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Why people play Bingo: Separating the decisions of Bingo participation and expenditure levels using data from the FES

Abstract: *This paper examines the rationale for playing Bingo. Using a sample of 6637 UK households in 2000-2001, Tobit analysis is first used to analyse the impact of income, sex, age, employment status, family composition and area on the decision to play Bingo. A two-step procedure is then used to estimate whether the decision to play is distinct from of the level of expenditure. The results indicate that most of the explanatory variables exert a significant influence on the probability of participation but not on the expenditure decision.*

(5510 words)

1. Bingo playing in the UK

With over 3 million regular players, Bingo is one of the most popular leisure activities in the UK. Bingo club numbers peaked in the 1960s when there were 2500 Bingo clubs. With the introduction of the 1968 Gaming Act (1968), which provided the Bingo industry with a secure legal framework within which to operate, clubs had to go through a strict legal process to obtain a licence. With increased regulation, an ageing audience, and an economic slowdown, Bingo struggled to remain in the gaming forefront. The number of Bingo clubs was reduced by nearly 50 percent (Ellis, 1995).

In recent years, there has been a further decline in the number of Bingo clubs. Between 1996 and 2001, the number of clubs fell another 20 percent to 700 clubs. By 2001-2002, the number fell to 706 holding board certificates. However, this recent decline has likely been offset to some extent by an increase in the average size of the clubs (Gaming Report, 1999-2000). Profits have actually increased, possibly due to a combination of closures, consolidation, and cost-cutting measures.

	Admissions		Average Spending per head	
	m	Index	pounds	Index
1996	96	100	13	100
1997	97	101	13	102
1998	98	102	13.5	104
1999	100	104	13.8	106
2000	101	105	14.2	109
2001	101	105	14.6	112

Table 1: Admissions and Spending on Bingo 1996-2001

Table 1 shows the total admissions and average spending per head on Bingo from the period 1996–2001. Despite the closures, Bingo in the UK appears to be making a comeback. Admissions have increased by 5 percent, and average spending has increased by 12 percent. Perhaps Bingo operators are increasing profits by encouraging existing customers to spend more, rather than by attracting new players. The Bingo revival may be due to technological advances (e.g., computerised screens and number calling), changes in the environment, and modern conveniences such as car-park space, air conditioning, comfortable seating, bars, etc., and increased advertising by and competition between the two main operators, Mecca and Gala.

The procedure of the game is such that Bingo game sheets are bought prior to the game. Numbers are selected at random and announced by a caller. A player wins by being the first to complete a line, multiple lines, or a full house. It is not clear as to whether Bingo can be considered a pure form of gambling because the outlay is exactly known and not exceeded. Bingo can thus be considered a fixed expenditure.

In recent years, there has been growing interest surrounding the various socio-economic and demographic characteristics of individuals and/or households participating in various gambling activities, namely lotteries and casino games. I have extended the

existing research, primarily done on lotteries, and applied it to Bingo players. Bingo, while being a type of gambling activity, is unique, as it has a strong social and entertainment component. Also, it is becoming increasingly attractive due to the media coverage of celebrity players, technical enhancements, and modern environments in clubs, for both young and old. However, very limited empirical research has been done on Bingo. Most of the studies done are descriptive in nature and use survey data to capture information about Bingo players. This study serves to deepen our understanding of Bingo and Bingo-players in the UK, and would be useful to Bingo marketers, as well as policy-makers concerned with taxation issues.

In Section 2, the main theories that provide the rationale for gambling are reviewed, and extended to Bingo. There are two separate decision "hurdles" to overcome before an expenditure is made. The theories discussed in section 2 only deal with the participation and not the consumption decision. Providing an estimation model for both decisions will take up section 3. Using data from the family expenditure survey, Section 4 presents estimates and evaluates the statistical significance of a number of socio-economic and demographic variables on the decision and level of participation on Bingo in the UK. Section 5 concludes with a critical evaluation of the results and further possible extensions.

2. Theoretical Explanation of Why People Gamble

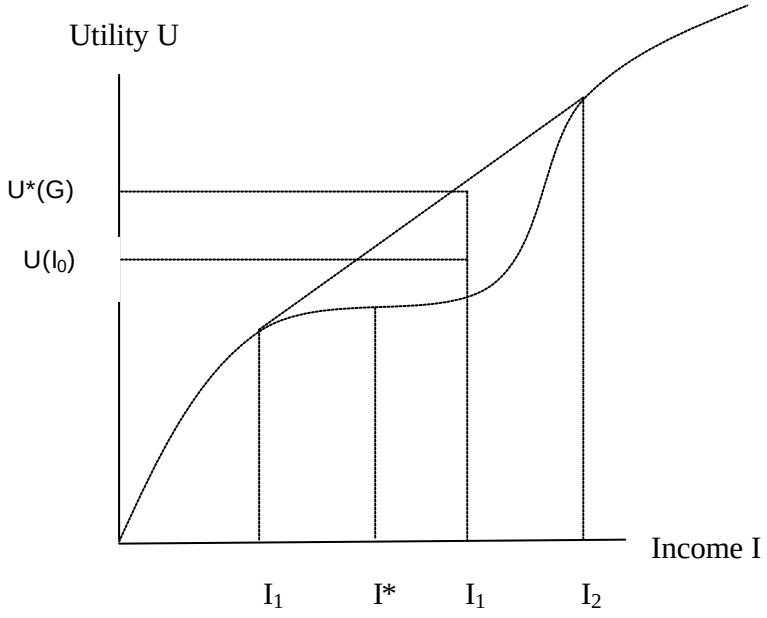
This section explains the rationale behind gambling and will highlight the main literature on this subject, applying it to the Bingo context.

The standard economic framework for analysing decision-making under risk is the expected utility theory. It is assumed that all rational people would obey the axioms of the theory in most cases, which says that utility gained from undertaking a risky activity can be measured by the expected utility associated with the activity. The traditional assumptions are that individuals maximise expected utility of wealth and that utility functions are concave. The expected utility is measured by combining the weighted average of utilities associated with each possible outcome. In most forms of gambling, expected return is usually lower than the stake. This means that expected utility is less than the stake without uncertainty. Engaging in gambling activities in the face of negative expected utility would seem contradictory and inconsistent with utility maximisation.

There have been several attempts to integrate the seemingly irrational behaviour of gamblers. In their classic paper, Friedman and Savage[1] extended the expected utility theory to explain why people are attracted to risky prospects when they exhibit risk aversion in other circumstances, for example, by buying insurance.

The basic idea proposed is that the utility function is composed of concave segments at low and very high income levels and a convex segment at the intermediate range of wealth. This is illustrated below.

[1] Friedman, M. and L J. Savage "The Utility Analysis of Choices involving Risk." Journal of Political Economy **56**(Issue 4): 279-304.



The diagram above shows an S-shaped utility function. I* represents a consumer's current wealth. A gamble is offered to the consumer with the following payout pattern: a small chance of winning a large sum given by (I_2-I*), and a large chance of losing a small sum given by (I*-I_1). The expected utility of this gamble, U*(G), exceeds the utility of the certain outcome, U(I_0). Thus, a gamble of this form will be accepted by the consumer. The interpretation of a utility function described above is one where the two convex segments represent different welfare classes, and the concave segment with increasing marginal returns represents a shift in the class. Individuals who have low initial wealth at I* will accept low probability/ high payoff gambles that potentially lift them out of their

present class, significantly altering their lifestyles. These individuals could be unskilled workers, for example. The model assumes every individual desires greater wealth, and everyone's utility function is of the S-shape, constructed around a point of inflexion associated with current wealth.

A number of objections to the Friedman-Savage hypothesis have been made. Machina (1982) observed that the behavioural patterns of individuals who gamble did not appear to change as drastically as that suggested by the model, in response to changes in their initial wealth. The S-shaped utility function also implies that only individuals near the inflexion point--a small percentage of the population-- would undertake both gambling and insurance. However, this is not so in reality.

Thus, attempts to produce a more adequate explanation of the observed gambling behaviour arose. A model influential in explaining gambling behaviour in the face of risk aversion came about with the aid of experimental studies[2], suggesting that individuals systematically misperceive probabilities associated with gambling activities.

Kahneman and Tversky, by the use of experimental sessions with different subjects, showed that individuals assess probabilities and make choices under uncertainty by means of heuristic rules implying systematic errors. An individual's probabilistic reasoning does not follow the rules of the theory of probability; thus, rationality is flawed. Prospect theory replaced the function of expected utility with a function of value. Results are weighted with decisional weights that are a function of probability, but do not represent probability themselves. The choices' outcomes are assessed with reference to

[2] Quiggin (1982), Kahneman and Tversky (1989)

the status quo, rather than in absolute terms. The value function is S-shaped: concave for earnings, and convex for losses.

Prospect theory demonstrates that people distort small probabilities. The subjective belief that they have a chance to win is larger than the correct objective probability. Due to this over-weighting of small (winning) probabilities, the effects of expected utility risk aversion, which discourages low probability/high payoff gambles, may be countered. This may explain the attractiveness of obviously unfair gambles.

In addition to the prospect theory, a psychological approach[3] was used to explain the over-weighting of small probabilities. A form of judgemental heuristic known as "availability" provides people a useful clue in assessing probabilities in decision-making. An example would be a person who had to assess the risk of heart attack among middle-aged people. He will typically do so by recalling occurrences amongst his acquaintances. However, availability is affected by factors besides frequency. In the Bingo industry and other forms of gambling, winners are often announced, together with dollar winnings, in advertisements. This may result in prospective gamblers exaggerating the perceived chance of a low probability win and underestimating the perceived chance of a highly likely loss. Hence, even though they are risk averse, reliance on "availability" creates bias and encourages their participation.

In many forms of gambling, players may have other motivations for taking part, besides the simple desire to increase one's wealth. By including a utility function that

[3] Tversky, A. and D. Kahneman (1974). "Judgement under Uncertainty: Heuristics and Biases." Science **185**(4157): 1124-1131.

recognizes the "fun" of gambling, utility functions may be concave throughout, and gambling may be consistent with risk aversion.[4] Markowitz[5] pointed out that there were two related reasons gamblers take up small bets with symmetrical payoffs. First, he demonstrated that for a small bet, the loss of utility is negligible, as the utility function can be shown to be almost linear. In addition, the utility of a gamble is given by the sum of expected utility of outcomes and the utility of playing the game. This utility, derived from the "fun" or pleasure of gambling, is considered independent of the outcome. Hirshleifer[6] further distinguished between two observably distinctive forms of gambling: pleasure-oriented gambling and wealth-oriented gambling. He attributes the acceptance of unfavourable bets to the pleasure, or consumption value of gambling. The price paid for the pleasure of gambling will be the high probability of loss from an adverse odd with a limited stake. Conlisk formalised this notion by attaching a "non-pecuniary" term that is identical to the "utility of playing the game" term that Markowitz suggested. This term illustrates how unfair bets can increase bettors' utility.[7] His model is given below:

Suppose a fair gamble exists where G is won with probability p and L lost with probability 1-p.

$pG = (1-p)\ L$

$E(G,p,W) = pU(W+G) + (1-p)\ U(W-L) + \varepsilon V(G,p)$

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[5] Markowitz, J. (1952). "The Utility of Wealth." Journal of Political Economy **IX**: 151-158.

[6] Hirshleifer, J. (1966). "Investment Decisions Under Uncertainty: Applications of the State Preference Approach." Quarterly Journal of Economics **80**: 252-277.

[7] Conlisk, J. (1993). "The Utility of Gambling." Journal of Risk and Uncertainty **6**: 255-275.

where εV(G,p) is known as the taste function, representing the additional utility of gambling, and ε is a non-negative scale parameter.

It is possible that gambles with initial negative expected utility can be compensated once the utility derived from the fun of gambling is taken into account. The overall utility of the bettor may be positive if the taste function is significantly positive.

In the next section, we will see whether the theoretical explanations discussed below can be tested for and applied to Bingo.

Empirical Validity and Applications to Bingo?

Empirically, even though the Friedman-Savage model remains the standard economic explanation for gambling, it is difficult to validate. The behaviour implied by the Friedman-Savage hypothesis is that low-income families, especially if they are towards the upper end of the initial concave segment, would be inclined to buy long-shot[8] gambles such as lotteries or participate in national Bingo games. According to the model, people who want to move to a higher social class would have a higher probability of being a gambler. A possible test of the model is a comparison between dissatisfaction with income level and participation in gambling activities.[9] In this paper, the variable "gross income" is used and the correlation between income and income satisfaction is assumed. If the Friedman-Savage hypothesis is applicable to Bingo, income should have a strong negative correlation with Bingo expenditure.

[8] Gambles of this kind are described as being low in cost with a low probability of winning a big prize.
[9] Brunk, G. G. (1981). "A Test of the Friedman-Savage Model." The Quarterly Journal of Economics **96**(2): 341-348.

Bingo is a game where both lottery-like wins and small wins[10] are observed in the same session. In addition, people often play for social and entertainment reasons, which may be more important than trying to win. These two observations make the application of the Friedman-Savage model to Bingo questionable.

Using evidence from Mintel[11] and survey evidence[12] on a sample of 412 Bingo players, there is evidence supporting the non-pecuniary reasons for playing Bingo. The survey by Mintel attempts to analyse attitudes towards Bingo. Using a word to describe Bingo, 1/3 used "sociable", 1/5 used "entertaining", and "fun" was cited by 1/6 of the respondents. In the next survey, research done showed that the key motivations of players were that they "enjoyed chatting with friends at Bingo" and "enjoyed the thrill of winning." In addition, 93 percent of players reported that they came with one or more friends or relatives (refer to Table in appendix).

This suggests that there is a positive utility associated with gambling. When applied to Bingo, this taste function may be exceptionally strong, thus offsetting any loss in utility from the unfair bet. Conlisk's model may give the best insight to people's motives for playing Bingo.

[10] Winnings are progressive, with cash prizes increasing when players obtain a single line across, full line across, or a full house. Cash amounts vary from 10 pounds to 50 pounds on nights with more players. Over the small range of wealth covered by the two possible outcomes of losing or winning a bet in such a scenario, there is no increasing marginal utility of wealth. Instead, utility is approximately linear. In addition, a "lottery like" prize, with 1 single big prize, applies to the National Bingo game, which is a computer generated game that links up 550 Bingo clubs on every night of the year.

[11] Mintel (2001). Bingo, Leisure Intelligence.

[12] Griffiths, M. D. and C. Bingham (2002). "Bingo playing in the UK: The influence of demographic factors on play." International Gambling Studies **2**: 51-60.

In the next section, a number of background and demographic indicators[13] to construct a complete model of gambling preferences is included.

3. Modelling zero expenditures in Bingo

(i) Data

The dataset used is the Family Expenditure Survey. The FES is a continuous survey, where individuals age 16 years and over are interviewed and asked to keep a diary recording their daily expenditure for 2 weeks. Detailed questions about income, sex, marital status, education, etc., were also asked. In total, over 6100 households participated in the 2000-2001 survey, of which 328 were Bingo players.

(ii) Method of estimation:

Dependent variables:

Both a dummy variable of participation *dBingo* and a continuous variable on the amount of Bingo stakes, *Bingo*, are used.

Independent variable:

The independent variables were chosen in the light of a review of theoretical and empirical literature that identified the factors below as the key determinants of demand for gambling.

[13] Results by Light (1977), Hakansson (1976), Layton(1999), Farrell and Walker(1999) showed that a wide variety of other characteristics influence the probability that an individual will gamble.

(1) Economic: Gross household income and employment status of household head. These variables are included to test for the validity of the Friedman-Savage model.

(2) Demographic Composition of household: Household composition, age, and sex of household head.

(3) Occupational Classifications and educational information.

(4) Indicators for presence of certain stock and purchases: Internet (dummy variable taking value 1 if household has internet access), gambling (household total expenditure on other gambling activities eg football pools, lottery stakes).

(5) Regional dummies giving region in which household is located, and finally,

(6) Seasonal dummies to take into account seasonal effects.

Table 2 gives the description of the explanatory variables used in the regression model, and the descriptive statistics for a full sample of 6637 households, 328 of which are "Bingo players", that is, have Bingo expenditure greater than zero.

The profile of players is considered first.

Participation Rate

Figures 1(a)-(d) give profiles in terms of participation rates. Females were considerably more likely than males to have played Bingo. This differs from established profiles of participants in other traditional forms of gambling, whose participants tend to be male. Age group participation rate peaked for household heads aged 65-74. Respondents age 44 and younger were less likely to participate.

Households composed of single women were the most likely to participate in Bingo. Household heads who were sick, retired, and unemployed were more likely to play Bingo than their healthy, employed counterparts. Across regions, we can see that population density resulted in different participation rates. Participation is higher in more densely populated regions.

Expenditure

Expenditure data was estimated from reported amounts spent and therefore may only provide an indication of trends and basis of comparison between demographic groups. Figures 2(a)-(e) give the results.

The overall trend, consistent with other gambling activities, shows that males spent more than females. Average weekly expenditure on Bingo was highest for household heads ages 25-34, at a rate of ten pounds. This shows that although a greater portion of participants is of the older generation, the younger generation spends more. This could be the result of the "modern" image that game promoters have attempted to convey through publicity. This has proved successful with the younger clientele.

By distribution of play across regions, average expenditure was almost 3 times higher for households living in the Greater London area, compared to other regions. Part of this significant difference could be due to difference in cost of playing bingo in different locations. Household heads who were employers or self-employed are bigger spenders than the retired, sick, or unemployed. The obvious reason for this could be the higher disposable income possessed by the former group of participants. Gamblers are

also shown to spent an average of more than a pound more than non-gamblers, all else remaining the same.

The above discussion is purely descriptive in nature and aims to provide an interesting profile of the different kinds of UK Bingo players. In the following an econometric analysis of Bingo demand will be provided.

(iii) The zero expenditure problem

A large portion of households in the Family Expenditure Survey reported zero expenditure for Bingo.

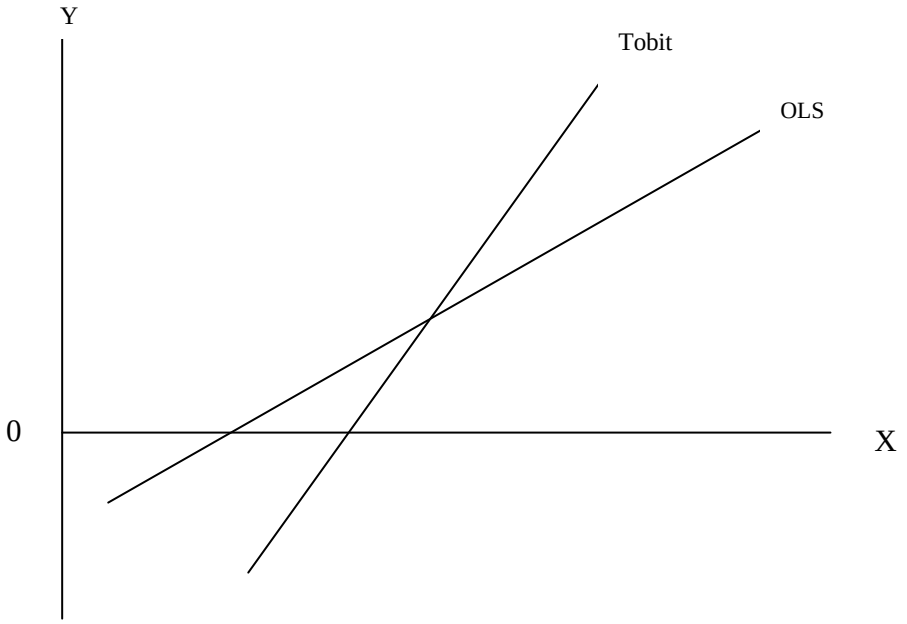
In the case for Bingo, zero consumption may have several interpretations:

(i) An economic decision: zero consumption corresponds to a corner solution in the maximization program. That is, every individual is a consumer and zero consumption occurs only as a result of price and income constraints.

(ii) Non-economic decision: Bingo may not enter every individual's utility function. Bingo players have different preferences from non-players. These can be observed by the different characteristics of players and non-players that are independent of the level played.

I will show, later in the paper, that when deriving a model for Bingo demand, emphasizing the different interpretations of zero expenditure gives rise to different models.

Ignoring the censoring process can lead to very different results when using ordinary least squares to estimate.



Suppose the true relationship is given by the sample of observations (given by the crosses). However, the dependent variable is subjected to a lower bound of zero. For consumption goods like Bingo, expenditure cannot take a negative value. These expenditure will take a value equal to zero, and clustering occurs at this point. Running an OLS regression on the full sample will cause the slope to be biased downwards.

Given that the relationship between observed Bingo purchases y_i and the latent dependent variable y_i^* is given by

$$y_i \begin{cases} y_i^* \text{ if } y_i^* > 0 \\ 0 \text{ otherwise} \end{cases}$$

For each i=1,2,..,N observations.

The relationship between X_i is the vector of explanatory variables and Y_i* is given by

$y_i^* = x_i\beta + \varepsilon_i$

β is the vector of coefficients, and ε_I 's are assumed to be independently normally distributed.

Estimation by ordinary least squares will give regression estimates of $E(y_i/x_i)$ and not $E(y_i^*/x_i) = x_i'\beta$. Thus, OLS will be biased for the parameter of interest β. Instead, two other methods have been proposed to circumvent the zero expenditure problem. The traditional approach is to use a Tobit procedure.

The Tobit model assumes that all individuals satisfy only interpretation (1) from above; that is, there is only 1 decision since every individual is a potential player. The factors that determine whether or not stakes are positive are the same as those that determine the level of stakes. This restrictive assumption may not give the best insights to people's Bingo behaviour. Thus, two step procedures have also been developed as a generalization.

"The underlying idea is that we observe a positive consumption if and only if two hurdles have been passed: the decision to adopt such a consuming behaviour and the decision on the level of consumption at the moment of the survey."

(cited from P.Bertail, et al, 1999).

The model by Cragg (1971) takes into account both interpretations of zero Bingo expenditure. The Heckman specification is a simplification of such a model, which makes

the participation decision endogenous and separate from the consumption decision. This is shown below:

Participation equation: $w_i^* = z_i\gamma + v_i$

Consumption equation: $y_i^* = x_i\beta + u_i$

where

$$w_i \begin{cases} 1 \text{ if } y_i^* > 0 \\ 0 \text{ otherwise} \end{cases}$$

β is the vector of unknown coefficient controlling the relationship between the dependent variables and market consumption. γ is the vector of unknown coefficients controlling the relationship between the dependent variables z_i, which may be the same or different from x_i, and the market participation. We make two further assumptions: u and v, the random error terms, are independent. The participation decision dominates the consumption decision; that is, people first make the decision whether or not to play Bingo, and then, conditional on that, face the corresponding choice of how much to spend.

The model described above can be estimated by a Heckman two-stage estimator, which reduces the first step to a Probit model. This estimates the participation equation. The second stage is the regression of the truncated sample of positive values of Bingo expenditure on the regressors, with an additional term which is derived from the first equation (called the inverse Mill's ratio) that corrects for the bias caused by the missing data. Joint likelihood of the two equations accounts for the probable correlation of the disturbance term and is supplied in a numerical maximum likelihood procedure.

4. Results

Table 3 presents results of the analysis. Column A shows parameter estimates and t-ratios by OLS, column B by Tobit, and Columns C and D by Heckman selection model.

Comparing between columns A and B shows that coefficient estimates have the roughly the same signs. Estimates using Tobit appears to yield more significant results than the corresponding OLS estimates. However, it is not informative to compare the magnitudes of OLS and Tobit estimates.

We now compare estimates from the Tobit model and the sample selection model.

Coefficients on gross household income are significantly positive, which contradicts the Friedman-Savage hypothesis. Bingo is a normal good, which people consume more at higher income levels. Estimation using the Heckman two-step approach shows that income has a much more significant effect on the level of Bingo expenditure than on the first decision of whether or not to play.

Compared to an unemployed household head, an employed head of household will spend noticeably less on Bingo. Heckman estimates reveal that employment variables do not have a proportional effect on the two different decisions. Employment variables operate more strongly on the participation decision than on the consumption one. When household heads are in the workforce, they may have less time and energy to play, thus lowering the probability of participation. Ill household heads may also face difficulties and inconveniences when going to Bingo halls, and thus refrain from doing so. The results here are contrary to prior expectations that household heads who are retired or unoccupied should play Bingo to pass their time.

Table 3: Estimates of Bingo Stakes Purchased

Independent Variable	A: OLS	B: Tobit	Heckman Selection	
			C: Probability of Participation	D: Determinents of expenditure
Constant				
Gross Income	0.0002727(1.49)	0.0101572(1.78)	0.000155(0.49)	0.0120587(1.84)
(Gross Income)^2	-0.0000000197 (-0.9)	-0.00000197 (-1.02)	-0.0000000188 (-0.27)	-0.00000134 (-0.56)
Employment Status of HOH				
unemployed (default)				
employee	-0.2281319 (-1.91)	-5.86026(-2.45)	-0.3528415(-2.57)	-0.335443 (-0.14)
self employed	-0.2317019 (-1.21)	-4.735338 (-1.25)	-0.240174(-1.12)	-9.208989 (-2.39)
sick	-0.0476448(-0.35)	-0.866985(-0.41)	-0.0689319(-0.57)	0.1237439(0.06)
retired	-0.1884903(-1.28)	-4.75655(-2.08)	-0.3072926 (-2.36)	0.6330507(0.28)
unoccupied	-0.0646429(-0.44)	-1.86784(-0.74)	-0.11917(-0.82)	-3.295017 (-1.27)
Male HOH (default)				
Female HOH	0.0274271(0.35)	1.921698(1.52)	0.5901403(4.95)	-2.253509 (-1.87)
Age of HOH				
15-24 years	-0.0830721 (-0.29)	-3.169355 (-0.34)	-0.176462(-0.33)	13.22049(0.85)
25-34 years	0.3086685(1.81)	9.498534(2.33)	0.4549947(1.84)	16.66993(3.19)
35-44 years (default)				
45-54 years	0.2250924(1.53)	7.941833(2.35)	0.4577885(2.35)	3.147367(0.72)
55-64 years	-0.0010206 (-0.01)	6.366229(1.9)	0.3648716(1.87)	4.477139(1.05)
65-74 years	0.9063622(4.13)	21.28376(4.97)	1.207847(4.84)	8.146892(1.53)
75-84 years	0.4396817(1.87)	18.91522(4.05)	1.104792(3.98)	5.682567(1.04)
85-over years	0.1146953(0.31)	14.43264(1.87)	0.961041(2.04)	-3.473056 (-0.46)
Age x Log Income				
15-24 years * Gincome	-0.0000749(-0.11)	-0.0125795 (-0.4)	-0.0008428(-0.45)	-0.0366828 (-0.59)
25-34 years * Gincome	-0.0004184(-1.72)	-0.0144259(-1.95)	-0.0007551(-1.65)	-0.0271589 (-2.9)
35-44 years *Gincome (def)				
45-54 years * Gincome	-0.0001076 (-0.64)	-0.0038691(-0.83)	-0.0001689(-0.62)	-0.0052312 (-0.83)
55-64 yearsn * Gincome	0.0004953(1.85)	0.0008167(0.17)	0.0000576(0.2)	-0.0073433

				(-1.13)
65-74 years * Gincome	-0.0011079 (-2.99)	-0.0337974(-3.51)	-0.001916(-3.37)	-0.0217615 (-2.02)
75-84 years * Gincome	-0.0007374 (-1.49)	-0.0441724(-2.76)	-0.0025498(-2.76)	-0.0237415(-1.52)
85-over years * Gincome	-0.00011(-0.08)	-0.0425886(-0.98)	-0.0031458(-1.14)	0.0455827(1.1)
Household Composition				
Single men	0.1810884(1.72)	0.8525399(0.52)	-0.001262(-0.01)	5.222341(3.59)
single women	0.0569556 (0.6)	-1.008609 (-0.66)	-0.0962792(-1.1)	2.437779(1.79)
single adult with children	0.0623422(1.44)	1.316795(0.62)	0.0598819(0.49)	1.766846(0.93)
couple (default)				
Adults only	-0.0802335 (-0.68)	-5.86026(-0.25)	-0.006186(-0.06)	-0.7816003 (-0.47)
adults with children	0.0188349(0.23)	-4.735338 (-0.39)	-0.044415(-0.57)	2.280466(1.84)
Internet	0.0330382(7.76)	0.2950733(6.87)	0.0153684(6.42)	0.2047717(3.04)
Gambling	0.1088833(1.4)	2.570862(1.82)	0.1473084(1.81)	0.7287423(0.52)
AgeEdu	-0.0543079(-3.9)	-2.467989 (-6.31)	-0.134253(-6.1)	0.1565264(0.35)
Area				
greater London	0.0853914(0.71)	-6.754513 (-2.39)	-0.5107866(-2.9)	17.6655(5.2)
metropolitan districts	0.1500229(1.63)	3.960437(1.84)	0.2586894(3.25)	0.20808(0.16)
non-metrop, pop den 3.2+	0.1828007(2.09)	3.63129(2.6)	0.2164751(2.71)	0.3688239(0.29)
non metrop, pop den 0.9-3.2	0.1374261(1.49)	0.9595269(0.63)	0.0135205(0.15)	2.055608(1.45)
non metrop, pop den <0.9 (default)				
Quarter				
Quarter 1	-0.128943(-1.48)	-1.84863(-1.36)	-0.0771156(-0.98)	
Quarter 2 (default)				
Quarter 3	-0.1851621(-2.1)	-3.628902 (-2.55)	-0.1966547(-2.4)	
Quarter 4	-0.1655473(-1.9)	-1.183649 (-0.88)	-0.0221213(-0.28)	
Adjusted R^2 / Log L	0.0225	-2152.0916	-2257.8	

Note: The dependent variable is amount staked on Bingo. T-statistics in parentheses.

From the Tobit results, it is observed that Bingo expenditures are high for female household heads than they are for their male counterparts. Gender in this case has interesting opposing effects on participation and level of play once these two decisions are separated. It can be seen that male household heads have a lower probability of being a bingo player. However, upon deciding to enter a bingo hall, they then spend more than females. This could be because females are compelled to play bingo for social reasons and hence go in groups. Male gamblers are less likely to participate, but are less cautious and play for significantly larger stakes than female gamblers. This result is generally consistent with existing survey results, where Bingo was shown to be female-dominated. Households made up of single women or men spend more on Bingo than the reference households, that is, households made up of couples, but have a smaller probability of being a player. Estimates on households with children appear to be contrary to prior expectations that Bingo play will decrease. Instead, household made up of single women with children have an increased expenditure on Bingo. No logical explanation can be given for this.

The age variables are divided into different age groups. Age is assumed not to be continuously correlated with expenditure. Instead, I would expect Bingo play to peak at a certain age. From my Tobit analysis, Bingo spending increased as household heads gets older, and at age 65-74. Upon separating the decisions, household heads aged 85 and over spend lesser on Bingo than the default category.

The variable "age that household head completed full-time education" is used as a proxy for educational levels. Consistent with other lottery results, the more educated an individual, the less he spends on Bingo. Another variable, gambling, which is the amount spent on other forms of gambling activity, correlates to the amount spent on Bingo. Do these two variables have proportionate effects on participation and expenditure conditional upon participation? Estimates using the more general model reveal that this was not so. Comparing the t-ratios on both variables in columns C and D, *ageEdu* and *gambling* strongly affect the probability of Bingo purchase, but not the level of expenditure. Estimated coefficient on *AgeEdu* was weakly positive, implying that a more educated gambler will spend more on Bingo. An explanation for this could be the high correlation between education and income. A more educated individual would earn more and thus spend more on Bingo.

I also included a variable *Internet*, to proxy the availability of information and advertising. Internet Bingo websites[14] allow users to sign up as members as well as provide a variety of information on prize values, nights with grand prizes and address of nearest bingo clubs. Members get regular email updates on events. People with internet access at home would be more likely to be tempted to play. As such, I expected the coefficient estimates on Internet to be highly significant in the participation decision, but hardly affecting the expenditure decision. The results obtained reinforced my beliefs.

Addition of interaction dummies into the model yields interesting insights. From my results, individuals from age groups 35-44 and 55-64, who have high income will be

[14] www.gala-bingo.co.uk, http://www.rank.com/Rank/static/Mecca/AboutmeccaIE.html

the most likely Bingo players. These individuals are working adults with a stable household income, and retirees with pensions or other forms of savings respectively. Separation of the decisions for these variables displayed little differences.

Most regional dummies have significant coefficient estimates. The amount of Bingo play tends to increase in direct proportion to population density. Estimated coefficients of these parameters reflect a number of social and convenience factors such as access to Bingo clubs, design and variety of Bingo clubs, and the number of players in the area. Also, since winnings are progressive, a high Bingo playing population increases winnings. This in turn encourages people to participate. Thus, regional dummies being significantly associated with Bingo play imply that such factors are important when a consumer is making a decision to play. The Heckman estimation provides some interesting insights on the dummy variable "Greater London." A household in Greater London, compared to the reference household (refer to Table 3), has a lower probability of participating in Bingo, but will spend more given positive participation. A possible explanation for this could be the presence of greater varieties of substitutes such as casinos and theatres that then decrease the probability of an individual entering a Bingo hall. However, upon choosing to enter a Bingo hall in Greater London, one then faces higher prices, thus increasing expenditure. Regional dummies capture both price and non-price differentials.

The final area of analysis is seasonal effects on expenditure. Expenditure on Bingo is highest during the second quarter. This result is consistent with prior expectations. Because Bingo is a popular seaside activity, we would expect to see an

increase in play during summer months. Also, people have a decreased tendency to go out during the winter months. Again, this implies that seasonality should affect the probability of play, but not the level of expenditure. Estimates by the two-stage process confirm this.

As we can see, parameter estimates from the Tobit model tend to be compromises between estimates that would be obtained from the separation of decisions. There is an obvious discontinuity between zero expenditure and the demand curve as observed by the difference in results between Tobit and Heckman's two-step estimation. Scott and Garen give an explanation for why dependent variables might have different effects on two closely related decisions.

Some factors exert their influence more through the probability of demand, while others may work through the quantity demanded. Consumption of Bingo, like many other forms of gambling, carries with it a social stigma and has an associated fixed cost influencing the former decision but not the latter.

"Stigma" is defined by Scott and Garen to be some disutility experienced from positive purchases. This could be due to the negative image people have of Bingo, either due to it being a form of gambling, and hence going against their morals, or its unpopular associations, like the "granny" image. Whatever their reasons, people who have an adverse attitude towards Bingo will choose not to participate. They see little difference between spending a pound or ten pounds on Bingo. A variable "gambling" is used in this model in this paper as a proxy to capture part of the stigma. Gambling is assumed to be reflective of people's attitudes towards other forms of gambling. This variable is strongly

significant in the participation decision, thus supporting the notion that stigma has a significant effect when people decide whether or not to play.

A further explanation by Cragg[15] argued that the purchase of some durable goods involved fixed costs that have an influence on the decision to purchase. In the Bingo context, fixed costs could exist in the form of transportation and convenience factors. Residents living in less densely populated areas, as compared to their populated counterparts, consider the higher commuting costs involved when making travelling to clubs. Once there, however, these factors have little influence on the amounts they will spend.

5. Conclusions

There are some drawbacks with using survey data such as the Family Expenditure Survey for empirical evaluation of household expenditure. The results here are just meant to be an indication of decision patterns. Data based on expenditure diaries, completed over a limited number of days, often have problems, such as infrequency of purchase, purchases that are actually consumed by other members of the household, and also unrepresentative purchases.

There may exist "beginning of period effects"[16], which may result in consumers recording greater than their rate of consumption over the survey period. Prior to the period, they may, for example, have played Bingo, and did not want to leave that

[15] Cragg, J. G. (1971). "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods." Econometrica **39**(5): 829 - 844.

[16] Kemsley et al., 1980, pp. 36,51

expenditure out, for fear it might escape enumeration. Thus, they falsely record the purchase as having taken place during the period. Thus, expenditure recorded in surveys such as the Family Expenditure Survey may be contaminated, leading to possible biases and instability of recorded expenditure.

I have addressed two main questions in this paper: Why do people gamble despite unfair bets? Given an unfair bet, what affects the wagering process?

The theoretical discussion in Section 2, and the models put forth by Friedman and Savage, Quiggins, Kahneman, and Tversky and Conlisk is limited to providing insights to the first question. Applying this to the Bingo context, the Friedman-Savage hypothesis is inappropriate, due to the nature of the game. Prospect theory and psychological models offer a partial but incomplete model of gambler's rationality. Due to the successful marketing of winners, consumers may indeed overweigh the probability of gain. Conlisk's explanation gives the best answer to the first question, allowing for pleasure which is associated with gambling to be included in the decision process, thus explaining why gamblers' behaviour might still be consistent with expected utility theory. From the regression result, this paper posits that explanatory variables such as geographical location, number of years of education, and household composition are important in the model, thus stating that there might be non-economic reasons behind people's willingness to play Bingo. These correspond to the "non-pecuniary" effects, such as an increase in utility from entertainment and the social aspects of the game.

Using the Heckman two step process I have shown that certain factors have differing effects on decisions, depending upon the player's decision stage. This is due to the

presence of fixed costs and social stigma, which are present when individuals make participation decisions, but not after that. However, I have not been able to determine precisely the determinants of expenditure. Most of the regressors appear to have significant impact on the first of the two-stage process, but not in the second stage. If time and volume of this project were extended, it would be possible to further explore additional variables captured in the consumption but not the participation equation. The second question of what affects people's wagers can then be answered in more detail.

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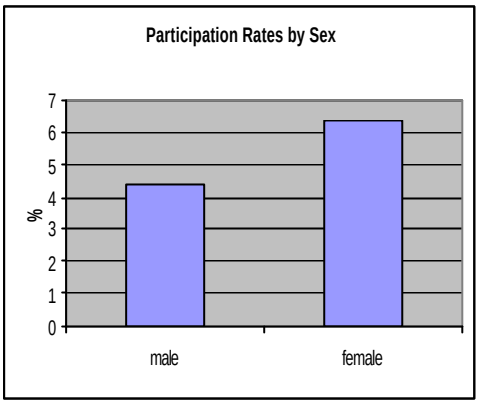
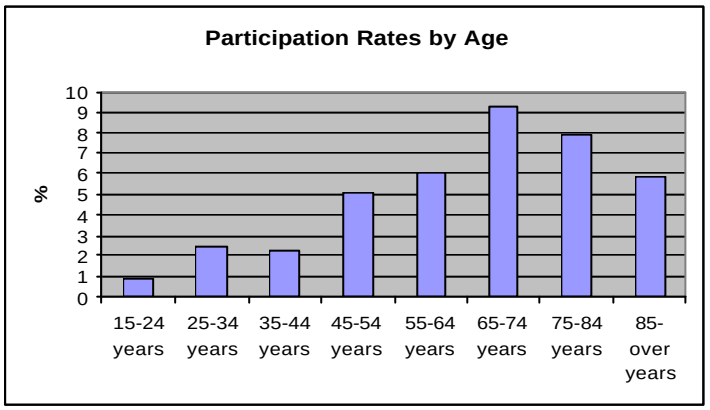
Appendix

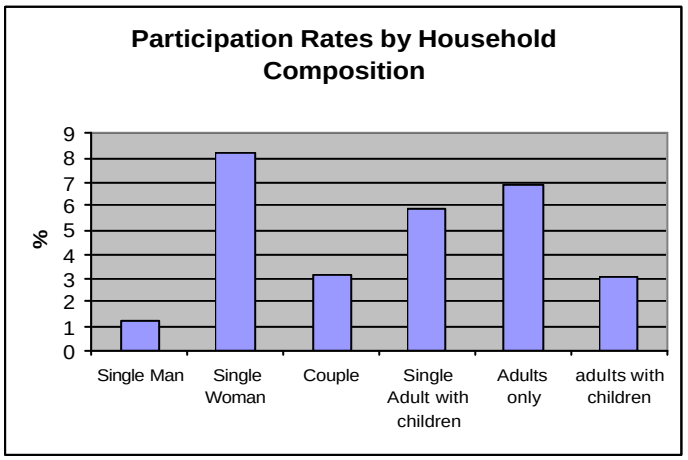
Figure 1(a)


Participation Rates by Sex
%
0
1
2
3
4
5
6
7
male
female

(b)


Participation Rates by Age
%
0
1
2
3
4
5
6
7
8
9
10
15-24 years
25-34 years
35-44 years
45-54 years
55-64 years
65-74 years
75-84 years
85- over years

(c)


Participation Rates by Household Composition
%
0
1
2
3
4
5
6
7
8
9
Single Man
Single Woman
Couple
Single Adult with children
Adults only
adults with children

(d)

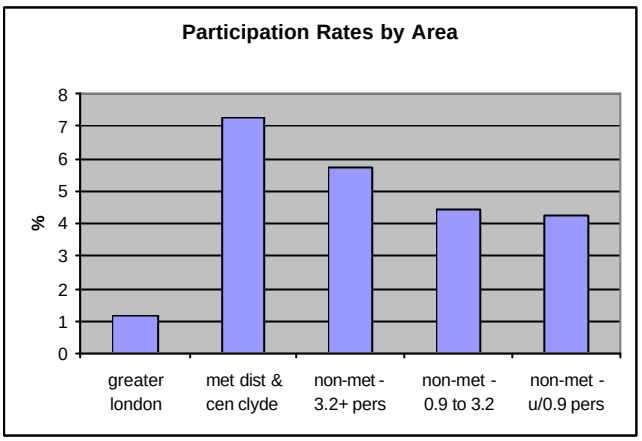
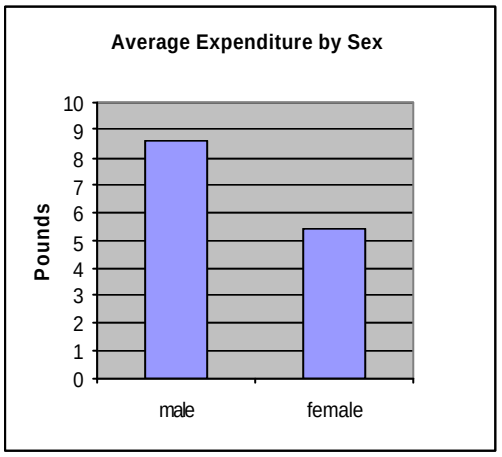
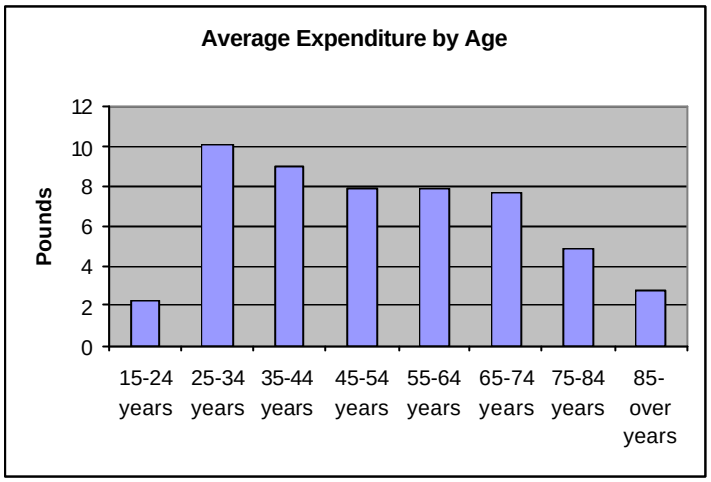

Participation Rates by Area
%
8
7
6
5
4
3
2
1
0
greater london
met dist & cen clyde
non-met - 3.2+ pers
non-met - 0.9 to 3.2
non-met - u/0.9 pers

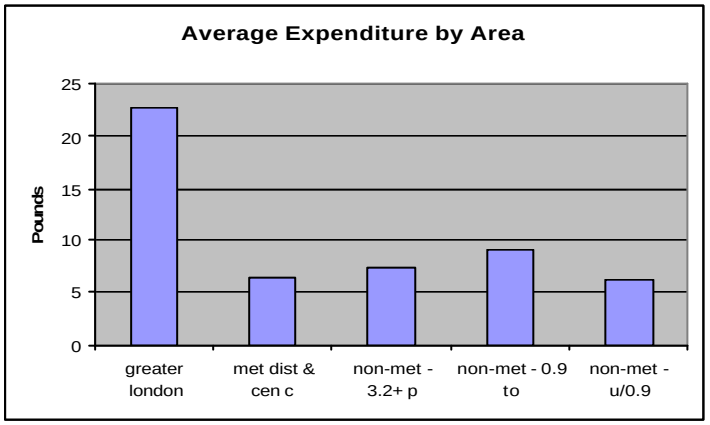
Figure 2(a)


Average Expenditure by Sex
Pounds
10
9
8
7
6
5
4
3
2
1
0
male
female

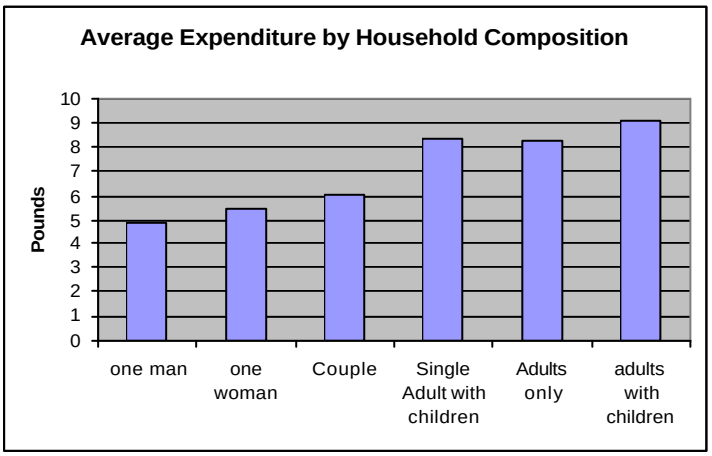
(b)


Average Expenditure by Age
Pounds
12
10
8
6
4
2
0
15-24 years
25-34 years
35-44 years
45-54 years
55-64 years
65-74 years
75-84 years
85- over years

(c)


Average Expenditure by Area
Pounds
25
20
15
10
5
0
greater london
met dist & cen c
non-met - 3.2+ p
non-met - 0.9 to
non-met - u/0.9

(d)


Average Expenditure by Household Composition
Pounds
10
9
8
7
6
5
4
3
2
1
0
one man
one woman
Couple
Single Adult with children
Adults only
adults with children

(e)

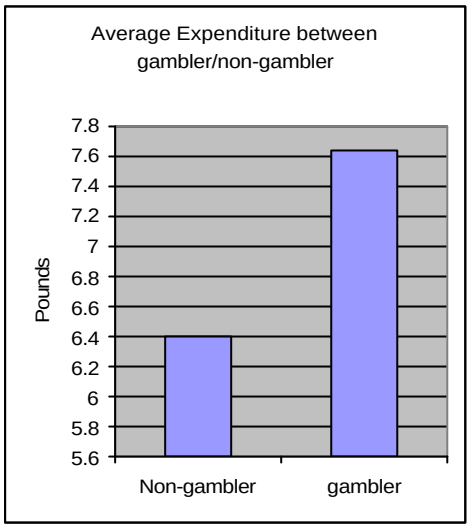


Table : Mean scores on attitudinal statements relating to bingo play (1 = "strongly agree" and 5 = "strongly disagree")

Statement	***Mean score (out of 5)***	***% who "strongly agree" with statement***
I enjoy chatting with friends at bingo	1.77	55%
I can forget about my problems at the bingo hall	2.63	32%
I play bingo to escape from my problems	3.87	14%
I enjoy the thrill of winning	1.48	75%
If I win at bingo it's due to chance	1.56	74%
If I win at bingo it's due to luck	1.70	72%
If I win at bingo it's due to my skill	4.42	7%
I share all big wins with my group	1.84	71%
Bingo is more of a man's game	4.50	4%
Bingo is more of a woman's game	3.03	24%
I have control over how lucky I am	4.36	7%
I get depressed if I don't win	3.63	12%
Trying to win is the fun part	1.70	60%

Bingo is a special night/day out	2.36	35%
I get upset if I miss a bingo session	4.18	8%
I get into a rhythm when the numbers are called	3.33	16%
My heart races if I'm nearly winning	2.04	47%
I feel I have a boring home life	4.20	11%
I always play at the same bingo hall	2.13	58%
I only play bingo at night	2.07	62%
Bingo is a form of gambling	1.68	64%
I only play bingo on "big money" nights	4.10	8%
I sometimes play cards between games	3.96	15%
Bingo is a big part of my life	3.98	9%
I believe in winning and losing streaks	2.95	27%
I often think about bingo when I'm not there	4.17	7%
I play bingo for the 'action' not the money	3.96	9%
I am superstitious when playing bingo	4.08	10%

From Griffiths, M. D. and C. Bingham (2002). "Bingo playing in the UK: The influence of demographic factors on play." International Gambling Studies **2**: 51-60.

Table 2: Summary Statistics

Variables	Entire Sample (n=6637)		Bingo players (n=328)	
	Mean	Std Dev.	Mean	Std Dev.
Bingo	0.3698373	2.540659	7.483567	8.808809
Gross Income	484.27	473.4257	371.0192	331.394
Employment Status of HOH				
employee	0.486967	0.4998678	0.387195	0.4878531
self employed	0.0816634	0.2738719	0.039634	0.1953962
unemployed	0.0299834	0.1705544	0.015244	0.1227087
sick	0.0702124	0.255524	0.085366	0.2798523
retired	0.2671388	0.4424988	0.420732	0.4944308
unoccupied	0.0611722	0.239664	0.051829	0.2220209
Male HOH (default)	0.7304505	0.4437592	0.652439	0.4769233
Female HOH	0.2695495	0.4437592	0.347561	0.4769233
Age of HOH				
15-24 years	0.0357089	0.1855774	0.006098	0.0779674
25-34 years	0.1664909	0.3725488	0.085366	0.2798523
35-44 years (default)	0.2008438	0.4006616	0.091463	0.2887074
45-54 years	0.1912008	0.3932765	0.195122	0.3969
55-64 years	0.1487118	0.3558309	0.179878	0.3846727
65-74 years	0.144041	0.3511577	0.271342	0.4453312

75-84 years	0.0899503	0.2861321	0.143293	0.3509064
85-over years	0.0230526	0.1500818	0.027439	0.1636085
Household Composition				
single women	0.1205364	0.3256123	0.030488	0.172188
single men	0.1663402	0.3724138	0.27439	0.4468882
couple (default)	0.0581588	0.2340611	0.036585	0.1880284
single adult with children	0.3209281	0.4668684	0.384146	0.4871359
Adults only	0.0881422	0.283523	0.121951	0.3277294
adults with children	0.2458942	0.4306486	0.152439	0.3599951
Age HOH completed edu	16.56863	2.911855	15.1189	1.416766
Internet	1.687509	0.4635435	1.832317	0.3741553
Gambling	3.401061	7.497885	6.639771	8.164395
Area				
greater London	0.0946211	0.2927129	0.021342	0.1447407
metropolitan districts	0.1987344	0.3990777	0.292683	0.4556893
non-metrop, pop den 3.2+	0.2338406	0.4233039	0.271342	0.4453312
non metrop, pop den 0.9-3.2	0.1939129	0.3953913	0.173781	0.3794996
non metrop, pop den <0.9 (default)	0.2788911	0.4484876	0.240854	0.428255
Quarter				
Quarter 1	0.2484556	0.4321499	0.234756	0.4244939
Quarter 2 (default)	0.261564	0.4395195	0.310976	0.4636001
Quarter 3	0.2400181	0.4271263	0.198171	0.3992305
Quarter 4	0.2499623	0.4330236	0.256098	0.4371432