Measuring the Impact of Multi-buy Alcohol Pricing Promotions

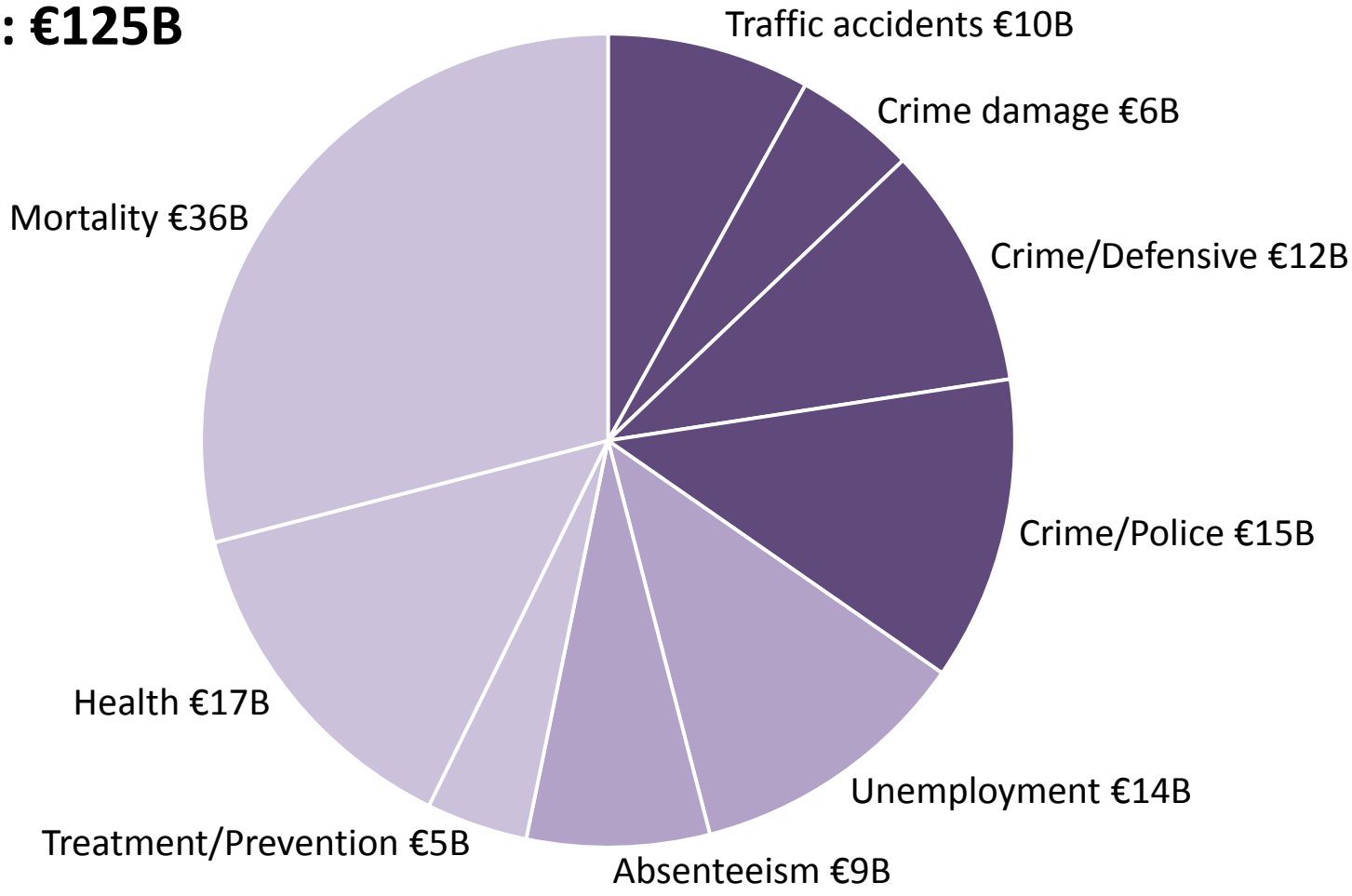
Lu, Daly, Rohr, Hess

ICMC, Austin, Texas, May 2015

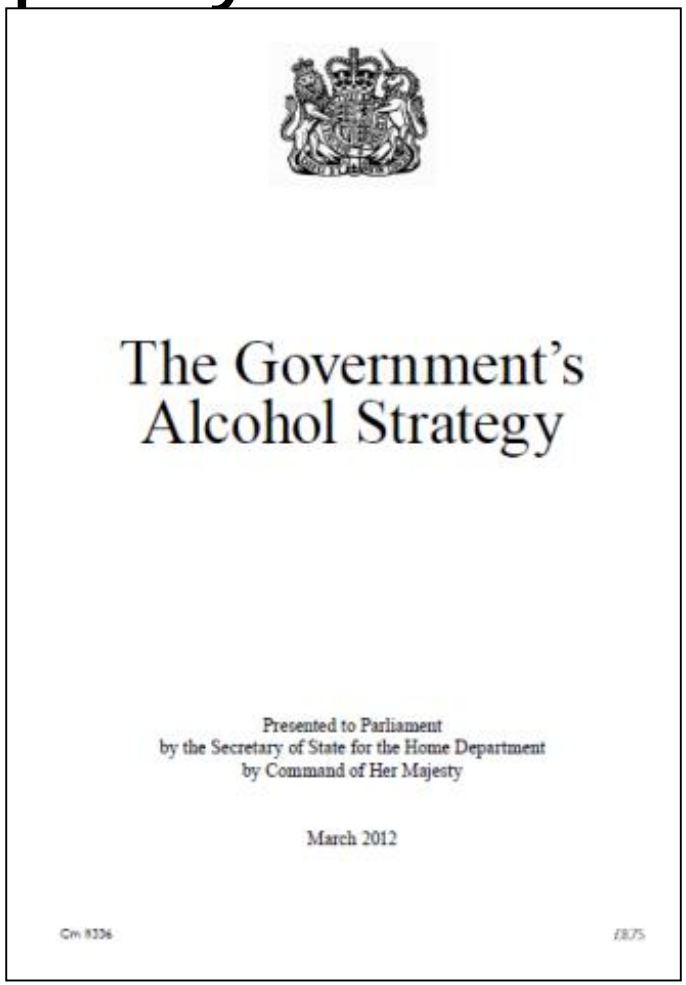
RAND EUROPE

Alcohol related harms cost the EU billions of euros each year

Total: €125B



RAND Europe work on alcohol pricing has been informing UK government policy



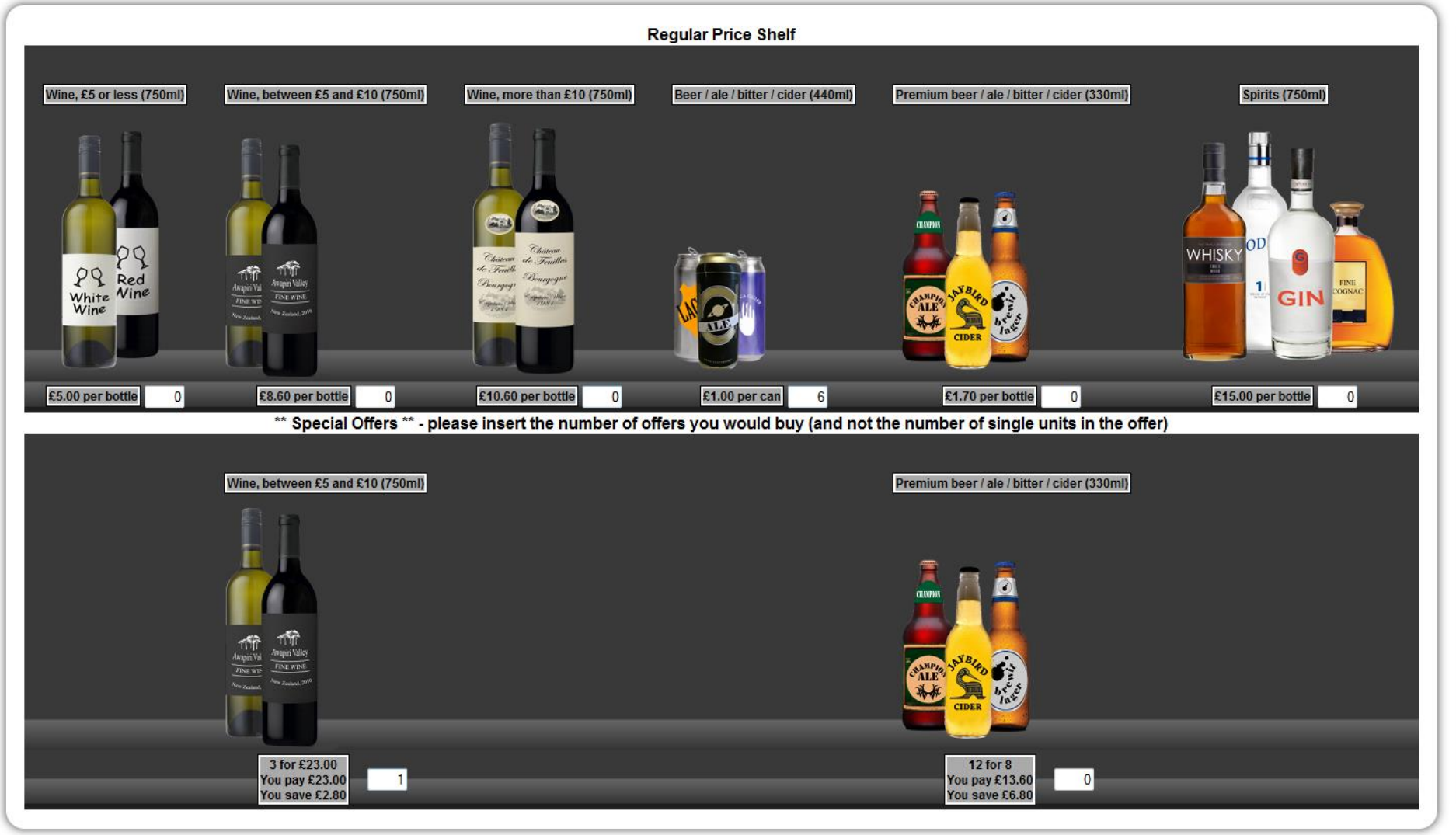
- previous work for Home Office on pricing policy options fed into Government Alcohol Strategy
- this strategy included commitments to:
  - introduce a minimum unit price for alcohol
  - consult on a ban on the sale of multi-buy alcohol discounting
- in September 2012 RAND Europe was commissioned by Her Majesty's Revenue and Customs (HMRC) to quantify the impact of multi-buy promotions on alcohol purchasing

Multi-buy promotions are common in shops and supermarkets

Our aim was to quantify the impact of multi-buy promotions on purchasing

- study objectives:
  - to quantify the impact of multi-buy promotions on consumer purchasing
  - to examine how different consumption groups are impacted by promotions
  - not required to estimate impact on tax revenue
  - study restricted to ‘off-premises’ sales, i.e. not pubs, restaurants etc.
- timescales for study were very tight to fit in with 10-week government consultation plan (Sept 2012 – January 2013)
- the study brief suggested the use of stated preference choice experiments to quantify the impact of multi-buy promotions on purchasing
- 1265 respondents, quotas by consumption (no non-drinkers), age and sex
  - 12 responses per respondent (4 without, 8 with promotions)

Choice experiments were presented in the form of an on-line supermarket



Total Price: £29.00

RAND EUROPE

Order of shelves was randomised to reduce bias

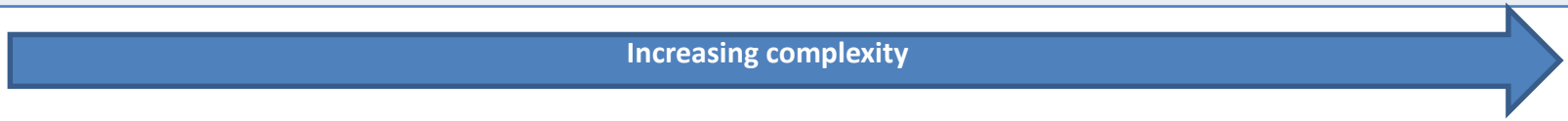
We checked the stated expenditure in the experiments against previous expenditure

	Average reported spend in previous 4 weeks in supermarkets	Average stated expenditure in the choice experiment for next 4 weeks
	Mean (£)	Mean (£)
All	37.92	36.90
Consumption segment		
Moderate A	13.17	14.51
Moderate B	25.49	22.83
Hazardous	45.28	43.37
Harmful	68.70	67.47

the variation in reported expenditure and the expenditure in the experiments are both large

Several discrete-continuous models, e.g.

Model	Tobit, 1958	Heckman, 1979	MDCEV, Bhat 2005
Description	Truncated regression model	Continuous model distinct from purchase model	Simultaneous for all alcohol types, choice and quantity
Benefits	Consistent and efficient	Consistent and can be efficient Different effects can be included in type choice and continuous models	Consistent and efficient Takes better account of choice and quantity competition between products
Disbenefits	Limited to binary alternatives: one alcohol type at a time Same function for choice and quantity	Extension to multiple types complex and covers only single choice (mixed logit or MNL) Forecasting issue	Modelling is complex (software issues) Budget not clear



It was hard work to get good modelling implemented and accepted

- pressure on time and budget
  - the work was let competitively with little premium on method
  - the client was very concerned to get exactly what they wanted
- we responded to the HMRC request for a model which fitted with previous Tobit work
- and added Heckman generalisation
- we also developed more complex (MDCEV) choice model structures
  - developed in transport sector – first transfer to analysis of alcohol purchasing
  - this was only possible because of previous academic work
  - and because software was available
- but we ourselves were not certain of the outcome, so the use of simpler models was also a fall-back option

Model formulations

- after initial testing...
  - separate models for two classes of drinker: moderate and hazardous/harmful
  - dependent variable is the quantity of alcohol purchased, in ‘units’
- Tobit, Heckman:
  - independent models for each of 6 alcohol types
  - can’t represent detailed specific impact of promotions
- MDCEV:
  - 24 different ‘products’, i.e. 6 alcohol types either not promo or different types of promo, plus ‘outside good’
  - this gives an IIA issue!
  - budget set to be maximum observed expenditure in games plus £1
    - this is problematic, as there is no basis for estimation

MDCEV specification

- basic utility equation (Bhat, Bhat & Pinjari):

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

- x are the quantities of goods consumed; α, γ and ψ to be estimated
- good 1 is the 'outside good' and must have positive consumption
- α is the satiation parameter for each product
- $\psi > 0$ is the fundamental utility of the product (e.g. of the first unit)
  - $\psi_1 = 1$ to avoid overspecification
- γ allows for corner solutions and influences satiation
- but α and γ are correlated in estimation and difficult to identify separately

MDCEV specifications were restricted

- because of the α, γ issue, we used the 'alpha-gamma profile'
  - α values constrained to be the same
  - this allows application of the forecasting procedure, which is tricky!
- we also specified $\psi(z_k, \varepsilon_k) = e^{\beta' z_k + \varepsilon_k}$
  - always positive
  - allows estimation of the importance β of the socioeconomics z
  - and introduction of the random ε distributed extreme value
  - this imposes an IIA structure on choices
- this is all following Bhat & Pinjari
  - we could not afford to research alternatives

Existing software made model estimation reasonably straightforward

- all the models indicated socio-economic variation
  - income: higher incomes buy more expensive types (not surprising!)
  - higher education people buy more expensive types
  - age, sex, race, household size: mixed results
  - no real trends with region
- in Tobit and Heckman models we found significant own-pricing and own-promotion effects
- ...and some cross-pricing and cross-promotion effects
- all the pricing and promotion effects are included in the structure of the MDCEV model

Validation of responsiveness was reasonable but not conclusive

- tested by price elasticity: 10% increase, what happens?
  - differences between drinker types
  - MDCEV more elastic than independent models, because switching represented better
- can we validate these models?
  - some comparative information exists from other models
  - and from marketplace
- some difficulties
  - e.g. to separate units & expenditure in previous studies (these models give separate elasticities)
- but seems generally within reasonable bounds

We find that the impact of individual promotions is large

- Imagine that the only promotion available is on beer…..

	Impact on demand for specific type of beer	
	Units	Expenditure
Cheap Beer, 12 for 8	381%	244%
Premium Beer, 12 for 8	624%	405%

- The impact on demand for beer is substantial
  - A 12 for 8 promotion on cheap beer nearly quadruples the number of units sold and more than doubles expenditure on cheap beer
  - The relative impact on Premium beer is even larger (because it draws more demand from the cheap beer market, which is much larger, and it has a relatively small market share so the impact is a large percentage)

We find that the impact of individual promotions is large

- Imagine that the only promotion available is on beer…..

	Impact on demand for specific type of beer		Impact on all beer purchases	
	Units	Expenditure	Units	Expenditure
Cheap Beer, 12 for 8	381%	244%	322%	158%
Premium Beer, 12 for 8	624%	405%	71%	110%

- The impact on all beer purchasing is lower, because of switching in these markets
  - For cheap beer, there is still substantial switching from other markets, say from more expensive Premium beer, or wine or spirits
  - For Premium beer, the impact is smaller – because it draws more demand from the cheap beer market, and people buy less cheap beer and spend more on premium beer

We find that the impact of individual promotions is large

- Imagine that the only promotion available is on beer…..

	Impact on demand for specific type of beer		Impact on all beer purchases		Impact on all alcohol purchases	
	Units	Expenditure	Units	Expenditure	Units	Expenditure
Cheap Beer, 12 for 8	381%	244%	322%	158%	41%	20%
Premium Beer, 12 for 8	624%	405%	71%	110%	-1%	13%

- Promotions on cheap beer tend to lead to increases in purchasing overall
  - Because people switch from more expensive options, and can buy more
- Whereas promotions on premium beer do not lead to increases in purchasing
  - Because people ‘trade-up’ to more expensive premium beer, and buy less

So what did we learn about the impact of multi-buy promotions?

- Promotions appear to have a large impact on purchasing
- The impact on total units purchased varies by product

Promotions on cheaper wine and cheaper beer lead to the largest increases in alcohol units purchased

- Because people can buy more cheaper wine and beer, within their budget

Promotions on more expensive wine and beer have a much smaller impact on the number of units of alcohol purchased (because people trade up and purchase less of the cheaper alternatives)

Promotions on spirits also have a large impact on the number of units of alcohol purchased, because of the higher number of units per bottle

Drinkers from different consumption segments are impacted differently

- the model results show higher relative impacts for moderate compared to hazardous and harmful drinkers
  - the findings with are consistent with others, e.g. Fogerty (2004)
  - but this makes it a ‘hard sell’ policy wise, because ‘responsible’ drinkers appear to be impacted more highly, in a relative sense
- however, because hazardous and harmful drinkers purchase much higher volumes of alcohol, the absolute impact on these segments will be higher
- the framing of who is most impacted by such a policy needs to be communicated carefully
- and the response of the drinks industry, e.g. general price reductions, needs to be factored in

Conclusions on modelling

- MDCEV is more plausible in structure and in outputs
  - it gives the right sign consistently, which other methods do not!
- still there are some issues...
  - how to specify the budget
  - IIA
  - forecasting depends on specific structure of model
  - estimation ignores correlation of responses (also Tobit & Heckman)
- can't trust SP for elasticity, though there is reasonable agreement with past data
  - want good RP data, preferably disaggregate (but specifying alternatives would be an issue)
  - we think we are overstating impacts because of this and IIA
- but certainly MDCEV is more plausible than Tobit for this market


RAND
EUROPE