addressing some of the risks noted above this decision introduced others, in particular by reducing the realism of the experiment.

We incorporated three types of wine – a less expensive category (described as 'less than £5.00'), a mid-price category (described as 'between £5.00 and £10.00') and a more expensive category (described as 'more than £10.00') – so that the price would not be confounded with quality (a number of the websites we reviewed for wine prices used a similar structure). This also meant that we could quantify consumers' likelihood of trading up or down, depending on offers and prices. We incorporated two categories of beer – standard beer/ale (around £1 per can) and premium beer/ale (around £2 per bottle) – for the same reason.

In the experiment we therefore presented respondents with six types of alcohol products, which had prices that varied in the different scenarios:

[9] See Tables 6 and 7 in Collis et al. (2010).

- Wine:
    - Wine A: Less expensive wine (less than £5.00), 750ml bottle
    - Wine B: Mid-price wine (between £5.00 and £10.00), 750ml bottle
    - Wine C: More expensive wine (more than £10.00), 750ml bottle
- Beer:
    - Beer A: Beer/ale/bitter/cider, per can
    - Beer B: Premium beer/ale/cider, per bottle
- Spirits: 750ml bottle

The prices presented in the choice scenarios are described in Appendix A.

2.2.4 Multi-buy offers tested in the choice scenarios

We found little publicly available information on the frequency of different types of multi-buys for alcohol promotion. These data may be collected by commercial data companies, such as Nielsen and Kantar, and through Nectar and Tesco club cards. However, acquisition of such data was outside the scope for this study.

Looking at all promotions across major supermarkets, *The Grocer* magazine, a weekly magazine for the consumer packaged goods sector, reported in July 2012 that multi-buy promotions in the format of a fixed number for a specific price (on promotion) accounted for 26.9 percent of all deals and that 'Tesco and Waitrose ran the highest proportion of multi-buy deals, with x-for-y promotions or bogofs [buy one get one free] accounting for 38.7% and 43.7% respectively'.[10]

A review of the major supermarket websites (Tesco, Sainsbury's, Asda and Morrisons) in the UK indicated that many of the alcohol multi-buy offers at the time of the survey were in the form of 'x for £y', with few 'x for y' offers found. Common examples included '3 for £10' for wine or '2 for £3' for bottled beers, although many of the promotions were focused on larger expenditure levels, e.g. a case of wine or a four/six-pack of beer, rather than individual bottles or cans.

Because of the relatively small sample sizes (300 respondents per consumption segment) and the requirements for robust modelling, it was judged that no more than three types of promotions for each alcohol type could be tested in the experiments. Moreover, because the survey was being undertaken across a wide range of the population, it was felt that the promotions tested in the survey should not require substantial monetary investment, so that they were attractive to a wider range of the population (rather than being focused on individuals who have more disposable income). Lastly, given the prevalence of multi-buy options with a fixed price discount in the market, we felt that it was important to include these at a range of price discount levels.

[10] *The Grocer* (2012). Promotions fall as multiples get set for Olympic bonanza [Online]. Available at http://www.thegrocer.co.uk/topics/olympics-and-jubilee/promotions-fall-as-multiples-get-set-for-olympic-bonanza/231269.article (Accessed on 4 June 2013).

It was also sensible for the study to address multi-buy promotions that were specifically identified within the consultation documents published by the Home Office for the Government's Alcohol Strategy Consultation (see BOX 2.1 for details from page seven of the Alcohol Multi-buy Promotions – Impact Assessment).[11]

Box 2.1: Alcohol Multi-buy Promotions – Impact Assessment:

Option 2 is to introduce a ban on multi-buy promotions, i.e. those where the price of a single product in that multi-pack is less than the price of buying that same product on its own.

The aim of a ban would be to stop incentivising purchases of more products than people would otherwise purchase, i.e. to break the link between the number of alcohol products purchased and the price per product. This would mean the following promotions were not allowed:

- 2 for the price of 1 (or 3 for 2, buy-one-get-one-free, or buy 6 get 20% off);
- 3 for £10 where each bottle costs more than £3.33;
- 24 cans of beer being sold for less than 24 times the price of one can in the same retailer, or a case of wine priced more cheaply than 12x the individual price of the same bottles;
- Different multipack prices or multi-buy multipack offers- 10 bottles of alcopops being sold for less per bottle than a package of 4 bottles, or 3 packages of 10 bottles being sold for less than 3x the price of one 10 bottle pack.

A ban on multi-buy promotions would not affect discounts which were not linked to the purchase of multiple bottles, or which were linked to the volume rather than the number of products. It would not stop retailers cutting the price of individual items to match multipack prices, or prevent them from having a minimum buy rule (or 'de-listing' single products). So the following would still be allowed:

- Half price, a third off, £x off any individual item;
- Single items being sold as cheaply as ones in a multipack or on offer (3 for £10 would be permitted, as long as each item can also be bought for £3.33);
- A case / multipack can be priced at any level if the items are not available to buy individually;
- Different prices for the same alcohol products sold in differed sized containers, where there is a per unit difference, e.g. a box of wine can still be sold for less than the price of 4 bottles of the same wine.

For these reasons, the following promotion types were tested in the experiments:

Wine

- 3 for a fixed price discount (70/80/90 percent of fixed price)
- 3 for 2
- 2 for 1

Beer

- 12 for a fixed price discount (70/80/90 percent of fixed price)
- 12 for 8
- 8 for 6

[11] http://www.homeoffice.gov.uk/publications/about-us/consultations/alcohol-consultation/ia-multi-buy-promotions?view=Binary (Accessed on 4 June 2013).

Spirits

- 2 for a fixed price discount (70/80/90 percent of fixed price)
- 3 for 2.

2.3 Structure of the choice experiments

Although the primary aim of the research was to model the specific impact of alcohol multi-buy promotions on purchasing behaviour, it was also important that the choice experiments quantified sensitivity to price accurately in order to ensure that the resulting price sensitivity of the model was reasonable. To meet both of these objectives it was important to include some choices with price differences only (and no promotions) and some choices with promotions. Respondents were therefore asked to participate in two experiments, being presented with 12 choice scenarios in total:

Experiment A: containing four choice scenarios between non-promotion items only, where the alcohol alternatives varied in price only;

Experiment B: containing eight choice scenarios between non-promotion items (but with varying price levels) and promotion items.

The first choice in Experiment A reflected a scenario where all alcohol types were present, at baseline prices, with no promotions. This scenario formed the baseline for analysis of changes as a result of the introduction of pricing changes and promotions.

The impact of promotions for specific types of alcohol is thus measured by the difference in behaviour between scenarios with and without promotions for that alcohol type.

The presentation of the choices drew on the visual presentation of two supermarket shelves. On one shelf were the six types of alcohol products, none of which was on promotion. Each was described by the type of alcohol and a price. Respondents were asked to indicate how many bottles or cans of each alcohol type they would purchase at that price. The total price for all choices they made was shown on the screen (this updated immediately after any adjustments to the choices made).

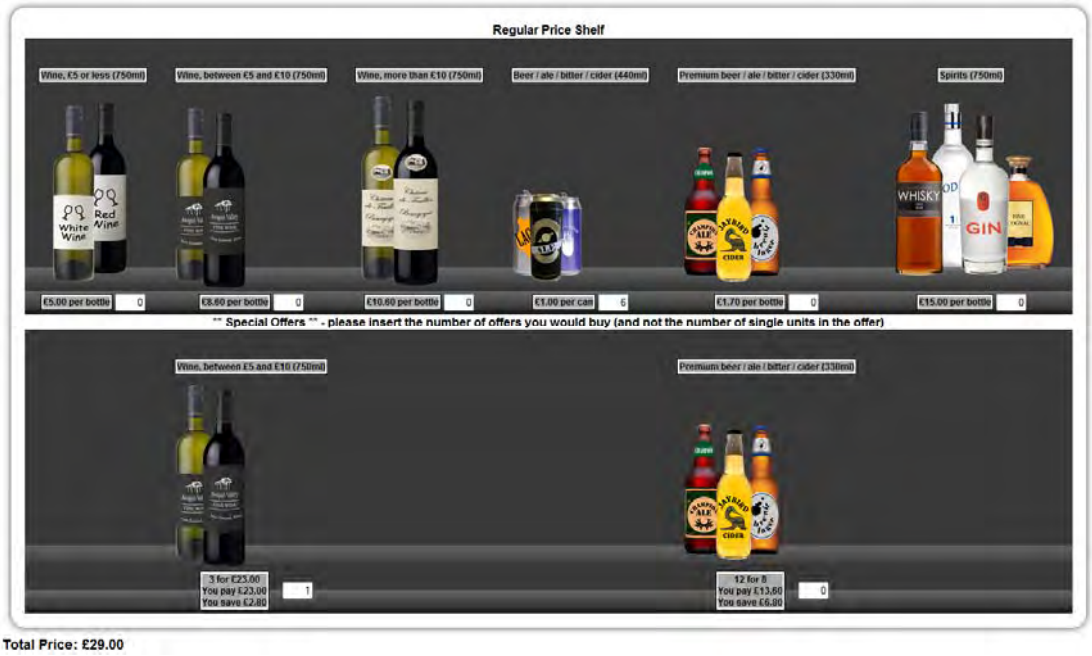
Figure 2.2 illustrates an example choice scenario for Experiment A.

Figure 2.2 Example choice scenario, Experiment A without multi-buy promotions

For the second part of the experiment, a second shelf containing promotion items was introduced. Each promotion was described by the type of promotion, the total cost and the amount saved for each offer. Respondents were asked to indicate the number of 'offers' they would purchase.

Figure 2.3 illustrates an example choice scenario for Experiment B.

Figure 2.3: Example choice scenario, Experiment B with multi-buy promotions



The order in which the shelves were presented, i.e. with either the promotions presented on the top shelf or the bottom shelf, was randomly varied between individuals. This allowed us to test whether the shelf location had an impact on choices, but each individual only saw one type of presentation to avoid confusion. The impact of the shelf order is discussed in Sections 3.3 and 3.4.

The details of the experimental design are presented in Appendix A.

Immediately following the experiment, respondents were asked about their experience in completing the experiment. Those who had indicated that they would not make any purchases were asked why this was the case. Other questions included whether participants had any difficulty making the choices presented, and whether they felt the choices, price levels and promotions offered were realistic. The findings from these questions are discussed in Chapter 3.

2.4 Other survey questions

The choice experiments were embedded in an online survey that was also used to ask questions about the alcohol consumption of participants as well as garner background information about the individual (age, gender, ethnicity, marital status, education, religion) and the household in which they lived (size of household, gender, age, drinking

habits and purchasing habits of others in the household where known, household income, socio-economic classification). In addition, after the choice experiment respondents were asked about their attitudes to multi-buy discounts, their alcohol consumption habits and preferences, and their attitude to alcohol more generally. More details about these additional questions are given below.

The survey acknowledged that it was being conducted on behalf of HMRC, and that all responses would be treated confidentially.

Alcohol consumption

Although questions about alcohol consumption were already asked in the screener questionnaire, a more detailed set of questions, using the Quantity-Frequency method, was used in the main survey to compute average alcohol consumption levels. These questions were adapted from the self-complete version of the General Lifestyle Survey.[12]

Multi-buy discounts

Respondents were asked whether they thought that their alcohol purchasing was affected by multi-buy discount offers, how an increase in their alcohol purchasing would affect their future behaviour (for example future purchasing or drinking levels), and their attitude to multi-buy offers.

Consumption habits and preferences

Respondents were asked about the situations in which they normally drink alcohol, and with whom they normally consume alcohol.

Attitudes to alcohol consumption

Finally, respondents were asked a set of questions about their attitudes to alcohol consumption, setting out whether they see drinking alcohol or getting drunk as a normal activity, conducive to socialising and/or damaging to health; whether higher prices for alcohol would discourage young and heavy drinkers, and whether alcohol should be taxed more heavily; and whose responsibility it should be (individual or government) to protect people from the consequences of their drinking. The attitudinal questions were adapted from a number of other surveys including the Health Survey for England 2007 – Drinking Module and Special Eurobarometer 331, 'EU citizens' attitudes towards alcohol'. These questions were included to provide a wider context for our experiment findings, and by harmonising with existing research help to provide external reference points and validation for our survey.[13, 14]

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[12] Economic and Social Data Service (2012). The General Household Survey [Online]. Available at http://www.esds.ac.uk/government/ghs/ (Accessed on 4 June 2013)

[13] Special Eurobarometer 331, 'EU citizens' attitudes towards alcohol'. Available at http://ec.europa.eu/health/alcohol/docs/ebs_331_en.pdf (Accessed on 4 June 2013)

[14] Health Survey for England 2007 – Drinking Module. Available at http://www.natcen.ac.uk/study/health-survey-for-england-2007 (Accessed on 4 June 2013)

CHAPTER 3 Model analysis and results

In this chapter we describe key characteristics of the data, the models used to quantify the impact of multi-buy promotions on purchase behaviour, and the model findings, in terms of coefficients, price elasticities and the predicted impacts of multi-buy promotions on alcohol purchases.

3.1 Overview of the choice data

In total 1,265 main surveys were undertaken between 22 November and 4 December 2012. As shown in Table 3.1, the surveys obtained a good spread of observations across consumption, age and gender segments.

Owing to differences in the methods of estimating respondents' consumption categorisation between the screener survey (based on a simple recall method for the previous week) and the main survey (based on the GLF method), we observed some switching between consumption segments. Specifically, in the main survey we obtained more observations in the Moderate A, Hazardous and Harmful segments and slightly fewer for the Moderate B segment (although the differences are relatively small). The consumption information measured with the GLF method is used in the modelling and is reported in tables throughout this section of the report.

Table 3.1 Number of observations by consumption, age and gender segments

	Consumption segment			
	Moderate A	**Moderate B**	**Hazardous**	**Harmful**
Gender				
Males	166	131	151	183
Females	182	149	170	133
Age				
18–24	55	37	41	35
25–34	43	30	33	59
35–44	47	33	51	64
45–54	53	39	60	59
55–64	59	54	64	53
65 plus	91	87	72	46
Total	**348**	**280**	**321**	**316**

3.1.1 Respondents' participation in and understanding of the experiments

After the choice experiments, respondents were asked a number of questions concerning their ability to participate in the experiments and the realism of the choices.

94.2 percent of respondents stated that they would make alcohol purchases in the experiments. Respondents who did not make any purchases in the experiment were then

asked to indicate why that was the case. Some 18 respondents indicated that they did not drink alcohol. However, for 14 of these, other background information indicated that others in the household did drink alcohol and therefore these respondents were retained in the model analysis. Four respondents were dropped from further analysis, on the basis that they reported that they had given up drinking alcohol since partaking in the screener questionnaire and that they did not live in households where others were drinking.

Around a quarter of respondents (25.5 percent) indicated that they had some difficulties in participating in the experiments. We examined the reasons for this in case the difficulties indicated a need to reconsider a particular respondent's inclusion in the analysis. Following this analysis we took the following decisions regarding the inclusion of these respondents in the modelling work:

- We dropped 38 respondents (3 percent) who indicated that they felt the choices were too difficult or confusing, or who could not make the choices because of lack of branding on the alcohol products;
- We retained the remaining respondents (22.5 percent), who reported that they thought the prices were not realistic – with some indicating that they felt that the prices were unrealistically low, others that they were unrealistically high, some who thought they were too similar and others that they were too varied. We concluded that there seemed to be no systematic bias in the prices for the different alcohol products;
- We also retained respondents who reported that they thought there was too much choice or too many scenarios.

Therefore, in total we dropped 42 individuals (3.3 percent of the sample) from the main model analysis (the four respondents who indicated that they were no longer drinking alcohol and the 38 who felt that the choices were too difficult).

3.1.2 Reliability of stated experiment responses compared to previous spending

Before the choice experiments, respondents were asked to report the amounts that they had spent on alcohol purchases, in supermarkets, at off-licences, abroad (alcohol purchased abroad but brought back to consume in the UK), through the internet and through other locations in the four weeks prior to the survey.

Table 3.2 compares the average spending on alcohol products in the previous four weeks and the stated expenditure levels in the choice experiment. At an aggregate level, the stated expenditure levels in the choice experiments are very similar to the reported expenditure in supermarkets, but are somewhat lower than total spending in all locations. Thus it appears that respondents were focused on supermarket spending. Moreover, we see increased expenditure across consumption segments, as would be expected, i.e. those in higher consumption segments have higher expenditure levels.

However, it is noteworthy that the standard deviations for total and stated expenditure are large, even within consumption segments and age, gender and socio-economic group.

Table 3.2 Comparison of average spending on alcohol products in the previous four weeks compared to the stated expenditure levels in the Stated Preference experiment

Segment	Average reported spend in previous four weeks in supermarkets		Average reported spend in previous four weeks in supermarkets, off-licences, abroad, internet and other locations		Average stated expenditure in choice experiment	
	Mean (£)	SD (£)	Mean (£)	SD (£)	Mean (£)	SD (£)
Consumption segment						
Moderate A	13.17	18.17	16.14	22.23	14.51	26.39
Moderate B	25.49	25.16	38.82	45.65	22.83	32.64
Hazardous	45.28	46.23	65.56	78.70	43.37	83.27
Harmful	68.70	80.77	102.10	149.83	67.47	114.93
Gender						
Male	37.81	50.78	54.83	74.71	38.36	91.72
Female	38.03	55.96	55.52	109.85	35.46	58.47
Age						
18–24	24.04	45.29	43.72	161.67	27.61	62.82
25–34	36.90	72.23	57.34	97.82	37.29	66.99
35–44	44.53	40.34	60.41	75.56	41.89	105.84
45–54	49.94	66.36	67.00	95.01	42.71	65.53
55–64	49.94	48.84	57.09	70.22	40.76	72.09
65plus	31.91	36.63	47.10	57.41	31.55	76.94
Socio-economic group						
ABC1	41.78	59.48	62.72	113.30	40.85	91.39
C2DE	33.53	45.22	46.59	64.35	32.42	55.67
All	37.92	53.44	55.17	93.97	36.90	76.89

* Measures of socio-economic group were collected as screening questions by Research Now. ABC1 refers to those employed in managerial, professional, administrative, supervisory or clerical roles, or students; C2DE refers to those performing unskilled, semi-skilled or skilled manual work or those not in permanent employment.

3.2 Models reflecting discrete and continuous choices

In general, the models that we have used are seeking to explain the importance of multi-buy promotions on alcohol purchasing behaviour as measured in the stated preference choice experiments.

In the stated preference choice experiments, respondents were asked to make choices both about the type of alcohol they would purchase (a discrete choice), and the amount that they would purchase (a continuous value). There are a range of econometric models available for modelling combinations of discrete and continuous choices, ranging in consistency in the modelling of the discrete and continuous processes, efficiency and complexity. These are briefly summarised in Table 3.4.

The key econometric properties of the models are consistency and efficiency. A model is described as consistent if the estimates approach the true value as the amount of data increases; this is a more-or-less essential property and all of the model procedures listed in Table 3.4 meet this criteria. Efficiency means that all of the information available in the data is used to estimate all of the parameters; this property is desirable but not essential and would not be possessed, for example, by models estimated in a two-step procedure, because the information required for the second step is not available when the first-step estimation is done. The usual sequential estimation of the Heckman model is not efficient, but in this study we used a simultaneous maximum likelihood procedure so that the Heckman model estimations were efficient in this technical sense.

Because of the tight timescales for the study, we focused initially on the development of Tobit models, for consistency with the existing HMRC model (Collis et al., 2010).

However, once the Tobit models were developed, we also tested the use of Heckman and multiple discrete-continuous extreme value (MDCEV) models, using a similar specification.

While the Tobit and Heckman models correct conventional regressions by incorporating the fact that purchases must be zero or positive (i.e. not negative), they represent substitution between alcohol types only at an aggregate level.[15] Moreover, because they are restricted to reflecting binary choices only, we use a similar approach to that used by Collis et al. (2010), whereby purchasing behaviour for a specific type of alcohol is modelled independently of other alcohol purchases. In other words, we focus on the development of models for the purchase of each alcohol type independently, although a general representation of competition can be modelled by including the prices and promotions on other alcohol types. Furthermore, because of the restriction to binary choices, we note that the Tobit and Heckman models do not explicitly predict the likelihood of choosing multi-buy promotions; rather they predict the impact of multi-buy promotions on overall purchasing. This poses some problems when estimating the impact of promotions on monetary expenditure (because it is not clear what proportion of individuals purchase the promotion and non-promotion items). We return to this matter in Section 3.5.

Heckman models are very similar in concept to Tobit models. The probability that consumers will be purchasers of a specific type of alcohol is predicted by a binary model, then for those that are purchasers, the quantity purchased is predicted by a linear model. The difference is that in the Tobit model the same function is used to predict both the decision to purchase and the quantity purchased, while in the Heckman model different functions are used. The main issues regarding Tobit models, such as the restriction to binary choices and the consequent limitation on the treatment of promotions, also apply to Heckman models. Heckman models offer greater freedom in modelling behaviour, but also present a specific problem in forecasting in that it is not guaranteed that the linear model will give a positive outcome.

The MDCEV models go further in representing competition between alcohol types at disaggregate level. That is, they explicitly reflect that an individual can choose between specific offers of wine, beer or spirits. Thus they better represent how the introduction of promotions impacts on the purchasing of other alcohol products and total alcohol purchases. Moreover, the MDCEV framework uses all the available information to estimate the choice of different types of alcohol type simultaneously, so that the statistical inefficiencies of sequential estimation, e.g. in Tobit or Heckman models, are avoided. Furthermore, the MDCEV models are able to represent better the particular choice of purchasing products on promotion, which are represented as separate choice alternatives in the model. This is not possible in the Tobit or Heckman models.

For this study we only tested multinomial model structures, where promotion and non-promotion items are represented as separate alternatives, equally competitive with each other and other types of alcohol. A key property of multinomial models is that the

[15] That is, the choice by respondents for a particular alcohol type is represented in these models by the price and promotions of other types, but does not take account of the specific choices of the individual. The MDCEV models consider the specific choices of the individual for all alcohol types together.

unexplained model error across alternatives in the model is IID. Practically, this means that for any two alternatives, the ratio of their choice probabilities in the model is unaffected by the presence or absence of any other alternatives in the choice set. In practice, however, we find that some alternatives are more 'similar' and therefore are closer substitutes than others (not IID). We hypothesise that this is probably true for promotion and non-promotion options of a specific type of alcohol, where we would expect higher cross-elasticities, for example between a Wine A non-promotion product and a Wine A promotion product. Correlation between similar alternatives in a logit model is introduced through a nesting structure. The introduction of such correlation would therefore give a better representation of the stated behaviour in the experiment. A further advantage is that with the inclusion of a nesting structure (if justified by the data), the effect of the introduction of a new alternative, i.e. a promotion alternative in this study, is reduced.[16] However, as noted above, it was feasible to estimate only multinomial model structures and therefore the impacts of promotions in the MDCEV models may be overstated.

3.3 Key modelling assumptions

In all the models the dependent variable is the number of units of alcohol purchased. In the development of the Tobit models we also tested expenditure as the dependent variable, but these models had a poorer fit to the data (and would be inconsistent with the concept of the MDCEV model, where expenditure is explicitly modelled through the money budget). We also tested log formulations for both units of alcohol and expenditure, but these also gave poorer models (and inconsistency with the concept of Tobit and Heckman models, where zero values for the dependent variable are incorporated in the modelling). We also tested log forms for the explanatory variables, again finding poorer results. These tests were not repeated for the Heckman models and it was assumed that the findings for the Tobit model could be used.

To convert the purchases available in the stated preference (SP) choice exercises into units, we used average alcohol by volume (ABV) conversions (as in the GLF methodology), i.e.:

- Wine: 12.5% ABV
- Beer/lager/cider: 4.5% ABV
- Spirits: 40% ABV

An ABV of 12.5% means that there are 12.5 units of alcohol in 1 litre. Therefore, the number of units in each type of alcohol is assumed to be:

- Wine, 750ml bottle: 9.375 units

[16] In transport studies this is often referred to as the 'red bus blue bus' problem, which looks at a multinomial logit choice model between car and a red bus, and assumes, say, that consumers choose between these two options with equal probability. If you now add a third transport mode, a blue bus, and assume that consumers do not care about the colour of the bus, you would expect in reality that consumers would continue to choose between bus and car with equal probability, so the probability of car would still be 0.5, while the probabilities of each of the two bus types would be 0.25. But the IID property of the model means that the choice probabilities between car and red bus have to be preserved, so the new probabilities in the model must be: car 0.33; red bus 0.33; blue bus 0.33. Thus the multinomial structure overstates the impact of new alternatives.

- Beer, 440ml can: 1.98 units
- Beer, 330ml bottle: 1.485 units
- Spirits, 750ml bottle: 30 units

The models are formulated with smooth functions of the explanatory variables, i.e. without threshold effects. This implies that the marginal impact of increasing and decreasing the value of a continuous explanatory variable, e.g. price, are equal and opposite. For non-marginal changes, e.g. the introduction or removal of a promotion, the impacts will be approximately equal and opposite.

As noted earlier, the models seek to explain the importance of price and promotions on alcohol purchasing behaviour. Promotions reflect the impact of both a price reduction (measured through the price sensitivity term) and the "psychological" impact of the promotion (measured through constants reflecting the impact of the different promotion types). Thus, in predicting demand for a specific alcohol type, the model incorporates the price and promotion characteristics of the specific alcohol type as well as the price and promotion characteristics of competitor products (referred to as cross-price and cross-promotion terms). So, if there is a promotion on a low-price bottle of wine, we may observe that respondents are more likely to purchase that product, and are less likely to purchase, for example, a medium-priced bottle of wine.

We seek to explain differences in the behaviour of respondents through the inclusion of socio-demographic and economic covariates, where they are significant. For example, if women are more likely to purchase low-priced wine, this will be incorporated in the model. These quantify the impact of socio-economic characteristics on alcohol purchasing, which improves the quality of the models and allows examination of different pricing and promotion scenarios on different segments of society.

Therefore, the utility formulations tested both price and promotion and socio-demographic and economic explanatory variables, as summarised in Table 3.3 below. Appendix B gives descriptions of the key socio-demographic and economic explanatory variables.

Table 3.3 Explanatory variables tested in the development of the Tobit and Heckman models

Price and promotion variables	Socio-demographic / economic variables
own price (per unit)	age
competitor prices (per unit)	gender
own category promotions, if promotion	region
own price, if promotion (per unit)	household income
amount saved, if promotion (per unit)	socio-economic classification
competition promotions, if promotions	religion
competition prices, if promotions (per unit)	education level
competition amount saved, if promotions (per unit)	marital status
promotion shelf location (top or bottom)	ethnicity
	number of adults/children in the household
	share of the household purchases that the individual makes

We also examined differences in the behaviour of respondents through the development of models across alcohol consumption segments. In developing the Tobit models, we sought to explain purchasing behaviour for each alcohol type (six categories), and for each

consumption segment (four segments). However, we found that many of the resulting coefficients were insignificant, and therefore we aggregated the consumption segments into two, and obtained much better levels of significance for the resulting parameters. Models are therefore reported for two consumption segments:

- Moderate = Moderate A + Moderate B
- H&H = Hazardous + Harmful

The Heckman and MDCEV models used the same segments, for consistency.

In the following sections we briefly describe the Tobit, Heckman and MDCEV model specifications and results. We present what we found to be the 'best' models of each type in the available study timescales.

Table 3.4 Econometric models of discrete and continuous choices

Model	Tobit (Tobin, 1958)	Heckman (1979)	Dubin-McFadden (Train, 1984–86)	Bolduc et al. (2001)	Multiple discrete-continuous expected value models (MDCEV) (Bhat and Pinjari, 2013)
Complexity	**Least Complex ----------**				**---------- Most Complex**
Description	Truncated regression model; for cases where an observation of a continuous quantity can be made only in a specific range, often positive.	Continuous model of amount purchased, discrete choice of alcohol type (probit), distinct from amount purchased model.	Continuous model of amount purchased, discrete choice of alcohol type choice (multinomial logit).	Continuous model of amount purchased, discrete choice of alcohol type choice (multinomial probit, mixed logit).	Continuous model of ownership/usage, discrete choice of ownership (logit).
Benefits	Model results are consistent.	Model results are consistent. Different effects can be included in type choice and amount purchased models.	Model results are consistent. Different effects can be included in type choice and amount purchased models. Choice (logit) component can take account of choice of purchase of different alcohol types.	Model results are consistent. Different effects can be included in alcohol type choice and amount purchased models. More complex types of models incorporated, e.g. mixed logit.	Model results are consistent and efficient. Different effects can be included in type choice and amount purchased models. Choice component can take account of choice of purchase of different types of alcohol and promotions.
Disbenefits	Choices limited to binary alternatives: focus on one alcohol type at a time. Not reasonable to expect that the determination of choice to purchase to be determined by the same function as that used to predict amount purchased.	Probit model effectively limited to choices with binary alternatives: this is very limiting. Modelling results are consistent, but may not be efficient.+ No guarantee of positive outcome.	Correction for sample selection bias may be complex for model structures more complex than multinomial logit. Modelling results are consistent, but **not** efficient. + No guarantee of positive outcome.	As for Dubin-McFadden, solving problem of sample selection bias for some complex models. Modelling results are consistent, but **not** efficient.+	Modelling is complex. Multinomial models are subject to properties of IID.
Estimation	Estimation can be undertaken using existing statistical software packages.	Estimation of alcohol type choice (probit) and amount purchased (OLS, with inverse Mill's ratio correction term for sample bias or use of instrumental variables) can be done sequentially or simultaneously. Estimation can be undertaken using existing statistical software packages, if functional forms are not complex.	Sequential estimation of alcohol type choice (logit) and amount purchased (OLS, with correction for sample bias, e.g. through Dubin-McFadden correction for MNL models or instrumental variables). Estimation can be undertaken using existing statistical software packages, if functional forms are not complex.	Sequential estimation of alcohol type choice (logit) and usage (OLS, with correction for sample bias). Estimation can be undertaken using advanced existing statistical software packages, if functional forms are not too complex.	Simultaneous full information maximum likelihood estimation of alcohol type choice (logit) and amount purchased (OLS, with correction for sample bias). Specialist software required.

+ These models may be 'inefficient' in that two-stage estimations may have to be made. Also these models may give rise to problems in the economic theory on which they are based (using Roy's Identity) if alcohol type choice is a function of income.

3.4 The Tobit models

One method to cope with the problem of censored data, i.e. where an observation of a continuous quantity can be made only if that quantity lies within a specific range (as is the case for this study where respondents can only be observed to purchase zero or positive purchases), is to employ a Tobit model (Tobin, 1958). Amemiya (1985) provides useful background about the use of Tobit models.

In our case, the dependent variable, y, reflects the number of alcohol units purchased, which can take on the value of 0 with a positive probability but is a continuous random variable over strictly positive values. For some individuals the optimal choice will indeed be the 'corner solution' y=0, i.e. no purchase is made. Conventional regression models fail to account for the qualitative difference between the zero and non-zero observations.

Because Tobit models are restricted to binary choices, we use a similar approach to that used by Collis et al. (2010), whereby purchasing behaviour for a specific type of alcohol is modelled independently of other alcohol purchases (referred to as Wine A, Wine B, Wine C, Beer A, Beer B and Spirits; see Section 2.2.3 for a detailed description of the different alcohol types), although a general representation of competition can be modelled by including the prices of other alcohol types (as discussed in Section 3.3). Moreover, because of the restriction to binary choices, we note that the Tobit models do not predict the likelihood of choosing multi-buy promotions – they only predict the impact of multi-buy promotions on overall purchasing. This poses some problems when estimating the impact of promotions on monetary expenditure (because it is not clear what proportion of individuals purchase the promotion and non-promotion items). We return to this matter in Section 3.5.

As noted earlier, the impact of own and competitor prices and promotion terms was tested, but it was difficult to identify significant competitor price and promotion terms for most of the alcohol types. Table 3.5 summarises the significant price and promotion terms identified in the Tobit models.

Table 3.5 Significant pricing and promotion terms in the Tobit models

	Wine A < £5 bottle	Wine B Between £5 and £10 bottle	Wine C > £10 bottle	Beer A Beer/ale/ bitter	Beer B Premium beer/ale/ bitter	Spirits
Own price	√	√	√	√	√	√
Own promotions	√	√	√	√	√	√
Own savings						√
Cross price	Wine B Wine C			Wine A Spirits	Beer A Spirits	
Cross promotions	Wine B Wine C	Wine A Wine C	Wine A Wine B	Beer B Spirits	Beer A Spirits	Beer A Beer B

√ Significant with the right sign, at the 95% level of significance

These imply, for example, that demand for Wine A products is a function of the price and promotion characteristics of Wine A products (so if there is a promotion on Wine A products, respondents were more likely to purchase these products), but also that it is a function of the price and promotion characteristics of Wine B and Wine C products (so if there is a promotion on Wine B products, respondents were less likely to purchase Wine A products).

Table 3.6 summarises the key socio-demographic and economic terms in the Tobit models.

Table 3.6 Socio-demographic and economic effects identified in the Tobit models

	Wine A < £5 bottle	Wine B Between £5 and £10 bottle	Wine C > £10 bottle	Beer A Beer/ale/ bitter	Beer B Premium beer/ale/ bitter	Spirits
Age 18–24	--	-	-	--	++	++
Age 45+	++	++	-	--	--	++
Female	++	++	--	--	+/-	++
Higher incomes		++	++		++	
Higher degree		++	++	+/-		++
GCSE or less		--	-	+		++
2 or more adults	-	--	-/+	+	+	
Low skilled/other	-	--	--	+/-	+/-	+/-

++ significant positive, + positive, - negative, -- significantly negative, +/- inconsistent across consumption categories

In testing the socio-economic terms, religion and ethnicity terms were dropped because of lack of significance, which may be a result of lack of variation in the data (nearly 94 percent of respondents were of 'white' ethnicity, 57 percent were Christian, 35 percent had no religion and the numbers of respondents with other religions was small).[17] Marital status was also dropped because of the high correlation with the number of adults in the household. The number of children term was also dropped, because of the lack of significance in explaining purchasing behaviour.

In most models, the respondent's share of alcohol purchasing for the household was positively linked with alcohol purchasing, as shown in Table 3.7 below.

Table 3.7 The impact of the respondent's share of alcohol purchasing for the household on purchasing levels in the Tobit models

	Wine A < £5 bottle	Wine B Between £5 and £10 bottle	Wine C > £10 bottle	Beer A Beer/ale/ bitter	Beer B Premium beer/ale/ bitter	Spirits
Share of household purchases	++	++	+	++	+	++

++ significant positive, + positive, - negative, -- significantly negative, +/- inconsistent across consumption categories

The region terms were variable in most of the models, which is not surprising given the small sample sizes.

The term testing for the impact of the shelf ordering in the experiment was significant for some of the alcohol products, for some of the segments, but the sign was inconsistent across these and thus we conclude that shelf order did not have a significant impact on respondents' purchasing decisions.

Appendix C provides the detailed coefficients from the Tobit model analysis.

[17] These results indicate that the panel survey may not be representative of the national population in terms of ethnicity and religion.

3.5 The Heckman models

The Heckman model (Heckman, 1976, 1979) is a more general model than the Tobit model for the analysis of self-selected data. Originally intended for the study of labour markets, looking at employment and wages, the model can also be applied to all contexts where an observation of quantity is made only when that quantity is positive.

Like the Tobit model, the Heckman model in its classical form is restricted to binary choices. However, it differs from the Tobit model in being formulated as two distinct models: a selection model and a quantity model, thus reflecting the different purchasing decisions made by respondents (to choose to purchase an alcohol type, and then to choose to purchase a specific amount). These two models can have distinct variables and coefficients, unlike the Tobit model which is restricted to the same variables and coefficients. Indeed, in the Heckman model it is *necessary* that the functions be different to allow full statistical identification of the model.

The Heckman model can be estimated either using the classical two-step procedure introduced by Heckman, which produces unbiased coefficient estimates but requires correction of the standard errors of the quantity model, or using a maximum likelihood procedure. We have used the maximum likelihood procedure, which is available as a standard option in the STATA software.

As for the Tobit model described in the previous section, we set up the Heckman model to predict alcohol purchase and quantity for six alcohol types and for two consumption segments. The explanatory variables tested were also the same, as set out in Table 3.3. The rationale for which variables were included in the purchase and quantity components of the Heckman models is discussed in Appendix D.

The significant pricing and promotion terms identified in the selection and quantity models are summarised in Table 3.8. It is noteworthy that fewer cross-price and cross-promotion terms have been identified in the Heckman models, compared to the Tobit models (see Table 3.5 for significant pricing terms for the Tobit models), particularly for the quantity component of the model, and this is probably because there are less data used for estimating these coefficients. This is particularly noteworthy for Wine C and Beer B, where it was not possible to identify an own-price coefficient for the quantity model for moderate drinkers – we could not identify a significant impact of the price of Wine C and Beer B products on the amount of Wine C and Beer B products purchased by moderate drinkers. One benefit of the Tobit model approach is that, because the same formulation is used for the selection and quantity formulations, the resulting coefficients are more reliably estimated – even though the implications of using the same formulations is less defensible from a behavioural perspective.

Table 3.8 Significant pricing and promotion terms in the Heckman models

	Wine A < £5 bottle	Wine B Between £5 and £10 bottle	Wine C > £10 bottle	Beer A Beer/ale/ bitter	Beer B Premium beer/ale/ bitter	Spirits
Quantity model						
Own price	√	√	√**	√	√**	√
Own promotions	√	√	√	√	√	√
Own savings						
Cross price	Wine B*				Spirits**	
Cross promotions				Beer B*	Beer A**	
Selection (purchase) model						
Own price	√	√	√	√	√	√
Own promotions	√	√	√	√	√	√
Own savings						
Cross price	Wine B			Beer B*	Beer A** Spirits	
Cross promotions	Wine B Wine C	Wine A Wine C	Wine B	Beer B	Beer A Spirits	Beer A Beer B
Cross savings						

√ Significant with the right sign, at the 95% level of significance

* In the model for those with moderate consumption only

** In the model for those with hazardous and harmful consumption only

Below we summarise key socio-demographic and economic effects identified in the selection and quantity components of the Heckman models. The differential income effects for selection and the quantity models for Wine A purchasing illustrate the strength of the incorporation of different behavioural formulations. Here we observe that respondents from higher incomes are ***less likely*** to purchase Wine A products, but for those who do make the decision to purchase these products, higher income levels are associated with ***higher levels*** of purchasing. Generally, we were able to identify more socio-economic variation in the selection (purchasing) model, particularly incorporating significant ethnicity terms, which were not able to be identified in the Tobit models, where such terms explain both purchasing and quantity purchased.

Table 3.9 Socio-demographic and economic effects identified in the Heckman models

	Wine A < £5 bottle	Wine B Between £5 and £10 bottle	Wine C > £10 bottle	Beer A Beer/ale/ bitter	Beer B Premium beer/ale/ bitter	Spirits
Quantity model						
Age 18–24	-		+			
Age 45+	++	++	+			++
Female		+	-/+	--	+	
Higher incomes	++	++	+/-	+	+	+
Higher degree			+			
GCSE or less			+	+/-	+	
2 or more adults	--	-	-	+	+	
Low skilled/other	-	-	-/+		-	
Student						++
Mixed / Asian British		-				--
Black / Black British		++			-	--
Selection (purchase) model						
Age 18–24	-	-		+	++	++
Age 45+	++		+/-	--	--	++
Female	++	++		--	--	++
Higher incomes	--	++	++	--	++	-/+
Higher degree	++	++		-	++	++
GCSE or less		--		++	--	++
2 or more adults	--	--	--	+	+	
Children				++		
Student					-	-
Low skilled/other	--	--	--	-		++
Unemployed	++			++		
Mixed / Asian British		-	-	--	-	
Black / Black British	--	+	+	-	+	

++ significant positive, + positive, - negative, -- significantly negative, +/- inconsistent across consumption categories

In most of the Heckman models, the respondent's share of alcohol purchasing for the household was positively linked with alcohol purchasing, as shown in Table 3.10 below.

Table 3.10 The impact of the respondent's share of alcohol purchasing for the household on purchasing levels in the Heckman models

	Wine A < £5 bottle	Wine B Between £5 and £10 bottle	Wine C > £10 bottle	Beer A Beer/ale/ bitter	Beer B Premium beer/ale/ bitter	Spirits
Quantity model						
Share of household purchases	++	+	+	+	-	
Selection (purchase) model						
Share of household purchases	++	++	+	++	++	++

++ significant positive, + positive, - negative, -- significantly negative, +/- inconsistent across consumption categories

As in the Tobit models, the region terms were variable in most of the models, which is not surprising given the small sample sizes.

Also as in the Tobit models, the term testing for the impact of the shelf ordering in the experiment was significant for some of the alcohol products, for some of the segments, but

the sign was inconsistent across these and thus we conclude that shelf order did not have a significant impact on respondents' purchasing decisions.

Appendix D provides the detailed coefficients from the Heckman model analysis.

3.6 The MDCEV models

The analysis using Tobit and Heckman models gives a reasonable assessment of the sensitivities of the market. However, these models contain inherent deficiencies that can be addressed by a more systematic approach to the modelling. Specifically:

- By considering only one type of alcohol product at a time, Tobit models do not allow for switching between alcohol types in response to price changes or promotions (the inclusion of the prices or promotion details of competing types captures the potential for switching but only in a general way);
- The models do not give any representation of 'satiation', i.e. that the additional benefit gained per unit purchased may decline as the amount purchased increases;
- The models also omit any consideration that the total amount spent may restrict the spending behaviour of consumers.

These model deficiencies would also apply to other models representing the choice of alcohol types independently, such as Dubin-McFadden models.

The MDCEV model is specifically designed for representing the behaviour of consumers confronted by a range of products that they choose to buy or not, while for each product they choose to buy they also choose the quantity to be bought. The model explicitly incorporates the assumption of a budget, which further facilitates competition between products. Such an assumption is not present in the regression models. Because all of the alcohol products are considered simultaneously the model is able to represent switching behaviour directly, and also to represent the impact of total spending on alcohol (for off-trade sales). Moreover, by including non-linear functions the effect of satiation can also be modelled.

The MDCEV model is complex. A detailed discussion is given by Bhat and Pinjari (2013), who gives the specification of the functions and shows how the specific assumption of a statistical form (EV[18]) makes it possible to estimate the parameters of the model. Forecasting with the model is also complex, but a paper by Pinjari and Bhat (2011) sets out a method that is applicable to the circumstances of this study. Despite these complexities, it was judged that the advantages of the MDCEV approach in representing the specific form of behaviour involved in alcohol purchasing make it a worthwhile addition to the study methodology.

A brief technical description of the MDCEV approach is given in the following paragraphs.

[18] In this context, 'EV' refers to 'extreme value', the assumption that is made for the distribution of the error term in the models.

3.6.1 Technical description of the MDCEV model

In a multiple discrete-continuous (MDC) framework, consumers are modelled as making a simultaneous choice of a number of different products, and for each of these products how many units to purchase. They are assumed to maximise a direct utility function U(**x**), where **x** is a vector of non-negative quantities of consumption for each of the goods, such that **x**=(x_1,…,x_K). In most applications, **x** includes an outside good to represent expenditure on all other items, say good number 1, which is assumed to have unit price (so that p_1=1). The consumption activities of a consumer are subject to a budget constraint, such that the consumer maximises U(**x**) subject to **xp**=E, where E is the budget, and where **p** is the vector of prices for the different goods. The chief advantage of a MDC framework in the context of the present study is that it is thus better able to capture the substitution effects between the different products.

At the heart of the model used in the present application is a non-linear utility form that allows the marginal utility, i.e. the additional benefit of an additional unit purchased, of each additional unit of a given good to decrease with increasing consumption of that good. Using the notation introduced by Bhat and Pinjari (2013), with good 1 being the outside good (of K goods), we have that:

$$U(x) = \frac{1}{\alpha_1}\psi_1 x_1^{\alpha_1} x_1^{\alpha_1 \square} + \sum_{k=2}^{K} \frac{\gamma_k}{\alpha_k}\psi_k \left(\left(\frac{x_k}{\gamma_k}+1\right)^{\alpha_k} - 1\right)$$

This model relies on three distinct parameters for each good, namely ψ_k, γ_k, and α_k. The specific role of these parameters is as follows:

- ψ_k is the marginal utility of good k at the point of zero consumption, also referred to as the baseline marginal utility. A higher baseline utility makes non-zero consumption of a good more likely. The baseline utility is parameterised by interactions between estimated parameters and (non-price) attributes of the good and characteristics of the decision maker. To ensure positive baseline marginal utilities, we define $\psi(z_k) = e^{\beta' z_k}$. With the addition of a multiplicative random element, we obtain $\psi(z_k, \varepsilon_k) = e^{\beta' z_k + \varepsilon_k}$, where ε_k is a log-extreme value error term, and where z_k contains the attributes of product k and those of the consumer, while β is an estimated vector of parameters, including a product-specific constant, and where, for normalisation, we set the deterministic part of the log baseline utility for one good to zero, say the outside good.
- The key role of γ_k is to allow for zero consumption for good k, although Bhat and Pinjari (2013) also suggests a role for γ_k as a satiation parameter. There is no translation parameter for the outside good (as it is always consumed), and we have a constraint that $\gamma_k > 0$ for k>1.
- α_k has a more explicit role as a satiation parameter as it reduces the marginal utility of good k with increasing consumption, where lower α_k means faster satiation, and where $\alpha_k \leq 0$.

As outlined by Bhat and Pinjari (2013), joint estimation of α_k and γ_k is numerically problematic due to the similar roles that the parameters have, and some normalisation is

generally required. In the present application, we have made use of the alpha-gamma profile (cf. Bhat and Pinjari, 2013), which sets $\alpha_k = \alpha_1, \forall\, k \geq 1$, i.e. using a generic α parameter and estimating $\gamma_k, k > 1$. A key advantage of this profile is the availability of the forecasting procedure outlined in Pinjari and Bhat (2011).

The probability of a given consumption vector $(x_1^*, x_2^*, \ldots, x_M^*, 0, \ldots, 0)$, where M of the K goods are consumed, is given by:

$$P(x_1^*, x_2^*, \ldots, x_M^*, 0, \ldots, 0) = \frac{1}{p_1}\frac{1}{\sigma^{M-1}}\left(\prod_{m=1}^{M} f_m\right)\left(\sum_{m=1}^{M}\frac{p_m}{f_m}\right)\left(\frac{\prod_{m=1}^{M} e^{V_i/\sigma}}{\left(\sum_{k=1}^{K} e^{V_k/\sigma}\right)^M}\right)(M-1)!$$

where σ is an estimated scale parameter and where $f_m = \left(\frac{1-\alpha_m}{x_m^* + \gamma_m}\right)$.

In the specification of the model for the present application, we made use of 24 products, where product 1 is the outside good, goods 2 to 4 are the three types of wine (as full price items), goods 5 and 6 are the two types of beer (as full price items) and good 7 is spirits (as full price item). These are then followed by the different promotion items, where different types of promotion for a given good are treated as separate products, so that we have three promotion items for each wine and beer type, with two promotion products for spirits. The treatment of promotions as separate goods allows both their different marginal price and their specific attraction as promotions to be modelled.

For the budget assumption, a number of different specifications were tested. The most meaningful results were obtained by assuming that the budget for a given consumer was the maximum expenditure observed for that consumer across any of the twelve choice tasks, plus £1, ensuring that in each task, at least one unit of the outside good is chosen. This is an area where further research would be welcome.

3.6.2 Results from the MDCEV estimation

In terms of developing the MDCEV models, the utility formulation was largely consistent with that used in the Tobit models.[19] Again, consistent with the Tobit and Heckman models, models were developed for two consumption segments: (i) Moderate and (ii) Hazardous and Harmful drinkers.

In terms of prices and promotions, the MDCEV structure implicitly includes the own and competitor prices and promotions within the structure (because the model incorporates competition between all alcohol types directly and simultaneously).

As noted in Section 3.2, it was only feasible to test multinomial model structures, with the resulting property of IID. As noted above, this is likely to lead to higher promotion impacts in the MDCEV models.

The socio-demographic and economic effects identified in the MDCEV models are summarised in Table 3.11. Mostly they are similar to those identified in the Tobit models,

[19] Because of time pressures, work was undertaken in parallel on the Tobit and MDCEV models, and therefore there are a few minor inconsistencies in terms of inclusion of socio-economic terms. We do not judge these to be serious.

except that an age term is not tested for Wine B (this was not significant in the separate choice models that were tested), and the impact of the low-skilled term for Spirits is much more positive (whereas the Age45+ term is not as positive as it is in the Tobit models for Spirits).

Table 3.11 Socio-demographic and economic effects identified in the MDCEV models

	Wine A < £5 bottle	Wine B Between £5 and £10 bottle	Wine C > £10 bottle	Beer A Beer/ale/ bitter	Beer B Premium beer/ale/ bitter	Spirits
Age 18-24	--	-	+/-	+/-	++	++
Age 45+	+/-		+/-	--	--	+/-
Female	++	++	-	--	+/-	++
Higher income	-	++	++	-	++	+
Higher degree		+	++	+/-	+/-	+
GCSE or less		--	+/-	++	+/-	+
2 or more adults	+/-		+/-		+	-
Low skilled/other	+/-	-	--	+/-		++

++ significant positive, + positive, - negative, -- significantly negative, +/- inconsistent across consumption categories

In the MDCEV models, the respondent's share of alcohol purchasing for the household was less positively linked with alcohol purchasing than in the Tobit models, except for purchasing Spirits (see Table 3.12 below).

Table 3.12 The impact of the respondent's share of alcohol purchasing for the household on purchasing levels in the MDCEV models

	Wine A < £5 bottle	Wine B Between £5-£10 bottle	Wine C > £10 bottle	Beer A Beer/ale/ bitter	Beer B Premium beer/ale/ bitter	Spirits
Share of household purchases	+/-	+/-	-	+	+	++

++ significant positive, + positive, - negative, -- significantly negative, +/- inconsistent across consumption categories

As in the other models, the region terms were variable in the models.

The term testing for the impact of the shelf ordering in the experiment was generally insignificant and inconsistent in sign across products and segments.

The MDCEV coefficients are presented in Appendix E.

3.7 Calculating the impact of promotions and price elasticities

We set up forecasting models for the Tobit, Heckman and MDCEV models, which were applied to individuals in the main survey sample to predict the impact of pricing and promotions on alcohol purchases and expenditure.

However, because the main survey sample was designed to obtain 300 observations in each alcohol consumption category and to provide enough observations to test whether purchasing behaviour varies across age and gender segments, the survey sample observations had to be re-weighted to reflect national population characteristics. To do this we first developed respondent weights to reflect national consumption patterns. We note that we had a small number of respondents who are non-drinkers in the main survey (those who indicated that their drinking patterns changed between the screen survey and the

main survey), and these have been included in the forecasting sample, but their influence on the impact of promotions will be minimal.

Estimates of alcohol consumption are given in the following sources:

- GLF data for England, summarising alcohol consumption levels by age and gender for 2010;[20]
- Similar data for Scotland, from ISD Scotland; latest consumption data from 2009.[21]

In the main survey, alcohol consumption has been defined in a consistent manner with the English and Scottish data. However, we note that the survey conducted for this study includes people aged 18 years or older, whereas the observed values for England and Scotland include people aged 16 and older.

Because we have relatively few Scottish respondents (as well as few Welsh and Northern Irish respondents), and not enough non-drinkers across age and gender categories in the other regions, we applied the weights for English respondents to all respondents, and then made an adjustment at the total sample level for respondents living in Scotland. We assumed that respondents from Northern Ireland and Wales have similar consumption levels to those in England (and the sample sizes from Northern Ireland and Wales are small). We then re-weighted to reflect population patterns in England, Wales and Northern Ireland and separately for Scotland. The weighting procedure is summarised in Appendix F.

We then applied the models to the first record for each respondent in the main survey, weighted to reflect population and consumption patterns (as described above). We used the first record, because this reflects the baseline in terms of presentation of all basic alcohol types at their baseline prices (without promotions). For Tobit and Heckman models, the forecasting procedure takes account of the probability that a purchase will be made and then of the expected amount purchased, given that a purchase is made. For the MDCEV models, a specific procedure has to be used.[22]

For background, the shares of each alcohol type observed in the baseline scenario are presented in Table 3.13 below. It is noted that these reflect the shares observed for the weighted survey sample, based on self-reported information, for a limited number of items, at a specific time of year, and thus will not necessarily reflect real-world market shares.

[20] General Lifestyle Survey 2010, Office for National Statistics (ONS).

[21] ISD Scotland Publications (2011), Alcohol Statistics Scotland 2011. Available at: http://www.alcoholinformation.isdscotland.org/alcohol_misuse/1407.html (Accessed on 4 June 2013)

[22] For the MDCEV models, we followed the iterative approach detailed in Pinjari & Bhat (2011), which is too complex to be reproduced here in detail.

Table 3.13 Market shares in the baseline scenario

	Units of alcohol			Expenditure		
	Moderate	H&H	All	Moderate	H&H	All
Wine A	29%	33%	31%	23%	26%	24%
Wine B	16%	15%	15%	23%	22%	23%
Wine C	2%	2%	2%	5%	5%	5%
Beer A	13%	14%	14%	12%	13%	13%
Beer B	5%	4%	4%	11%	9%	10%
Spirits	35%	32%	34%	26%	24%	25%

* Note that not all columns sum to 100% due to rounding.

We then ran a series of tests, including:

- An increase in price of 10 percent to compute price elasticities for each type of alcohol product (six categories) separately, plus a 10 percent increase for all wines separately and a 10 percent increase for all beers separately;
- Introduction of 29 different promotion types, to indicate the impact of these, plus one test with a package of promotions.

The models predict the impact of these pricing changes on the number of alcohol units purchased by type of alcohol. We then computed the impact on expenditure. For the Tobit and Heckman models, the expenditure calculation cannot be computed exactly because the model does not explicitly predict the proportion of respondents who make their purchases through the promotion (see Section 3.2 for further discussion). We have therefore examined the expenditure between promotion and non-promotion items in the choice exercises where both were present (Experiment B) and have applied an average price assuming that 86 percent of the expenditure came from the promotion items and 14 percent from non-promotion items, and we use these proportions when computing expenditure from these models. In the MDCEV models, the expenditure calculation accurately reflects the predicted purchase pattern predicted in the model.

3.7.1 Price elasticities

Below we summarise the own-price elasticities for each specific alcohol type, derived from the Tobit, Heckman and MDCEV models.

Table 3.14 Own-price elasticities from the Tobit models

	Units			Expenditure		
	Total	Moderate	H&H	Total	Moderate	H&H
Wine A	-0.33	-0.37	-0.29	+0.67	+0.63	+0.71
Wine B	-1.76	-1.76	-1.76	-0.76	-0.76	-0.76
Wine C	-1.57	-1.57	-1.56	-0.57	-0.57	-0.56
Beer A	-0.61	-0.57	-0.66	+0.39	+0.43	+0.34
Beer B	-1.07	-1.18	-0.87	-0.07	-0.18	+0.13
Spirits	-1.34	-1.52	-1.14	-0.34	-0.53	-0.14
All wine	-0.19	-0.15	-0.24	+0.43	+0.44	+0.41
All beer	-0.58	-0.64	-0.50	+0.38	+0.30	+0.50

Table 3.15 Own-price elasticities from the Heckman models

	Units			Expenditure		
	Total	Moderate	H&H	Total	Moderate	H&H
Wine A	-0.37	-0.45	-0.30	+0.63	+0.55	+0.70
Wine B	-2.00	-2.04	-1.95	-1.00	-1.04	-0.95
Wine C	-1.77	-1.63	-1.95	-0.77	-0.63	-0.95
Beer A	-0.45	-0.32	-0.59	+0.55	+0.68	+0.41
Beer B	-1.05	-1.11	-0.91	-0.05	-0.11	+0.09
Spirits	-1.45	-1.45	-1.47	-0.45	-0.45	-0.47
All wine	-0.47	-0.51	-0.42	+0.19	+0.13	+0.26
All beer	-0.48	-0.40	-0.56	+0.46	+0.46	+0.46

Table 3.16 Own-price elasticities from the MDCEV models

	Units			Expenditure		
	Total	Moderate	H&H	Total	Moderate	H&H
Wine A	-1.30	-1.41	-1.23	-0.30	-0.41	-0.23
Wine B	-1.60	-1.69	-1.50	-0.60	-0.69	-0.50
Wine C	-2.19	-2.19	-1.78	-1.19	-1.19	-0.78
Beer A	-1.36	-1.48	-1.26	-0.36	-0.48	-0.26
Beer B	-1.51	-1.57	-1.39	-0.51	-0.57	-0.39
Spirits	-1.44	-1.58	-1.33	-0.44	-0.58	-0.33
All wine	-1.30	-1.39	-1.22	-0.33	-0.43	-0.25
All beer	-1.35	-1.45	-1.26	-0.37	-0.47	-0.28

Generally, we find the elasticities to be quite similar between the Tobit and Heckman models, but we see higher price elasticities, particularly for cheaper alcohol products, in the MDCEV models. Across all models, we see that the elasticities for purchasing units are higher (more strongly negative[23]) than for expenditure, which is expected (if price increases lead to reductions in the number of units purchased, but the amount paid for each unit increases, then the elasticities for purchasing units would be expected to be higher than the elasticity for expenditure).

In the MDCEV models, we observe that the own-price elasticities on units purchased for less expensive Wine A and Beer A products are higher (more negative), because of a better representation of competition in these models. Moreover, some of the expenditure elasticities from the Tobit and Heckman models are positive, which are not observed in the MDCEV models (nor in the literature, see below). These positive elasticities occur because with the higher price assumptions the number of units purchased is predicted to decline, as expected, but the overall expenditure is higher because of the higher prices. This feature is probably the result of a more complete modelling of competition between alcohol types in the MDCEV models.

For most products, we tend to find that the price elasticities for moderate drinkers are higher than for hazardous and harmful drinkers (although the differences are less in the Tobit and Heckman models). These findings are consistent with findings from others, e.g. Fogerty (2004). However, because hazardous and harmful drinkers purchase much higher volumes of alcohol, the absolute impact on these groups will be higher.

Collis et al. (2010) report the following elasticities from UK alcohol studies:

- Beer, median = -0.40, mean = -0.56

[23] When a single alcohol type is considered, the expenditure elasticity is exactly 1 more than the units elasticity.

- Wine, median = -0.86, mean = -0.90
- Spirits, median = -0.72, mean = -0.75

It is difficult to make direct comparisons with the model outputs from this study, because it is not clear to what extent these published values reflect units purchased or expenditure (Collis et al. (2010) refer to the impact of price on alcohol consumption more generally). Furthermore, in their summary they do not state to what extent these reflect on-trade or off-trade purchases (or both). However, we note generally that the mean values reported by Collis et al. (2010) fall between the units and expenditure elasticities from the MDCEV models developed in this study.

3.7.2 Impacts of promotions

In the following section we first present the impacts of introducing individual promotions, using the Tobit, Heckman and MDCEV models (summary tables for all promotions tested in the choice experiments are presented in Appendix G). It is assumed that the prices of all other alcohol products are equal to the non-discounted prices. We then report the impact of removing a package of promotions. In all tests with promotions, non-promotion items are also assumed to be available, for example for the tests with promotions on Wine A products, these same products are also available at non-discounted prices.

We report the impacts both on the specific alcohol type (e.g. the impact of a '3 for 2' promotion on the purchasing of Wine A products), the alcohol category (e.g. the impact of a '3 for 2' promotion on Wine A products on all wine products) and across all alcohol products. In the Tobit and Heckman models, the impacts across categories and across all alcohol products are obtained by summing the impacts across the different models. They are calculated directly from the MDCEV models.

The reported figures reflect both the impact of the price reduction (measured through the price term) and the psychological impact of the promotion itself (measured as a constant in the model).

The figures reflect the proportional change on demand, i.e. measured as the change in demand / demand from the baseline scenario (without promotions).

Consistent with the price elasticity impacts, we observe that the ***relative*** impact on moderate drinkers may be higher than the impact on hazardous and harmful drinkers, although this varies across products (see Appendix F for details). However, again we note that the absolute impact will be higher on hazardous and harmful drinkers, when absolute volumes of alcohol purchased are taken into account.

Impacts of individual promotions from the Tobit models

The predicted impacts from the Tobit models are presented in Table 3.17 below. In general, we see that the introduction of a promotion always leads to a predicted increase in the purchasing of alcohol units for that product. For example, with the introduction of a '3 for 2' promotion on Wine A products, the Tobit models predict a 0.88 increase (88 percent increase) in the units of Wine A products purchased overall compared to the baseline situation with no promotions. This leads to a 35 percent increase in expenditure on Wine A products overall – the proportional increase in expenditure is less than the increase in units purchased because some of the purchases are made at a reduced price

(because of the promotion). Again we emphasise that the expenditure calculations from the Tobit models are imprecise, because the model does not explicitly predict the proportion of the market that would purchase promotions.

The relative impact on expenditure for the alcohol category, e.g. wine, is much smaller – because of cross-switching effects. For example, with a promotion on Wine A products, people who tend to purchase Wine B products may purchase fewer of these and instead purchase Wine A products, so we see an increase in Wine A products, but the increase across all wine purchases is not as large. So, we see that the '3 for 2' promotion on Wine A leads to a 35 percent increase in the purchasing of *units* of wine products overall, but a 17 percent reduction in *expenditure* on wine products overall. The impact across all alcohol purchases is still smaller – where the '3 for 2' Wine A promotion leads to a 15 percent increase in purchasing units of all alcohol but an 8 percent reduction in expenditure. Again, we note concerns regarding the reliability of the expenditure calculations from the Tobit models.

Table 3.17 Impacts of individual promotions from the Tobit models (proportion change), including all consumption types

	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
Wine A – 3 for 2	0.88	0.35	0.35	-0.17	0.15	-0.08
Wine B – 3 for 2	4.55	2.97	0.83	0.81	0.36	0.37
Wine C – 3 for 2	9.54	6.55	-0.04	0.22	-0.02	0.10
Beer A – 8 for 6	1.20	0.72	0.82	0.20	0.08	-0.03
Beer B – 8 for 6	2.00	1.35	0.17	0.39	-0.09	0.03
Spirits – 2 for 90%	3.58	3.19	3.58	3.19	1.09	0.68

We observe much higher predicted increases for promotions introduced in the Wine C (expensive wine) market, particularly with regard to increases in Wine C units purchased relative to the baseline scenario (a 954 percent increase). But we note that Wine C purchases account for only around 2 percent of units in the baseline scenario. Therefore, with promotions that make Wine C nearly as attractive as Wine B (around 16 percent of the market in the baseline scenario), we see a large percentage change, but for a small market, so the overall impact is not large. In fact the impact on total wine units and all alcohol units is negligible (due to cross-trading), although the impact on total wine expenditure is larger (because some respondents will be trading up to purchase more expensive wine).

Impacts of individual promotions from the Heckman models

The predicted impacts from the Heckman models are presented in Table 3.18 below. In general, they are higher than those predicted from the Tobit models, except for Spirits (which are quite similar), which is consistent with the higher price elasticities for the Heckman models. However, we note that many of the price terms were not as significant in the Heckman models, which is likely a result of having to estimate models for the two separate processes (selection and quantity). So, whilst having separate functions is desirable theoretically, in practice more data would be needed to provide more reliable estimates in the Heckman models. The Tobit models are therefore more reliable.

Table 3.18 Impacts of individual promotions from the Heckman models (proportion change), including all consumption types

	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
Wine A – 3 for 2	1.31	0.65	0.71	0.07	0.34	0.04
Wine B – 3 for 2	5.55	3.69	1.04	1.06	0.50	0.54
Wine C – 3 for 2	17.01	11.90	0.24	0.59	0.11	0.31
Beer A – 8 for 6	2.80	1.99	2.10	0.94	0.31	0.16
Beer B – 8 for 6	6.69	5.04	1.06	1.83	0.13	0.39
Spirits – 2 for 90%	3.85	4.61	3.85	4.61	1.25	1.12

Impacts of individual promotions from the MDCEV models

Consistent with the price elasticity impacts, we find that the direct impacts (for example the impact of a promotion on a Wine A product on Wine A purchases) measured from the MDCEV models are generally higher than those measured from the Tobit and Heckman models, particularly for wine products, but not for beer and spirits. This may be because the MDCEV models better represent the impacts of competition, but IID assumptions are also a concern (see Section 3.2 for a more detailed discussion of this issue).

Table 3.19 Impacts of promotions from the MDCEV models (proportion change)

	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
Moderate						
Wine A – 3 for 2	2.90	1.81	2.21	1.06	0.80	0.29
Wine B – 3 for 2	6.00	3.85	0.91	0.95	0.23	0.25
Wine C – 3 for 2	23.5	15.5	0.15	0.33	-0.01	0.08
Beer A – 8 for 6	3.15	2.29	2.43	1.23	0.30	0.16
Beer B – 8 for 6	3.50	2.56	0.56	0.93	-0.03	0.11
Spirits – 2 for 90%	1.88	1.65	1.88	1.65	0.46	0.23
Hazardous and Harmful						
Wine A – 3 for 2	2.40	1.48	1.98	0.99	0.81	0.31
Wine B – 3 for 2	6.28	4.05	0.63	0.69	0.17	0.21
Wine C – 3 for 2	33.1	21.9	0.18	0.46	-0.01	0.13
Beer A – 8 for 6	2.74	1.99	2.39	1.39	0.28	0.16
Beer B – 8 for 6	4.15	3.06	0.36	0.69	-0.02	0.07
Spirits – 2 for 90%	2.11	1.87	2.11	1.87	0.44	0.24
All						
Wine A – 3 for 2	2.59	1.60	2.10	1.04	0.83	0.32
Wine B – 3 for 2	6.30	4.06	0.72	0.79	0.20	0.23
Wine C – 3 for 2	35.4	23.5	0.16	0.39	-0.01	0.11
Beer A – 8 for 6	2.92	2.12	2.46	1.37	0.29	0.17
Beer B – 8 for 6	4.03	2.97	0.44	0.80	-0.02	0.09
Spirits – 2 for 90%	2.02	1.79	2.02	1.79	0.44	0.23

However, the benefit of the MDCEV models is that they better reflect the impacts of pricing and promotions on other products and on total alcohol purchased (see Section 3.6). So, from the promotion impacts of the MDCEV model we see the following trends:

- The introduction of a promotion always leads to increased purchasing of alcohol for that specific type of product (both in terms of units purchased and expenditure).
    - As noted above, in general these impacts are larger than those observed from the Tobit and Heckman models, particularly for the specific alcohol type and alcohol category, and in particular the increases on Wine C products are very high, but again it is noted that this product has a very

small market share in the baseline scenario (around 2 percent of alcohol units), and therefore the impacts are large relative to a small base. So, with promotions that make Wine C products as affordable as Wine B alternatives, we predict a very large percentage change in market share, but for a small market, so the overall impact is not large.

- This increase is partly compensated by a reduction in purchasing of units for other types of alcohol, which are measured directly in the model.
    - So, for example, the introduction of a '3 for 2' promotion on medium-priced wine (Wine B-type products), for both Moderate and Hazardous and Harmful drinkers, leads to a 630 percent increase in purchasing of Wine B units, but a smaller increase (72 percent) in all wine products, because of the likelihood of switching between wine products.
- Moreover, the MDCEV models predict the impact on all alcohol purchases, taking account of cross-product trading.
    - So, the '3 for 2' promotion on Wine B products will lead to a 20 percent increase in all alcohol units, because of consumer trade-offs between beer and spirits and wine, and a 23 percent increase in expenditure across all alcohol products.

More generally, in the MDCEV models applying individual promotions on less expensive wine and less expensive beer lead to increased purchasing of alcohol units, while promotions on expensive wine and beer lead to more purchases of these items at the expense of cheaper counterparts and therefore a smaller increase (or even a small reduction) in total units purchased. For spirits, promotions lead to increased purchases of units, because of the higher number of units per bottle.

Removing a package of promotions

The previous tests reflect the impact of (introducing) a single promotion, measured relative to a baseline situation with no promotions. However, the real-world market reflects a number of different competing promotions at once.

Therefore, one further test was undertaken to quantify the impact of removing a 'package' of promotions. A quick review of supermarket websites[24] indicated that the most prevalent offers were in the form of x for £y, and that many of the discounts were in the order of 25–50 percent. In order to test a package that reflected the observed size of discounts more generally, we did a test simultaneously offering '3 for 2' promotions for all wine options (Wine A, Wine B and Wine C) and '8 for 6' promotions for beer and premium beer. No promotion for spirits was included in the test, as these were less common. As was the case with all single-promotion tests (discussed previously), we have assumed that non-promotion items are also available in the test at their non-promotion (baseline) price.

The resulting impacts from each model are summarised in Table 3.20 below. It is noted that in this table we summarise the impacts of moving from a situation with the combined package of promotions available to one with no promotions (opposite to what has been presented for the individual promotions), but more in line with a real-world situation. We

[24] The review was undertaken using the MySupermarket website: http://www.mysupermarket.co.uk/ (Accessed on 4 June 2013)

present the aggregate results across both consumption segments. Detailed results for the different consumption segments are presented in Appendix G.

We caution that these tests may overstate the impact of promotions, because it is not known to what extent all promotions would be presented simultaneously in the market place.

We see that with the removal of the wine and beer promotions the Tobit and Heckman models predict a decrease in purchasing of Wine B and Wine C products, but an increase in Wine A products. The result for Wine A products is a consequence of the strong cross-price and cross-promotion terms for Wine B and Wine C products in that model. So, even though we would expect demand for Wine A products to decrease with the removal of Wine A promotions, because of the very strong cross-price and cross-promotion terms, we see an increase in Wine A products with the removal of Wine B and Wine C promotions. Moreover, because of the relatively large size of the Wine A market, the Tobit models predict an overall increase in units and expenditure for all wine products and for all alcohol products. We believe this to be a structural problem with the Tobit and Heckman models, as each has been estimated with a relatively small amount of data, and cross-effects are not well estimated. Although the Heckman models also predict an increase in Wine A units, they predict a decrease in all wine and all alcohol products with the removal of the promotions. The impacts predicted on Wine B, beer and spirits look more reasonable; although the impact of the increased purchasing of spirits is different between the two models.

The MDCEV models predict reductions in wine markets (the smallest reduction in Wine A, followed by Wine B and Wine C) and beer markets, and an increase in purchasing of spirits. Interestingly, the size of the increase predicted between the Tobit and MDCEV models is very similar. Overall, removing this specific package of promotions leads to a predicted 48 percent reduction in purchasing of alcohol units and a 37 percent reduction in expenditure.

Table 3.20 Impacts of removing packages of promotions (proportion reduction relative to situation with promotions)

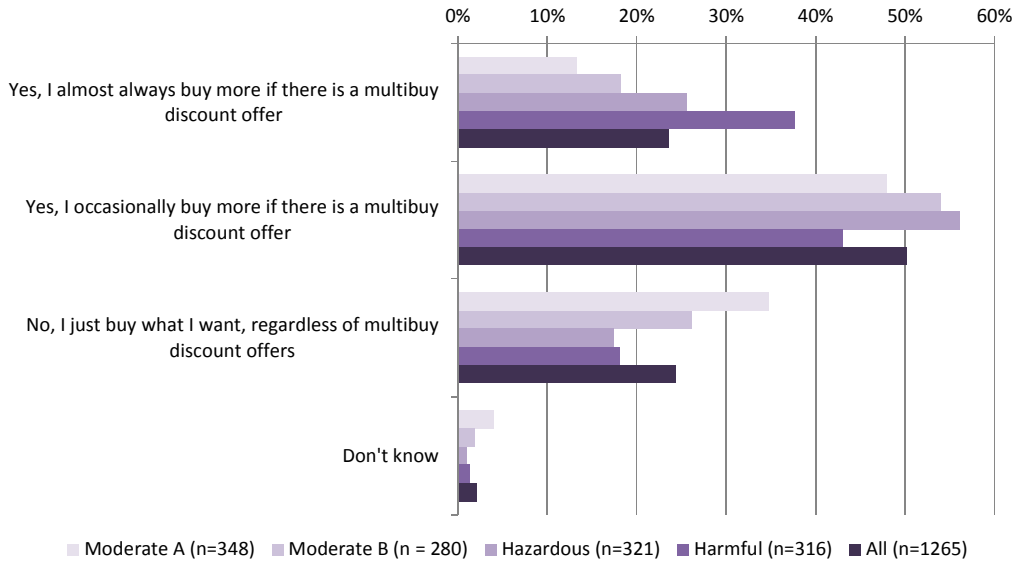
	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
Tobit						
Wine A – 3 for 2	2.58	4.00				
Wine B – 3 for 2	-0.26	0.03	0.32	0.29		
Wine C – 3 for 2	-0.73	-0.62			0.20	0.19
Beer A – 8 for 6	-0.34	-0.16	-0.37	-0.23		
Beer B – 8 for 6	-0.46	-0.31				
Spirits – 2 for 90%	2.35	2.35	2.35	2.35		
Heckman						
Wine A – 3 for 2	1.37	2.31				
Wine B – 3 for 2	-0.54	-0.36	-0.27	-0.36		
Wine C – 3 for 2	-0.93	-0.90			-0.28	-0.36
Beer A – 8 for 6	-0.59	-0.48	-0.65	-0.62		
Beer B – 8 for 6	-0.78	-0.72				
Spirits – 2 for 90%	0.95	0.95	0.95	0.95		
MDCEV						
Wine A – 3 for 2	-0.58	-0.42				
Wine B – 3 for 2	-0.75	-0.64	-0.63	-0.53		
Wine C – 3 for 2	-0.93	-0.89			-0.48	-0.37
Beer A – 8 for 6	-0.61	-0.44	-0.62	-0.47		
Beer B – 8 for 6	-0.67	-0.52				
Spirits – 2 for 90%	2.33	2.33	2.33	2.33		

3.7.3 Evidence from the background questions on promotions

As part of the background questions, respondents were asked whether their alcohol purchasing was affected by multi-buy discount offers. We emphasise that these findings cannot be considered as robust representations of wider population behaviours, because of the nature of the sampling method (relying on internet panel data and the data reflecting quota-based sampled), and thus they should only be treated as indicative. However, they provide some interesting insights for this sample of individuals.

Across all respondents nearly a quarter indicated that they always buy more if there is a multi-buy discount offer, with a further half indicating that they occasionally buy more. Harmful drinkers were more likely to report that they would buy more with the presence of a multi-buy offer.

Figure 3.1 Respondents' reported use of alcohol multi-buy promotions



Sample = main survey sample (1265 respondents), unweighted responses

Moreover, respondents were asked a number of attitudinal questions regarding multi-buy promotions. Nearly half of respondents indicated that they felt that it was worth waiting for or shopping around for multi-buy offers on alcoholic drinks, and that they frequently did so.

Figure 3.2 Respondents' views on multi-buy offers

Sample = main survey sample (1265 respondents), unweighted responses

3.8 Extrapolating what we know about purchasing to consumption

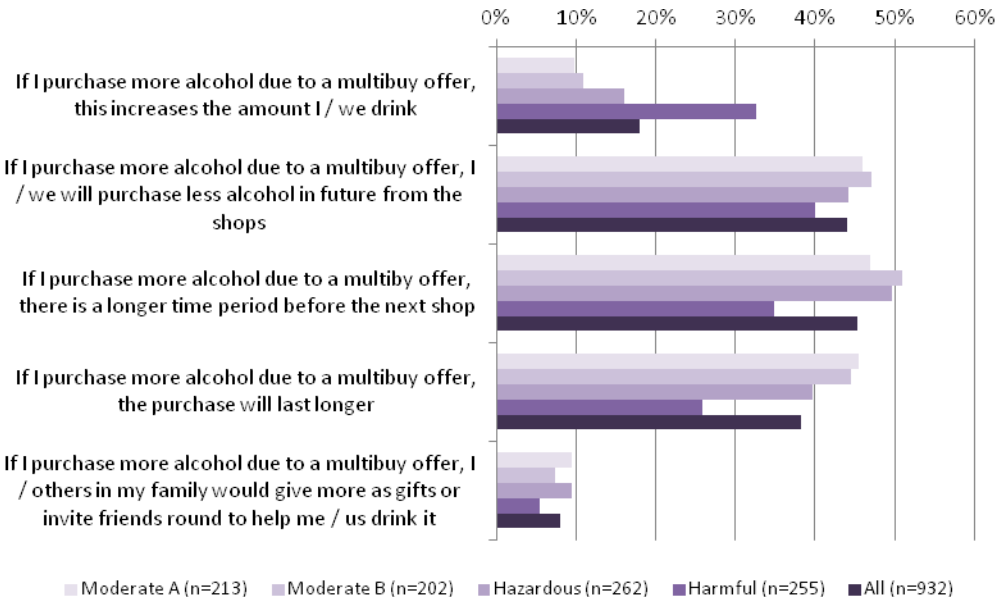
In this study the primary outcome assessed was alcohol purchasing. As we have observed, the quantity of alcohol purchased varied with the price of alcohol and the discounts offered. However, the data available from the choice experiments do not tell us directly what effect changes in purchasing will have on alcohol consumption.

To understand this question better, we looked for studies in the literature that provide a method of extrapolation from purchasing to consumption data, but no such studies were found. Previous studies have either looked at consumption directly, for example through surveys of consumption (Stockwell et al., 2012), or in studies using data on purchasing have equated purchasing with consumption (Collis et al., 2010; Purshouse et al., 2010). Purshouse et al. (2010), in their work estimating the effect of alcohol pricing policies, equated purchasing and consumption, linking purchasing data from the Expenditure and Food Survey with General Lifestyle Survey consumption data. In an earlier paper this assumption was tested by comparing beverage preferences between subgroups in each survey. This comparison showed a good match overall, although the authors found that older females purchased a greater proportion of beer and spirits (in the EFS) than they consumed (measured in the GLF), probably because they were purchasing for the household, rather than for themselves (Meier et al., 2009).

In our survey we included qualitative questions on the likely impacts of changes in purchasing on consumption. In particular we presented respondents who indicated that their alcohol purchasing was influenced by multi-buy promotions (n = 932, 73.7 percent of the sample) with five statements about alcohol purchasing and consumption and asked whether any of these applied to them. The results are shown in Figure 3.3.

Whilst we would recommend that these statements should be interpreted with caution because they rely on self-reported behaviour, we observe that in general respondents stated that purchasing more alcohol as a result of a multi-buy offer would cause them to either purchase less in the future or leave a longer time period until the next shop, and that the purchase would last longer. Interestingly, harmful drinkers were significantly more likely than others to state that purchasing more alcohol would increase the amount they drank, and less likely than others to state that the purchase would last longer or that there would be a longer time period before the next shop.

Figure 3.3 Percentage of respondents who agree with statements on the impact of increased alcohol purchasing due to multi-buy offers



Sample = percentage of respondents who indicated that multi-buy offers influenced their purchasing (73.7 percent of sample), unweighted responses

CHAPTER 4 Conclusions and discussions

The aim of this study was to quantify the impact of multi-buy promotions on off-trade alcohol purchasing. We conducted an online stated preference choice experiment to measure consumers' responses to pricing and promotions. Ideally this work would be checked and calibrated against revealed choice behaviour, for example through examination of detailed market data of observed choices. However, this was out of the scope of this project, although the project methodology included a number of checks and balances to mitigate for this (as detailed below).

We developed a survey and choice experiment to test the impact of alcohol pricing and promotions on respondents' alcohol purchasing decisions. The requirement for 300 interviews for each of four alcohol consumption segments led to a two-stage recruitment methodology, whereby a screener survey was undertaken with a large online panel of respondents representing age, gender, socio-economic group and the regional distribution of the national population to identify potential respondents in each consumption segment. Respondents were then drawn from each consumption segment to participate in the main survey. A total of 1,265 respondents participated in the stated preference choice experiments. Individuals who did not consume alcohol and who lived in households where no one consumed alcohol were excluded from the survey, on the basis that the project budget was constrained and it was assumed that they would not be affected by promotions, particularly the removal of promotions. Thus it could be argued that the research might understate the impact of promotions on those who might be induced to start purchasing alcohol with more generous promotions.

A number of important assumptions were necessarily made during the development of the choice experiments and a number of these have implications for the findings:

- For realism, we asked respondents to consider purchases that they had made themselves (for themselves and their household where relevant), rather than focusing on the household's purchases as a whole, because it was judged that individual respondents would not be able to report purchases made by all household members. This is inconsistent with the structure of the HMRC model (see Collis et al. (2010) for details), which focuses on household purchases.
- We asked respondents to consider a four-week purchase period, in order to ensure that enough 'stated' purchases were made to be able to estimate models with significant coefficients and to try to measure the impact of cross-trading between products.

- We considered six types of alcohol in the choice experiments: spirits, three types of wine and two types of beer; the wine and beer options were defined by price and quality, so that for these products price would not be directly confounded with quality:
    - Wine A: Less expensive wine (less than £5.00), 750ml bottle
    - Wine B: Mid-price wine (between £5.00 and £10.00), 750ml bottle
    - Wine C: More expensive wine (more than £10.00), 750ml bottle
    - Beer A: Beer/ale/bitter/cider, per can
    - Beer B: Premium beer/ale/cider, per bottle
    - Spirits: 750 ml bottle
- Based on the proposed sample sizes, we judged that it was feasible to test a maximum of three promotions for each type of alcohol.
- In order to reduce the complexity of the choice scenarios for respondents, we never tested more than three promotions in a specific choice scenario, which means that respondents were never presented with all promotion types simultaneously.

The presentation of the choice experiments drew on the visual presentation of two supermarket shelves. On one shelf were the six types of (generic) alcohol products, none of which were on promotion. Each was described by the type of alcohol and a price. The second shelf contained promotion items. Each promotion was described by the type of promotion, the total cost and the amount saved for each offer. The order of the shelf presentation was randomly varied across respondents.

From the data collected from the choice experiments, we developed a number of different models that treated competition between products differently. Specifically we tested Tobit and Heckman regression models for each alcohol type separately and MDCEV models that include all choices – discrete and continuous – simultaneously, to quantify the importance of price and multi-buy promotions on respondents' stated purchases. We then applied these models to the weighted survey sample to reflect a nationally representative sample across consumption, age, gender and region and have produced price elasticities and quantified the impacts of promotions tested in the experiments. Details of the weighting procedure are provided in Appendix E.

Below we summarise the key conclusions from the study, discuss key points for interpretation of results and discuss additional work that could be undertaken to further inform the issues investigated in this study.

4.1 Promotions have a large impact on which alcohol products consumers purchase, but the overall impact on all alcohol purchases is smaller

We have quantified the impacts of a number of different promotion types tested in the choice experiments on purchasing. Most of these tests reflect the impact of the introduction of a single promotion, for example the impact of a 3-for-2 promotion on a

specific type of wine. When measuring the impact of the promotion, we measure the impact as a result of the reduction in price as a result of the promotion and the "psychological" impact of the promotion (measured in the models through price sensitivity terms and constants reflecting the impact of the different promotion types, respectively). All tests reflect the impact of multi-buy promotions relative to a baseline at full (non-promotion) prices.

We see from these tests that the impact of individual promotions, particularly on the demand for the specific alcohol product, is large, i.e. that if there is a 3-for-2 promotion for a specific type of wine, more consumers will purchase that wine. However, because consumers switch between different products, the impact on the total number of alcohol units purchased across all products is less. That is, if consumers purchase more wine because of a promotion, they will purchase fewer other products.

From the MDCEV model results, we see that individual promotions on less expensive wine and less expensive beer tend to lead to an increase in the total units purchased, while individual promotions on expensive wine and beer lead to more purchases of these items at the expense of cheaper counterparts and therefore a smaller increase (or even a small reduction) in total units purchased. For spirits, the application of individual promotions always led to an increase in the total units purchased because of the high number of units per bottle.

However, the real-world market reflects a number of different competing promotions at the same time, and the single product tests may overstate the impact of a promotion. We have therefore also undertaken a scenario test to examine the impact of removing a package of promotions, specifically promotions for all wine ('3 for 2') and beer ('8 for 6') options (but not spirits), broadly reflecting the types of promotions currently available in the market. However, we caution that these tests may also overstate the impact of promotions more generally, because it is not known to what extent all promotions would be presented simultaneously in the market place.

Table 4.1 below summarises the predicted impacts of removing these promotions. We emphasise that these are estimates of the impacts, and should not be taken as accurate point estimates. Moreover, the results reflect those produced from the MDCEV models, which are judged to best represent potential switching across products, but which may overestimate the impacts for reasons discussed below. In the main body of the report, we also present results from Tobit and Heckman models, which have more limited representation of competition, and could be considered as lower-bound estimates.

The results show the impact of removing these promotions on each specific alcohol type, the general alcohol category (wine, beer or spirits) and overall across all alcohol purchases. The reported figures reflect the proportional change on demand, i.e. measured as the 'change in demand / demand with promotions'.

Table 4.1 Impacts of removing packages of beer and wine promotions (proportion reduction relative to situation with promotions)

	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
MDCEV						
Wine A – 3 for 2	-0.58	-0.42				
Wine B – 3 for 2	-0.75	-0.64	-0.63	-0.53		
Wine C – 3 for 2	-0.93	-0.89			-0.48	-0.37
Beer A – 8 for 6	-0.61	-0.44	-0.62	-0.47		
Beer B – 8 for 6	-0.67	-0.52				
Spirits – 2 for 90%	2.33	2.33	2.33	2.33		

Source: Based on MDCEV model results

With the removal of beer and wine promotions, reductions in purchasing are predicted for all wine markets – the smallest reduction in the cheapest wine category (Wine A), followed by medium-priced and more expensive wine (Wine B and Wine C, respectively) – and also both beer markets. The models predict an increase in the purchasing of spirits, as a result of the relative increase in price of all other items when promotions are removed (the price of spirits remains unchanged because they were not assumed to be on promotion in the scenario test).

The models predict a larger reduction in units purchased compared to expenditure (because the price of each unit is higher as a result of the removal of promotions).

Overall, when the package of promotions for wine and beer products is removed the MDCEV models predict a 48 percent reduction in purchasing of alcohol units and a 37 percent reduction in expenditure.

We caution that the predicted impacts are likely to be an overestimate of real-world impacts for a number of reasons, including that:

- The models are based on stated responses, specifically on stated preference choice experiments where the focus was on promotions, whereas in real-world shopping environments consumers will be subject to many different promotions and stimuli. Moreover, these responses are likely to reflect short-term choices, and it is not clear how behaviour over the longer term would develop (e.g. changes in consumer behaviour and / or retailer behaviour).
- The surveys were undertaken close to the Christmas period, when multi-buy alcohol promotions may have been more attractive to respondents – although it is noteworthy that the reported spending in the choice experiments was very similar to that reported for the four weeks previous to the survey.
- In the stated preference choice experiments we presented generic (unbranded) alcohol products and this may have had an impact on some respondents decisionmaking, since these would be unfamiliar when compared with the brands generally purchased.
- Because of the technical properties of the MDCEV model, specifically assumptions about cross-elasticities between products (as a result of the IID property of the models), it is likely to lead to overestimates of the impacts of promotions. The Tobit and Heckman models may be less likely to lead to overestimates of impacts, as a result of their model structure, but the predicted impacts from these models are still subject to the points raised above.

- As noted above, the single-product promotion tests are likely to overestimate the impacts of these promotions on individual products, because they do not reflect real-world market conditions which may include a number of different competing promotions at the same time. Moreover, the package tests may also overstate the impact of promotions because it is not known to what extent all promotions would be presented simultaneously in the market place.

Background evidence also collected in the survey supports that respondents thought that multi-buy promotions were important. We emphasise that these findings cannot be considered as robust representations of wider population behaviours, because of the nature of the sampling method (relying on internet panel data and the data reflecting quota-based sampled), and thus they should only be treated as indicative. However, they provide some interesting insights for this sample of individuals. Across all respondents nearly 25 percent indicated that they always buy more if there is a multi-buy discount offer, with a further half indicating that they occasionally buy more if there is a multi-buy offer. Harmful drinkers were more likely to report that they buy more with the presence of a multi-buy offer. Furthermore, nearly half of the consumers in this study agreed or strongly agreed that it was worth waiting for or shopping around for multi-buy offers on alcohol drinks, and that they frequently did so.

Finally, we note that the model results tend to show higher price elasticities and relative impacts for moderate compared to hazardous and harmful drinkers (and this is consistent with the findings of others, e.g. Fogerty (2004)). However, because hazardous and harmful drinkers purchase much higher volumes of alcohol, the absolute impact on these groups will be higher.

4.2 Other relevant findings

In deriving the predicted impacts of promotions, we considered the impact of the data and models, as discussed below.

The results from the stated preference choice experiments appear to be credible, but they are likely to overestimate the impact of multi-buy promotions

Review of the background questions after the experiments suggested that respondents treated the experiments seriously and with due consideration. The stated levels of expenditure during the experiments were broadly consistent with (supermarket) expenditure levels reported for the previous four weeks (see Section 3.1.2 for details). Reported levels of understanding of the experiments were also reasonably high (as discussed in Section 3.1.1) Moreover, the resulting price elasticities seem to be, generally, of the same order of magnitude as other reported values, although it is difficult to make direct comparisons because of differences in study scope (on-trade vs. off-trade) and lack of clarity of output measures (units, monetary expenditure, consumption, etc.) in other studies.

However, as highlighted above, we note that the use of stated responses is likely to lead to overestimates of multi-buy promotion impacts, because of the specific focus on alcohol promotions in the experiments (compared to real-world purchasing, where consumers will be subject to many different promotions and stimuli in a shopping environment).

Different model assumptions lead to different estimates of the impact of promotions

The MDCEV models allow for better representation of the competition between alcohol products, which is not measured as well in the single-product regression models, i.e. Tobit and Heckman models. Thus we get a better representation of how multi-buy promotions impact on the purchasing of other alcohol products and total alcohol purchases. Moreover, the MDCEV models better represent choices where multiple options are chosen – and in the stated preference experiments around 42 percent of respondents made purchase choices that included more than one alcohol type within a specific choice scenario. Furthermore, the MDCEV models also explicitly consider the impact of an available maximum budget for purchases, so that competition between products is again better represented.

Because the MDCEV models explicitly represent promotion choices, they accurately reflect the pricing of promotions in estimates of the impact on expenditure. The models used for this study could be developed further to better understand the socio-economic characteristics of those who tend to use promotions and to take account of correlation between choice alternatives and individuals (which would be difficult with the Tobit and Heckman models). These options are discussed further below.

The MDCEV models additionally represent the effect of satiation, i.e. that the marginal utility of additional purchases declines as more of a given product is purchased.

Furthermore, the MDCEV models use the data more efficiently, because all observations (within a segment) contribute to the estimation of the model parameters.

However, within the timescale of the study, it was feasible to develop models with multinomial structures only, with promotion and non-promotion items being represented as separate alternatives, equally competitive with each other and other types of alcohol. A key property of multinomial models is that the unexplained model error across alternatives in the model is IID, and this property means that the impact of introducing promotions is likely to be overstated. Without undertaking further modelling work (discussed below), it is difficult to say by how much.

On the other hand, the Tobit and Heckman models are likely to underestimate the impact of promotions, because of the limited representation of competition in these models.

For these reasons we recommend that the results from the MDCEV models be treated as maximum estimates of the impacts of promotions on alcohol purchasing, and that sensitivity tests be undertaken using the lower values provided by the Tobit and Heckman models.

4.3 Key points for interpretation of results

Below we clarify some important points regarding interpretation of results from the study.

Quantifying the impacts of promotions

The choice experiments tested the impact of changes in prices (increases and reductions) and the presence of promotions (some choices had promotions, others did not) on purchasing behaviour. This presentation reflects what happens in reality – sometimes there are promotions on items at supermarkets and sometimes there are not. Thus, we measure

the impact of a promotion on purchasing behaviour generally, with no specific directional effects, e.g. by introducing or banning promotions.

Household versus individual elasticities

During the design of the experiments much thought was given to whether to ask individuals to consider their own alcohol purchases or whether to ask them to estimate purchases for the household. Given that the survey for this study was undertaken with one individual in the household, it was felt that it was unrealistic to ask respondents to report purchasing by all members of the household. We also considered focusing on only those who were the main household purchasers; however, since this study was intended to examine the purchasing behaviour of different groups of people in the population, this could have led to sample biases, for example towards women or away from young people or those drinkers with hazardous or harmful consumption levels. For these reasons, we interviewed adults about their own purchases only (although these may have included purchases for others in the household). The resulting models therefore reflect the influence of prices and promotions as well as the socio-economic characteristics of the individual and household on individuals' alcohol purchases.

However, at the aggregate level (across all households or all individuals) we would argue that the total changes should be the same, since the measured change is relative to the total units or expenditure on alcohol.

Extrapolating what we know about purchasing to consumption

In this study the primary outcome assessed was alcohol purchasing. The quantity of alcohol purchased varied with the price of alcohol and the discounts offered. However, the data available from the choice experiments do not tell us directly what effect changes in purchasing will have on alcohol consumption.

The linkage between purchasing and consumption is not well reported in the literature. Purshouse et al. (2010) in their work estimating the effect of alcohol pricing policies equated purchasing and consumption. In an earlier paper this assumption was tested by comparing beverage preferences between subgroups in each survey. This comparison showed a good match overall, although they found that older females purchased a greater proportion of beer and spirits (in the EFS) than they consumed (measured in the GLF), probably because they were purchasing for the household, rather than for themselves (Meier et al., 2009).

The main survey included qualitative questions on the likely impacts of changes in purchasing on consumption. In particular we presented respondents who indicated that their alcohol purchasing was influenced by multi-buy promotions (n = 932, 73.7 percent of the sample) with five statements about alcohol purchasing and consumption and asked whether any of these applied to them. Whilst we would recommend that these statements should be interpreted with caution because they rely on self-reported behaviour, we observed that in general respondents stated that purchasing more alcohol as a result of a multi-buy offer would cause them to purchase less in the future, leave a longer time period until the next shop and that the purchase would last longer. However, harmful drinkers were significantly more likely than others to state that purchasing more alcohol would increase the amount they drank, and less likely than others to state that the purchase would last longer or that there would be a longer time period before the next shop.

4.4 Further potential work

Below we set out additional work that could further inform the issues investigated in this study.

Compare/calibrate findings against revealed preference evidence

Stated preference choices often have different errors and biases relative to revealed choices, which impact the model error and sensitivity through the model scale (this issue is discussed in Bradley and Daly, 1997). It would therefore be useful to compare and calibrate the findings of this study against revealed preference evidence. This would best be done by developing MDCEV models on revealed preference data since other models, such as Tobit models, do not fully represent the competition between alcohol types.

Investigate potential supply-side responses

An analysis of the supply-side response to pricing policies should be undertaken, because it is plausible that policies that have a large effect on beverage prices might lead to market restructuring, leading to supply-side responses (Kenkel, 2005).

Take account of intra-respondent and between alternative correlation

In the models developed for this study, it has been assumed that the responses from each individual are independent and that preferences for alcohol types are independent. Correcting these assumptions would be difficult or perhaps impossible in the Tobit models, but the possibility exists in the MDCEV models. Specifically we recommend taking account of correlation between product alternatives, because there is probably significant correlation between non-promotion and promotion alternatives for the same type of alcohol, and probably significant correlation between alcohol types within the same category (wine and beer). Making these improvements would give a better representation of the observed behaviour and in particular would give better estimates of the statistical significance of the findings and a better representation of the competition between alcohol types.

Better understand consumers' preferences for promotions

It is likely that certain people are influenced more than others by the existence of promotions. In the modelling, attempts could be made to identify which person types are influenced and the extent of that influence on their purchasing behaviour.

Understand the behaviour of potential drinkers and their sensitivity to promotions

In this study we focused on measuring promotion impacts on individuals who consume alcohol or who purchase alcohol for others in their household who consume alcohol. Individuals from non-drinking households were excluded from the survey sample, because the survey sample sizes were constrained, and it was judged that individuals from non-drinking households were unlikely to provide information on the impacts of promotion. However, it may be possible that promotions could induce such people to start consuming alcohol, and this could be an area for future investigation.

Test the sensitivity of 'alcohol budget' assumptions in the MDCEV models

The MDCEV models explicitly incorporate an alcohol budget in the model specification, to better represent competition between choices. In developing the models, a number of

different budget specifications were tested. The most meaningful results were obtained by assuming that the budget for a given consumer was the maximum expenditure observed for that consumer across any of the twelve choice tasks, plus £1, ensuring that in each task, at least one pound's worth of the outside good is chosen. However, further testing could be undertaken to investigate the impact of different assumptions on the sensitivity of the model impacts.

Use the attitudinal data that has been collected in the modelling

As part of the main survey, information was collected concerning the attitudes of individual respondents to the consumption of alcohol. It would quite likely improve the models considerably to utilise this information in the modelling, leading to insights into behaviour that might help with policy formulation. Modern approaches to modelling with attitudinal variables (Daly et al., 2012) can allow forecasts of behaviour without requiring exogenous forecasts of attitudes.

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APPENDICES

Appendix A: Experimental design

This appendix details the experimental design for the online experiments.

Experiment A: Attributes and levels

In order to measure the impact of prices, we tested the impact of five price levels for each alcohol type in Experiment A. The price adjustments tested in the exercise are shown in Table A.1 below. The levels were chosen to present as wide a price variation as was judged to be realistic to encourage shifts in purchasing behaviour. Both price reductions and increases were tested.

Table A.1 Price adjustments tested in first three choices

	Levels					Base Price
	1	2	3	4	5	
Price_WineA	0.70	0.85	1.00	1.15	1.25	£4.00
Price_WineB	0.70	0.85	1.00	1.15	1.25	£7.50
Price_WineC	0.80	0.90	1.00	1.15	1.25	£12.50
Price_BeerA	0.70	0.85	1.00	1.15	1.25	£1.00
Price_BeerB	0.70	0.85	1.00	1.15	1.25	£2.00
Price_Spirits	0.80	0.90	1.00	1.15	1.25	£12.00

Using an orthogonal experimental design, which allows estimation of main effects, requires the presentation of 25 scenarios to test 5 price levels (this includes an option with all prices at the same (base) level). We therefore developed 8 blocks of 3 scenarios (such that correlation between prices was minimised within each block), which were randomly assigned across respondents. Each respondent therefore saw one block of scenarios, plus the one choice where all alcohol options were presented at the base price level.

Experiment B: Attributes and levels

To include promotions in the experimental design, attributes were included in the design to describe the presence of promotions for wine, beer and spirits (called avail_wine, avail_beer and avail_spirits). For wine and beer promotions, in order to have enough promotion options across the different types of wine and beer, we offered promotions on one type of wine and beer in each choice scenario. For spirits, two promotion levels were tested: promotion or no promotion.

If the promotion attribute was 'on', then we identified the type of promotion from the discount variable, i.e. wine_disc, beer_disc, spirit_disc. For multi-buy discount options, the level of discount was set randomly through the wine_disc_p, beer_disc_p and

spirit_disc_p attributes. With the addition of the promotion options to the design, we had to drop the number of price levels to four. To keep prices realistic, we dropped the lower price level from Table A.1.

The attributes and levels are summarised in Table A.2 below.

Table A.2 Levels and attributes in Experiment B

	Levels				Base Price
	1	2	3	4	
Price_WineA	0.85	1.00	1.15	1.25	£4.00
Price_WineB	0.85	1.00	1.15	1.25	£7.50
Price_WineC	0.85	1.00	1.15	1.25	£12.50
Price_BeerA	0.85	1.00	1.15	1.25	£1.00
Price_BeerB	0.85	1.00	1.15	1.25	£2.00
Price_Spirits	0.85	1.00	1.15	1.25	£12.00
Avail_Wine	A	B	C		
Avail_Beer	A	B			
Avail_Spirits	No deals	A			
Wine_disc	3 for £x	2 for 1	3 for 2		
Beer_disc	12 for £x	12 for 8	8 for 6		
Spirit_disc	3 for 2	2 for			
Wine_disc_p	0.6	0.7	0.8	0.9	
Beer_disc_p	0.5	0.7	0.8	0.9	
Spirit_disc_p	0.7	0.8	0.85	0.9	

An orthogonal design required the presentation of 64 scenarios. Thus we developed blocks of 8 scenarios (which again minimised correlation between scenarios), which were randomly assigned across respondents.

Appendix B: Descriptives of key socio-economic and demographic variables

This appendix contains descriptives for the key socio-demographic and economic explanatory variables tested in the models.

fQGender Are you?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	631	49.9	49.9	49.9
	Female	634	50.1	50.1	100.0
	Total	1265	100.0	100.0	

dAge --Hidden to store the age group--

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-24	168	13.3	13.3	13.3
	25-34	165	13.0	13.0	26.3
	35-44	195	15.4	15.4	41.7
	45-54	211	16.7	16.7	58.4
	55-64	230	18.2	18.2	76.6
	65+	296	23.4	23.4	100.0
	Total	1265	100.0	100.0	

QRegion Where do you live? (You may be living with parents or in halls of residence: please indicate wherever you consider 'home')?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	East of England	107	8.5	8.5	8.5
	East Midlands	72	5.7	5.7	14.2
	London	134	10.6	10.6	24.7
	North East	66	5.2	5.2	30.0
	North West	155	12.3	12.3	42.2
	Northern Ireland	34	2.7	2.7	44.9
	Scotland	117	9.2	9.2	54.2
	South East	184	14.5	14.5	68.7
	South West	109	8.6	8.6	77.3
	Wales	80	6.3	6.3	83.6
	West Midlands	103	8.1	8.1	91.8
	Yorkshire / Humberside	104	8.2	8.2	100.0
	Total	1265	100.0	100.0	

DSOCIAL DUMMY TO RECORD SOCIAL GRADE FROM PREVIOUS QUESTION

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ABC1	673	53.2	53.2	53.2
	C2DE	592	46.8	46.8	100.0
	Total	1265	100.0	100.0	

Q22xHSIZE.1 (Please indicate the number of people in your household, including yourself)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	.2	.3	.3
	2	511	40.4	55.3	55.6
	3	191	15.1	20.7	76.3
	4	147	11.6	15.9	92.2
	5	47	3.7	5.1	97.3
	6	14	1.1	1.5	98.8
	7	8	.6	.9	99.7
	9	2	.2	.2	99.9
	11	1	.1	.1	100.0
	Total	924	73.0	100.0	
Missing	System	341	27.0		
Total		1265	100.0		

Q23xADULT_1 (Please indicate the number of adults (age 16+) in your household, including yourself)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	.9	1.2	1.2
	2	663	52.4	72.0	73.2
	3	152	12.0	16.5	89.7
	4	74	5.8	8.0	97.7
	5	18	1.4	2.0	99.7
	6	1	.1	.1	99.8
	7	2	.2	.2	100.0
	Total	921	72.8	100.0	
Missing	System	344	27.2		
Total		1265	100.0		

Q24xCHILD.1 (Please report the number of children under 16 years of age in your household)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	698	55.2	75.8	75.8
	1	110	8.7	11.9	87.7
	2	81	6.4	8.8	96.5
	3	18	1.4	2.0	98.5
	4	10	.8	1.1	99.6
	5	2	.2	.2	99.8
	6	2	.2	.2	100.0
	Total	921	72.8	100.0	
Missing	System	344	27.2		
Total		1265	100.0		

Q26xETH01 To which of these ethnic groups do you consider you belong?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	White	1184	93.6	93.6	93.6
	Mixed	15	1.2	1.2	94.8
	Asian or Asian British	28	2.2	2.2	97.0
	Black or Black British	13	1.0	1.0	98.0
	Chinese	6	.5	.5	98.5
	Prefer not to say	15	1.2	1.2	99.7
	Other ethnic group	4	.3	.3	100.0
	Total	1265	100.0	100.0	

Q27xMARST Are you currently ...

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single, that is never married	359	28.4	28.4	28.4
	Married and living with your husband/wife	676	53.4	53.4	81.8
	A civil partner in a legally recognised Civil Partnership	13	1.0	1.0	82.8
	Married and separated from your husband/wife	21	1.7	1.7	84.5
	Divorced	90	7.1	7.1	91.6
	Widowed	47	3.7	3.7	95.3
	Prefer not to say	6	.5	.5	95.8
	Other	53	4.2	4.2	100.0
	Total	1265	100.0	100.0	

Q28xHIGH1 What is the highest level of qualification that you have received from school, college or since leaving education? Please include any work-based training.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Degree-level qualification (or equivalent)	413	32.6	32.6	32.6
	Higher-educational qualification below degree level	164	13.0	13.0	45.6
	A-Levels or Highers	218	17.2	17.2	62.8
	ONC / National Level BTEC	76	6.0	6.0	68.9
	O Level or GCSE equivalent (Grade A–C) or O Grade/CSE equivalent (Grade 1) or Standard Grade level 1-3	205	16.2	16.2	85.1
	GCSE grade D–G or CSE grade 2–5 or Standard Grade level 4–6	86	6.8	6.8	91.9
	Other qualifications (including foreign qualifications below degree level)	34	2.7	2.7	94.5
	No formal qualifications	69	5.5	5.5	100.0
	Total	1265	100.0	100.0	

Q29xRELIG What is your religion, even if you are not currently practising?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Christian	725	57.3	57.3	57.3
	Buddhist	9	.7	.7	58.0
	Hindu	11	.9	.9	58.9
	Jewish	3	.2	.2	59.1
	Muslim	6	.5	.5	59.6
	Sikh	3	.2	.2	59.8
	Prefer not to say	44	3.5	3.5	63.3
	Any other religion	21	1.7	1.7	65.0
	No religion at all	443	35.0	35.0	100.0
	Total	1265	100.0	100.0	

Q30xGROSS 'What is your total personal income before deductions for income tax, National Insurance etc?'/'What is your total household income before deductions for income tax, National Insurance etc?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Under £10,000	128	10.1	10.1	10.1
	£10,000 - £19,999	271	21.4	21.4	31.5
	£20,000 - £29,999	278	22.0	22.0	53.5
	£30,000 - £39,999	189	14.9	14.9	68.5
	£40,000 - £49,999	105	8.3	8.3	76.8
	£50,000 - £59,999	59	4.7	4.7	81.4
	£60,000 - £69,999	28	2.2	2.2	83.6
	£70,000 - £79,999	28	2.2	2.2	85.8
	£80,000 - £89,999	15	1.2	1.2	87.0
	£90,000 - £99,999	13	1.0	1.0	88.1
	£100,000 - £149,999	7	.6	.6	88.6
	£150,000 - £199,999	3	.2	.2	88.9
	Prefer not to answer	141	11.1	11.1	100.0
	Total	1265	100.0	100.0	

Q31xWKSTA 'Which of these categories best describes you at present?'/'Which of these categories best describes the head of the household at present?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Working full time	572	45.2	45.2	45.2
	Working part time	129	10.2	10.2	55.4
	Unemployed	49	3.9	3.9	59.3
	Full-time student	51	4.0	4.0	63.3
	Looking after family home	19	1.5	1.5	64.8
	Long-term sick or disabled	57	4.5	4.5	69.3
	Retired from paid work	374	29.6	29.6	98.9
	Not in paid work for some other reason	14	1.1	1.1	100.0
	Total	1265	100.0	100.0	

Q32xPEROC 'Have you ever had a paid job?'/'Has the head of the household ever had a paid job?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	500	39.5	97.5	97.5
	No	13	1.0	2.5	100.0
	Total	513	40.6	100.0	
Missing	System	752	59.4		
Total		1265	100.0		

dSTATUS - Hidden question to contain punch - [Hidden]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full time student	51	4.0	4.0	4.0
	Never worked	13	1.0	1.0	5.1
	Work/have worked	1201	94.9	94.9	100.0
	Total	1265	100.0	100.0	

Q33xOCC1 'Do you work as an employee or are you self-employed?''/'Does the head of the household work as an employee or are they self-employed?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employee	595	47.0	84.9	84.9
	Self-employed with employees	28	2.2	4.0	88.9
	Self-employed/freelance without employees	78	6.2	11.1	100.0
	Total	701	55.4	100.0	
Missing	System	564	44.6		
Total		1265	100.0		

Q34xOCC2 'How many people work for your employer at the place where you work?'/'How many people work for the employer of the head of the household, at the place where they work?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 24	233	18.4	39.2	39.2
	25 or more	362	28.6	60.8	100.0
	Total	595	47.0	100.0	
Missing	System	670	53.0		
Total		1265	100.0		

Q35xOCC2b 'How many people do you employ?'/'How many people does the head of the household employ?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 24	26	2.1	92.9	92.9
	25 or more	2	.2	7.1	100.0
	Total	28	2.2	100.0	
Missing	System	1237	97.8		
Total		1265	100.0		

Q36xOCC3 'Do you supervise any other employees?Note/A supervisor or foreman is responsible for overseeing the work of other employees on a day-to-day basis' : 'Does the head of the household supervise any other employees?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	18	1.4	64.3	64.3
	No	10	.8	35.7	100.0
	Total	28	2.2	100.0	
Missing	System	1237	97.8		
Total		1265	100.0		

Q37xOCC4 'Please tick one box to show which best describes the sort of work you do.'/'Please tick one box to show which best describes the sort of work the head of the household does.'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Modern professional occupations such as: teacher - nurse - physiotherapist - social worker - welfare officer - artist - m	117	9.2	16.7	16.7
	Clerical and intermediate occupations such as: secretary - personal assistant - clerical worker - office clerk - call ce	125	9.9	17.8	34.5
	Senior managers or administrators (usually responsible for planning, organising and co-ordinating work, and for finance)	72	5.7	10.3	44.8
	Technical and craft occupations such as: motor mechanic - fitter - inspector - plumber - printer - tool maker - electric	121	9.6	17.3	62.1
	Semi-routine manual and service occupations such as: postal worker - machine operative - security guard - caretaker - fa	88	7.0	12.6	74.6
	Routine manual and service occupations such as: HGV driver - van driver - cleaner - porter - packer - sewing machinist -	58	4.6	8.3	82.9
	Middle or junior managers such as: office manager - retail manager - bank manager - restaurant manager - warehouse manag	67	5.3	9.6	92.4
	Traditional professional occupations such as: accountant - solicitor - medical practitioner - scientist - civil/mechanic	53	4.2	7.6	100.0
	Total	701	55.4	100.0	
Missing	System	564	44.6		
Total		1265	100.0		

Q38xSELF1 'Did you work as an employee or were you self-employed?'/'Did the head of the household work as an employee or were they self-employed?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employee	414	32.7	82.8	82.8
	Self-employed with employees	30	2.4	6.0	88.8
	Self-employed/freelance without employees	56	4.4	11.2	100.0
	Total	500	39.5	100.0	
Missing	System	765	60.5		
Total		1265	100.0		

Q39xSELF2 'How many people worked for your employer at the place where you worked?'/'How many people worked for the employer of the head of the household at the place where they worked?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 24	124	9.8	30.0	30.0
	25 or more	290	22.9	70.0	100.0
	Total	414	32.7	100.0	
Missing	System	851	67.3		

Q39xSELF2 'How many people worked for your employer at the place where you worked?'/'How many people worked for the employer of the head of the household at the place where they worked?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 24	124	9.8	30.0	30.0
	25 or more	290	22.9	70.0	100.0
	Total	414	32.7	100.0	
Missing	System	851	67.3		
Total		1265	100.0		

Q40xSELF3 'How many people did you employ?'/'How many people did the head of the household employ?'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 24	30	2.4	100.0	100.0
Missing	System	1235	97.6		
Total		1265	100.0		

Q41xSELF4 'Did you supervise any other employees?Note/A supervisor or foreman is responsible for overseeing the work of other employees on a day-to-day basis.' : 'Did the head of the household supervise any other employees?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	270	21.3	60.8	60.8
	No	174	13.8	39.2	100.0
	Total	444	35.1	100.0	
Missing	System	821	64.9		
Total		1265	100.0		

Q42xSELF5 'Please tick one box to show which best describes the sort of work you did in your last job.'/'Please tick one box to show which best describes the sort of work the head of the household did in their last job.'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Modern professional occupations such as: teacher - nurse - physiotherapist - social worker - welfare officer - artist - m	93	7.4	18.6	18.6
	Clerical and intermediate occupations such as: secretary - personal assistant - clerical worker - office clerk - call ce	66	5.2	13.2	31.8
	Senior managers or administrators (usually responsible for planning, organising and co-ordinating work, and for finance)	75	5.9	15.0	46.8
	Technical and craft occupations such as: motor mechanic - fitter - inspector - plumber - printer - tool maker - electric	74	5.8	14.8	61.6
	Semi-routine manual and service occupations such as: postal worker - machine operative - security guard - caretaker - fa	56	4.4	11.2	72.8
	Routine manual and service occupations such as: HGV driver - van driver - cleaner - porter - packer - sewing machinist -	33	2.6	6.6	79.4
	Middle or junior managers such as: office manager - retail manager - bank manager - restaurant manager - warehouse manag	70	5.5	14.0	93.4

	Traditional professional occupations such as: accountant - solicitor - medical practitioner - scientist - civil/mechanic	33	2.6	6.6	100.0
	Total	500	39.5	100.0	
Missing	System	765	60.5		
Total		1265	100.0		

Appendix C: Tobit model coefficients

The following tables present the model coefficients for the Tobit models. Separate tables are presented for each alcohol type, with separate columns for the results for Moderate and Hazardous and Harmful (H&H) drinkers.

The coefficients in the table are defined using the following conventions:

- 'O' at the start indicates a term applied to the alcohol type in question, e.g. O_price_WA is the own price coefficient for Wine A products;
- 'X' at the start indicates a term applied to the competitor alcohol products, e.g. X_price_WB is the cross-price term for Wine B products.

Product-type suffixes are included on price and promotion terms, i.e.:

- WA = Wine A
- WB = Wine B
- WC = Wine C
- BA = Beer A
- BB = Beer B
- SP = spirits

Coefficients for promotions are identified by the type of promotion, e.g.:

- Wine:
    - 3_fxd = 3 for a fixed price
    - 2_1 = 2 for 1
    - 3_2 = 3 for 2
- Beer:
    - 12_fxd = 12 for a fixed price
    - 12_8 = 12 for 8
    - 8_6 = 8 for six
- Spirits
    - 2_fxd = 2 for a fixed price
    - 3_2 = 3 for 2

The socio-economic terms are described explicitly, and the base level for categorical variables is specified explicitly.

The shelf-ordering terms (dShelfOrd) reflects the condition that the promotion shelf was on the top in the shelf presentation.

Table C.1 Tobit results: Wine A

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-37968.7	14736	9191	5545
All			
tu_wa	Coef.	Std. Err.	t
O_3_fxd_WA	45.91	5.95	7.72
O_2_1_WA	39.85	5.83	6.83
O_3_2_WA	43.91	6.39	6.87
O_Price_WA	-47.16	12.91	-3.65
X_3_fxd_WB	-79.31	5.35	-14.82
X_2_1_WB	-90.28	5.31	-16.99
X_3_2_WB	-74.08	5.58	-13.29
X_3_fxd_WC	-40.36	6.25	-6.45
X_2_1_WC	-45.93	6.44	-7.13
X_3_2_WC	-31.54	6.79	-4.64
X_Price_WB	55.14	5.87	9.39
X_Price_WC	6.83	4.22	1.62
dShelfOrd	-0.62	2.01	-0.31
Age 18 - 24	-35.01	3.71	-9.43
Age 25 - 44 (Base)			
Age above 45	7.96	2.28	3.49
Male (Base)			
Female	23.80	2.03	11.71
Adult_1 (Base)			
adult_2plus	-14.20	3.01	-4.71
HHldShare	20.15	1.48	13.6
LondonSE (base)			
East	0.44	3.32	0.13
West	0.29	2.89	0.1
North	2.55	2.73	0.94
Scotland	-2.64	3.88	-0.68

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-14106.2	7380	5164	2216
Moderate			
tu_wa	Coef.	Std. Err.	t
O_3_fxd_WA	25.70	4.51	5.7
O_2_1_WA	27.91	4.27	6.53
O_3_2_WA	20.59	4.79	4.3
O_Price_WA	-28.35	9.79	-2.9
X_3_fxd_WB	-47.43	4.13	-11.5
X_2_1_WB	-54.03	4.28	-12.63
X_3_2_WB	-48.96	4.46	-10.97
X_3_fxd_WC	-26.25	4.68	-5.61
X_2_1_WC	-27.67	4.89	-5.66
X_3_2_WC	-17.88	5.21	-3.43
X_Price_WB	34.42	4.54	7.58
X_Price_WC	6.37	3.19	2
dShelfOrd	7.72	1.54	5
Age 18 - 24	-6.85	2.78	-2.46
Age 25 - 44 (Base)			
Age above 45	4.36	1.83	2.38
Male (Base)			
Female	10.28	1.57	6.54
Adult_1 (Base)			
adult_2plus	-12.35	2.24	-5.5
HHldShare	9.40	1.04	9.06
LondonSE (base)			
East	0.59	2.47	0.24
West	-7.91	2.18	-3.63
North	-3.47	2.15	-1.62
Scotland	-6.02	2.81	-2.14

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-22801.3	7356	4027	3329
H & H			
tu_wa	Coef.	Std. Err.	t
O_3_fxd_WA	59.54	9.29	6.41
O_2_1_WA	50.43	9.41	5.36
O_3_2_WA	57.28	10.09	5.68
O_Price_WA	-54.47	20.23	-2.69
X_3_fxd_WB	-90.30	8.37	-10.79
X_2_1_WB	-103.02	8.06	-12.78
X_3_2_WB	-81.69	8.49	-9.62
X_3_fxd_WC	-41.90	9.96	-4.21
X_2_1_WC	-51.12	10.09	-5.07
X_3_2_WC	-39.71	10.55	-3.76
X_Price_WB	62.22	9.12	6.82
X_Price_WC	6.56	6.67	0.98
dShelfOrd	-6.19	3.15	-1.96
Age 18 - 24	-49.63	5.98	-8.3
Age 25 - 44 (Base)			
Age above 45	20.49	3.47	5.91
Male (Base)			
Female	32.90	3.16	10.4
Adult_1 (Base)			
adult_2plus	-9.35	5.10	-1.83
HHldShare	16.71	2.66	6.28
LondonSE (base)			
East	3.44	5.28	0.65
West	14.22	4.60	3.09
North	8.12	4.17	1.95
Scotland	14.10	6.37	2.22

Islands	0.00	(omitted)	
HighMedSkills (base)			
Lowskillsother	-8.07	2.75	-2.93
Constant	-99.04	10.14	-9.77
Sigma	100.62	1.04	

Islands	0.00	(omitted)	
HighMedSkills (base)			
Lowskillsother	-7.96	2.07	-3.85
Constant	-63.13	7.65	-8.25
Sigma	51.35	0.86	

Islands	0.00	(omitted)	
HighMedSkills (base)			
Lowskillsother	-0.30	4.43	-0.07
Constant	-95.56	16.06	-5.95
Sigma	115.97	1.54	

Table C.2 Tobit results: Wine B

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-23485.6	14736	11410	3326
All			
tu_wb	Coef.	Std. Err.	t
O_3_fxd_WB	94.75	5.02	18.87
O_2_1_WB	113.75	4.74	24.01
O_3_2_WB	96.86	5.38	18
O_Price_WB	-111.91	6.03	-18.56
X_3_fxd_WA	-51.08	5.20	-9.82
X_2_1_WA	-50.58	7.14	-7.08
X_3_2_WA	-54.28	7.32	-7.42
X_3_fxd_WC	-50.89	5.17	-9.85
X_2_1_WC	-63.45	7.73	-8.21
X_3_2_WC	-54.50	7.27	-7.5
dShelfOrd	5.02	2.23	2.26
Age 18 - 24	-16.31	4.21	-3.87
Age 24_45 (Base)			
Age above 45	4.91	2.54	1.94
Male (Base)			
Female	19.38	2.25	8.61
HIncLT20k (Base)			
HInc20_40k	24.02	2.98	8.05
HInc40_60k	40.08	3.80	10.55
HIncGT60k	51.42	4.49	11.45
HIncNA	21.97	4.01	5.47
HiNtDegree	5.60	3.16	1.77
Alevel (Base)			
GCSE and Less	-15.12	3.46	-4.37
adult_1 (Base)			
adult_2plus	-22.82	3.42	-6.67
HighMedskill			
Lowskillsother	-18.13	3.49	-5.2
HHldShare	14.45	1.66	8.71
LondonSE(Base)			
East	-8.09	3.76	-2.15
West	-10.14	3.23	-3.14

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-9264.1	7380	6010	1370
Moderate			
tu_wb	Coef.	Std. Err.	t
O_3_fxd_WB	57.18	4.63	12.36
O_2_1_WB	66.71	4.45	14.98
O_3_2_WB	57.12	5.12	11.16
O_Price_WB	-69.77	5.66	-12.32
X_3_fxd_WA	-32.96	4.93	-6.69
X_2_1_WA	-27.12	6.21	-4.37
X_3_2_WA	-35.16	6.82	-5.16
X_3_fxd_WC	-33.91	4.86	-6.98
X_2_1_WC	-41.66	7.22	-5.77
X_3_2_WC	-24.61	6.48	-3.8
dShelfOrd	6.73	2.10	3.2
Age 18 - 24	-7.55	3.89	-1.94
Age 24_45 (Base)			
Age above 45	5.31	2.51	2.12
Male (Base)			
Female	11.17	2.14	5.22
HIncLT20k (Base)			
HInc20_40k	8.98	2.71	3.32
HIncGT40k	15.87	3.24	4.89
HIncNA	16.13	3.55	4.54
HiNtDegree	7.49	3.10	2.42
Alevel (Base)			
GCSE and Less	-11.39	3.44	-3.31
adult_1 (Base)			
adult_2plus	-15.21	3.11	-4.89
HighMedskill			
Lowskillsother	-12.18	3.21	-3.8
HHldShare	9.23	1.43	6.48
LondonSE(Base)			
East	-18.62	3.59	-5.18
West	-13.30	3.00	-4.43

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-13852.1	7356	5400	1956
H & H			
tu_wb	Coef.	Std. Err.	t
O_3_fxd_WB	121.92	8.00	15.25
O_2_1_WB	142.98	7.42	19.26
O_3_2_WB	121.62	8.35	14.56
O_Price_WB	-138.72	9.46	-14.66
X_3_fxd_WA	-59.92	8.09	-7.4
X_2_1_WA	-65.60	11.97	-5.48
X_3_2_WA	-64.15	11.54	-5.56
X_3_fxd_WC	-57.06	8.10	-7.05
X_2_1_WC	-73.47	12.24	-6
X_3_2_WC	-78.86	11.87	-6.64
dShelfOrd	2.83	3.54	0.8
Age 18 - 24	-10.51	6.84	-1.54
Age 24_45 (Base)			
Age above 45	9.95	3.90	2.55
Male (Base)			
Female	24.30	3.52	6.89
HIncLT20k (Base)			
HInc20_40k	35.31	4.90	7.2
HInc40_60k	48.51	6.00	8.09
HIncGT60k	75.78	7.01	10.81
HIncNA	20.99	6.62	3.17
HiNtDegree	10.84	4.87	2.23
Alevel (Base)			
GCSE and Less	-13.03	5.27	-2.47
adult_1 (Base)			
adult_2plus	-19.96	5.80	-3.44
HighMedskill			
Lowskillsother	-19.74	5.67	-3.48
HHldShare	10.98	3.00	3.65
LondonSE(Base)			
East	4.46	5.92	0.75
West	-2.45	5.16	-0.48

North	-3.30	3.01	-1.1	North	-7.25	2.88	-2.52	North	-1.02	4.65	-0.22
Scotland	-0.72	4.13	-0.17	Scotland	3.04	3.60	0.84	Scotland	-4.50	6.95	-0.65
Islands	0.00	(omitted)		Islands	0.00	(omitted)		Islands	0.00	(omitted)	
Constant	-29.66	6.99	-4.24	Constant	-19.39	6.54	-2.97	Constant	-25.10	11.14	-2.25
Sigma	94.75	1.28		Sigma	59.47	1.28		Sigma	109.84	1.93	

Table C.3 Tobit results: Wine C

Log Likelihood	Obs.	Left Censor-ed Obs	Uncensor-ed Obs
-6554.3	14736	13900	836
All			
tu_wc	Coef.	Std. Err.	t
O_3_fxd_WC	83.67	7.13	11.74
O_2_1_WC	107.04	6.65	16.1
O_3_2_WC	85.09	7.56	11.25
O_Price_WC	-38.22	5.16	-7.41
X_3_fxd_WA	-19.22	6.25	-3.08
X_2_1_WA	-19.43	8.59	-2.26
X_3_2_WA	-28.31	9.50	-2.98
X_3_fxd_WB	-29.05	5.17	-5.62
X_2_1_WB	-17.72	6.16	-2.88
X_3_2_WB	-20.66	6.39	-3.23
dShelfOrd	2.68	2.78	0.96
Age 18 - 24	-7.80	5.28	-1.48
Age 24_45 (Base)			
Age above 45	-8.94	3.10	-2.89
Male (Base)			
Female	-7.01	2.80	-2.51
HIncLT20k (Base)			
HInc20_40k	29.55	4.06	7.28
HIncGT40k	33.01	4.48	7.37
HIncNA	19.80	5.33	3.71
HiNtDegree	18.92	4.13	4.58
Alevel (Base)			
GCSE and Less	-4.71	4.61	-1.02
adult_1 (Base)			
adult_2plus	-10.05	4.25	-2.37
HighMedskill			
Lowskillsother	-19.73	4.90	-4.03
HHldShare	7.02	2.03	3.47
LondonSE(Base)			
East	-18.87	4.76	-3.96
West	-24.32	4.22	-5.77
North	-7.28	3.61	-2.02
Scotland	-6.10	4.88	-1.25
Islands	0.00	(omitted)	

Log Likelihood	Obs.	Left Censor-ed Obs	Uncensor-ed Obs
-2548.9	7380	7042	338
Moderate			
tu_wc	Coef.	Std. Err.	t
O_3_fxd_WC	52.55	6.82	7.71
O_2_1_WC	69.74	6.60	10.57
O_3_2_WC	52.24	7.51	6.95
O_Price_WC	-23.46	5.00	-4.69
X_3_fxd_WA	-9.60	6.09	-1.58
X_2_1_WA	-14.20	8.49	-1.67
X_3_2_WA	-18.64	9.53	-1.96
X_3_fxd_WB	-18.60	5.19	-3.58
X_2_1_WB	-10.43	6.42	-1.62
X_3_2_WB	-8.65	6.19	-1.4
dShelfOrd	4.20	2.76	1.52
Male (Base)			
Female	-5.59	2.75	-2.03
HIncLT20k (Base)			
HInc20_40k	15.75	3.83	4.11
HIncGT40k	14.74	4.40	3.35
HIncNA	20.61	4.73	4.35
HiNtDegree	16.86	3.02	5.58
Alevel and Less(Base)			
adult_1 (Base)			
adult_2plus	-19.50	4.47	-4.37
HighMedskill			
Lowskillsother	-13.79	4.71	-2.93
HHldShare	7.12	1.88	3.79
LondonSE(Base)			
East	-19.52	5.14	-3.8
West	-20.22	4.32	-4.68
North	-4.69	3.70	-1.27
Scotland	11.05	4.23	2.61
Islands	0.00	(omitted)	

Log Likelihood	Obs.	Left Censor-ed Obs	Uncen-sored Obs
-3883.5	7356	6858	498
H & H			
tu_wc	Coef.	Std. Err.	t
O_3_fxd_WC	103.75	11.33	9.16
O_2_1_WC	129.51	10.29	12.59
O_3_2_WC	105.70	11.66	9.06
O_Price_WC	-45.79	8.07	-5.67
X_3_fxd_WA	-26.17	9.73	-2.69
X_2_1_WA	-18.00	13.28	-1.36
X_3_2_WA	-34.43	14.71	-2.34
X_3_fxd_WB	-33.61	7.90	-4.25
X_2_1_WB	-22.68	9.22	-2.46
X_3_2_WB	-32.11	10.07	-3.19
dShelfOrd	0.46	4.32	0.11
Age 18 - 24	-0.28	7.93	-0.04
Age 24_45 (Base)			
Age above 45	-19.79	4.73	-4.18
Male (Base)			
Female	-8.57	4.33	-1.98
HIncLT20k (Base)			
HInc20_40k	35.63	6.57	5.42
HIncGT40k	41.87	7.04	5.94
HIncNA	7.31	9.14	0.8
HiNtDegree	19.58	6.04	3.24
Alevel (Base)			
GCSE and Less	-15.81	6.82	-2.32
adult_1 (Base)			
adult_2plus	7.62	5.40	1.41
HighMedskill			
Lowskillsother	-27.69	7.76	-3.57
HHldShare			
LondonSE(Base)			
East	-11.91	7.13	-1.67
West	-20.51	6.38	-3.21
North	-10.18	5.47	-1.86
Scotland	-44.39	9.69	-4.58
Islands	0.00	(omitted)	

Constant	-94.71	9.94	-9.53
Sigma	76.47	2.19	

Constant	-75.91	9.26	-8.2
Sigma	49.23	2.31	

Constant	-81.06	14.78	-5.48
Sigma	87.70	3.21	

Table C.4 Tobit results: Beer A

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-31679.5	14736	10188	4548
All			
tu_ba	Coef.	Std. Err.	t
O_12_fxd_BA	60.85	4.99	12.2
O_12_8_BA	49.63	5.80	8.56
O_8_6_BA	44.88	6.14	7.31
O_Price_BA	-71.96	9.81	-7.34
X_12_fxd_BB	-29.93	3.73	-8.03
X_12_8_BB	-28.19	4.67	-6.03
X_8_6_BB	-29.07	4.68	-6.2
X_3_2_S	2.76	4.98	0.55
X_2_fxd_S	-9.09	5.66	-1.61
X_Price_WA	8.15	8.07	1.01
X_Price_S	10.78	13.47	0.8
dShelfOrd	3.36	2.12	1.59
Age 18 - 24	-9.90	3.65	-2.71
Age 24_45 (Base)			
Age above 45	-36.94	2.41	-15.33
Male (Base)			
Female	-32.06	2.16	-14.84
HiNtDegree	-2.43	3.07	-0.79
Alevel (Base)			
GCSE and Less	12.66	3.18	3.98
adult_1			
adult_2plus	5.19	3.10	1.67
HHldShare	17.26	1.56	11.08
LondonSE(Base)			
East	-21.80	3.58	-6.08
West	-6.24	3.01	-2.07

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-12175.6	7380	5597	1783
Moderate			
tu_ba	Coef.	Std. Err.	t
O_12_fxd_BA	38.51	5.27	7.3
O_12_8_BA	33.46	6.23	5.37
O_8_6_BA	35.73	6.52	5.48
O_Price_BA	-45.56	10.47	-4.35
X_12_fxd_BB	-13.74	3.90	-3.52
X_12_8_BB	-21.59	5.19	-4.16
X_8_6_BB	-16.96	4.94	-3.44
X_3_2_S	0.03	5.32	0.01
X_2_fxd_S	-4.56	6.11	-0.75
X_Price_WA	5.99	8.46	0.71
X_Price_S	-0.64	14.33	-0.04
dShelfOrd	8.66	2.27	3.81
Age 18 - 24	-11.25	3.90	-2.88
Age 24_45 (Base)			
Age above 45	-26.29	2.65	-9.9
Male (Base)			
Female	-21.90	2.34	-9.37
HiNtDegree	-7.91	3.33	-2.37
Alevel (Base)			
GCSE and Less	5.92	3.48	1.7
adult_1			
adult_2plus	7.59	3.09	2.46
HHldShare	7.95	1.51	5.27
LondonSE(Base)			
East	-21.09	3.83	-5.51
West	-4.40	3.14	-1.4

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-19136.1	7356	4591	2765
H & H			
tu_ba	Coef.	Std. Err.	t
O_12_fxd_BA	80.59	7.61	10.58
O_12_8_BA	62.57	8.71	7.18
O_8_6_BA	48.87	9.31	5.25
O_Price_BA	-91.65	14.81	-6.19
X_12_fxd_BB	-41.85	5.70	-7.35
X_12_8_BB	-31.06	6.89	-4.51
X_8_6_BB	-35.94	7.15	-5.03
X_3_2_S	3.92	7.53	0.52
X_2_fxd_S	-13.45	8.45	-1.59
X_Price_WA	3.01	12.41	0.24
X_Price_S	23.99	20.44	1.17
dShelfOrd	0.22	3.22	0.07
Age 18 - 24	-3.25	5.62	-0.58
Age 24_45 (Base)			
Age above 45	-36.02	3.58	-10.07
Male (Base)			
Female	-35.68	3.26	-10.94
HiNtDegree	11.55	4.61	2.5
Alevel (Base)			
GCSE and Less	21.74	4.74	4.59
adult_1			
adult_2plus	6.00	5.31	1.13
HHldShare	18.93	2.78	6.81
LondonSE(Base)			
East	-12.60	5.46	-2.31
West	0.07	4.67	0.02

North	-4.69	2.85	-1.65
Scotland	-26.25	4.20	-6.25
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	0.14	2.88	0.05
Constant	-19.46	9.13	-2.13
Sigma	100.36	1.14	

North	-7.31	3.16	-2.31
Scotland	-11.40	4.14	-2.75
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	-8.61	3.10	-2.77
Constant	-14.65	9.73	-1.51
Sigma	71.09	1.31	

North	-2.51	4.21	-0.6
Scotland	-35.26	6.87	-5.13
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	11.24	4.44	2.53
Constant	-20.69	13.93	-1.49
Sigma	112.53	1.62	

Table C.5 Tobit results: Beer B

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-17121.1	14736	12159	2577
All			
tu_bb	Coef.	Std. Err.	t
O_12_fxd_BB	21.70	3.32	6.53
O_12_8_BB	33.91	3.08	11.03
O_8_6_BB	27.19	3.32	8.19
O_Price_BB	-19.78	2.11	-9.35
X_12_fxd_BA	-20.60	3.06	-6.73
X_12_8_BA	-22.63	3.67	-6.16
X_8_6_BA	-18.46	3.79	-4.87
X_3_2_S	-3.43	2.88	-1.19
X_2_fxd_S	-6.83	3.35	-2.04
X_Price_BA	7.44	5.83	1.28
X_Price_S	13.55	7.79	1.74
dShelfOrd	-0.78	1.20	-0.65
Age 18 - 24	7.89	1.90	4.15
Age 24_45 (Base)			
Age above 45	-18.78	1.37	-13.69
Male (Base)			
Female	-1.78	1.21	-1.47
HIncLT20k (Base)			
HInc20_60k	12.23	1.52	8.05
HIncGT60k	19.38	2.44	7.95
HIncNA	4.15	2.21	1.87
adult_1			
adult_2plus	3.28	1.72	1.91
HHldShare	5.25	0.86	6.13
LondonSE(Base)			
East	-5.25	2.06	-2.55
West	2.84	1.71	1.66
North	-2.88	1.66	-1.73

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-7546.7	7380	6213	1167
Moderate			
tu_bb	Coef.	Std. Err.	t
O_12_fxd_BB	20.29	3.73	5.45
O_12_8_BB	27.27	3.49	7.82
O_8_6_BB	25.55	3.68	6.95
O_Price_BB	-18.54	2.38	-7.8
X_12_fxd_BA	-11.37	3.35	-3.4
X_12_8_BA	-13.52	4.09	-3.31
X_8_6_BA	-9.30	4.20	-2.21
X_3_2_S	-4.82	3.29	-1.46
X_2_fxd_S	-9.35	3.86	-2.42
X_Price_BA	2.02	6.47	0.31
X_Price_S	15.52	8.81	1.76
dShelfOrd	2.90	1.35	2.14
Age 18 - 24	7.50	2.16	3.47
Age 24_45 (Base)			
Age above 45	-9.65	1.58	-6.09
Male (Base)			
Female	-5.84	1.39	-4.19
HIncLT20k (Base)			
HInc20_60k	8.25	1.67	4.95
HIncGT60k	18.23	2.78	6.56
HIncNA	5.47	2.36	2.32
adult_1			
adult_2plus	0.65	1.84	0.35
HHldShare	4.82	0.88	5.5
LondonSE(Base)			
East	0.17	2.41	0.07
West	10.88	1.98	5.49
North	9.94	2.01	4.94

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-9403.9	7356	5946	1410
H & H			
tu_bb	Coef.	Std. Err.	t
O_12_fxd_BB	21.45	5.24	4.09
O_12_8_BB	38.49	4.81	8
O_8_6_BB	26.73	5.30	5.04
O_Price_BB	-19.45	3.34	-5.83
X_12_fxd_BA	-29.47	4.94	-5.97
X_12_8_BA	-30.80	5.83	-5.29
X_8_6_BA	-27.54	6.04	-4.56
X_3_2_S	-2.43	4.49	-0.54
X_2_fxd_S	-5.52	5.16	-1.07
X_Price_BA	13.19	9.27	1.42
X_Price_S	13.54	12.23	1.11
dShelfOrd	-5.10	1.92	-2.66
Age 18 - 24	10.95	3.05	3.59
Age 24_45 (Base)			
Age above 45	-25.76	2.16	-11.93
Male (Base)			
Female	4.73	1.91	2.48
HIncLT20k (Base)			
HInc20_60k	14.24	2.48	5.74
HIncGT60k	20.75	3.85	5.39
HIncNA	0.71	3.68	0.19
adult_1			
adult_2plus	10.73	2.98	3.6
HHldShare	1.12	1.59	0.7
LondonSE(Base)			
East	-6.70	3.21	-2.09
West	-3.61	2.73	-1.32
North	-13.45	2.52	-5.34

Scotland	3.07	2.23	1.38
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	-0.55	1.70	-0.32
	-		
Constant	34.35	5.72	-6.01
Sigma	48.51	0.75	

Scotland	14.04	2.43	5.77
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	-2.57	1.90	-1.35
	-		
Constant	33.33	6.38	-5.22
Sigma	37.26	0.86	

Scotland	-6.00	3.76	-1.6
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	0.20	2.76	0.07
	-		
Constant	30.81	9.16	-3.36
Sigma	55.15	1.14	

Table C.6 Tobit results: Spirits

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-32618.7	14568	10174	4394
All			
tu_os	Coef.	Std. Err.	t
O_3_2_S	168.40	7.24	23.26
O_2_fxd_S	164.61	8.17	20.14
O_Price_S	-281.04	19.40	-14.49
X_12_fxd_BA	-49.41	5.14	-9.61
X_12_8_BA	-47.09	6.42	-7.33
X_8_6_BA	-46.27	6.42	-7.2
X_12_fxd_BB	-45.89	5.13	-8.94
X_12_8_BB	-38.74	6.29	-6.16
X_8_6_BB	-49.83	6.41	-7.78
dShelfOrd	-7.32	3.08	-2.37
Age 18 - 24	25.85	5.26	4.92
Age 24_45 (Base)			
Age above 45	5.10	3.59	1.42
Male (Base)			
Female	12.54	3.12	4.02
HiNtDegree	14.66	4.46	3.29
Alevel (Base)			
GCSE and Less	11.34	4.67	2.43
HHldShare	25.57	1.91	13.36
LondonSE(Base)			
East	-20.67	5.22	-3.96
West	-12.69	4.50	-2.82
North	6.68	4.17	1.6
Scotland	18.55	5.74	3.23
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	1.65	4.23	0.39
Constant	-21.56	10.30	-2.09
Sigma	146.38	1.74	

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-11974.7	7332	5686	1646
Mod			
tu_os	Coef.	Std. Err.	t
O_3_2_S	112.78	7.09	15.91
O_2_fxd_S	113.55	8.13	13.97
O_Price_S	-201.56	18.98	-10.62
X_12_fxd_BA	-27.92	4.97	-5.62
X_12_8_BA	-31.40	6.29	-4.99
X_8_6_BA	-35.06	6.40	-5.48
X_12_fxd_BB	-26.05	4.94	-5.27
X_12_8_BB	-26.62	6.28	-4.24
X_8_6_BB	-30.06	6.18	-4.86
dShelfOrd	-2.58	3.01	-0.86
Age 18 - 24	19.86	5.07	3.91
Age 24_45 (Base)			
Age above 45	10.64	3.72	2.86
Male (Base)			
Female	10.61	3.09	3.43
HiNtDegree	23.57	4.62	5.1
Alevel (Base)			
GCSE and Less	10.89	4.91	2.22
HHldShare	14.77	1.83	8.08
LondonSE(Base)			
East	-5.32	5.02	-1.06
West	-8.24	4.33	-1.9
North	-3.68	4.26	-0.86
Scotland	26.41	5.22	5.06
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	14.25	3.97	3.59
Constant	-37.87	10.13	-3.74
Sigma	94.44	1.94	

Log Likelihood	Obs.	Left Censored Obs	Uncensored Obs
-20164.8	7236	4488	2748
H & H			
tu_os	Coef.	Std. Err.	t
O_3_2_S	192.75	10.80	17.84
O_2_fxd_S	182.87	12.04	15.19
O_Price_S	-305.79	29.00	-10.54
X_12_fxd_BA	-59.24	7.72	-7.68
X_12_8_BA	-53.06	9.58	-5.54
X_8_6_BA	-49.73	9.50	-5.23
X_12_fxd_BB	-54.33	7.74	-7.02
X_12_8_BB	-45.16	9.25	-4.88
X_8_6_BB	-58.09	9.66	-6.01
dShelfOrd	-5.41	4.64	-1.17
Age 18 - 24	45.65	8.13	5.61
Age 24_45 (Base)			
Age above 45	11.02	5.22	2.11
Male (Base)			
Female	15.75	4.65	3.39
HiNtDegree	13.79	6.52	2.12
Alevel (Base)			
GCSE and Less	15.38	6.75	2.28
HHldShare	21.43	2.99	7.17
LondonSE(Base)			
East	-27.20	7.92	-3.44
West	-6.54	6.86	-0.95
North	11.51	6.09	1.89
Scotland	16.09	9.20	1.75
Islands	0.00	(omitted)	
HighMedskills (Base)			
Lowskillsother	-12.61	6.61	-1.91
Constant	5.67	15.45	0.37
Sigma	162.92	2.41	

Appendix D: Heckman model coefficients

The following tables present the model coefficients for the Heckman models. Separate tables are presented for each alcohol type, with separate columns for the results for Moderate and Hazardous and Harmful (H&H) drinkers.

We note that to allow the full statistical identification of the Heckman model, at least one variable needs to be different in the selection process and the output (regression) model, i.e. a variable which has significant impact on the "whether or not to buy" decision (selection model), but is unlikely to influence the "how much to buy" process (output model). In practice several variables may differ in the models of the two different processes and the choice of variables to be included in each component depended on their statistical significance and plausibility.

The variables in both parts of the Heckman models were selected carefully for each of the six alcohol types and the two consumption segments. The starting point for each model was always the full list of explanatory variables. The selection model considered the variables found to be significant in development of choice models reflecting the choice of a specific alcohol type (developed as the first step towards Dubin-McFadden models) and the Tobit models. It is noted that the excluded variables are not necessarily the same for different alcohol types.

Moreover, we found that promotion terms for competing alcohol projects could be one of these exclusion variables for some alcohol types. For instance, the promotion of wine B (medium-priced wine) and wine C (expensive wine) are included in the selection model for wine A, but they were not found to be significant in the output model for wine A (regression part). Therefore the competing product promotion term shows a significant impact on the decision to purchase but not on the amount of purchase. Hence the competing promotion terms for wine A are only included in the selection model. Similar patterns are found in other alcohol type models. Other variables (for example the region variables in some alcohol types) show different impact on decision / amount purchased.

The coefficients in the table are defined using the following conventions:

- 'O' at the start indicates a term applied to the alcohol type in question, e.g. O_price_WA is the own price coefficient for Wine A products;
- 'X' at the start indicates a term applied to the competitor alcohol products, e.g. X_price_WB is the cross-price term for Wine B products.

Product-type suffixes are included on price and promotion terms, i.e.:

- WA = Wine A
- WB = Wine B
- WC = Wine C
- BA = Beer A
- BB = Beer B
- SP = spirits

Coefficients for promotions are identified by the type of promotion, e.g.:

- Wine:
    - 3_fxd = 3 for a fixed price
    - 2_1 = 2 for 1
    - 3_2 = 3 for 2
- Beer:
    - 12_fxd = 12 for a fixed price
    - 12_8 = 12 for 8
    - 8_6 = 8 for six
- Spirits
    - 2_fxd = 2 for a fixed price
    - 3_2 = 3 for 2

The socio-economic terms are described explicitly, and the base level for categorical variables is specified explicitly. The shelf-ordering term (dShelfOrd reflects the condition that the promotion shelf was on the top in the shelf presentation.

All significant terms (at the 95% level of significance) are highlighted.

Table D.1 Heckman results: Wine A

Heckman Model Estimation

Loglikelihood:	-15010.5			Loglikelihood:	-23814.9		
Selection Model Obs:	7332			Selection Model Obs:	7236		
Regression Censored Obs:	5117			Regression Censored Obs:	3950		
Uncensored Obs:	2215			Uncensored Obs:	3286		
Wine A	**Moderate**			**Wine A**	**H & H**		
WA	Coef.	Std. Err.	t	WA	Coef.	Std. Err.	t
Regression				**Regression**			
O_Price_WA	-13.355	9.01	-1.48	O_Price_WA	-18.120	19.01	-0.95
X_Price_WB	2.093	2.35	0.89	O_3_fxd_WA	61.153	8.49	7.2
O_3_fxd_WA	32.559	3.92	8.31	O_2_1_WA	36.158	8.49	4.26
O_2_1_WA	26.726	3.71	7.21	O_3_2_WA	48.592	9.13	5.32
O_3_2_WA	16.691	4.12	4.05	dShelfOrd	6.703	3.03	2.22
dShelfOrd	3.719	1.44	2.58	Age 18 - 24	-34.210	5.95	-5.75
Age below 45 (Base)				Age 25 - 44 (Base)			
Age above 45	9.620	1.48	6.5	Age 45 - 54	28.818	4.36	6.6
Male (Base)				Age 55 - 64	35.687	4.29	8.33
Female	-0.699	1.48	-0.47	Age 65 +	15.796	4.59	3.44
Hinc LT 20k (Base)				Hinc LT 20k (Base)			
HInc20_40k	3.227	1.60	2.02	HInc20_40k	-8.330	3.51	-2.37
HInc40_60k	6.846	2.52	2.72	HInc40_60k	32.574	4.62	7.05
HIncGT60k	13.334	3.19	4.19	HIncGT60k	7.634	6.29	1.21
HighMedSkills + others (student /unemployment) (base)				Other Religions (Base)			
Low Skill	-3.845	2.20	-1.75	Black or Black British	8.249	3.32	2.48
Adult_1 (Base)				GCSE and above (Base)			
adult_2plus	-9.984	2.09	-4.78	Other Education	-31.315	5.46	-5.73
HHldShare	3.781	0.98	3.87	No high eduction	-16.375	7.21	-2.27
LondonSE + Scotland (base)				Adult_1 (Base)			
West	-5.608	1.76	-3.19	adult_2plus	-14.781	4.85	-3.05
North	2.733	1.73	1.58	HighMedSkills + Student (base)			
Constant	18.379	5.51	3.34	Low Skill	-10.695	4.71	-2.27
				Unemployment	-23.617	10.15	-2.33
Selection Model				**HHldShare**	16.214	2.59	6.25
O_Price_WA	-0.434	0.21	-2.1	LondonSE + E/N/Scotland (base)			
X_Price_WB	0.687	0.09	7.36	West	14.225	3.70	3.85
O_3_fxd_WA	0.185	0.10	1.91	Constant	31.759	10.81	2.94
O_2_1_WA	0.302	0.09	3.25				
O_3_2_WA	0.279	0.10	2.7	**Selection Model**	0.000	0.00	0
X_3_fxd_WB	-1.016	0.08	-12.16	O_Price_WA	-0.521	0.20	-2.6
X_2_1_WB	-1.164	0.09	-13.57	X_Price_WB	0.720	0.09	8.3
X_3_2_WB	-1.059	0.09	-11.64	O_3_fxd_WA	0.232	0.09	2.47
X_3_fxd_WC	-0.462	0.06	-7.53	O_2_1_WA	0.356	0.10	3.61
X_2_1_WC	-0.537	0.08	-6.41	O_3_2_WA	0.291	0.10	2.83
X_3_2_WC	-0.269	0.08	-3.24	X_3_fxd_WB	-1.033	0.08	-13.14
dShelfOrd	0.149	0.03	4.6	X_2_1_WB	-1.167	0.07	-15.57
Age 18 - 24	-0.072	0.06	-1.21	X_3_2_WB	-0.976	0.08	-12.16
Age 25 - 44 (Base)				X_3_fxd_WC	-0.438	0.06	-7.25
Age 45 - 54	-0.042	0.06	-0.74	X_2_1_WC	-0.584	0.08	-7.13
Age 55 - 64	0.297	0.05	5.45	X_3_2_WC	-0.398	0.08	-5.14
Age 65 +	0.129	0.05	2.56	dShelfOrd	-0.103	0.03	-3.33
Male (Base)				Age 18 - 24	-0.370	0.06	-6.71
Female	0.225	0.03	6.81	Age 25 - 44 (Base)			
Hinc LT 20k (Base)				Age 45 - 54	0.056	0.05	1.24
HInc20_40k	0.119	0.04	3.04	Age 55 - 64	0.113	0.04	2.52
HInc40_60k	-0.058	0.06	-1.01	Age 65 +	0.025	0.05	0.55
HIncGT60k	-0.130	0.07	-1.79	Male (Base)			
HIncNA	-0.077	0.06	-1.38	Female	0.332	0.03	10.67
Adult_1 (Base)				Hinc LT 60k (Base)			
adult_2plus	-0.172	0.05	-3.64	HIncGT60k	-0.187	0.06	-3.23
with Child	0.309	0.05	6.05	Other Religions (Base)			
HighMedSkills + others (student /unemplo				Black or Black British	-0.100	0.03	-2.95
Low Skill	-0.112	0.05	-2.25	Alevel + Other Education (Base)			
HHldShare	0.164	0.02	7.38	HiNtDegree	0.128	0.04	3.48
LondonSE (base)				GCSE	0.017	0.04	0.39
West	-0.121	0.04	-2.9	HighMedSkills + Student (base)			
North	-0.132	0.04	-3.21	Low Skill	0.079	0.05	1.57
Scotland	-0.155	0.06	-2.77	Unemployment	0.355	0.12	3.07
_cons	-1.106	0.13	-8.51	HHldShare	16.214	2.59	6.25
/athrho	-0.090	0.07	-1.29	LondonSE + West+ Scotland (base)			
wineA_mod_lambda	-2.948	2.29	0	East	0.067	0.05	1.45
lnsigma	3.492	0.02	223.01	North	0.095	0.03	2.74
rho	-0.090	0.07	0	Constant	31.759	10.81	2.94
sigma	32.861	0.51	0	/athrho	-0.027	0.08	-0.32
				wineA_hh_lambda	-2.262	7.04	0
				/lnsigma	4.428	0.01	356.77
				rho	-0.027	0.08	0
				sigma	83.773	1.04	0

Table D.2 Heckman results: Wine B

Heckman Model Estimation

Loglikelihood:	-9872.559			Loglikelihood:	-14535.180		
Selection Model Obs:	7332			Selection Model Obs:	7236		
Regression Censored Obs:	5979			Regression Censored Obs:	5327		
Uncensored Obs:	1353			Uncensored Obs:	1909		
Wine B	**Moderate**			Wine B	**H & H**		
WB	**Coef.**	Std. Err.	t	**WB**	**Coef.**	Std. Err.	t
Regression				Regression			
O_Price_WB	-15.515	6.20	-2.5	O_Price_WB	-27.797	12.45	-2.23
O_3_fxd_WB	30.182	4.87	6.2	O_3_fxd_WB	46.512	10.26	4.53
O_2_1_WB	18.541	4.82	3.85	O_2_1_WB	38.961	10.91	3.57
O_3_2_WB	26.281	5.37	4.89	O_3_2_WB	39.803	10.89	3.66
Age below 34 (Base)				dShelfOrd	8.535	3.78	2.26
Age 35-44	3.214	3.46	0.93	Age below 44 (Base)			
Age 45 - 54	9.754	3.38	2.89	Age 45 - 54	25.504	5.19	4.91
Age 55 - 64	5.626	2.82	1.99	Age 55 - 64	30.791	5.00	6.16
Hinc LT 20k (Base)				Age 65 +	8.611	5.52	1.56
HInc20_60k	5.228	2.73	1.92	Male (Base)			
HIncGT60k	11.996	4.57	2.63	Female	6.778	3.83	1.77
HIncNA	9.252	3.76	2.46	Hinc LT 40k (Base)			
Other Region (Base)				HInc40_60k	15.279	5.26	2.91
Asian or Asian British	-16.331	9.28	-1.76	HIncGT60k	4.170	6.38	0.65
Black or Black British	5.965	2.35	2.53	HIncNA	-11.872	6.27	-1.89
Adult_1 (Base)				Other Region (Base)			
adult_2plus	-8.506	2.86	-2.97	Asian or Asian British	-5.802	9.74	-0.6
LondonSE + E/W (base)				Black or Black British	17.387	4.04	4.31
North	6.877	2.57	2.68	HiNtDegree	6.449	3.95	1.63
Scotland	8.680	3.38	2.57	AlevelandBelow(Base)			
Constant	27.161	5.88	4.62	HighMed Skill (Base)			
Selection				Low Skill	-14.147	7.57	-1.87
O_Price_WB	-1.203	0.10	-12.01	Student	-16.351	11.78	-1.39
X_3_fxd_WA	-0.633	0.09	-7.23	Unemployment	-13.182	13.00	-1.01
X_2_1_WA	-0.525	0.11	-4.87	HHldShare	4.425	2.54	1.74
X_3_2_WA	-0.644	0.12	-5.46	LondonSE + N/W (base)			
O_3_fxd_WB	0.834	0.09	9.8	East	23.212	5.53	4.2
O_2_1_WB	1.156	0.08	14.06	Scotland	6.406	6.64	0.96
O_3_2_WB	0.866	0.09	9.28	Constant	30.148	11.35	2.66
X_3_fxd_WC	-0.672	0.09	-7.71	Selection			
X_2_1_WC	-0.748	0.12	-6.04	O_Price_WB	-1.396	0.09	-14.9
X_3_2_WC	-0.478	0.11	-4.19	X_3_fxd_WA	-0.651	0.08	-8.47
X_3_2_S	0.101	0.06	1.79	X_2_1_WA	-0.725	0.12	-6.3
X_2_fxd_S	-0.033	0.06	-0.57	X_3_2_WA	-0.771	0.11	-6.9
dShelfOrd	0.120	0.04	3.22	O_3_fxd_WB	1.108	0.08	13.77
Age 18 - 24	-0.192	0.07	-2.7	O_2_1_WB	1.449	0.08	19.21
Age 25 - 44 (Base)				O_3_2_WB	1.141	0.08	13.74
Age above 45	0.042	0.05	0.8	X_3_fxd_WC	-0.587	0.08	-7.7
Male(Base)				X_2_1_WC	-0.839	0.12	-7.15
Female	0.235	0.04	6.11	X_3_2_WC	-0.788	0.11	-7.18
Hinc LT 20k (Base)				Age 18 - 24	-0.074	0.07	-1.04
HInc20_40k	0.124	0.05	2.59	Age 25 - 44 + Age 65 plus (Base)			
HInc40_60k	0.325	0.06	5.01	Age 45 - 54	0.043	0.05	0.9
HIncGT60k	0.241	0.08	2.94	Age 55 - 64	0.046	0.05	0.99
HIncNA	0.244	0.06	3.81	Male(Base)			
White (Base)				Female	0.218	0.03	6.23
Mixed	-1.016	0.24	-4.29	Hinc LT 20k (Base)			
Asian or Asian British	-0.242	0.14	-1.79	HInc20_40k	0.365	0.05	7.74
Black or Black British	0.119	0.04	2.87	HInc40_60k	0.385	0.06	6.55
Alevel (Base)				HIncGT60k	0.876	0.07	12.71
HiNtDegree	0.104	0.05	1.9	HIncNA	0.314	0.06	4.85
GCSE	-0.293	0.07	-4.35	Other Region (Base)			
Other Education	-0.169	0.08	-2.05	Asian or Asian British	0.062	0.09	0.7
No high eduction	-0.115	0.10	-1.16	GCSE and above (Base)			
Adult_1 (Base)				Other Education	-0.087	0.07	-1.33
adult_2plus	-0.210	0.05	-3.85	No high eduction	-0.639	0.10	-6.47
No Child (Base)				Adult_1 (Base)			
with Child	-0.137	0.06	-2.27	adult_2plus	-0.222	0.06	-3.8
HighMedSkills (base)				HighMedSkills + Unemployment (			
Lowskillsother	-0.208	0.06	-3.69	Low Skill	-0.281	0.06	-4.61
HHldShare	0.161	0.03	6.41	Student	-0.215	0.11	-1.89
LondonSE (base)				HHldShare	0.095	0.03	3.24
East	-0.361	0.06	-6.02	LondonSE +N/W (base)			
West	-0.296	0.05	-5.96	East	-0.052	0.05	-1.02
North	-0.181	0.05	-3.82	Scotland	-0.023	0.06	-0.36
Constant	-0.157	0.12	-1.33	Constant	0.060	0.10	0.62
/lnsigma	3.657	0.02	186.24	wineB_hh_lambda	-3.812	7.85	0
/athrho	-0.078	0.07	-1.11	/athrho	-0.049	0.10	-0.49
wineB_mod_lambda	-3.024	2.72	0	/lnsigma	4.364	0.02	264.46
rho	-0.078	0.07	0	rho	-0.048	0.10	0
sigma	38.760	0.76	0	sigma	78.603	1.30	0

Table D.3 Heckman results: Wine C

Heckman Model Estimation

Loglikelihood:	-2544.110
Selection Model Obs:	7332
Regression Censored Obs:	6994
Uncensored Obs:	338

Wine C	Moderate		
WC	**Coef.**	Std. Err.	t
Regression			
O_3_fxd_WC	18.665	2.81	6.63
O_2_1_WC	6.120	3.37	1.81
O_3_2_WC	15.068	3.87	3.9
Age 18 - 24	10.704	4.59	2.33
Age 25 - 44 (Base)			
Age 45 - 54	5.482	3.95	1.39
Age 55 - 64	7.316	3.15	2.32
Age 65 +	-4.367	3.28	-1.33
Male (Base)			
Female	-9.053	2.09	-4.33
Hinc lt 20k (Base)			
HInc20_40k	7.410	2.57	2.88
HInc40_60k	7.752	4.01	1.93
HIncNA	5.130	3.42	1.5
A level (base)			
HiNtDegree	6.966	3.65	1.91
GCSE	9.804	4.37	2.24
Other Education	3.287	6.37	0.52
No high eduction	5.559	5.69	0.98
Adult_1 (Base)			
adult_2plus	-11.273	4.36	-2.59
HighMed Skill + Umployment (Base)			
Low Skill	10.327	5.06	2.04
Student	-7.965	6.57	-1.21
HHldShare	2.558	1.61	1.59
Constant	19.684	8.07	2.44
Selection			
O_Price_WC	-0.500	0.10	-4.81
X_3_fxd_WB	-0.339	0.10	-3.25
X_2_1_WB	-0.174	0.13	-1.32
X_3_2_WB	-0.166	0.13	-1.31
O_3_fxd_WC	1.080	0.14	7.96
O_2_1_WC	1.580	0.13	12.54
O_3_2_WC	1.122	0.15	7.36
dShelfOrd	0.130	0.06	2.21
Age 18 - 24	-0.091	0.12	-0.74
Age 25 - 44 (Base)			
Age 45 - 54	0.133	0.11	1.27
Age 55 - 64	0.398	0.10	3.94
Age 65 +	0.202	0.10	2.06
Male (Base)			
Female	-0.038	0.06	-0.63
Hinc lt 20k (Base)			
HInc20_40k	0.311	0.08	3.86
HInc40_60k	0.116	0.11	1.03
HIncGT60k	0.655	0.11	5.87
HIncNA	0.479	0.10	4.73
Other Religion (Base)			
Asian or Asian British	-0.572	0.30	-1.91
Black or Black British	0.277	0.06	4.42
A level (base)			
HiNtDegree	0.448	0.10	4.46
GCSE	0.169	0.12	1.41
Other Education	-0.237	0.16	-1.45
No high eduction	0.629	0.16	3.92
Adult_1 (Base)			
adult_2plus	-0.320	0.09	-3.38
With no child (Base)			
with Child	0.189	0.09	2.03
HighMed Skill + Student/Umployn			
Low Skill	-0.396	0.12	-3.19
HHldShare	0.109	0.04	2.77
LondonSE + North (base)			
East	-0.311	0.10	-3.14
West	-0.412	0.08	-5
Scotland	0.265	0.08	3.27
Constant	-2.053	0.20	-10.02
/lnsigma	2.901	0.06	49.07
/athrho	-0.417	0.14	-2.88
wineC_mod_lambda	-7.179	2.56	0
rho	-0.395	0.12	0
sigma	18.188	1.08	0

Loglikelihood:	
Selection Model Obs:	7236
Regression Censored Obs:	6742
Uncensored Obs:	494

Wine C	H & H		
WC	**Coef.**	Std. Err.	t
Regression			
O_Price_WC	-22.044	10.762	-2.05
O_3_fxd_WC	76.761	17.51	4.38
O_2_1_WC	74.697	18.99	3.93
O_3_2_WC	63.218	18.15	3.48
X_3_fxd_WB	-14.460	10.37	-1.39
X_2_1_WB	-7.240	11.67	-0.62
X_3_2_WB	-10.706	13.93	-0.77
Age below 44 (Base)	0.000	0.00	0
Age above 45	3.197	5.27	0.61
Hinc lt 40k (Base)	0.000	0.00	0
HIncGT40k	15.379	5.76	2.67
HIncNA	-11.869	9.67	-1.23
HiNtDegree	20.415	6.79	3.01
A level and below (Base)	0.000	0.00	0
HighMed Skill (Base)	0.000	0.00	0
Lowskillsother	-17.965	10.88	-1.65
LondonSE (base)	0.000	0.00	0
East	-3.352	8.42	-0.4
West	-9.747	7.87	-1.24
North	-2.935	6.05	-0.48
Scotland	-31.862	12.10	-2.63
Constant	-10.979	24.54	-0.45
Selection			
O_Price_WC	-0.535	0.09	-5.66
X_3_fxd_WB	-0.318	0.09	-3.66
X_2_1_WB	-0.203	0.10	-1.95
X_3_2_WB	-0.332	0.11	-2.89
O_3_fxd_WC	1.178	0.13	9.21
O_2_1_WC	1.528	0.11	13.56
O_3_2_WC	1.265	0.13	9.69
Age 18 - 24	0.086	0.09	0.98
Age 24 - 64 (Base)	0.000	0.00	0
Age 65 +	-0.465	0.08	-5.84
Male (Base)	0.000	0.00	0
Female	-0.112	0.05	-2.22
HInc20_40k	0.458	0.07	6.12
HInc40_60k	0.506	0.09	5.81
HIncGT60k	0.493	0.10	4.88
HIncNA	0.104	0.11	0.99
HiNtDegree	0.306	0.06	5.19
A level and other education (Base	0.000	0.00	0
GCSE	-0.257	0.08	-3.16
Adult_1 (Base)	0.000	0.00	0
adult_2plus	0.065	0.06	1.03
HighMed Skill (Base)	0.000	0.00	0
Lowskillsother	-0.296	0.09	-3.38
LondonSE +E/N (base)	0.000	0.00	0
West	-0.218	0.07	-3.3
Scotland	-0.408	0.10	-3.9
Constant	-1.130	0.15	-7.32
wineC_hh_lambda	27.653	14.71	1.88
rho	0.482	0.00	0
sigma	57.374	0.00	0

Table D.4 Heckman results: Beer A

Heckman Model Estimation

Loglikelihood:	-15010.530			Loglikelihood:	-23814.940		
Selection Model Obs:	7332			Selection Model Obs:	7236		
Regression Censored Obs:	5117			Regression Censored Obs:	3950		
Uncensored Obs:	2215			Uncensored Obs:	3286		
Beer A	**Moderate**			Beer A	**H & H**		
BA	**Coef.**	Std. Err.	t	**BA**	**Coef.**	Std. Err.	t
Regression				Regression			
O_Price_BA	-5.482	11.84	-0.46	O_Price_BA	-3.207	16.08	-0.2
O_12_fxd_BA	42.660	5.64	7.56	O_12_fxd_BA	60.595	7.76	7.81
O_12_8_BA	33.017	6.64	4.97	O_12_8_BA	39.643	8.96	4.43
O_8_6_BA	21.197	7.12	2.98	O_8_6_BA	31.004	9.43	3.29
X_12_fxd_BB	-2.902	4.10	-0.71	Age below 44 (Base)			
X_12_8_BB	-6.559	5.94	-1.1	Age 45 - 54	6.928	4.60	1.51
X_8_6_BB	-2.852	5.49	-0.52	Age 55 - 64	13.163	5.90	2.23
Male (Base)				Age 65 +	20.142	6.58	3.06
Female	-11.346	2.93	-3.87	Male (Base)			
Hinc lt 20k (Base)				Female	-19.639	3.74	-5.25
HInc20_40k	-4.572	2.95	-1.55	HiNtDegree	-9.009	5.01	-1.8
HInc40_60k	-12.050	4.25	-2.84	A level (Base)			
HIncGT60k	10.527	4.97	2.12	GCSE	-6.136	5.47	-1.12
HIncNA	2.759	4.13	0.67	Other Education	-7.288	6.93	-1.05
GCSE and above (base)				No high eduction	-24.474	10.46	-2.34
Other Education	-9.820	4.19	-2.35	Adult_1 (Base)			
No high eduction	16.701	5.66	2.95	adult_2plus	17.328	4.25	4.07
HHldShare	12.449	1.75	7.1	LondonSE + West (base)			
LondonSE + West (base)				East	-19.257	5.36	-3.59
East	-8.905	4.17	-2.14	North	-10.799	3.91	-2.76
North	-3.568	2.98	-1.2	Scotland	-8.479	7.62	-1.11
Scotland	-9.128	4.24	-2.15	Constant	53.536	9.98	5.37
Constant	-9.062	8.55	-1.06	Selection			
Selection				O_Price_BA	-1.055	0.15	-7.25
O_Price_BA	-0.792	0.15	-5.17	O_12_fxd_BA	0.560	0.07	7.76
X_Price_BB	0.162	0.06	2.67	O_12_8_BA	0.507	0.08	6.06
O_12_fxd_BA	0.317	0.07	4.26	O_8_6_BA	0.359	0.09	4.03
O_12_8_BA	0.306	0.09	3.39	X_12_fxd_BB	-0.497	0.05	-10.08
O_8_6_BA	0.451	0.09	4.79	X_12_8_BB	-0.391	0.06	-6.35
X_12_fxd_BB	-0.470	0.10	-4.91	X_8_6_BB	-0.472	0.06	-7.36
X_12_8_BB	-0.549	0.10	-5.74	Age 18 - 24	0.113	0.06	1.98
X_8_6_BB	-0.512	0.10	-5.21	Age 24- 44 (Base)	0.000	0.00	0
dShelfOrd	0.151	0.03	4.5	Age 45 - 54	-0.115	0.05	-2.37
Male (Base)				Age 55 - 64	-0.616	0.05	-12.09
Female	-0.350	0.03	-10.41	Age 65 +	-0.698	0.05	-12.74
Age below 44 (Base)				Male (Base)	0.000	0.00	0
Age 45 - 54	-0.316	0.05	-6.18	Female	-0.287	0.03	-8.86
Age 55 - 64	-0.400	0.05	-8.46	Hinc LT 60k	0.000	0.00	0
Age 65 +	-0.583	0.04	-13.36	HIncGT60k	-0.299	0.06	-4.91
GCSE/ A level/ No high educ				HIncNA	-0.393	0.05	-7.15
HiNtDegree	-0.207	0.04	-5.73	White (Base)	0.000	0.00	0
Other Education	-0.017	0.06	-0.28	Mixed	-0.299	0.10	-3.08
Adult_1 (Base)				Asian or Asian British	-0.401	0.09	-4.69
adult_2plus	0.121	0.04	2.74	Black or Black British	-0.058	0.04	-1.62
HighMed Skill (Base)				HiNtDegree	0.299	0.05	6.59
Lowskillsother	-0.207	0.05	-4.59	A level (Base)	0.000	0.00	0
HHldShare	0.054	0.02	2.44	GCSE	0.269	0.05	5.33
LondonSE + West (base)				Other Education	0.498	0.07	7.5
East	-0.267	0.05	-5.27	No high eduction	0.220	0.09	2.49
North	-0.030	0.04	-0.73	Adult_1 (Base)	0.000	0.00	0
Scotland	-0.059	0.06	-1.05	adult_2plus	-0.078	0.05	-1.45
Constant	0.011	0.13	0.09	no child (Base)	0.000	0.00	0
rho	0.344	0.00	0	with Child	0.104	0.04	2.36
sigma	52.061	0.00	0	Skilled + Student (Base)	0.000	0.00	0
BeerA_mod_lambda	17.907	6.53	2.74	Unemployment	0.239	0.12	2.04
				HHldShare	0.201	0.03	7.21
				LondonSE (base)	0.000	0.00	0
				East	-0.066	0.05	-1.23
				West	-0.048	0.05	-1.02
				North	0.028	0.04	0.66
				Scotland	-0.402	0.07	-5.99
				/athrho	-0.080	0.07	-1.11
				Constant	0.308	0.10	2.95
				BeerA_hh_lambda	-7.059	6.36	0
				/lnsigma	4.487	0.01	319.66
				rho	-0.079	0.07	0
				sigma	88.884	1.25	0

Table D.5 Heckman results: Beer B

Heckman Model Estimation

Loglikelihood:	-8111.475			Loglikelihood:			
Selection Model Obs:	7332			Selection Model Obs:	7236		
Regression Censored Obs:	6184			Regression Censored Obs:	5852		
Uncensored Obs:	1148			Uncensored Obs:	1384		
Beer B	**Moderate**			Beer B	**H & H**		
BB	**Coef.**	Std. Err.	t	**BB**	**Coef.**	Std. Err.	t
Regression				Regression			
O_12_fxd_BB	15.619	2.13	7.35	O_Price_BB	-4.115	4.43	-0.93
O_12_8_BB	19.827	2.43	8.17	X_Price_S	7.457	8.03	0.93
O_8_6_BB	7.875	2.32	3.39	X_12_fxd_BA	-4.195	4.86	-0.86
Age 18 - 24	-2.125	2.12	-1	X_12_8_BA	-6.217	6.23	-1
Age 24- 44 (Base)				X_8_6_BA	-3.708	5.76	-0.64
Age 45 - 54	-3.942	2.31	-1.7	O_12_fxd_BB	28.348	6.34	4.47
Age 55 - 64	0.783	2.19	0.36	O_12_8_BB	35.556	5.99	5.94
Age 65 +	8.131	2.70	3.02	O_8_6_BB	23.774	6.37	3.73
Male (Base)				Age below 45 (Base)			
Female	4.009	1.57	2.55	Age above 45	-6.702	4.26	-1.57
Hinc lt 20k (Base)				Male (Base)			
HInc20_60k	4.729	1.77	2.67	Female	2.094	2.30	0.91
HIncGT60k	2.679	2.97	0.9	Hinc lt 60k (Base)			
Other Religion (Base)				HIncGT60k	5.954	3.74	1.59
Black or Black British	-3.658	1.54	-2.37	GSCE and above /other education (Base)			
HiNtDegree	-2.780	1.58	-1.76	No high eduction	25.910	8.02	3.23
GSCE and A level (Base)				Adult_1 (Base)			
No high eduction	-11.706	4.84	-2.42	adult_2plus	11.042	3.66	3.02
HighMed Skill (Base)				HighMed Skill (Base)			
Lowskillsother	-4.807	2.12	-2.27	Lowskillsother	-4.670	2.97	-1.57
LondonSE + East (base)				HHldShare	-4.930	1.97	-2.51
North	8.132	1.80	4.52	LondonSE + East (base)			
Scotland	1.760	2.23	0.79	West	-2.753	3.01	-0.92
Constant	7.975	3.95	2.02	North	-6.439	2.89	-2.23
Selection				Scotland	-11.021	4.16	-2.65
O_Price_BB	-0.506	0.07	-7.57	Constant	13.495	8.43	1.6
X_Price_S	0.361	0.25	1.46	Selection			
X_12_fxd_BA	-0.354	0.06	-5.7	X_Price_BA	0.231	0.17	1.32
X_12_8_BA	-0.398	0.08	-4.73	O_Price_BB	-0.408	0.06	-6.37
X_8_6_BA	-0.278	0.08	-3.45	X_Price_S	0.373	0.23	1.6
O_12_fxd_BB	0.362	0.11	3.43	X_12_fxd_BA	-0.627	0.09	-6.82
O_12_8_BB	0.527	0.10	5.31	X_12_8_BA	-0.650	0.11	-5.99
O_8_6_BB	0.581	0.10	5.6	X_8_6_BA	-0.586	0.11	-5.21
X_3_2_S	-0.167	0.09	-1.8	O_12_fxd_BB	0.232	0.10	2.3
X_2_fxd_S	-0.241	0.11	-2.22	O_12_8_BB	0.526	0.09	5.63
dShelfOrd	0.071	0.04	1.86	O_8_6_BB	0.371	0.10	3.64
Age 18 - 24	0.195	0.06	3.2	X_3_2_S	-0.063	0.09	-0.74
Age 24- 44 (Base)				X_2_fxd_S	-0.215	0.10	-2.17
Age 45 - 54	-0.096	0.06	-1.55	dShelfOrd	-0.106	0.04	-2.9
Age 55 - 64	-0.115	0.06	-1.95	Age 18 - 24	0.421	0.07	6.28
Age 65 +	-0.573	0.06	-9.57	Age 24- 44 (Base)	0.000	0.00	0
Male (Base)				Age above 45	-0.507	0.04	-12.24
Female	-0.195	0.04	-4.93	Male (Base)	0.000	0.00	0
Hinc lt 20k (Base)				Female	0.095	0.04	2.62
HInc20_40k	0.207	0.05	4.19	Hinc lt 20k (Base)	0.000	0.00	0
HInc40_60k	0.163	0.07	2.32	HInc20_40k	0.294	0.04	6.68
HIncGT60k	0.484	0.08	5.96	HInc40_60k	0.267	0.06	4.78
HIncNA	0.064	0.07	0.96	HIncGT60k	0.324	0.07	4.61
Other religion (Base)				White (Base)	0.000	0.00	0
Mixed	-0.733	0.18	-3.97	Mixed	-0.082	0.10	-0.79
Black or Black British	0.129	0.04	3.12	Asian or Asian British	0.060	0.09	0.68
HiNtDegree	-0.112	0.05	-2.06	Black or Black British	0.061	0.04	1.51
GCSE	-0.219	0.07	-3.3	A level + GCSE (Base)	0.000	0.00	0
A level (Base)				HiNtDegree	0.261	0.04	6.51
Other Education	0.210	0.08	2.77	Other Education	0.409	0.07	6.25
No high eduction	-0.306	0.11	-2.69	No high eduction	-0.012	0.10	-0.12
High Skill	0.018	0.05	0.38	Adult_1 (Base)	0.000	0.00	0
HighMed Skill (Base)				adult_2plus	0.142	0.06	2.42
Low Skill	-0.015	0.07	-0.23	Skilled + Unemployment (Ba	0.000	0.00	0
Student	0.234	0.10	2.36	Student	-0.254	0.10	-2.59
Unemployment	-0.362	0.16	-2.25	HHldShare	0.062	0.03	2.02
HHldShare	0.131	0.02	5.61	LondonSE (base)	0.000	0.00	0
LondonSE + East (base)				East	-0.101	0.06	-1.73
West	0.310	0.05	6.31	West	-0.041	0.05	-0.83
North	0.243	0.05	4.84	North	-0.226	0.05	-4.93
Scotland	0.361	0.06	5.66	Constant	-0.593	0.17	-3.4
Constant	-0.591	0.16	-3.68	BeerB_hh_lambda	7.992	6.71	1.19
/athrho	-0.080	0.10	-0.83	mills	0.000	0.00	0
/lnsigma	3.166	0.02	146.07	rho	0.192	0.00	0
rho	-0.080	0.10	0	sigma	41.622	0.00	0
sigma	23.713	0.51	0				
BeerB_mod_lambda	-1.890	2.29	0				

Table D.6 Heckman results: Spirits

Heckman Model Estimation

Loglikelihood:	-12126.320
Selection Model Obs:	7332
Regression Censored Obs:	5686
Uncensored Obs:	1646

Spirits	**Moderate**		
S	**Coef.**	Std. Err.	t
Regression			
O_Price_S	-19.940	16.27	-1.23
O_3_2_S	51.755	5.87	8.82
O_2_fxd_S	30.256	6.73	4.49
dShelfOrd	5.036	2.16	2.33
Age below 45 (Base)			
Age 45 - 54	11.025	3.44	3.2
Age 55 - 64	3.922	3.12	1.26
Age 65 +	9.366	2.88	3.25
White (Base)			
Mixed	-29.735	7.55	-3.94
Asian or Asian British	-27.226	7.41	-3.68
Black or Black British	-5.289	2.30	-2.3
A level and above / No high education (base)			
GCSE	4.012	2.70	1.48
Other Education	4.544	3.98	1.14
High Skill	1.841	2.33	0.79
Med and Low Skill (Base)			
Student	16.959	5.76	2.94
Unemployment	18.242	8.82	2.07
LondonSE + E/N (base)			
West	-2.185	2.61	-0.84
Scotland	5.725	3.25	1.76
Constant	48.886	6.51	7.51
Selection			
O_Price_S	-2.318	0.21	-10.9
X_12_fxd_BA	-0.339	0.06	-6.13
X_12_8_BA	-0.358	0.07	-5.08
X_8_6_BA	-0.395	0.07	-5.55
X_12_fxd_BB	-0.326	0.06	-5.91
X_12_8_BB	-0.295	0.07	-4.18
X_8_6_BB	-0.354	0.07	-5.13
O_3_2_S	1.089	0.08	13.83
O_2_fxd_S	1.204	0.09	13.3
dShelfOrd	-0.076	0.03	-2.22
Age 18 - 24	0.277	0.06	4.75
Age 24- 44 (Base)			
Age 45 - 54	0.014	0.06	0.24
Age 55 - 64	0.102	0.05	1.93
Age 65 +	0.088	0.05	1.78
Male (Base)			
Female	0.138	0.04	3.95
HInc20_40k	-0.041	0.04	-0.96
HInc40_60k	-0.334	0.07	-5.08
HIncGT60k	-0.024	0.08	-0.31
HIncNA	0.091	0.06	1.57
HiNtDegree	0.329	0.05	6.29
A Level (Base)			
GCSE	0.133	0.06	2.22
Other Education	0.126	0.07	1.71
No high eduction	-0.130	0.09	-1.39
High Skill	-0.054	0.04	-1.35
Med Skill			
Low Skill	0.286	0.06	5.18
Student	-0.210	0.10	-2.1
Unemployment	-0.191	0.13	-1.44
HHldShare	0.169	0.02	7.86
LondonSE + E/N (base)			
West	-0.075	0.04	-1.84
Scotland	0.351	0.05	6.52
Constant	-0.260	0.11	-2.3
/athrho	-0.048	0.12	-0.39
/lnsigma	3.730	0.02	207.89
rho	-0.048	0.12	0
sigma	41.665	0.75	0
Spirits_mod_lambda	-1.987	5.13	0

Loglikelihood:	
Selection Model Obs:	7236
Regression Censored Obs:	4488
Uncensored Obs:	2748

Spirits	**H & H**		
S	**Coef.**	Std. Err.	t
Regression			
O_Price_S	-200.144	36.67	-5.46
O_3_2_S	138.239	13.73	10.07
O_2_fxd_S	120.181	14.92	8.06
Age 18 - 24	30.558	8.49	3.6
Age 24- 64 (Base)			
Age 65 +	16.931	6.45	2.62
Hinc lt 20k (Base)			
HInc20_40k	16.087	6.33	2.54
HInc40_60k	32.212	7.71	4.18
HIncGT60k	-13.225	9.76	-1.35
HiNtDegree	15.699	6.14	2.56
A level and above / No high education (base)			
GCSE	17.671	7.11	2.48
Other Education	55.980	9.38	5.97
adult_1 (Base)			
adult_2plus	22.522	6.20	3.63
High Med Skills			
Lowskillsother	-12.158	7.12	-1.71
LondonSE + North (base)			
East	-40.026	7.28	-5.5
West	-18.022	6.08	-2.96
Scotland	-2.234	8.63	-0.26
Constant	44.045	16.22	2.72
Selection			
O_Price_S	-2.093	0.20	-10.71
X_12_fxd_BA	-0.421	0.05	-8.26
X_12_8_BA	-0.431	0.06	-6.75
X_8_6_BA	-0.444	0.06	-7.02
X_12_fxd_BB	-0.434	0.05	-8.47
X_12_8_BB	-0.332	0.06	-5.38
X_8_6_BB	-0.417	0.06	-6.51
O_3_2_S	1.125	0.07	15.47
O_2_fxd_S	1.143	0.08	14.14
dShelfOrd	-0.170	0.03	-5.47
Age 18 - 24	0.289	0.05	5.36
Age 24- 64 (Base)	0.000	0.00	0
Age 65 +	0.120	0.04	2.73
Male (Base)	0.000	0.00	0
Female	0.157	0.03	5.03
Hinc lt 20k (Base)	0.000	0.00	0
HInc20_40k	0.193	0.04	5.27
HInc40_60k	0.101	0.05	2.09
HIncNA	-0.087	0.05	-1.59
HiNtDegree	0.059	0.04	1.5
A Level (Base)	0.000	0.00	0
GCSE	0.061	0.04	1.36
No high eduction	-0.136	0.08	-1.66
adult_2plus	-0.084	0.05	-1.63
adult_1 (Base)	0.000	0.00	0
Lowskillsother	-0.001	0.05	-0.03
HHldShare	0.231	0.03	8.7
LondonSE + East (base)	0.000	0.00	0
West	0.100	0.04	2.36
North	0.232	0.04	6.3
Scotland	0.262	0.06	4.38
Constant	0.046	0.10	0.45
mills	0.000	0.00	0
Spirits_hh_lambda	78.325	14.00	5.6
rho	0.593	0.00	0
sigma	132.188	0.00	0

Appendix E: MDCEV model coefficients

The following table presents the model coefficients for the MDCEV models. The results for Moderate and Hazardous and Harmful (H&H) drinkers are presented in separate columns.

Satiation parameters for each of the alcohol type alternatives (the six alcohol types, as well as alternatives for each offer type) are presented first.

These are followed by alternative-specific constants for the choice component of the model, again for each of the alcohol type alternatives, and then by socio-economic terms for each of the alcohol type alternatives.

The socio-economic terms are described explicitly, and the base level for categorical variables is specified explicitly. The shelf-ordering terms (Prtopshelf) reflects the condition that the promotion shelf was on the top in the shelf presentation.

Table E.1 MDCEV model coefficients

	Total		Moderate		H&H	
Likelihood	142373.9291		54789.85599		87159.06349	
	beta	t-statistic	beta	t-statistic	beta	t-statistic
Parameters						
Satiation parameters						
Wine A	23.98	32.01	20.25	21.15	26.41	24.6
Wine B	22.8	21.33	22.47	13.76	23.2	16.44
Wine C	16.91	12.16	18.34	7.341	15.88	9.699
Beer A	13.34	29.15	13.01	18.42	13.47	22.68
Beer B	5.36	24.39	6.224	16.36	4.791	18.03
Spirits	42.54	28.26	57.31	15.93	36.6	22.82
Wine A Offer A	47.65	10.46	51.39	6.698	43.94	8.031
Wine A Offer B	27.21	8.672	26.73	6.207	27.86	6.11
Wine A Offer C	42.09	7.825	35.92	5.375	45.24	5.867
Wine B Offer A	55.95	11.17	69.08	6.375	49.02	9.038
Wine B Offer B	24.17	11.67	24.39	7.561	23.61	8.885
Wine B Offer C	52.06	8.536	60.07	4.988	47.16	6.96
Wine C Offer A	91.92	4.22	92.47	2.738	84.54	3.405
Wine C Offer B	35.73	5.643	34.48	3.813	37.14	4.236
Wine C Offer C	68.84	3.687	88.298	1.853	58.41	3.221
Beer A Offer A	41.09	13.75	46.73	8.104	36.53	11.01
Beer A Offer B	38.02	9.388	44.62	5.594	34.21	7.515
Beer A Offer C	29.58	9.029	26.61	5.973	32.08	6.856
Beer B Offer A	53.93	5.532	74.28	2.85	45.72	4.63
Beer B Offer B	33.39	6.831	44.18	3.712	28.2	5.658
Beer B Offer C	21.24	6.833	24.81	4.315	18.77	5.282
Spirits Offer A	149.1	11.89	241.2	5.756	120.77	10.05
Spirits Offer B	92.06	12.39	134.5	6.522	77.17	10.2
Alternative specific constants						
Wine A	-4.782	-64.16	-4.555	-41.72	-4.89	-48.02
Wine A Offer A	-4.133	-39.73	-4.033	-27.3	-4.113	-28.41
Wine A Offer B	-4.267	-34.42	-4.116	-24.54	-4.278	-23.7
Wine A Offer C	-4.186	-35.12	-4.003	-23.85	-4.244	-25.41
Wine B	-5.515	-36.72	-4.907	-23.44	-5.987	-28.14
Wine B Offer A	-4.576	-28.67	-4.258	-19.33	-4.837	-21.29
Wine B Offer B	-3.744	-23	-3.449	-15.19	-4.003	-17.43
Wine B Offer C	-4.513	-27.19	-4.079	-17.5	-4.866	-20.81
Wine C	-7.022	-24.12	-7.558	-15.02	-6.803	-18.47
Wine C Offer A	-5.544	-17.64	-6.331	-12.02	-5.114	-12.52
Wine C Offer B	-4.754	-15.41	-5.416	-10.63	-4.439	-10.99
Wine C Offer C	-5.557	-17.14	-6.499	-11.84	-5.002	-12.04
Beer A	-4.255	-32.65	-3.386	-18.3	-4.919	-27.15
Beer A Offer A	-3.712	-26.27	-3.144	-15.67	-4.129	-21.06
Beer A Offer B	-3.855	-25.61	-3.086	-14.38	-4.44	-21.34
Beer A Offer C	-3.826	-25.1	-2.899	-13.51	-4.542	-21.34
Beer B	-4.93	-30.31	-4.255	-18.87	-5.449	-23.21
Beer B Offer A	-5.539	-29.08	-4.883	-18.63	-6.039	-22.17
Beer B Offer B	-4.705	-25.02	-4.232	-16.09	-5.131	-19.07
Beer B Offer C	-4.734	-24.59	-4.108	-15.59	-5.254	-18.85
Spirits	-6.023	-43.33	-6.233	-28.7	-5.927	-32.1
Spirits Offer A	-5.64	-37.45	-6.014	-25.83	-5.438	-27.04
Spirits Offer B	-5.461	-36.47	-5.778	-24.87	-5.293	-26.52

	Total		Moderate		H&H	
Likelihood	142373.9291		54789.85599		87159.06349	
	beta	t-statistic	beta	t-statistic	beta	t-statistic
Socio-economic characteristics						
Wine A						
Female	0.3789	9.07	0.2928	4.915	0.4702	8.087
Age18_24	-0.2726	-3.682	-0.08154	-0.8189	-0.4984	-4.597
Age 45plus	0.05022	1.129	-0.1073	-1.616	0.1742	2.904
HHinc40_60k_Mod	-0.2535	-2.787	-0.2216	-2.506		
HHincGT60k_Mod	-0.3619	-3.023	-0.4754	-4.02		
HHincNA_Mod	-0.4076	-4.563	-0.3237	-3.702		
Lowskilled	0.004691	0.08619	-0.1801	-2.353	0.2069	2.688
East	0.0074	1.715	-0.1967	-20.76	0.3733	3.849
North	-0.05665	-1.009	-0.2844	-3.446	0.09179	1.203
Scotland	0.1717	-2.127	-0.3786	-3.508	0.0253	-0.2133
West	-0.1401	-2.34	-0.2641	-3.183	-0.05326	-0.6269
Adults2plus	0.1745	4.143	0.3958	6.704	-0.01036	-0.1751
Prtopshelf	-0.07059	-0.8383	-0.1699	-1.424	-0.03714	-0.3178
Wine B						
Female	0.3056	6.077	0.2793	3.888	0.3125	4.479
Age18_24	-0.1576	-1.871	-0.1932	-1.723	-0.07134	-0.5742
HHinc20_60k	0.4823	7.894	0.2876	3.513	0.6652	7.402
HHincGT60k	0.8622	9.45	0.1695	1.193	1.345	10.67
HHincNA	0.3973	4.733	0.2355	2.067	0.5647	4.67
Lowskilled	-0.2454	-3.16	-0.4056	-3.749	-0.07603	-0.6944
East	-0.2129	-2.534	-0.6849	-5.702	0.1584	1.36
North	-0.2119	-3.201	-0.3233	-3.352	-0.1626	-1.793
Scotland	0.01865	0.2042	-0.002138	-0.01801	-0.1325	-0.9568
West	-0.3514	-4.853	-0.5047	-4.994	-0.2503	-2.455
HighEduc	0.09618	1.447	0.1085	1.106	0.1024	1.134
GCSEandless	0.4628	-6.257	-0.4472	-4.065	-0.4168	-4.168
Hhldshare	-0.0003017	-0.9597	0.0001821	0.4396	-0.0006393	-1.36
Prtopshelf	-0.1432	-2.1	-0.1763	-1.748	-0.1112	-1.205
Wine C						
Female	-0.1856	-2.096	-0.1211	-0.9325	-0.2848	-2.346
Age18_24	0.07572	0.4611	-0.214	-0.7821	0.3668	1.749
Age 45plus	-0.3211	-3.348	0.1426	0.9269	-0.6136	-4.769
HHinc20_60k_Mod	0.7283	4.552	0.5935	3.259		
HHincGT60k_Mod	1.273	5.247	1.237	4.869		
HHincGT20k_HH	0.885	7.084			0.8782	5.634
HHincNA_Mod	0.9098	4.433	0.7799	3.551		
Lowskilled	-0.5957	-3.678	-0.5823	-2.46	-0.6736	-3.035
East	-0.3828	-2.503	-0.7123	-2.913	-0.08017	-0.3999
North	-0.2838	-2.48	-0.02516	-0.1454	-0.3669	-2.414
Scotland	-0.03568	-0.2328	0.801	4.131	-1.111	-4.159
West	-0.747	-5.595	-0.7566	-3.672	-0.6473	-3.654
HighEduc	0.5165	3.987	0.8408	3.695	0.3672	2.243
GCSEandless	-0.3007	-2.031	0.2366	0.9593	-0.6838	-3.542
Adults2plus	-0.105	-1.07	-0.2573	-1.917	0.07222	0.503
Hhldshare	-0.2598	-1.917	-0.0002152	-0.2964		
Prtopshelf	-2598	-1.917	0.0118	0.0611	-0.4518	-2.392

	Total		Moderate		H&H	
Likelihood	142373.9291		54789.85599		87159.06349	
	beta	t-statistic	beta	t-statistic	beta	t-statistic
Beer A						
Female	-0.5647	-12.61	-0.5682	-8.789	-0.5371	-8.676
Age18_24	0.1789	2.509	-0.04134	-0.4161	0.316	3.104
HHincGT60_HH	-0.2527	-2.585			-0.2584	-2.411
HHincNA_HH	-0.5611	-5.924			-0.6578	-6.378
Lowskilled	0.02203	0.3823	-0.3356	-3.993	0.3074	3.831
East	-0.1836	-2.462	-0.5596	-5.233	0.1947	1.885
North	-0.0754	-1.284	-0.1379	-1.579	-0.002329	-0.02943
Scotland	-0.331	-3.769	-0.1579	-1.382	-0.5184	-3.908
West	-0.1154	-1.833	-0.0507	-0.5835	-0.1391	-1.556
HighEduc	-0.02482	-0.4099	-0.259	-2.961	0.185	2.231
GCSEandless	0.32	5.126	0.2249	2.461	0.3926	4.626
Hhldshare	0.0008543	3.082	7.85E-05	0.1993	0.001231	3.113
Prtopshelf	-0.2794	-4.057	-0.3197	-3.124	-0.281	-3.027
Beer B						
Female	-0.1699	-3.109	-0.441	-5.801	0.06915	0.8876
Age18_24	0.7823	9.666	0.5897	5.324	0.9532	8.021
Age 45plus	-0.9096	-15.21	-0.7185	-8.552	-1.106	-12.99
HHinc20_60k	0.4647	7.118	0.4275	4.939	0.589	6.041
HHincGT60	0.7285	7.15	0.868	6.046	0.8686	5.905
HHincNA	0.2162	2.308	0.2692	2.204	0.1433	1.024
East	-0.0773	-0.8286	-0.07006	-0.5227	0.004562	0.3521
North	-0.2441	-3.276	0.3389	3.031	-0.5635	-5.559
Scotland	0.2118	2.14	0.6593	4.94	-0.187	-1.241
West	0.1003	1.309	0.576	5.321	-0.284	-2.575
GCSEandless	-0.03721	-0.4677	-0.1332	-1.232	0.05539	0.4853
Adults2plus	0.144	2.448	0.1318	1.725	0.155	1.764
Hhldshare	0.0007213	2.196	0.001008	2.311	0.0004772	0.9721
Prtopshelf	-0.04296	-0.4258	-0.3086	-2.086	0.2278	1.638
Spirits						
Female	0.2043	4.586	0.2032	3.096	0.2243	3.698
Age18_24	0.5352	7.094	0.5143	4.866	0.5363	5.021
Age 45pl	0.07345	1.482	-0.04264	-0.5591	0.1287	1.976
HHincGT20HH	0.3131	7.242			0.3343	5.334
Lowskilled			0.2561	3.14	0.194	2.32
East	0.07398	0.9809	-0.1675	-1.569	0.2798	2.663
North	0.1332	2.22	-0.09815	-1.088	0.3001	3.72
Scotland	0.4359	5.34	0.3586	3.314	0.4073	3.379
West	-0.8371	-1.288	-0.1596	-1.731	-0.05009	-0.554
HighEduc	0.1967	3.253	0.5082	5.26	0.02426	0.3072
GCSEandless	0.1312	2.056	0.3873	3.768	0.002413	0.02914
Adults2plus	-0.2196	-4.848	-0.1041	-1.636	-0.2968	-4.643
Hhldshare	0.001266	4.698	0.000984	2.622	0.001445	3.748
Prtopshelf	-0.05219	-0.7486	-0.1206	-1.128	-0.01742	-0.1884
Other parameters						
Sigma	1.186	143.3	1.085	92.08	1.243	109.2

Appendix F: Weighting procedure for producing elasticities and impacts

Below we summarise the re-weighting procedure for application of the models to compute elasticities and the impact of promotions.

Step 1: Re-weight consumption patterns by age and gender to reflect observed consumption levels in the General Lifestyle Survey (for England)

The observations in the main survey sample have been re-weighted to reflect consumption patterns in England, based on consumption incidence rates from the General Lifestyle Survey for England. The weights have been obtained by comparing the GLF consumption distributions by age and gender (see Table 2.1 of the main report) with those obtained in the main survey (including the SDS responses). These weights are summarised in Table F.1 below.

Table F.1 Weights to adjust consumption patterns by age and gender for all respondents to reflect those observed in England

Segment / Age	18–24	25–44	45–64	65 plus
Males				
Non-drinker	3.57	4.88	3.43	5.60
Moderate A	1.77	1.64	1.66	1.94
Moderate B	1.39	1.41	0.99	0.64
Hazardous	0.54	0.98	0.98	0.59
Harmful	0.21	0.18	0.24	0.22
Females				
Non-drinker	3.18	6.80	10.59	8.14
Moderate A	1.83	2.13	2.09	1.67
Moderate B	0.42	0.85	0.78	0.36
Hazardous	0.64	0.63	0.48	0.32
Harmful	0.22	0.10	0.21	0.14

* Note that non-drinkers are identified by having units (dTotalU) of zero and in estimations they are included in the Moderate A segment

These weights were applied to the full sample of 1,265 respondents from the main survey.

Step 2: Adjusted weights for Scottish residents to reflect different consumption patterns in Scotland.

We adjusted the weights for residents of Scotland to reflect different consumption levels at an aggregate level for men and women. These weights are summarised in Table F.2 below.

Table F.2 Adjustments for Scottish consumption patterns for Scottish respondents

Segment	English consumption levels (%)	Scottish alcohol consumption levels (%)	Adjustment for Scottish respondents
Males			
Non-drinker	13.1%	10%	0.76
Moderate	60.8%	61%	1.00
Hazardous	19.9%	22%	1.10
Harmful	6.2%	7%	1.13
Females			
Non-drinker	19.4%	14%	0.72
Moderate	63.6%	66%	1.04
Hazardous	13.8%	16%	1.16
Harmful	3.3%	4%	1.22

Step 3: Adjust weights to reflect age and gender population patterns in England, Wales, Northern Ireland and Scotland

Population data was obtained from the Office for National Statistics (ONS).[25] Because the aggregate categories did not match for 18–24 year olds, we used half of the population for 16–19 year olds and the population for 20–24 year olds for this category. Otherwise, the age categories were consistent between sources. The population weights are summarised in Table F.3 below.

Table F.3 Population weights (thousands)

	Males	Females
England, Wales, NI		
18-24	56.1	26.9
25-44	45.3	59.0
45-64	34.4	40.0
65 plus	30.3	37.4
Scotland		
18-24	88.3	33.1
25-44	27.4	29.8
45-64	44.4	27.6
65 plus	35.0	101.4

The total population figure is around 50 million, as summarised in Table F.4 below.

[25] http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Population (Accessed on 4 June 2013)

Table F.4 Total population by age and gender, 18 and over (2011)

	Males	Females	Total
England, Wales, NI			
18–24	2,919,387	2,846,684	5,766,071
25–44	7,884,301	7,965,519	15,849,820
45–64	7,265,391	7,440,046	14,705,437
65 plus	4,210,799	5,275,994	9,486,793
Total	22,279,878	23,528,243	45,808,121
Scotland			
18–24	265,000	264,500	529,500
25–44	686,000	716,000	1,402,000
45–64	711,000	744,000	1,455,000
65 plus	385,000	507,000	892,000
Total	2,047,000	2,231,500	4,278,500
United Kingdom			
18–24	3,184,387	3,111,184	6,295,571
25–44	8,570,301	8,681,519	17,251,820
45–64	7,976,391	8,184,046	16,160,437
65 plus	4,595,799	5,782,994	10,378,793
Total	24,326,878	25,759,743	50,086,621

Source: ONS, 2011, Census: Population and household estimates for the United Kingdom

Appendix G: Promotion Impacts

The following tables summarise firstly the impacts of introducing individual promotions and then the impacts as a result of removing the package of promotions described in Section 3.7.2 on the units of alcohol purchased and expenditure as predicted by the Tobit, Heckman and MDCEV models. We note that the impacts reflect both the impact of the price reduction (measured through the price term) and the psychological impact of the promotion itself (measured as a constant in the model). The reported figures reflect the factor change on demand, i.e. measured as change in demand / original demand.

Table G.1 Impacts of promotions from the Tobit models

				Total Units			Total Expenditure				Total Units	Total Expenditure		Total Units			Total Expenditure		
Promotion Type			change in	Overall	Moderate	H & H	Overall	Moderate	H & H	change in	Overall	Overall	change in	Overall	Moderate	H & H	Overall	Moderate	H & H
1	Wine A	3 for 90%	Wine A	0.93	1.00	0.86	0.76	0.83	0.70	All Wine	0.39	0.05	All alcohol	0.17	0.16	0.18	0.02	0.02	0.03
2	Wine A	3 for 80%	Wine A	0.97	1.05	0.89	0.63	0.69	0.57	All Wine	0.42	-0.01	All alcohol	0.18	0.17	0.19	-0.01	-0.01	0.00
3	Wine A	3 for 70%	Wine A	1.01	1.09	0.93	0.49	0.55	0.43	All Wine	0.44	-0.08	All alcohol	0.19	0.19	0.20	-0.04	-0.04	-0.04
4	Wine A	3 for 2	Wine A	0.88	0.87	0.89	0.35	0.34	0.35	All Wine	0.35	-0.17	All alcohol	0.15	0.12	0.18	-0.08	-0.10	-0.06
5	Wine A	2 for 1	Wine A	1.08	1.30	0.85	0.18	0.31	0.06	All Wine	0.49	-0.22	All alcohol	0.21	0.25	0.17	-0.10	-0.08	-0.13
6	Wine B	3 for 90%	Wine B	3.56	3.50	3.64	3.16	3.11	3.24	All Wine	0.55	0.89	All alcohol	0.24	0.26	0.21	0.40	0.43	0.38
7	Wine B	3 for 80%	Wine B	3.97	3.92	4.04	3.12	3.08	3.17	All Wine	0.66	0.86	All alcohol	0.29	0.32	0.25	0.39	0.42	0.36
8	Wine B	3 for 70%	Wine B	4.41	4.38	4.46	3.02	2.99	3.05	All Wine	0.78	0.81	All alcohol	0.34	0.38	0.30	0.37	0.40	0.33
9	Wine B	3 for 2	Wine B	4.55	4.50	4.61	2.97	2.94	3.01	All Wine	0.83	0.81	All alcohol	0.36	0.40	0.32	0.37	0.40	0.33
10	Wine B	2 for 1	Wine B	6.42	6.39	6.45	3.23	3.22	3.25	All Wine	1.35	0.88	All alcohol	0.59	0.65	0.52	0.40	0.44	0.36
11	Wine C	3 for 90%	Wine C	7.72	7.97	7.48	6.97	7.20	6.75	All Wine	-0.16	0.22	All alcohol	-0.07	-0.10	-0.04	0.10	0.06	0.15
12	Wine C	3 for 80%	Wine C	8.47	8.77	8.17	6.84	7.09	6.59	All Wine	-0.14	0.20	All alcohol	-0.06	-0.09	-0.02	0.09	0.05	0.14
13	Wine C	3 for 70%	Wine C	9.26	9.64	8.89	6.61	6.89	6.34	All Wine	-0.11	0.18	All alcohol	-0.05	-0.08	-0.01	0.08	0.04	0.13
14	Wine C	3 for 2	Wine C	9.54	9.75	9.34	6.55	6.70	6.40	All Wine	-0.04	0.22	All alcohol	-0.02	-0.02	-0.01	0.10	0.09	0.11
15	Wine C	2 for 1	Wine C	17.02	18.99	15.09	9.27	10.39	8.17	All Wine	0.18	0.39	All alcohol	0.08	0.07	0.09	0.18	0.17	0.18
16	Beer A	12 for 90%	Beer A	1.45	1.34	1.58	1.24	1.14	1.36	All Beer	1.00	0.46	All alcohol	0.13	0.13	0.13	0.06	0.05	0.07
17	Beer A	12 for 80%	Beer A	1.54	1.43	1.68	1.11	1.01	1.22	All Beer	1.07	0.39	All alcohol	0.15	0.14	0.15	0.03	0.03	0.04
18	Beer A	12 for 70%	Beer A	1.64	1.52	1.79	0.96	0.87	1.07	All Beer	1.14	0.30	All alcohol	0.17	0.16	0.17	0.00	0.00	0.01
19	Beer A	12 for 8	Beer A	1.34	1.30	1.40	0.68	0.65	0.72	All Beer	0.91	0.12	All alcohol	0.10	0.10	0.11	-0.05	-0.06	-0.04
20	Beer A	8 for 6	Beer A	1.20	1.37	0.98	0.72	0.86	0.55	All Beer	0.82	0.20	All alcohol	0.08	0.11	0.04	-0.03	-0.01	-0.06
21	Beer B	12 for 90%	Beer B	1.24	1.40	0.98	1.05	1.19	0.81	All Beer	0.01	0.26	All alcohol	-0.12	-0.08	-0.17	0.00	0.06	-0.08
22	Beer B	12 for 80%	Beer B	1.41	1.59	1.11	1.00	1.15	0.74	All Beer	0.05	0.24	All alcohol	-0.11	-0.06	-0.16	-0.01	0.06	-0.09
23	Beer B	12 for 70%	Beer B	1.59	1.80	1.23	0.92	1.07	0.66	All Beer	0.09	0.21	All alcohol	-0.10	-0.05	-0.15	-0.02	0.04	-0.10
24	Beer B	12 for 8	Beer B	2.63	2.77	2.40	1.60	1.70	1.44	All Beer	0.30	0.49	All alcohol	-0.04	-0.02	-0.06	0.08	0.12	0.03
25	Beer B	8 for 6	Beer B	2.00	2.32	1.46	1.35	1.60	0.93	All Beer	0.17	0.39	All alcohol	-0.09	-0.04	-0.14	0.03	0.11	-0.06
26	Spirits	2 for 90%	Spirits	3.58	4.19	2.91	3.19	3.75	2.57	Spirit	3.58	3.19	All alcohol	1.09	1.24	0.92	0.68	0.75	0.60
27	Spirits	2 for 80%	Spirits	3.87	4.57	3.11	3.04	3.61	2.40	Spirit	3.87	3.04	All alcohol	1.18	1.35	0.98	0.64	0.72	0.55
28	Spirits	2 for 70%	Spirits	4.17	4.96	3.31	2.84	3.42	2.20	Spirit	4.17	2.84	All alcohol	1.27	1.46	1.04	0.60	0.67	0.50
29	Spirits	3 for 2	Spirits	4.20	5.12	3.18	2.72	3.38	1.99	Spirit	4.20	2.722	All alcohol	1.24	1.48	0.95	0.53	0.63	0.41

Table G.2 Impacts of promotions from the Heckman models

				Total Units			Total Expenditure				Total Units	Total Expenditure		Total Units			Total Expenditure		
Promotion Type			change in	Overall	Moderate	H & H	Overall	Moderate	H & H	change in	Overall	Overall	change in	Overall	Moderate	H & H	Overall	Moderate	H & H
1	Wine A	3 for 90%	Wine A	1.59	1.88	1.32	1.37	1.64	1.12	All Wine	0.91	0.46	All alcohol	0.44	0.46	0.42	0.24	0.25	0.22
2	Wine A	3 for 80%	Wine A	1.64	1.95	1.36	1.19	1.44	0.95	All Wine	0.95	0.37	All alcohol	0.46	0.48	0.43	0.19	0.20	0.17
3	Wine A	3 for 70%	Wine A	1.70	2.01	1.40	1.00	1.24	0.78	All Wine	0.98	0.27	All alcohol	0.48	0.50	0.45	0.14	0.15	0.12
4	Wine A	3 for 2	Wine A	1.31	1.38	1.24	0.65	0.70	0.60	All Wine	0.71	0.07	All alcohol	0.34	0.31	0.38	0.04	0.03	0.05
5	Wine A	2 for 1	Wine A	1.60	2.11	1.12	0.48	0.77	0.21	All Wine	0.92	0.01	All alcohol	0.45	0.54	0.34	0.00	0.06	-0.07
6	Wine B	3 for 90%	Wine B	4.89	5.28	4.40	4.39	4.74	3.93	All Wine	0.87	1.34	All alcohol	0.42	0.51	0.32	0.69	0.78	0.57
7	Wine B	3 for 80%	Wine B	5.34	5.81	4.74	4.25	4.63	3.76	All Wine	0.98	1.27	All alcohol	0.48	0.57	0.36	0.65	0.75	0.53
8	Wine B	3 for 70%	Wine B	5.79	6.34	5.09	4.04	4.45	3.52	All Wine	1.10	1.18	All alcohol	0.53	0.64	0.40	0.61	0.71	0.47
9	Wine B	3 for 2	Wine B	5.55	6.13	4.83	3.69	4.11	3.17	All Wine	1.04	1.06	All alcohol	0.50	0.61	0.37	0.54	0.65	0.41
10	Wine B	2 for 1	Wine B	6.44	6.96	5.79	3.24	3.54	2.87	All Wine	1.24	0.84	All alcohol	0.60	0.71	0.47	0.43	0.52	0.32
11	Wine C	3 for 90%	Wine C	15.54	14.38	17.14	14.12	13.06	15.58	All Wine	0.12	0.72	All alcohol	0.06	0.04	0.08	0.37	0.34	0.41
12	Wine C	3 for 80%	Wine C	16.84	15.58	18.59	13.77	12.73	15.22	All Wine	0.16	0.69	All alcohol	0.08	0.06	0.10	0.35	0.32	0.39
13	Wine C	3 for 70%	Wine C	18.21	16.84	20.10	13.25	12.24	14.65	All Wine	0.21	0.65	All alcohol	0.10	0.08	0.12	0.33	0.30	0.37
14	Wine C	3 for 2	Wine C	17.01	16.49	17.72	11.90	11.53	12.41	All Wine	0.24	0.59	All alcohol	0.11	0.14	0.08	0.31	0.34	0.26
15	Wine C	2 for 1	Wine C	24.95	23.28	27.25	13.79	12.84	15.10	All Wine	0.36	0.61	All alcohol	0.18	0.18	0.17	0.32	0.31	0.33
16	Beer A	12 for 90%	Beer A	3.62	3.96	3.27	3.22	3.54	2.90	All Beer	2.76	1.68	All alcohol	0.44	0.40	0.49	0.35	0.31	0.39
17	Beer A	12 for 80%	Beer A	3.75	4.10	3.38	2.93	3.23	2.62	All Beer	2.86	1.51	All alcohol	0.46	0.42	0.51	0.30	0.27	0.35
18	Beer A	12 for 70%	Beer A	3.87	4.25	3.49	2.61	2.89	2.33	All Beer	2.96	1.33	All alcohol	0.48	0.44	0.53	0.26	0.22	0.30
19	Beer A	12 for 8	Beer A	2.10	2.38	1.81	1.22	1.42	1.02	All Beer	1.57	0.54	All alcohol	0.20	0.16	0.25	0.06	0.03	0.09
20	Beer A	8 for 6	Beer A	2.80	3.22	2.38	1.99	2.31	1.65	All Beer	2.10	0.94	All alcohol	0.31	0.29	0.34	0.16	0.14	0.19
21	Beer B	12 for 90%	Beer B	3.98	4.08	3.79	3.55	3.64	3.38	All Beer	0.53	1.24	All alcohol	0.02	0.02	0.01	0.24	0.30	0.17
22	Beer B	12 for 80%	Beer B	4.29	4.41	4.04	3.38	3.48	3.18	All Beer	0.59	1.17	All alcohol	0.03	0.03	0.02	0.22	0.28	0.15
23	Beer B	12 for 70%	Beer B	4.60	4.75	4.31	3.16	3.27	2.94	All Beer	0.65	1.07	All alcohol	0.04	0.05	0.03	0.20	0.25	0.14
24	Beer B	12 for 8	Beer B	4.05	3.95	4.25	2.62	2.55	2.76	All Beer	0.53	0.85	All alcohol	0.01	0.00	0.03	0.14	0.15	0.13
25	Beer B	8 for 6	Beer B	6.69	6.71	6.66	5.04	5.05	5.01	All Beer	1.06	1.83	All alcohol	0.13	0.13	0.12	0.39	0.45	0.32
26	Spirits	2 for 90%	Spirits	3.85	4.15	3.39	4.61	4.95	4.08	Spirit	3.85	4.61	All alcohol	1.25	1.50	0.95	1.12	1.32	0.87
27	Spirits	2 for 80%	Spirits	4.13	4.44	3.64	4.50	4.83	3.98	Spirit	4.13	4.50	All alcohol	1.34	1.61	1.02	1.09	1.29	0.85
28	Spirits	2 for 70%	Spirits	4.40	4.73	3.90	4.34	4.66	3.84	Spirit	4.40	4.34	All alcohol	1.43	1.71	1.09	1.05	1.24	0.81
29	Spirits	3 for 2	Spirits	3.65	3.82	3.39	3.48	3.64	3.23	Spirit	3.65	3.478	All alcohol	1.17	1.35	0.94	0.81	0.92	0.68

Table G.3 Impacts of promotions from the MDCEV models

		Units			Expenditure				Units			Expenditure				Units			Expenditure		
introduction of	change in	overall	Moderate	H&H	overall	Moderate	H&H	change in	overall	Moderate	H&H	overall	Moderate	H&H	change in	overall	Moderate	H&H	overall	Moderate	H&H
wine A, 3 for 90% of price	wine A	1.85	2.12	1.71	1.63	1.87	1.50	all wine	1.47	1.59	1.39	1.05	1.10	1.00	all alcohol	0.52	0.51	0.50	0.32	0.30	0.32
wine A, 3 for 80% of price	wine A	2.19	2.53	2.01	1.68	1.95	1.53	all wine	1.76	1.92	1.65	1.09	1.14	1.02	all alcohol	0.65	0.65	0.63	0.33	0.31	0.32
wine A, 3 for 70% of price	wine A	2.64	3.07	2.40	1.73	2.03	1.56	all wine	2.13	2.34	1.98	1.12	1.19	1.05	all alcohol	0.83	0.84	0.79	0.34	0.33	0.33
wine A, 2 for 1	wine A	2.92	3.40	2.69	1.31	1.54	1.19	all wine	2.38	2.62	2.24	0.85	0.91	0.80	all alcohol	1.00	1.01	0.97	0.26	0.25	0.25
wine A, 3 for 2	wine A	2.59	2.90	2.40	1.60	1.81	1.48	all wine	2.10	2.21	1.98	1.04	1.06	0.99	all alcohol	0.83	0.80	0.81	0.32	0.29	0.31
wine B, 3 for 90% of price	wine B	3.95	3.34	4.30	3.52	2.97	3.83	all wine	0.39	0.45	0.37	0.68	0.73	0.65	all alcohol	0.05	0.06	0.05	0.20	0.19	0.20
wine B, 3 for 80% of price	wine B	4.72	4.06	5.07	3.70	3.17	3.97	all wine	0.50	0.58	0.46	0.72	0.78	0.68	all alcohol	0.10	0.10	0.09	0.21	0.20	0.21
wine B, 3 for 70% of price	wine B	5.76	5.04	6.09	3.91	3.40	4.14	all wine	0.65	0.75	0.59	0.76	0.84	0.71	all alcohol	0.16	0.17	0.15	0.22	0.22	0.21
wine B, 2 for 1	wine B	11.28	9.92	11.43	5.39	4.71	5.47	all wine	1.42	1.63	1.25	1.07	1.17	0.95	all alcohol	0.50	0.52	0.45	0.33	0.32	0.30
wine B, 3 for 2	wine B	6.30	6.00	6.28	4.06	3.85	4.05	all wine	0.72	0.91	0.63	0.79	0.95	0.69	all alcohol	0.20	0.23	0.17	0.23	0.25	0.21
wine C, 3 for 90% of price	wine C	24.20	16.68	22.11	21.74	14.96	19.85	all wine	0.07	0.07	0.08	0.36	0.32	0.42	all alcohol	-0.05	-0.04	-0.05	0.10	0.08	0.12
wine C, 3 for 80% of price	wine C	29.52	20.69	26.46	23.52	16.46	21.07	all wine	0.11	0.11	0.12	0.40	0.35	0.45	all alcohol	-0.04	-0.03	-0.04	0.11	0.08	0.13
wine C, 3 for 70% of price	wine C	36.79	26.26	32.30	25.61	18.23	22.46	all wine	0.16	0.16	0.17	0.43	0.39	0.48	all alcohol	-0.02	-0.02	-0.02	0.12	0.09	0.14
wine C, 2 for 1	wine C	82.72	71.83	61.36	41.06	35.60	30.40	all wine	0.47	0.56	0.42	0.71	0.79	0.65	all alcohol	0.08	0.09	0.08	0.20	0.20	0.19
wine C, 3 for 2	wine C	35.44	23.52	33.14	23.47	15.52	21.91	all wine	0.16	0.15	0.18	0.39	0.33	0.46	all alcohol	-0.01	-0.01	-0.01	0.11	0.08	0.13
beer A, 12 for 90% of price	beer A	2.89	2.51	3.09	2.56	2.23	2.74	all beer	2.42	1.93	2.68	1.66	1.19	1.93	all alcohol	0.25	0.21	0.27	0.21	0.16	0.23
beer A, 12 for 80% of price	beer A	3.42	3.02	3.60	2.66	2.36	2.81	all beer	2.87	2.33	3.14	1.73	1.26	1.98	all alcohol	0.33	0.28	0.35	0.22	0.17	0.24
beer A, 12 for 70% of price	beer A	4.11	3.71	4.28	2.77	2.50	2.88	all beer	3.47	2.87	3.73	1.80	1.34	2.03	all alcohol	0.44	0.37	0.46	0.23	0.18	0.24
beer A, 12 for 8	beer A	3.81	4.11	3.57	2.44	2.63	2.28	all beer	3.22	3.19	3.12	1.58	1.41	1.60	all alcohol	0.41	0.42	0.39	0.20	0.19	0.19
beer A, 8 for 6	beer A	2.92	3.15	2.74	2.12	2.29	1.99	all beer	2.46	2.43	2.39	1.37	1.23	1.39	all alcohol	0.29	0.30	0.28	0.17	0.16	0.16
beer B, 12 for 90% of price	beer B	1.91	1.62	2.11	1.71	1.44	1.88	all beer	0.19	0.23	0.17	0.46	0.52	0.42	all alcohol	-0.03	-0.04	-0.02	0.05	0.06	0.04
beer B, 12 for 80% of price	beer B	2.37	2.05	2.57	1.86	1.60	2.02	all beer	0.25	0.31	0.21	0.50	0.57	0.45	all alcohol	-0.02	-0.03	-0.02	0.05	0.07	0.05
beer B, 12 for 70% of price	beer B	3.01	2.66	3.20	2.05	1.79	2.18	all beer	0.33	0.43	0.28	0.55	0.65	0.49	all alcohol	-0.01	-0.02	-0.01	0.06	0.08	0.05
beer B, 12 for 8	beer B	6.24	4.81	6.82	4.05	3.10	4.45	all beer	0.71	0.80	0.62	1.10	1.13	1.01	all alcohol	-0.01	-0.01	-0.01	0.13	0.14	0.11
beer B, 8 for 6	beer B	4.03	3.50	4.15	2.97	2.56	3.06	all beer	0.44	0.56	0.36	0.80	0.93	0.69	all alcohol	-0.02	-0.03	-0.02	0.09	0.11	0.07
spirits, 3 for 2	spirits	3.33	3.04	3.49	2.09	1.89	2.20	spirits	3.33	3.04	3.49	2.09	1.89	2.20	all alcohol	0.83	0.85	0.83	0.28	0.27	0.28
spirits, 2 for 90% of price	spirits	2.02	1.88	2.11	1.79	1.65	1.87	spirits	2.02	1.88	2.11	1.79	1.65	1.87	all alcohol	0.44	0.46	0.44	0.23	0.23	0.24
spirits, 2 for 80% of price	spirits	2.42	2.29	2.49	1.87	1.76	1.93	spirits	2.42	2.29	2.49	1.87	1.76	1.93	all alcohol	0.56	0.60	0.55	0.25	0.25	0.25
spirits, 2 for 70% of price	spirits	2.96	2.85	3.00	1.96	1.88	1.99	spirits	2.96	2.85	3.00	1.96	1.88	1.99	all alcohol	0.72	0.79	0.70	0.26	0.27	0.26

Table G.4 Impacts of removing packages of promotions from the Tobit models (proportion reduction relative to situation with promotions)

	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
Moderate						
Wine A – 3 for 2	5.40	7.93				
Wine B – 3 for 2	-0.32	-0.05	0.30	0.22		
Wine C – 3 for 2	-0.76	-0.67				
Beer A – 8 for 6	-0.40	-0.23			-0.29	-0.41
Beer B – 8 for 6	-0.56	-0.44	-0.01	-0.05		
Spirits – 2 for 90%	2.73	2.73	2.73	2.73		
Hazardous and Harmful						
Wine A – 3 for 2	1.50	2.49				
Wine B – 3 for 2	-0.18	0.15	0.33	0.38		
Wine C – 3 for 2	-0.68	-0.56				
Beer A – 8 for 6	-0.24	-0.03			-0.27	-0.33
Beer B – 8 for 6	-0.11	0.14	0.36	0.45		
Spirits – 2 for 90%	2.01	2.01	2.01	2.01		
Combined						
Wine A – 3 for 2	2.58	4.00				
Wine B – 3 for 2	-0.26	0.03	0.32	0.29		
Wine C – 3 for 2	-0.73	-0.62				
Beer A – 8 for 6	-0.34	-0.16			-0.28	-0.36
Beer B – 8 for 6	-0.46	-0.31	-0.37	-0.23		
Spirits – 2 for 90%	2.35	2.35	2.35	2.35		

Table G.5 Impacts of removing packages of promotions from the Heckman models (proportion reduction relative to situation with promotions)

	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
Moderate						
Wine A – 3 for 2	1.87	3.01				
Wine B – 3 for 2	-0.59	-0.43	-0.35	-0.44		
Wine C – 3 for 2	-0.93	-0.90			-0.28	-0.40
Beer A – 8 for 6	-0.56	-0.44	-0.21	-0.36		
Beer B – 8 for 6	-0.80	-0.75				
Spirits – 2 for 90%	1.65	1.65				
Hazardous and Harmful						
Wine A – 3 for 2	1.04	1.84				
Wine B – 3 for 2	-0.46	-0.24	-0.16	0.25		
Wine C – 3 for 2	-0.92	-0.89			-0.27	-0.30
Beer A – 8 for 6	-0.62	-0.52	-0.36	-0.36		
Beer B – 8 for 6	-0.73	-0.66				
Spirits – 2 for 90%	0.38	0.38	0.38	0.38		
MDCEV						
Wine A – 3 for 2	1.37	2.31				
Wine B – 3 for 2	-0.54	-0.36	-0.27	-0.36		
Wine C – 3 for 2	-0.93	-0.90			-0.28	-0.36
Beer A – 8 for 6	-0.59	-0.48	-0.65	-0.62		
Beer B – 8 for 6	-0.78	-0.72				
Spirits – 2 for 90%	0.95	0.95	0.95	0.95		

Table G.6 Impacts of removing packages of promotions from the MDCEV models (proportion reduction relative to situation with promotions)

	Impact on alcohol type		Impact on alcohol category		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
Moderate						
Wine A – 3 for 2	-0.60	-0.43				
Wine B – 3 for 2	-0.76	-0.64	-0.65	-0.54		
Wine C – 3 for 2	-0.93	-0.89				
Beer A – 8 for 6	-0.62	-0.46			-0.51	-0.39
Beer B – 8 for 6	-0.66	-0.50	-0.62	-0.47		
Spirits – 2 for 90%	2.45	2.45	2.45	2.45		
Hazardous and Harmful						
Wine A – 3 for 2	-0.57	-0.40				
Wine B – 3 for 2	-0.74	-0.62	-0.62	-0.52		
Wine C – 3 for 2	-0.92	-0.88				
Beer A – 8 for 6	-0.61	-0.44			-0.46	-0.35
Beer B – 8 for 6	-0.68	-0.53	-0.62	-0.47		
Spirits – 2 for 90%	2.24	2.24	2.24	2.24		
MDCEV						
Wine A – 3 for 2	-0.58	-0.42				
Wine B – 3 for 2	-0.75	-0.64	-0.63	-0.53		
Wine C – 3 for 2	-0.93	-0.89				
Beer A – 8 for 6	-0.61	-0.44			-0.48	-0.37
Beer B – 8 for 6	-0.67	-0.52	-0.62	-0.47		
Spirits – 2 for 90%	2.33	2.33	2.33	2.33		