



# **Searching and Switching: Empirical estimates of consumer behaviour in regulated markets**

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## **CCP Working Paper 13-11**

### **Abstract**

Governments and agencies increasingly intervene to influence consumer decisions, both to benefit individual outcomes and to improve market functioning. With a unique data set directly incorporating consumers' own beliefs about potential gains and the time needed to search and switch across eight markets, we identify separately what motivates consumers to search and switch (or not). Controlling for consumers' expectations of gain and time needed, intrinsic markets differences and demographic factors, we find persistent variations in consumer responses across individuals and markets. Such variations enable identification of (in)active consumers to target, but challenge the wisdom of imposing uniform regulatory policies. Overall, we conclude that policies which emphasise potential gains and reduce anticipated switching time are the most likely to increase consumer activity, but that policies tailored to particular markets and target groups are necessary to gain maximum effect.

# Searching and Switching: Empirical estimates of consumer behaviour in regulated markets<sup>1</sup>

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December 2013

## Abstract

Governments and agencies increasingly intervene to influence consumer decisions, both to benefit individual outcomes and to improve market functioning. With a unique data set directly incorporating consumers' own beliefs about potential gains and the time needed to search and switch across eight markets, we identify separately what motivates consumers to search and switch (or not). Controlling for consumers' expectations of gain and time needed, intrinsic markets differences and demographic factors, we find persistent variations in consumer responses across individuals and markets. Such variations enable identification of (in)active consumers to target, but challenge the wisdom of imposing uniform regulatory policies. Overall, we conclude that policies which emphasise potential gains and reduce anticipated switching time are the most likely to increase consumer activity, but that policies tailored to particular markets and target groups are necessary to gain maximum effect.

Key words: consumer choice, competition policy, search and switching costs, random parameters (coefficients), Probit

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<sup>1</sup> The support of the Economic and Social Research Council (ESRC) is gratefully acknowledged. This paper is based on previous analysis of this data set by Yoonhee Tina Chang. We are very grateful for her contribution to organising the collection of the data and initial analysis. The authors thank audiences at seminars at the University of California Energy Institute, the Royal Economic Society, the Competition Law and Economics European Network and the ESRC Centre for Competition Policy for comments on earlier versions of this paper; and Steve Davies, Morten Hviid, Bob Sugden and Chris Wilson for helpful suggestions. The usual disclaimer applies.

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## ***“Better Choices: Better Deals. Consumers Powering Growth”***

(Department of Business, Innovation and Skills/Cabinet Office paper, April 2011)

### **1. Introduction**

Public policy focuses increasingly on the role of consumers’ decisions in markets. The European Commission and the UK government are both actively pursuing a strategy of altering the ‘choice architecture’ of consumers to achieve better outcomes both for the individuals concerned and for markets as a whole. The Consumer section of DG Sanco of the European Commission states that “Knowledge of consumer markets, of national consumer conditions and consumer behaviour in the EU helps make better European policies, and smarter regulation.” (DG Sanco, 2011a<sup>3</sup>). In the US, and elsewhere, ‘default’ pension schemes are progressively designed to guide employees to choose more ‘beneficial’ schemes (Bodie and Prast, 2011). In the UK, the Cabinet Office’s Behavioural Insights Team is exerting a profound effect on the approach of ministers, civil servants and regulators in its quest “to transform how government thinks about the behavioural aspects of public policy, making it easier for citizens to make better choices for themselves” (Cabinet Office<sup>4</sup>, 2011 p. 4). A similar advisory group has now been established in the US White House. Amongst regulators, the UK Competition Commission has introduced consumer remedies in markets even where the main adverse effect is identified as a supply rather than demand failure (Garrod et al., 2009). The UK energy regulator has introduced radical restrictions on tariffs to enable consumers to make better choices (Ofgem, 2011). To design such interventions effectively (and avoid unintended consequences) policy makers need to understand the drivers of consumer behaviour. This paper informs such policies by identifying how consumers’ search and switching activity relates to their expectations about the potential available gain and effort involved (and other relevant factors) across eight markets, each subject to sector regulation.

If markets are to work well, consumers need to seek better deals to motivate firms to make such offers available (McFadden, 2006). A particular danger arises if consumers are inactive because they believe that markets are competitive, while firms can exploit this belief by raising prices (Waterson, 2003). We use a specially commissioned survey to relate consumers’ search and switching activity to their own expectations about potential gains

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<sup>3</sup> (DG Sanco, 2011 [http://ec.europa.eu/consumers/consumer\\_research/index\\_en.htm](http://ec.europa.eu/consumers/consumer_research/index_en.htm), accessed 27<sup>th</sup> November 2011).

<sup>4</sup> Cabinet Office, 2011, Behavioural Insights Team. Annual update 2010–11, [http://www.cabinetoffice.gov.uk/sites/default/files/resources/Behaviour-Change-Insight-Team-Annual-Update\\_acc.pdf](http://www.cabinetoffice.gov.uk/sites/default/files/resources/Behaviour-Change-Insight-Team-Annual-Update_acc.pdf) ; accessed 27th November 2011

from switching and the time it will take them to look around for better deals and change supplier. It is well established that consumers are heterogeneous, so the effect of expected gains or search/switch time may be different for different consumers. For instance, Flores and Waddams Price (2013) identify different groups of consumers among whom the effect of various drivers of searching and switching activities differs in the UK retail electricity market. In our model, which is explained in Section 3, we take a general approach that allows effects to vary both across demographic groups and for each individual consumer.

Our focus on consumers' expectations enables us to abstract from direct issues of information by utilising the respondents' own beliefs as reported to interviewers. Such separation informs the development of appropriate policies to address the causes of inappropriate choice, beyond 'poor information' issues. In particular we focus separately on the searching and switching decision, and find significant differences between markets.

Search and switching behaviour are analysed across eight markets, all similar in that the consumer has an ongoing 'default relationship' with a retailer, and therefore needs to take active steps to change provider. All the markets are also subject to sector specific regulation (energy, telecommunications, financial), as well as general competition provisions, so multiple agencies have policy responsibility. We ask (relevant) respondents whether they have looked around for better deals or changed supplier in the last three years. We follow preceding literature in identifying the factors which determine activity in these markets, Our model exhibits some similarities with earlier explanations and provides a good fit with the observations from the survey.

Using empirical models to control for underlying factors, and allowing heterogeneity across individuals, we explore the effect on searching and switching across markets of three 'primary' determinants: the expected saving from the activity, and anticipated time required to find a better deal and to change suppliers. We identify robust evidence of significant differences not only across markets and demographic groups, but also more generally, across individuals.

The next section briefly discusses the most relevant literature, and section 3 presents the motivation of the model, the survey and the data. Section 4 includes the main results and a discussion of selection issues, and identifies persistent differences between markets and across individuals; section 5 concludes and discusses policy implications.

## **2. Literature**

In modelling search and switching behaviour, we draw on literature which focuses on the effect of either search or switching costs or both. Klemperer (1995) derives the interaction between such costs and market outcomes, and Farrell and Klemperer (2007) review relevant empirical studies in a variety of settings. Biglaiser, Crémer and Dobos (2013) show that the presence of a number of inactive consumers given the number of active consumers may make the market more attractive to potential entrants, if they can capture some of them, thereby limiting incumbency advantages.

Wilson (2012) suggests that before starting their search, consumers may be more deterred by expected search costs than anticipated switching costs, partly because any investigation involves search costs for certain, but switching costs only if a better deal is discovered during the search. Moshkin and Shachar (2002) estimate that 71% of consumers' behaviour (in television viewing choices) is consistent with the existence of search costs.

The decision to switch suppliers has often been estimated as a function of the gains available from doing so (objectively calculated from the researchers' information about opportunities in the market) and a set of demographic and individual variables to proxy search and switching costs, though these often explain little of the observed switching activity (Chen and Hitt, 2002; Kiser, 2002). Demographic characteristics are relatively easily measured in surveys and Giulietti *et al.* (2005) find that searching cost proxies appear to be the biggest barriers to changing suppliers in the newly opened UK gas market, dominating both switching cost proxies and demographic variables. Pomp *et al.* (2005) use a similar methodology across a series of nine different product markets in Holland. Their approach enables comparison of switching behaviour across markets while allowing for unobserved consumer effects, but is limited by a binary measure for consumer beliefs about gains (high/low). Neither of these studies explicitly separates the activities of searching and switching.

Considering only the energy market, Sturluson (2003) suggests that the probability of switching is over four times higher for those consumers who have actively searched. Like Giulietti *et al.* (2005)'s findings, and Wilson's predictions (2012), Sturluson finds that switching costs exert a larger effect than switching costs. However, this study, too, is limited by the measure of consumers' expectations of the savings available from switching.

We follow these studies in investigating consistency (and inconsistencies) across individual search and switching decisions (Foote *et al.*, 2009), focusing on whether or not to search or

switch, based on a subjective measure of expected gains, rather than whether the choice of producer is objectively optimal<sup>5</sup>.

Our data are unique in focusing on the beliefs of the consumers themselves about potential gains and time needed for searching and switching. Use of consumers' estimates of gains rather than researcher calculations from market intelligence enables the exclusion of consumers' (mis)information. Direct estimates of anticipated costs enable us to identify the influence of other factors (such as age and gender) in their own right, as well as via any impact which they may have on these 'core' expectations<sup>6</sup>. Like Sturluson (2003), we focus on the factors which determine search behaviour, and then those that influence switching amongst those who have searched; and like Pomp *et al.* (2005), we can compare behaviours and decisions of the same group of consumers across a range of different markets. The ability to distinguish between search and switching behaviour has direct implications for consumer policy as we discuss in our conclusions. Identifying which consumers are more likely to switch and persistent differences between markets also has policy implications.

The growing literature on behavioural economics challenges a model of consumer decisions based solely on a model of utility maximisation which trades off potential gains and losses. DellaVigna (2009) provides an excellent survey of empirical evidence of 'non-standard' decision making; the most relevant for consumer activity in 'default relationship' markets like those we analyse are choice avoidance and status quo bias (see Mehta (2013) for a review. Huck and Zhou (2011) emphasise the difficulty of exploring the rationality of inertia, and Wilson *et al.* (2013) relate inertia to transactions costs. Recent findings from Levav *et al.* (2012) that a sequence of increasing choice-set sizes triggers deeper search may also be relevant for exploration across markets containing different numbers of potential suppliers. If consumers were Prior experience may also play a role in justifying decisions to avoid regret in the context of switching decisions, as suggested by Inma and Zeelenberg (2001).

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<sup>5</sup> Several papers provide empirical evidence of consumers choosing sub optimal: Economides *et al.*, 2006 and Miravete, 2003 for US telecoms; Agarwal *et al.* (2006) for US credit cards; Agarwal *et al.* (2009) for US credit markets; Lambrecht and Skiera (2006) for German internet provision; Wilson and Waddams Price (2010) for UK electricity consumers.

<sup>6</sup> A recent interesting stream of empirical studies uses data on observed search and switching behaviour in response to market offers, see for example Hortaçsu *et al.* (2011) in electricity; Honka (2010) in insurance; and De los Santos *et al.* (2009) for online books; these capture consumer behaviour directly, rather than depending on consumer report, but are unable to capture consumer beliefs as our data do.

Our approach is not to identify whether individual consumers exhibit ‘non-standard’ behaviour, but rather to understand the pattern of consumers’ responses across markets. As outlined in the next section, we employ an underlying model which balances anticipated gains against expected time commitment of activity, identifying patterns in and across markets which can guide governments and agencies in developing their policy for the market as a whole. In a separate stream of literature, the importance of confidence of beliefs has been recognised (Tversky and Kahneman, 1981) and Camerer’s survey (2001) provides several examples of such characteristics in practice.

### **3. Modelling and data**

In this section we first explain the motivation for the model we use and the flexible approach to account for consumer heterogeneity, and then describe the survey and the data which it generated.

#### ***3.1. Motivation for model***

Consumers maximising utility in a classic economic model would increase search and switching activity as anticipated monetary gains rose and the expected hours needed to search and switch fell. In deciding whether to search, both the time anticipated for that activity, and potential time spent switching later (if a better offer is found) will be relevant; while in deciding whether to switch, once search has occurred, only anticipated switching time will be germane (Wilson, 2012). The trade off between expected monetary gains and the value of the time varies between consumers according to their circumstances, in particular income: respondents with higher income would be less likely to switch for given expected gains and anticipated time, since both the value of the monetary gain to them would be lower and the opportunity cost of their time would be greater, raising the disincentive effect of the activity. If the gain is expected to be competed away because other firms soon match the lower price, respondents may be less likely to make the switch, because the current value of the accumulated expected gains is lower. Any direct influence of more years of formal education on expected time needed to search and switch should be captured in the direct estimates of anticipated time, but higher levels of education may render the time spent less onerous as well as (perhaps) shortening it. Other demographic variables which might affect the trade-off between expected gains and costs include age and gender, either for intrinsic reasons or as a result of targeting by firms<sup>7</sup>. The importance of

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<sup>7</sup> Giuliotti et al. (2005) found that prepayment consumers were less likely to change suppliers in the early days of the gas market because they were less actively targeted by firms.

quality dimensions (which varies between products) may be captured by whether consumers believe it is important to trust suppliers, so that consumers and markets where this is more important exhibit less search and switching activity, *ceteris paribus*. Differences in homogeneity of products (and the importance of quality) across markets may also be captured by the market dummies; electricity is essentially homogeneous by definition<sup>8</sup>, so we use it as a base case, and anticipate that quality is more likely to be pertinent in telecoms and financial markets.

Consumers' willingness to search and switch will also depend on how confident they are in their estimates of the potential gains and costs, and in their ability to realise them, with a greater willingness to act (for given central expectations of gain and pain) the less variation they perceive around their central estimate. Consumer specific confidence is likely to be positively related to experience of switching in other markets.

A consumer's attitude to search and switching, and to the potential gains available, might vary between markets for several reasons. The searching and switching process may be less psychologically onerous for some products than for others, independently of the time consumers expect to spend; potential gains which are a very small proportion of expenditure may be regarded as less motivating than if gains represent a large share of the bill; prices in some markets may be perceived as more changeable; and there may be more knowledge about some markets than others, for example because of sales or information campaigns, so that consumers are more confident in their estimates.

In each of the 'relationship' markets which we study, consumers continue to receive supply from their current provider unless they take action to move away from this default position. Applying a 'utility maximisation' model as in the literature above, once consumers are aware of a choice in any market they face a two stage decision: firstly whether or not to search; and secondly, depending on the information obtained during such search, whether or not to switch to a new provider. We can formalise this through 'backwards induction', adapting the modelling approach in Giulietti et al (2005).

The monetary value of the time spent searching and switching depends both on its opportunity cost and on the intrinsic (dis)pleasure of the search and switching activities. As explained above, the opportunity cost depends on income, while the (dis)pleasure may be influenced by education, age and gender, and by experience and attitudes.

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<sup>8</sup> Reliability depends on the monopoly owner of the distribution wires rather than the retailer chosen by the consumers.



We follow Giulietti et al. (2005) p. 954 in using an expenditure function to derive an approximation using the consumer surplus difference between being with the old and the (potential) new supplier. We analyse the process of deciding whether or not to search and switch away from the current supplier in each of the eight markets ( $k=8$ ). In addition to allowing for variations in behaviour across markets, we also allow for variations in searching/switching decisions across individuals. The importance of allowing for observed and unobserved heterogeneity across individuals has been demonstrated by Hutchinson et al. (2000), who demonstrate that effects that are significant in an aggregate analysis may exist separately but not in combination at the segment level; similarly, when effects at segment level are significant but in opposite directions they may cancel each other in the aggregate analysis. To allow for heterogeneity across individuals, we apply a general approach by estimating a random parameter (mixed) model. These models allow the estimated coefficients to vary across individuals. Note that this captures not only variations related to the observed characteristics of individuals but also those related to unobserved characteristics, or random preference variations. An early paper to take this into account was Hausman and Wise (1978), using a covariance Probit (as opposed to independent Probit or Logit) model to allow for random taste variations. With the development of simulation methods, a more general framework with a mixed model of Logit or Probit allows for random taste variations, based on simulated maximum likelihood estimators. Appendix 1 provides a brief description of the estimation techniques (for technique details, please refer to Train 2002; Hensher, Rose and Greene, 2006; Greene 2008.).

The models used for the probit estimations of the probability of searching,  $P(se)$ , of switching,  $P(sw)$ , and of searching-and-switching,  $P(sesw)$ , were as follows:

$$\Pr[U_i = 1 | X_i, \beta_i]$$

where  $U_i = 1$  if individual  $i$  searched/switched/searched-and-switched. Note that we treat a person in each market as different individuals to capture the difference in markets in terms of searching/switching decisions.

The independent variables are expected gain, expected search time, expected switch time, switched other, market, income, education, age, gender. To decide whether each independent variable, should have a random or fixed parameter, we start by allowing expected gain, expected search time, expected switch time and switched other to have random parameters (coefficients), and test the significance of the dispersion of each of these random parameters. If the dispersion is significant we treat it as a random parameter. If the

dispersion of a parameter is not statistically significant, we then treat it as a fixed parameter and re-estimate the model. This process results in treating expected gain, expected switch time and 'switched other' as random parameters in the search model and the search-and-switch model, with all other independent variables having fixed parameters; in the switching model, expected gain and expected switch time are treated as random parameters, and all other variables are allocated fixed parameters.

Apart from unobserved variations, we also allow for preference heterogeneity around the mean of the random parameter estimate on the basis of the observed covariates (the second term in Equation A3 in Appendix 1) applied to the individual and market characteristics: income, education, age, gender and market. This is equivalent to introducing interactive terms in the models (see the Appendix 1 for details), as in the bivariate probit model above. If the interaction is not statistically significant then we rely only on the standard deviation of the random parameter estimate, i.e. unobserved heterogeneity or random taste variations (the third term in Equation A3 in Appendix 1) for sources of preference heterogeneity across individuals. Therefore our estimates of random parameters include three main parts: the mean estimates of the random parameter (the first term in Equation A3), the heterogeneity around the mean observed from covariates (the second term in Equation A2), and the standard deviation of the random parameter distribution (related to the significance of the random variation- the third term in Equation A3).

To assess the effect of allowing variations across individuals from the random parameter model, we also model the observed decision of a consumer to search and switch as resulting from two seemingly unrelated bivariate latent variables in a bivariate probit model. Details are given in appendix 3.

### ***3.2. The survey and the data***

The data were generated by a large scale survey administered in the summer of 2005, especially commissioned to identify consumers' own estimates of search and switching costs and expected gains from switching. The survey was conducted by Market and Opinion Research International for the ESRC Centre for Competition Policy, and administered to a nationally representative sample of 2027 adults aged 16 or over, interviewed face-to-face, in-home, in 167 sampling points across Great Britain. The survey used quota sampling which followed the Government Office Regions' set quota on demographics (age, gender, class etc.).

Respondents were asked which products the household consumed and paid for, from a list comprising electricity, mobile phone, fixed phone line rental, national and overseas (fixed line) calls, broadband internet, car insurance, mortgage and current bank account. These markets are similar in that all involve a 'relationship' between supplier and consumers which the consumer needs to sever in order to switch to an alternative provider, and all are subject to (different forms of) sector regulation; but they differ in the degree of homogeneity of the product and the nature of regulatory oversight, the transparency of prices and in how long choice had been available. Respondents were asked whether they had a choice of supplier for each product (all did have such a choice); their responses were included for each market if they were aware that choice was available and they were solely or jointly responsible for decisions on who supplied that product to the household.

Respondents were asked whether they had searched around for better deals and whether they had switched supplier in each market during the previous three years (other than when moving house). They were also asked how long such search and switching had taken and whether this was more or less than they had expected; or, if they had no experience, how long they would expect to have to spend on each activity<sup>9</sup>. Respondents were asked how much they thought they could save in each market if they shopped around<sup>10</sup>, and whether they believed their supplier would match cheaper offers in the next few years. Demographic characteristics, including age and gender, were recorded to distinguish their direct effect on propensities to search and switch from their role as proxies for these costs, as used in previous studies. Consumers were asked to report their current expenditure in each market. The questions posed and the construction of the variables are reported in appendix 2.

We analyse each household and market as an individual observation, i.e. we regard our data as a panel ( $I \times K$ ) across households ( $I$ ) and products ( $K$ ). Each such household/market observation was included only if all the relevant variables described above were known for that case. We discuss the effect of this selection process in section 4.3 below.

#### **4. Results**

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<sup>9</sup> Unfortunately we have been unable to distinguish between any changes in expectations of switching time which resulted from the search process itself. We explore how expectations related to market activity and the implications for selection in section 4.3 below.

<sup>10</sup> The question does not specify whether this estimate is of changed expenditure (i.e. incorporating any demand response to a lower price) or the amount that would be saved if demand were constant. For car insurance and current bank accounts, only a single unit is purchased, though cheaper rates might prompt an increased demand for quality (e.g. more comprehensive insurance). In other markets, demand is typically inelastic, so the ambiguity of the question should not have a substantial influence on the results.

In section 4.1 we present the results from the random parameter probit model, first examining ‘primary’ determinants of the decision process, namely expected gain, time anticipated to search and switch and experience. We then identify the effect of other factors, including demographics, and analyse how the effects of the primary variables vary across markets and across individuals. In section 4.2 we test the model for goodness of fit and make brief comparisons with a corresponding bivariate probit model (which is presented in Appendix 3, table A4). In section 4.3 we discuss issues of potential selection bias.

#### 4.1 Main Results

**Table 1: Average expected savings, search and switch time in each market**

Market	No. of respondents aware and responsible	Expected maximum gains (£/month)			Expected search time (hours)		Expected switch time (hours)	
		No of resp's	Mean (std dev)	Avg'e bill	No of resp's	Mean (std dev)	No of resp's	Mean (Std. dev)
Electricity	1460	617	9.50 (12.99)	35.82	1070	13.93 (25.67)	1081	16.71 (29.45)
Mobile phone	1502	686	9.95 (12.66)	25.69	1135	10.03 (21.42)	1152	7.93 (19.52)
Fixed phone line	1217	446	7.14 (9.53)	22.27	868	11.70 (23.80)	891	12.66 (25.23)
Calls	1160	396	8.14 (10.36)	19.30	845	11.22 (23.38)	862	11.72 (24.51)
Broadband	537	236	6.86 (8.78)	19.99	399	11.25 (22.63)	389	14.61 (27.21)
Car insurance	984	481	19.60 (34.94)	53.90	758	11.86 (23.24)	753	7.54 (19.50)
Mortgage	581	217	44.57 (47.79)	427.89	419	27.32 (33.33)	413	30.49 (35.08)
Current bank a/c	1437	313	5.28 (18.65)	7.32	978	19.20 (29.40)	985	22.61 (32.18)
<b>Average</b>			<b>12.22</b>	<b>55.37</b>		<b>13.85</b>		<b>14.53</b>

Table 1 presents descriptive statistics of the ‘primary’ independent variables, and shows considerable variation between markets in expected potential savings and time for searching and switching, as well as in the number of respondents who could provide such estimates. Descriptive statistics for other variables are shown in Appendix 2, table A3.

The main results are reported in Table 2, which is presented in three parts: the first part reports coefficients of variables with fixed parameters; the second reports coefficients of variables with random parameters; and the third part reports various statistics related to model performance. For the random parameters (part II), the reported means and heterogeneity in the means correspond to the first and second terms in Equation A3 in Appendix1, while the standard deviations of the random parameter distribution correspond to the third term in the same equation. All the random parameter models are estimated by throwing different numbers of draws (100, 150, 200, 250, 300) following the Halton sequence (see Appendix 1) to achieve a stable set of results.

**Table 2: Results from the random parameter models of searching/switching**

Dependent Variable → Independent Variable↓	Probability of Searching	of Probability of switching	of Probability of searching-and-switching
<b>Part I: Fixed Parameters</b>			
Age in years	-0.101*** (0.020)	-0.054*** (0.017)	-0.066*** (0.019)
Age in years squared	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Gender (1=male, 0=female)	-0.510*** (0.162)	-0.576*** (0.156)	-0.640*** (0.177)
Income (gross annual household in £000)	-0.008 (0.004)	-0.009* (0.005)	-0.014** (0.006)
Education (in years)	0.053 (0.036)	-0.022 (0.034)	-0.026 (0.041)
Expected search time (hrs)	-0.023 (0.025)		-0.014 (0.017)
Switched other	<i>random parameter</i>	0.555 (0.591)	<i>random parameter</i>
Constant	1.294* (0.684)	0.668 (0.603)	1.004 (0.696)
<b>Market (base case electricity)</b>			
Mobile phone	0.104 (0.241)	0.423* (0.229)	0.313 (0.254)
Fixed phone line	-1.087*** (0.373)	-0.950*** (0.339)	-2.155*** (0.741)
National and overseas calls	-0.768** (0.359)	-1.740*** (0.552)	-1.793*** (0.613)
Broadband internet	-0.144 (0.363)	-1.111*** (0.426)	-0.786* (0.463)
Car insurance	0.022 (0.260)	0.300 (0.235)	0.393 (0.267)
Main mortgage	-4.218*** (1.142)	-1.577*** (0.545)	-16.350*** (2.134)
Current bank account	-0.234 (0.395)	0.073 (0.335)	0.213 (0.391)
<b>Switched other interacted with market (base case electricity)</b>			
Mobile phone	Switched other: random parameter	-0.379 (0.256)	Switched other: random parameter
Fixed phone line	(see below)	0.902** (0.358)	(see below)
National and overseas calls		1.971*** (0.523)	
Broadband internet		1.272*** (0.440)	
Car insurance		-0.009 (0.268)	
Main mortgage		1.313** (0.571)	
Current bank account		-0.382 (0.406)	
Age		-0.016* (0.006)	
Gender		0.220 (0.176)	
Income		0.010* (0.005)	
Education		0.043 (0.176)	

Table 2-continued

Part II: Random Parameters	Probability Searching	of Probability switching	of Probability of searching-and-switching
Mean estimates			
Expected gain per month (£)	0.105*** (0.032)	0.081*** (0.025)	0.080*** (0.030)
Expected switch time (hrs)	-0.619*** (0.060)	-0.102*** (0.024)	-0.126*** (0.033)
Switched other (1=yes, 0=no)	1.130* (0.683)	fixed parameter	0.419 (0.652)
Standard Deviation of Random Parameter Distribution			
Expected gain per month (£)	0.118*** (0.008)	0.081*** (0.005)	0.113*** (0.007)
Expected switch time (hrs)	0.430*** (0.029)	0.071*** (0.006)	0.131*** (0.011)
Switched other (1=yes, 0=no)	0.944*** (0.080)	fixed parameter	0.521*** (0.062)
Heterogeneity in the Means of Random Parameters			
Expected Gain: Income	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)
Expected Gain: Education	-0.010*** (0.002)	-0.003** (0.001)	-0.005*** (0.002)
Expected Gain: Age	0.002*** (0.000)	0.000 (0.000)	0.001*** (0.000)
Expected Gain: Gender	0.037*** (0.009)	0.035*** (0.007)	0.041*** (0.008)
Expected Gain: Mobile phone	0.042** (0.019)	-0.004 (0.014)	0.007 (0.017)
Expected Gain: Fixed phone line	-0.028 (0.027)	-0.033* (0.020)	-0.036 (0.025)
Expected Gain: National and overseas calls	-0.019 (0.024)	0.005 (0.021)	-0.015 (0.022)
Expected Gain: Broadband internet	-0.117*** (0.035)	-0.062** (0.026)	-0.112*** (0.034)
Expected Gain: Car insurance	-0.014 (0.018)	-0.031** (0.014)	-0.039** (0.016)
Expected Gain: Main mortgage	-0.097*** (0.018)	-0.089*** (0.014)	-0.100*** (0.017)
Expected Gain: Current bank account	-0.059** (0.025)	-0.091*** (0.020)	-0.095*** (0.023)

**Table 2-Contituned**

	<b>Probability Searching</b>	<b>of Probability switching</b>	<b>of Probability of searching-and-switching</b>
Expected switch time: Income	0.004*** (0.000)	0.000 (0.000)	0.001*** (0.000)
Expected switch time: Education	0.024*** (0.003)	0.001 (0.001)	0.005** (0.002)
Expected switch time: Age	-0.002*** (0.001)	0.001*** (0.000)	0.000 (0.000)
Expected switch time: Gender	0.105*** (0.015)	-0.000 (0.006)	0.026*** (0.009)
Expected switch time: Mobile phone	0.088*** (0.023)	-0.006 (0.011)	0.012 (0.015)
Expected switch time: Fixed phone line	-0.143*** (0.026)	-0.044** (0.017)	-0.114*** (0.030)
Expected switch time: National and overseas calls	-0.082*** (0.026)	-0.045*** (0.014)	-0.049** (0.019)
Expected switch time: Broadband internet	0.067*** (0.024)	0.052*** (0.012)	0.068*** (0.015)
Expected switch time: Car insurance	0.205*** (0.029)	0.022* (0.012)	0.033** (0.016)
Expected switch time: Main mortgage	0.047** (0.023)	0.029*** (0.010)	0.071*** (0.016)
Expected switch time: Current bank account	-0.272*** (0.031)	-0.050*** (0.013)	-0.088*** (0.018)
Switched other: Income	0.012** (0.006)	<i>Switched other: fixed parameter (see above)</i>	0.016*** (0.006)
Switched other: Education	0.014 (0.043)		0.052 (0.044)
Switched other: Age	-0.022*** (0.007)		-0.017*** (0.007)
Switched other: Gender	-0.017 (0.200)		0.180 (0.197)
Switched other: Mobile phone	-0.351 (0.295)		-0.609** (0.284)
Switched other: Fixed phone line	1.023*** (0.392)		1.962*** (0.724)
Switched other: National and overseas calls	0.726* (0.377)		1.896*** (0.589)
Switched other: Broadband internet	-0.047 (0.411)		0.785 (0.479)
Switched other: Car insurance	0.762** (0.318)		-0.024 (0.295)
Switched other: Main mortgage	4.062*** (1.073)		15.117*** (1.987)
Switched other: Current bank account	-0.369 (0.480)	-0.498 (0.451)	
<b>Part III</b>			
Log likelihood	-1021.906	-947.839	-899.886
Restricted Log likelihood	-1104.322	-1008.296	-1000.420
Degree of freedom (d.f)	36	24	36
chi2 (d.f)	164.831	120.914	201.069
Goodness of fit†	96.90	89.49	94.50
Obs.	1836	1836	1836
No. of draws	250	200	200



\*, \*\*, \*\*\* represent significant difference from zero at the 10, 5 and 1% levels respectively. † % of correctly predicted observations: If the predicted probability is greater than 0.5, the observation is considered as searched/switched/searched and switched.

To interpret Table 2, consider the search model as an example, where expected gain, switching time and switching experience in other markets (switched other) demonstrate random coefficients in the probability of searching<sup>11</sup>. The results show that the mean estimator of the coefficient (i.e. the first part in Part II of the table which corresponds to the first term in equation A3) of expected gain is positively significant; the mean estimator of the coefficient of expected switching time is negatively significant; and the mean estimator of the coefficient of 'switched other' is positively significant at 10%. The terms for heterogeneity in the means of these random parameters show, for example, that the influence of expected gain is more positive with higher income, but less positive with more education; expected gain is most positive amongst men and older people, and in the mobile phone and electricity markets, and least so in the mortgage and broadband markets.<sup>12</sup>

To consider the results more generally we first consider the effect of expected gain and anticipated search and switching time on behaviour, noting that the mean estimates of expected gain (the first part in Part II of the table which corresponds to the first term in equation A3) in the random parameter model are statistically significant. Figure 1 shows how expected gains predict the probability of searching or switching. The search model predicts that when the expected gain is at the sample mean (around £12 per month), the probability of searching is about 37% (panel a). If the expected gain is reduced by about half a standard deviation to zero, the probability of searching falls to 16.5%, while an *increase* of about half a standard deviation to £24 raises the probability of searching to about 60%. The equivalent probabilities of switching are around 18% (for zero expected gain), 40% (£12 gain) and 66% (£24 gain) respectively; and for searching-and-switching model the corresponding figures are about 8%, 24% and 46%. The positive switching rate at zero gain may be explained by those who switch for non-financial reasons, and is also consistent with the proportion of 'pure errors' in switching identified by Wilson and Waddams Price (2010).

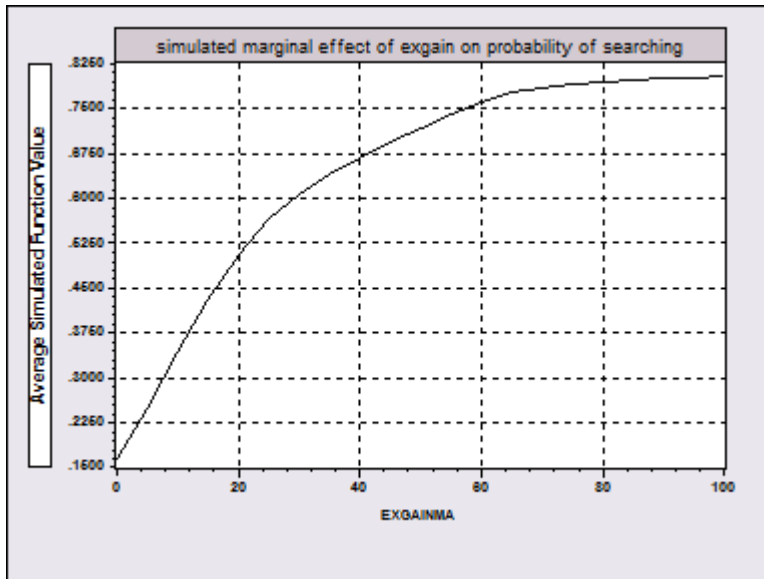
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<sup>11</sup> A full model was run to include expected searching time with random coefficient but the dispersion of the coefficient (referring to the section of Standard Deviation of Random Parameter Distribution in Table 2) was insignificant, therefore expected search time is considered to have a fixed coefficient. The same approach is taken with the switching model and the search-and-switching model.

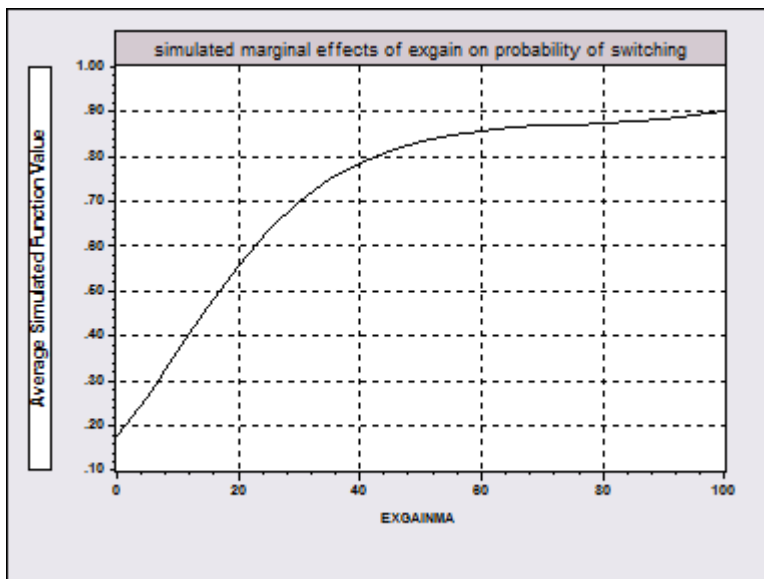
<sup>12</sup> The interactive terms of expected search time with other factors are not reported as they were not significant.

Figure 3: Simulated effect of expected gain on the probability of

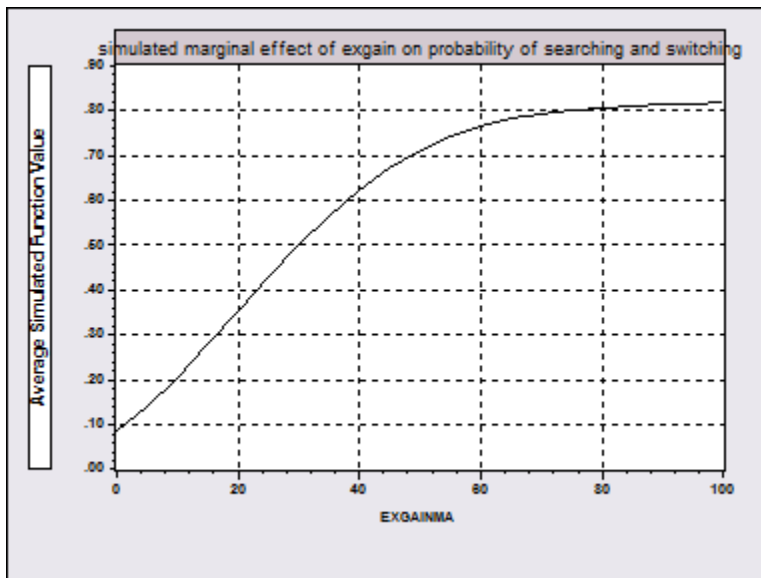
a. searching



b. switching



c. searching-and-switching



We note that respondents do not seem to be deterred from searching by longer anticipated search times, since this variable does not have coefficients which are statistically significant (though they are of the expected negative sign). However we find that anticipated switching time does have a statistically significant and negative effect on the probability of searching, switching and searching-and-switching in the random parameter model. Table 3 shows that the search model predicts the probability of searching at 62% and the probability of switching at around 48% when anticipated switch time is zero, while the predicted probability of searching-and-switching is around 30% when it takes no time to switch. Note that the predicted probability of switching goes down faster than the predicted probability of searching as expected switching time increases, suggesting that anticipated switching time has a greater deterrent effect on searching than on switching. All the predictions above are based on the population mean estimates, to provide better general estimates, rather than on the individual-level conditional estimates which take account of individual heterogeneity<sup>13</sup>.

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<sup>13</sup> The use of the individual-level conditional estimates means that the predicted outcome is limited to within the sample drawn as part of the study. These individual-specific estimates are only as good as the data from which they are estimated and may not be ideal for prediction of population behavioural reactions to changes in certain attributes/policies (such as expected gains) (Hensher et al, 2005, Greene, 2001). Therefore the above predictions are based on the unconditional (population) mean estimates only. The same problem is also likely to exist by using unconditional mean estimates obtained from non-representative samples.

**Table 3: Simulated effect of expected switching time on the probability of searching/switching**

Switch time	Simulated probability of searching	Simulated probability of switching	Simulated probability of searching-and-switching
<b>0 (no time at all)</b>	0.619	0.484	0.308
<b>1 (up to an hour)</b>	0.476	0.458	0.281
<b>2 (1-3 hours)</b>	0.345	0.432	0.255
<b>6 (4-8 hours)</b>	0.086	0.336	0.167
<b>8 (about 1 day)</b>	0.053	0.293	0.133

Note: The probability of activity drops to around zero when expected switching time exceeds one day.

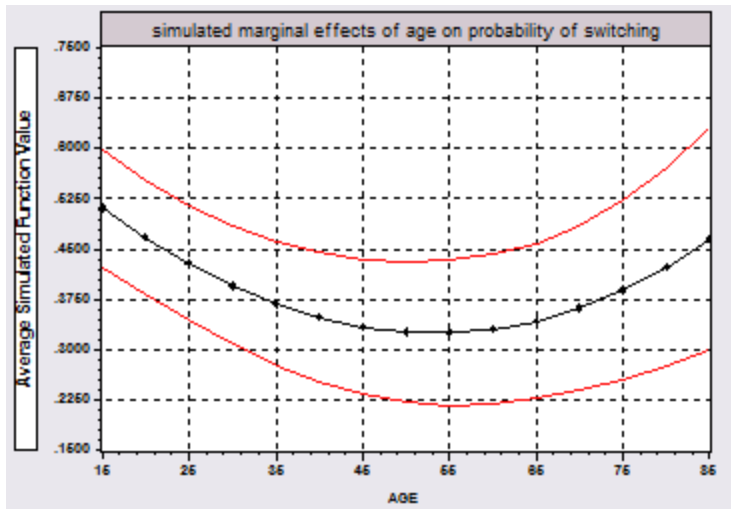
While the mean estimates (shown in the first part of Part II in table 2) of switching experience in other markets are not significant in the random parameter model, the effect varies significantly across markets and individuals. For instance, switching experience has a greater effect on activity in the fixed phone line, national and overseas calls, car insurance and mortgage markets. Switching experience has less effect in other markets, particularly the mobile phone market, and among people who have lower income and are older. We discuss the variations across individuals and markets regarding the effect of expected gain, switching time and switching experience in more detail below.

Next we analyse the effect of other demographic factors, in particular age, gender, income and education, and their interactive effect with expected gain, expected switching time and switching experience in other markets. The effect of each of these factors is shown in the fixed parameter part (the first part of Part I in table 2), which also shows their interactive effect with switching experience in the switch equation. Other interactions, with parameters found to be random in the relevant equation, are shown in Part II of Table 2.

As in other similar surveys we found a U-shaped effect of age on searching/switching (see Figure 2 below for the switching model), and are able to separate out the direct effects of age on behaviour from their indirect effects on expectations of gain and effort. In terms of the interactive effects of age with expected gain, switching time and switching experience, we find that older people are likely to value gain more, are more deterred from searching (but less deterred from switching) by longer switching time, and are less affected by their own

experience of switching in other markets. Switching is least likely around age 56, with its probability increasing as respondents reach and pass retirement age.

**Figure 2: Simulated effect of age on the probability of switching**



We also find a significant effect of gender in the random parameter models. Overall males are less likely to search/switch than females. And men seem to value gain more and switching time less than women.

Income has on average a negative effect on the probability of switching and of searching-and-switching, showing that respondents with higher income are less likely to search and switch, as we might expect; but the (negative) effect on the probability of searching is not statistically significant. The random parameter model shows that the positive effect of expected gain is more significant with people of higher income, suggesting that richer households value a pound of gain more. We also find that higher income respondents are less likely to value switching time (in the sense that switching time is less negative with higher income) and more likely to value switching experience (switching experience is more positive for higher income).

Education seems to have no significant effect on the probability of searching or switching on average in the random parameter model. However the interaction terms indicate that more educated people are less likely to search or switch for a given level of potential gains. People with more education are also less likely to be deterred from searching by higher expected switching time (since the effect of expected switching time is less negative with more education).

Having shown the effect of primary variables and their interaction with various demographic variables, we now focus on differences between the markets included in the survey. The market dummies reported in Table 2 (Part I) show large variations across markets: other things being equal, consumers are less likely to search/switch their fixed line suppliers (phone line and calls) and their mortgage providers than they are for electricity. Such differences reflect the descriptive data shown in table 1 and confirm a range of market specific factors, including the presence of intermediaries such as switching web sites, advertising and sales activity, concern about quality issues which might make consumers more reluctant to switch and how long a market has been open to competition.

Even after these market variations (and other variables) have been taken into account, differences between markets remain in three important respects: the marginal influence of an additional pound's expected gain; the effect of expected switching time; and the experience of switching in another market<sup>14</sup>). Consumers respond differently in different markets, even when they hold the same expectations about expected gains, switching time and switching experience, and correcting for aggregate differences in activity between markets. The same monetary expected gain is more likely to stimulate searching for an alternative mobile phone provider than in the electricity, fixed phone and car insurance markets, but is less likely to motivate search or switch activity for broadband, mortgages or current accounts. Expected switching time seems to provide more of a deterrent to searching and switching in fixed phone provision and current bank accounts, but is less off-putting for mobile phones, broadband, car insurance and mortgages than in electricity. Table 2 also shows that switching experience is particularly likely to encourage searching and switching for alternative mortgages and fixed phone lines.

Table 4 below shows the variation of estimated random parameters of expected gain, switch time and 'switched other' across markets based on individual-specific mean estimates<sup>15</sup>. This enables comparison of the different average effect of each of the 'primary' variables on consumer behaviour across markets, given the demographic characteristics of individual respondents in the sample.

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<sup>14</sup> These are shown in the interactive terms with market dummies in the last rows of Parts I and II in table 2.

<sup>15</sup> Note that these are means (and standard deviations) of individual-specific conditional estimates of coefficients and should be distinguished from the marginal effects reported in Table A5 and A6 (which are assumed to have fixed parameters across individuals within a market in the bivariate probit model).

**Table 4: means and standard deviations by market of the individual-specific conditional estimates of the coefficients of:**

**a. Expected gain**

Market	Search Model		Switch Model		Search-and Switch-Model	
	mean	standard deviation	mean	standard deviation	mean	standard deviation
Electricity	0.115	0.126	0.095	0.085	0.103	0.118
Mobile phone	0.145	0.127	0.090	0.086	0.107	0.119
Fixed phone line	0.087	0.128	0.064	0.086	0.069	0.120
National/overseas calls	0.099	0.127	0.102	0.086	0.091	0.120
Broadband internet	-0.001	0.127	0.040	0.086	0.001	0.120
Car insurance	0.110	0.129	0.071	0.086	0.075	0.120
Mortgage	0.026	0.123	0.014	0.084	0.014	0.118
Current bank account	0.061	0.127	0.006	0.086	0.013	0.119
All	0.095	0.127	0.070	0.086	0.072	0.119

**b. Expected switch time**

Market	Search Model		Switch Model		Search-and Switch-Model	
	mean	standard deviation	mean	standard deviation	mean	standard deviation
Electricity	-0.256	0.450	-0.061	0.072	-0.136	0.135
Mobile phone	-0.149	0.444	-0.072	0.072	-0.124	0.134
Fixed phone line	-0.392	0.447	-0.105	0.072	-0.249	0.133
National/overseas calls	-0.332	0.448	-0.105	0.072	-0.183	0.134
Broadband internet	-0.136	0.450	-0.011	0.071	-0.061	0.134
Car insurance	-0.033	0.454	-0.038	0.072	-0.096	0.135
Mortgage	-0.174	0.443	-0.033	0.071	-0.056	0.134

<b>Current bank account</b>	-0.532	0.449	-0.110	0.072	-0.221	0.135
<b>All</b>	-0.236	0.448	-0.069	0.072	-0.143	0.134

**c. Switched other**

<b>Market</b>	<b>Search Model</b>		<b>Search-and-Switch Model</b>	
	<b>mean</b>	<b>standard deviation</b>	<b>mean</b>	<b>standard deviation</b>
<b>Electricity</b>	0.683	1.019	0.835	0.700
<b>Mobile phone</b>	0.484	1.004	0.358	0.652
<b>Fixed phone line</b>	1.722	1.027	2.820	0.684
<b>National/overseas calls</b>	1.393	1.031	2.731	0.704
<b>Broadband internet</b>	0.788	1.004	1.819	0.684
<b>Car insurance</b>	1.494	1.023	0.881	0.692
<b>Mortgage</b>	4.880	0.991	16.110	0.656
<b>Current bank account</b>	0.299	1.034	0.319	0.693
<b>All</b>	1.250	1.017	2.319	0.683

Table 4 shows considerable differences in the simulated conditional coefficients averaged across markets, as well as the standard deviation<sup>16</sup>. These differences suggest that the primary drivers of activity, namely anticipated gain and time needed to switch, have different effects in each market.

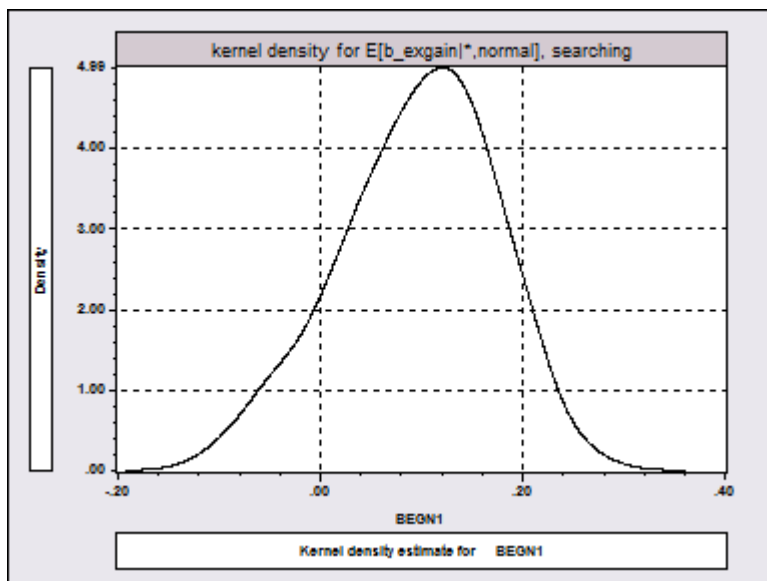
Finally, we discuss how the estimated effects of expected gain, switching time and experience of switching in other markets vary across individuals, even after controlling for the observed heterogeneity related to markets and to individual characteristics (the demographics discussed above). The observed heterogeneity in the mean ( $\beta + \Delta z_i$ , in equation A2) should reduce the role of the ‘residual’ mean estimate (the third term in equation A2) for random variables including expected gain, switch time and switched other. However, we still observe significant dispersions of individual estimates of these coefficients (see the section of Standard Deviation of Random Parameter Distribution in part II of Table

<sup>16</sup> This is computed from the average of the conditional variances plus the variance of the conditional means.



2), and the conditional mean estimates exhibit such differences across individuals. To visualise the extent of variation in the effect of the same expected gain on different individuals, Figure 3 shows the distributions<sup>17</sup> of the conditional coefficients on the expected gains, showing that different individuals respond very differently to the prospect of an additional pound of gain (further illustrations of heterogeneity across consumers are presented in Appendix 4).

**Figure 3: Distribution of the random parameter of expected gain (denoted as BEGN) in the search model**



#### 4.2 Goodness of Fit and comparison with bivariate probit model

The large Chi2 values in the third part of Table 2 show that all three models are statistically significant, and the high percentage of correctly predicted observations in the same part of Table 2 demonstrates how closely the predicted probability matches the actual searching/switching decisions. The extent of such matching is shown for each market in Table 5.

<sup>17</sup> The Chi2 normality tests do not reject the null hypothesis of normal distributions, even though the conditional distribution may not necessarily be either symmetric or normal.

**Table 5: Predicted probabilities of activity by market**

[observed ratios in square brackets]

(standard deviations of predicted probability in round brackets)

<b>Market</b>	<b>Search</b>	<b>Switch</b>	<b>Search-and-switch</b>
<b>Electricity</b>	[0.471] 0.475 (0.403)	[0.417] 0.419 (0.337)	[0.372] 0.365 (0.364)
<b>Mobile phone</b>	[0.534] 0.541 (0.392)	[0.475] 0.481 (0.307)	[0.419] 0.413 (0.353)
<b>Fixed phone line</b>	[0.323] 0.316 (0.397)	[0.241] 0.238 (0.288)	[0.194] 0.183 (0.298)
<b>National/overseas calls</b>	[0.383] 0.375 (0.406)	[0.340] 0.341 (0.353)	[0.273] 0.264 (0.343)
<b>Broadband internet</b>	[0.360] 0.347 (0.392)	[0.324] 0.323 (0.320)	[0.252] 0.237 (0.317)
<b>Car insurance</b>	[0.651] 0.670 (0.380)	[0.509] 0.516 (0.332)	[0.480] 0.481 (0.371)
<b>Mortgage</b>	[0.419] 0.418 (0.486)	[0.333] 0.327 (0.443)	[0.295] 0.293 (0.450)
<b>Current bank account</b>	[0.182] 0.167 (0.316)	[0.132] 0.119 (0.203)	[0.132] 0.116 (0.229)
<b>ALL</b>	[0.445] 0.446 (0.420)	[0.374] 0.374 (0.345)	[0.328] 0.321 (0.364)

As an alternative approach for cross-checking we have also undertaken a bivariate probit analysis, whose results are reported in Appendix 4. The bivariate probit model confirms the main results from the random parameter model (see the comparisons between the two models in Appendix 4), though with lower levels of statistical significance. In particular, the random parameter model highlights the unobserved heterogeneous preferences among consumers regarding their searching/switching decisions made in response to expected gain or switching time. With regard to switching experience, it seems that in the random parameter model, there is more variation in terms of switching experience, resulting in the

insignificance of the mean estimates. This arises because in the random parameter model, the mean estimates of 'switched other' have much higher standard deviations (the second part of part II in table 2) than those of the two primary variables, expected gain and expected switching time. We discuss the policy implications of large variations across individuals, both observed and unobserved, in section 5.

It is important to note that the assessment based on the simple mean estimator and the observed heterogeneity in the mean ( $\beta + \Delta z_i$ , in equation A2) is not complete. This is equivalent to an estimate of the common unconditional mean as estimated in the bivariate probit model. It is more informative to look at the conditional mean estimates ( $\beta_i$  in equation A2) across each individual, since individual-specific information is used in the estimate. The fact that we still observe significant dispersions in individual estimates of the coefficients (see the Standard Deviation of Random Parameter Distribution in part II of Table 2) after controlling for the observed heterogeneity confirms the importance of taking into account unobserved heterogeneity or random preferences variations. Using random parameter models enables a more realistic assumption and a more robust model specification which allows for heterogeneity across each individual, arising from consumer-specific preferences which affect searching or switching decisions. Although the two types of models are not nested and the likelihood ratio test is not directly applicable, we note that the likelihood is much higher (around -1000) for the random parameter model than for the bivariate probit (where it is around -1700). For the above reasons, the random parameter model is preferred to the bivariate probit model in our application, with the latter largely confirming the main findings of the former.

### **4.3 Selection issues**

Only about half the respondents were able to provide estimates of all the 'primary' variables, namely how much they expected to gain from changing provider and how long they thought searching and switching would take, and more data were lost<sup>18</sup> through refusal to answer the income question<sup>19</sup>. This raises concerns about two potential sources of bias: first, those who

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<sup>18</sup> We lost 1556 due to missing expected gain and 4690 due to missing expected switch time; 3425 observations were lost due to missing income. The combined effect was to lose 7042 out of 8878 potential observations

<sup>19</sup> An earlier selection process included only those who were responsible for choosing the provider and aware of choice of provider (see table A7, appendix 5). However since we are interested in the population which is both responsible and aware of choice, these differences merely show that the population we are sampling differs from a stratified sample of all adults.

could provide estimates may be more likely to be searchers and switchers; second, the searching-and-switching process itself may have resulted in different expectations of potential gain and time required to make the change. Table A8 in appendix 5 shows that those who were included in the analysis were indeed more likely to have searched and switched, confirming the first potential bias, so that the results apply to a disproportionately 'active' subset of the consumers approached, and we take account of this in drawing policy conclusions in the next section<sup>20</sup>.

The second potential bias arises in identifying the causality of the relationship between switching and search activity and expectations of potential gain and effort. Activity in the market could have affected respondents' estimates of gain and time taken to search and switch, rather than vice versa. Cognitive dissonance may also have played a part, with respondents expressing justification for their (in)activity by understating gains and exaggerating time estimates. The raw associations shown in table A9 (Appendix 5) naturally raise these questions.

We have addressed this issue both by asking those who have switched what they thought they could save beforehand, and by constructing the expectations of time as far as possible from prior estimates (see tables A1 and A2 in appendix 2). Amongst those who have switched, their mean expectations of gain before they switched were significantly higher than the gains they thought they could make by switching again, as one would expect if they believed they had already realised a substantial portion of any potential gains.

While our methodology of basing analysis on consumer expectations rather than market values means that we are unable to identify specific potential gains available in all markets to check the realism of individual expectations, homogeneity in the electricity market enables some comparisons. Amongst consumers who had searched, those who were still with their electricity incumbent expected to be able to save an average of around £4.6 more per month than those who were not. Since incumbents were charging around 10% (£3.6 per month) more than non incumbents at this period (Ofgem, 2008), average consumer expectations amongst searchers reflected these market circumstances reasonably closely.

## **5. Policy Discussion and Conclusions**

Our model predicts well the factors which motivate consumers in our sample to be active. The main findings are that anticipated gains are an important stimulus, and that both

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<sup>20</sup> Table A7 shows other variations in the characteristics of the included and excluded groups.

searching and switching are deterred by the expected time required for switching. Sales tactics which emphasise “Switch to us and save £100 a year on your bills”, and which shorten the switching process, anticipates just such consumer behaviour. Moreover while the time to search has little deterrent effect, suggesting that it may be intrinsically more enjoyable or less stressful than the switching process, the expected time to switch discourages searching more than switching, so that consumers do not even engage in the initial stage of looking around for better deals if they think that the process of realising them is lengthy. Sales activities of course aim to bypass the search process altogether by presenting potential buyers with a ready-made offer. Regulators who want to stimulate activity need to offer the same package as do marketers in terms of confidence in potential gains, and a switching process which is not perceived as time consuming. In practice such messages may be more successfully conveyed to consumers by firms than by regulators, whose most important role may lie in ensuring that firms have the incentive and ability to stimulate consumers.

Policy makers may have concerns or statutory duties towards particular groups of consumers, in particular the elderly and those with low income, and our results show differences in the behaviour of these groups. There is a familiar U-shape in the age profile of underlying propensity to switch, showing the middle aged least active, and the young and old more so. The effects of the main drivers of activity are exaggerated among older people – gains provide a greater incentive to action, and switching time a greater deterrent for searching; while the experience of previous experience of switching has a smaller effect on older respondents, probably because they have more experience in total. Efforts to emphasise potential gains and minimise expected time spent in switching would therefore be expected to have a stronger effect amongst older consumers. However the greater activity amongst older respondents suggests that there is no need for regulatory intervention on the basis of age alone.

Unsurprisingly, lower income respondents are more likely to switch (but not significantly more likely to search) than those with higher incomes, since their marginal value of savings is likely to be higher. However lower income households are less likely to search and switch in response to *increases* in potential gains; and they are more deterred from searching (but not from switching alone) by longer switching time. Those with lower income may be more risk averse, since they are less responsive to gains and more responsive to the length of the process, perhaps because they have more at stake (relatively) than higher income households. The experience of switching in other markets is smaller for lower income households. These findings suggest that policies such as those above which emphasise

gains may be less effective amongst lower income households, and may have to be supplemented with other measures, in particular reducing switching times which particularly deter these households.

Policy makers may also be concerned to increase activity in the market by those with lower educational achievements. While there is no significant difference in the underlying level of searching and switching amongst such households, they are more responsive both to higher expected gains in encouraging searching and switching, and to anticipated switching time in deterring searching. This indicates the importance of communicating the available gains and any shortening of switching time to this group to encourage them to take advantage of potential gains.

Policy makers concerned to increase consumer confidence can learn from the role of experience of switching in other markets, which is likely to increase such confidence. The substantial and significant variation of this factor between markets demonstrates that it is not due merely to consumer characteristics. The strong effect on searching in the mortgage market suggests that such experience is particularly valuable in providing confidence for this high expense financial market where consumers may be cautious, and base levels of confidence especially low. This may reflect in part the effect of a larger choice-set of potential suppliers in the mortgage market, as predicted by Levav et al (2012), or reduced regret (Inma and Zeelenberg (2001)). However our results of heterogeneity across individual consumers regarding the importance of prior experience indicate that such effects vary considerably across consumers.

Consistent differences between markets in the underlying propensity to switch are shown by the market dummies in table 2 and the effects of the 'primary' variables in table 5. Since the analysis controls for other influences on switching, these reflect a more fundamental difference in switching behaviour. In this context we note no significant underlying difference in searching or switching behaviour between electricity, mobile phone, broadband, car insurance and current accounts, despite apparently much higher activity by car insurance consumers and much lower activity in the current account market shown in the raw data in table A10. Relative to these markets, the model predicts lower underlying activity levels in fixed phone lines (perhaps because of the relative novelty of choice at the time of the survey) and the mortgage market.

Such differences reflect a variety of disparities between markets, including the amount of advertising and marketing, the length of time for which choice has been available, perceptions of ease of searching and switching (as well as the expected time involved which

is directly measured) and concern about quality levels which are common within each market but vary between markets.

Each of these differences between markets provides evidence for regulators who wish to increase activity in their own sector. Increasing (well founded) consumer confidence is likely to be an important element in their strategy. Authorities who want to increase switching need to engender the same confidence as does the doorstep salesperson, while ensuring that it is based on unbiased information. Initiatives such as the UK energy regulator is taking to simplify tariffs, to develop its own price comparison tool and to administer the confidence code for commercial price comparison websites (Ofgem, 2011) are clearly aimed at helping improve both the quality of consumer information and their (justified) confidence levels. However since anticipated savings will be strongly influenced by the price offers of competitors, policy makers need to be careful not to dampen competition and so inadvertently reduce the gains that can be made from switching supplier (as for example happened with reduced switching rates after introduction of the non-discrimination clause<sup>21</sup>). In the retail banking sector, financial gains do not appear to be the main driver for switching compared to other regulated markets, consistent with the OFT (2008)'s finding that only 14% of the consumers surveyed switch current account for better rates, and perhaps reflecting the greater value to consumers of other services in this sector compared to other markets. However our results do indicate that the length of switching could be a major deterrent.

The significant heterogeneity between consumers makes it more difficult for regulators to stimulate significant levels of activity through uniform policies. For example the model predicts that gains have to be as high as £100 per month (when the sample mean is about £12 per month) to ensure the majority of consumers (around 80%) to search and switch. But the existence of consumer heterogeneity (i.e. the co-existence of both inactive and active consumers) supported by the empirical results in this study may have important implications on the pro-competitive role played by market entrants in the presence of switching costs.

The distinction between search and subsequent switching behaviour is important in designing policy to affect activity levels and improve outcomes for consumers. Both frequency of switching and its quality in terms of choosing the best deal provide incentives for competitive behaviour among providers. If Ofgem's (2008) categorisation into active

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<sup>21</sup> See Hviid and Waddams Price, 2012, Waddams Price and Zhu, 2013, and [http://www.decc.gov.uk/en/content/cms/statistics/energy\\_stats/prices/prices.aspx](http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/prices/prices.aspx) for figures on switching from the Department of Energy and Climate Change (2013)

searching consumers, who choose well, and passive consumers, who often choose poorly under the influence of direct marketing, extends to other markets, policy to increase the quantity and quality of switching should focus on stimulating active searching. Identifying the characteristics of such searchers and their motivation enables more effective targeting, and maximises the spill-over effects between products. This is an area where co-ordination of information and campaigns across sectors are likely to be particularly effective.

Of major policy relevance is those factors which have little effect on searching or switching activity. Two particular expectations, namely of the time needed to search, and whether other suppliers would match better offers, were both found to be influential in previous studies but not in our models. The time which respondents expected to spend looking around for a better deal had no effect on the probability of searching, so reducing such anticipated time would have little impact on searching (or switching) levels. The implications are that consumers who value comparison websites do so as much to facilitate the switching process as to reduce the time needed for search. The insignificant effect of expectations about future matching suggest that regulators should emphasise short-term gains as the main stimulus for consumer activity in the market.

In summary, our findings provide a number of policy implications for regulators.

1. Regulators who want to increase activity in markets should emphasise the potential gains available from switching, increase (well founded) consumer confidence in achieving such gains and reduce the time which consumers anticipate it will take to switch.
2. To make such gains obvious, regulators may want to facilitate comparisons between prices offered by different competitors, particularly in sectors such as telecoms, energy and financial markets where obfuscation is often rife. However there are dangers of unintended consequences if this results in easier co-ordination for firms, or inappropriate restrictions are placed on offers so that available gains are curtailed.
3. Regulators wanting to increase the accuracy of switching (as compared with its frequency) should focus on targeting consumers to encourage them to search, noting that search is deterred by expectations of longer switching processes. In particular a strategy to encourage searching among the middle aged may increase activity in this group.



4. Consumer heterogeneity, i.e. the existence of a number of inactive consumers given the number of active consumers, means that uniform policies across the board are unlikely to be very effective.
5. Vulnerable groups such as those with low income, or with lower educational achievements, react differently from others, and may require specific focused policies to increase their activity in the markets.
6. Policies should be tailored to particular markets. In the mobile phone market additional expected gains will particularly encourage searching, and activity in the fixed phone line and current account markets is likely to be stimulated more than in others by reducing expected switching time.

Finally we note that in the data sample used for estimations, we have included only the subset who are able to respond to the relevant questions, and that they are more active than the representative group which was interviewed. Our sample therefore consists of the most 'active' half of the population. Within this active group virtually all the switchers had looked around for a better deal first, so are likely to make better decisions. These selection issues suggest that passive consumers who may have switched without first searching were excluded from our analysis because of incomplete answers to the survey, in particular their inability to estimate potential gains.

So while our findings can inform policies to increase activity amongst those who are already reasonably well informed about the market, their effect may be very different amongst the more 'disengaged' half of households. If activity among this latter group is to be encouraged, research is clearly needed to understand further the drivers of (in)activity. Field experiments which capture real time responses of consumers facing competing demands on their time and attention would provide robust results for this inactive group; it would also test the recommendations from this study, which while benefiting from capturing consumers' own expectations and experience are also subject to the limitations of partial recall and response.

In conclusion, we have provided evidence to show variations in searching and switching behaviour which exhibit distinct patterns across markets, between types of consumers, and with further heterogeneity between individuals. Differences in switching levels across markets are well documented; using our empirical data of consumers' own expectations of potential gains and time required, we have shown that searching and switching behaviour is stimulated by higher expected gains and lower expected switching time. The model can inform regulatory policies to empower consumers, increase (effective) activity in relevant

markets, and generate additional pressure on firms to provide a good deal for all their customers, including those who are inactive. Once such policies have been designed, field experiments to test how consumers respond in real markets and real time are needed to refine instruments so that they deliver the maximum benefit to individuals, markets and economies without incurring unintended and undesirable consequences.

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## Appendices

### Appendix 1: Econometric model

The random parameter probit model:

Suppose the utility associated with the binary decision of searching/switching as evaluated by each individual  $i$  is represented in a binary choice model by a utility expression of the form:

$$U_i = \beta_i X_i + e_i, \quad e_i \sim N[0,1]. \quad (\text{A1})$$

$X_i$  is a vector of (non-stochastic) explanatory variables that are observed.  $e_i$  is independent and identically distributed.  $\beta_i$  and  $e_i$  are not observed and are treated as stochastic influences. The parameter vector  $\beta_i$  is assumed to be randomly distributed over individuals according to:

$$\beta_i = \beta + \Delta z_i + v_i = \beta + \Delta z_i + \Gamma \eta_i. \quad (\text{A2})$$

where  $\beta + \Delta z_i$  is the mean of the distribution (population mean or unconditional mean).  $\beta_i$  depends on individual characteristics as well as parameters yet to be estimated, and the random variation comes from the individual heterogeneity,  $v_i$ . This random vector is assumed to have mean zero and covariance matrix  $\Sigma$ . Now the utility function involves terms:

$$\beta_i X_i = \beta X_i + (\delta' z_i) X_i + \gamma' \eta_i X_i. \quad (\text{A3})$$

As shown in (2) and (3), introducing  $z_i$  in (2) to reveal the presence or absence of preference heterogeneity around the mean parameter estimate is equivalent to introducing interactive terms in the utility function as shown in (3). If the interaction is not statistically significant then we can conclude that there is an absence of preference heterogeneity around the mean on the basis of the observed covariates,  $z_i$ . But this does not mean that there is no preference heterogeneity around the mean, but simply that we have failed to reveal its presence in the second term in (3). This means that we rely only on the standard deviation of the parameter estimate, i.e. the third term in (3) for sources of preference heterogeneity across individuals.

The conditional density of the parameters is denoted

$$g(\beta_i | z_i, \beta, \Delta, \Sigma) = g(v_i + \beta + \Delta z_i, \Sigma). \quad (\text{A4})$$

The unconditional density for  $U_i$  is obtained by integrating over  $\beta_i$ ,

$$f(U_i | X_i, z_i, \beta, \Delta, \Sigma) = E_{\beta_i} [f(U_i | X_i, \beta_i)] = \int_{\beta_i} f(U_i | X_i, \beta_i) g(\beta_i | z_i, \beta, \Delta, \Sigma) d\beta_i. \quad (\text{A5})$$

The integration will not exist in closed form. They can be estimated by simulation. The simulated log likelihood is

$$\ln L = \sum_{i=1}^n \ln \left\{ \frac{1}{R} \sum_{r=1}^R f(U_i | X_i, \beta + \Delta z_i + v_i) \right\} \quad (\text{A6})$$

Note that the simulation is over R draws on  $v_i$  through  $\beta_i$  as defined in (2). The maximum simulated likelihood estimator is obtained by maximising (A6) over the full set of structural parameters.

As we are interested in estimating individual-specific parameters, we compute the posterior estimate as follows based on individual information and the prior estimate,  $\beta + \Delta z_i$ :

$$\hat{E}[\beta_i | \beta, \Delta, X_i, z_i, \Sigma] = \frac{1/R \sum_{r=1}^R \hat{\beta}_i f(U_i | X_i, \hat{\beta}_i)}{1/R \sum_{r=1}^R f(U_i | X_i, \hat{\beta}_i)} \quad (\text{A7})$$

where  $f(U_i | X_i, \hat{\beta}_i)$  is the simulated probability of choice and  $\hat{\beta}_i = \hat{\beta} + \hat{\Delta} z_i + v_i$

In terms of selecting the number of points for the simulation, we follow the Halton sequence suggested by Bhat (2001) and Train (2003). We try different number of draws to secure a stable set of parameter estimates. Estimations are obtained by using NLOGIT 5 software.

## Appendix 2: Relevant questions from the survey and construction of variables

### *Relevant questions from the survey*

QA. Firstly, could you tell me if you are involved solely, jointly or not at all in the decision of which supplier to use for any of these services or products? (Solely, Jointly, Not at all)

Q1. In your area, do you have a choice of more than one provider for the following products? (Yes, No, Don't know)

Q2. Which of the following does your household currently have and pay for?

Q4. Using the words on this card, how important or unimportant is it to trust your provider for the following products? (Very important, Fairly important, Neither important nor unimportant, Fairly unimportant, Very unimportant, Don't know)

Q5. Have you looked around for a new provider for any of the following products at any time in the last three years, that is, since May 2002? (Yes, No, Don't know)

Q11. Apart from when moving home, have you switched provider of any of these products in the last three years, that is, since May 2002? (Yes, No, Don't know)

Q15. (Ask all who switched any) Please tell me how much time you spent searching around and looking for the necessary information before you switched each relevant product area? (No time at all, Up to an hour, 1 to 3 hours, 4 to 8 hours, About 1 day, 2 to 3 days, 4 to 6 days, A week or more, Don't know)

Q17. (Ask if any time spent searching at Q15) Would you say it took more time than expected, less time than expected or as long as expected to search for information? (More time than expected, As expected, Less time than expected, Don't know)

Q23. (Ask all who switched any) How much of your own time did it take to switch PRODUCT AREA after you made a decision? (No time at all, Up to an hour, 1 to 3 hours, 4 to 8 hours, About 1 day, 2 to 3 days, 4 to 6 days, A week or more, Don't know)

Q29. (Ask all not switched but searched in any area) How much time did it take you to search for the necessary information on PRODUCT AREA? (No time at all, Up to an hour, 1 to 3 hours, 4 to 8 hours, About 1 day, 2 to 3 days, 4 to 6 days, A week or more, Don't know)

Q33. (Ask all not switched but searched in any area) How long do you think it would have taken of your own time to switch once you had all the necessary information for switching? (No time at all, Up to an hour, 1 to 3 hours, 4 to 8 hours, About 1 day, 2 to 3 days, 4 to 6 days, A week or more, Don't know)



Q35. (Ask all non-switchers who have not searched) How much of your own time did you think it would take you to find enough information to decide whether and to whom to switch PRODUCT AREA? (No time at all, Up to an hour, 1 to 3 hours, 4 to 8 hours, About 1 day, 2 to 3 days, 4 to 6 days, A week or more, Don't know)

Q36. (Ask all non-switchers who have not searched) Once you have found all the necessary information to choose a new supplier, how much of your own time do you think it would take to switch PRODUCT AREA? (No time at all, Up to an hour, 1 to 3 hours, 4 to 8 hours, About 1 day, 2 to 3 days, 4 to 6 days, A week or more, Don't know)

Q38. (Ask all relevant switchers) How much did you originally expect to save per month by switching PRODUCT AREA?

Q43 Approximately how much do you pay on average per month for each of these PRODUCT AREAS?

Q44. (Ask all if answered Q43) To what extent would you agree or disagree that you are confident your estimate for PRODUCT AREAS is accurate?

Q46. (Ask all relevant) How much is the most you think you could save per month if you shopped around for PRODUCT AREA?

*Construction of expected time spent searching and switching and expected gains.*

The expected search time (*exsetime*) and the expected switching time (*exswtime*) are constructed from different questions for different consumer groups according to the table below.

**Table A1. Construction of expected search and switching time**

<b><u>Consumer group</u></b>	<i>time spent searching?</i>	<i>more or less than expected?</i>	<i>expected search time ex ante?</i>	<i>switching time ex post?</i>	<i>expected switching time ex ante?</i>
<i>Searched &amp; switched</i>	Q15	Q17	Adjusted Q15 by one scale down or up according to Q17.	Q23	
<i>Searched but not switched</i>	Q29				Q33
<i>Not searched nor switched</i>			Q35		Q36
<i>Not searched (Q15=0) and switched</i>	0 from Q15	Q17	Adjusted, but not downwards	Q23	

The construction of the maximum expected gains from switching (*exgainmax*) variable differs by whether or not the consumer was a switcher. Table A2 below describes how this variable was constructed.

**Table A2. Construction of expected gains**

<b><u>Consumer group</u></b>	<i>Expected gains ex ante</i>
<i>Switched</i>	Q38
<i>Not switched</i>	Q46

**Table A3: Summary statistics**

<b>Variables</b>	<b>Obs</b>	<b>Mean</b>	<b>S.D.</b>	<b>Min</b>	<b>Max</b>
Expected gain (£ per month)	3392	12.223	23.065	0	400
Expected search time (hours)	6472	13.848	25.583	0	100
Expected switch time (hours)	6526	14.526	27.206	0	80
Expected total time (hours)	6033	28.289	45.691	0	180
Age (years)	16216	43.393	17.542	15	99
Gender (1=male, 0=female)	16216	0.469	0.499	0	1
Education (years)	16216	12.523	2.377	11	20
Income (household annual gross, £000)	8568	24.483	18.395	2.25	100
Switched in other markets (1=yes, 0=no)	16216	0.398	0.489	0	1
Trust important (1=yes, 0=no)	9541	0.919	0.273	0	1
Supplier reluctant to match (1=yes, 0=no)	9541	0.152	0.359	0	1

### Appendix 3: the bivariate probit model

The models used for the bivariate probit estimations of the probability of searching,  $P(se)$ , and of switching,  $P(sw)$  were as follows:

$$P(se)=f(\text{expected gain, expected gain}^2, \text{expected gain*income, expected gain*education, expected gain*market, expected search cost, expected switch cost, expected search cost*income, expected switch cost*income, expected search cost*education, expected switch cost*education, expected search cost* market, expected switch cost*market, switched other, switched other*market, supplier expected to match, supplier expected to match*market, important to trust supplier, important to trust supplier*market, market, income, education, age, gender}) \quad (A8)$$

$$P(sw)=g(\text{expected gain, expected gain}^2, \text{expected gain*income, expected gain*education, expected gain*market, expected switch cost, expected switch cost*income, expected switch cost*education, expected switch cost*market, switched other, switched other*market, supplier expected to match, supplier expected to match*market, important to trust supplier, important to trust supplier*market, market, income, education, age, gender}) \quad (A9)$$

Table A4. shows the results from the bivariate probit model described in equations (A8) and (A9). Importance of trust (trust), supplier reluctant to match (reluctmat)<sup>22</sup> and their associated interactions were subsequently dropped as they did not significantly improve the model fit in the random parameter model.

**Table A4. Results from a seemingly unrelated bivariate probit model of searching and switching(full model)**

Variable	SEARCH EQUATION	SWITCH EQUATION
Expected gain per month (£)	0.036*** (0.012)	0.036*** (0.012)
Expected gain per month squared (£)	-0.00004** (0.00002)	-0.0001*** (0.00002)
Expected search time (hrs)	-0.001 (0.006)	
Expected switch time (hrs)	0.002 (0.009)	-0.005 (0.009)
Age in years	-0.044*** (0.0160)	-0.034** (0.015)
Age in years squared	0.0004*** (0.002)	0.0003** (0.0002)
Gender (1=male, 0=female)	-0.044	-0.120

<sup>22</sup> In the random parameter model, the factor whether suppliers are reluctant to match is not significant in all cases therefore is dropped from the model.

	(0.086)	(0.078)
Income (gross annual household in £000)	0.006**	0.001
	(0.003)	(0.003)
Education (in years)	0.050**	0.018
	(0.023)	(0.019)
Trust important	0.145	0.123
	(0.170)	(0.152)
Supplier reluctant to match	0.194	0.400**
	(0.197)	(0.196)
Switched other (1=yes, 0=no)	0.370***	0.518***
	(0.144)	(0.149)
Constant	-0.273	-0.271
	(0.508)	(0.417)
Market (base case electricity)		
Mobile phone	0.151	0.281*
	(0.167)	(0.162)
Fixed phone line	-0.776***	-0.996***
	(0.199)	(0.313)
National and overseas calls	-0.601***	-1.204***
	(0.207)	(0.246)
Broadband internet	-0.598**	-1.243***
	(0.254)	(0.401)
Car insurance	0.263	0.079
	(0.187)	(0.188)
Main mortgage	-0.907***	-1.131***
	(0.299)	(0.443)
Current bank account	-0.769***	-0.705**
	(0.280)	(0.301)
Expected gains interacted with market (base case electricity)		
Mobile phone	0.003	-0.002
	(0.010)	(0.010)
Fixed phone line	0.006	0.006
	(0.015)	(0.015)
National and overseas calls	0.006	0.021*
	(0.011)	(0.012)
Broadband internet	-0.023	-0.014
	(0.016)	(0.015)
Car insurance	-0.007	-0.004
	(0.008)	(0.009)
Main mortgage	-0.010	-0.011
	(0.008)	(0.009)
Current bank account	0.0006	-0.009
	(0.010)	(0.010)
Expected search time interacted with market (base case electricity)		
Mobile phone	0.003	
	(0.004)	
Fixed phone line	0.004	
	(0.004)	
National and overseas calls	0.004	
	(0.005)	
Broadband internet	0.002	

	(0.004)	
Car insurance	0.006	
	(0.004)	
Main mortgage	0.002	
	(0.004)	
Current bank account	0.002	
	(0.004)	
Expected switch time interacted with market (base case electricity)		
Mobile phone	-0.003	-0.003
	(0.005)	(0.005)
Fixed phone line	-0.002	-0.007
	(0.006)	(0.006)
National and overseas calls	-0.000	-0.006
	(0.006)	(0.008)
Broadband internet	0.005	0.007
	(0.005)	(0.005)
Car insurance	-0.007	-0.003
	(0.005)	(0.005)
Main mortgage	0.003	0.006
	(0.005)	(0.005)
Current bank account	-0.003	-0.001
	(0.005)	(0.006)
Reluctant to match interacted with market (base case electricity)		
Mobile phone	-0.047	-0.105
	(0.263)	(0.275)
Fixed phone line	-0.321	-0.640*
	(0.311)	(0.349)
National and overseas calls	-0.252	-0.002
	(0.324)	(0.414)
Broadband internet	0.243	-0.022
	(0.398)	(0.358)
Car insurance	-0.112	-0.381
	(0.296)	(0.290)
Main mortgage	0.441	-0.343
	(0.356)	(0.349)
Current bank account	-0.091	-0.489
	(0.396)	(0.383)
Switched other interacted with market (base case electricity)		
Mobile phone	-0.175	-0.197
	(0.176)	(0.170)
Fixed phone line	0.484**	0.742***
	(0.209)	(0.287)
National and overseas calls	0.426**	1.120***
	(0.211)	(0.249)
Broadband internet	0.441	1.288***
	(0.279)	(0.393)
Car insurance	0.347*	0.161
	(0.188)	(0.186)
Main mortgage	0.640**	0.639*

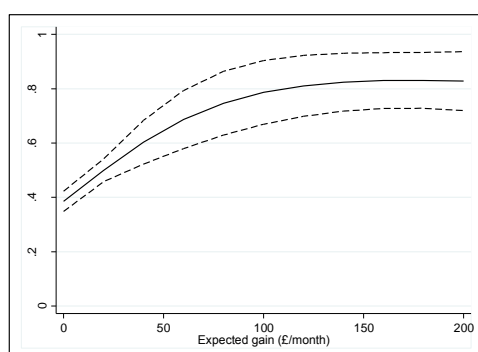
	(0.292)	(0.350)
Current bank account	0.015	-0.009
	(0.283)	(0.286)
Expected gain interaction with income and education		
Income (gross annual household in £000)	0.0001	0.0002**
	(0.0001)	(0.0001)
Education (in years)	-0.002**	-0.001
	(0.001)	(0.001)
Expected search time interaction with income and education		
Income (gross annual household in £000)	0.000008	
	(0.0001)	
Education (in years)	-0.0002	
	(0.0004)	
Expected switch time interaction with income and education		
Income (gross annual household in £000)	0.000003	-0.00001
	(0.0001)	(0.0001)
Education (in years)	-0.001	-0.0005
	(0.001)	(0.0006)
Arc-hyperbolic tangent of rho	1.324*** (0.077)	
Rho	0.867***† (0.019)	
Wald chi2 (100)	298.765***	
Pseudolikelihood	-1724.1553	
Obs.	1836	

Errors clustered by individual (619 clusters). Robust, cluster-adjusted standard errors in parentheses. \*, \*\*, \*\*\* represent significant difference from zero at the 10, 5 and 1% levels respectively.

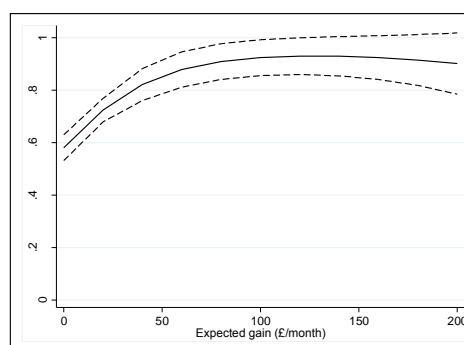
†From a Wald test of  $\rho=0$ .

**Figure A1: The effect of expected gain on the probability<sup>23</sup> of:**

**a: searching**



**b. switching-given-search**



**Table A5: Change in probability of activity if respondent has switched in (one or more) other markets**

Market	Search	Switch	Switch-given-search	Search and switch
--------	--------	--------	---------------------	-------------------

<sup>23</sup> The probability is averaged at each observation

<b>Electricity</b>	0.139*** (0.053)	0.185*** (0.052)	0.133** (0.055)	0.162*** (0.047)
<b>Mobile phone</b>	0.073 (0.052)	0.120** (0.052)	0.086* (0.046)	0.102** (0.048)
<b>Fixed phone line</b>	0.266*** (0.053)	0.291*** (0.048)	0.378*** (0.135)	0.250*** (0.040)
<b>National/overseas calls</b>	0.274*** (0.061)	0.424*** (0.048)	0.531*** (0.078)	0.336*** (0.042)
<b>Broadband internet</b>	0.272*** (0.074)	0.451*** (0.057)	0.660*** (0.118)	0.353*** (0.052)
<b>Car insurance</b>	0.248*** (0.055)	0.244*** (0.056)	0.128** (0.057)	0.253*** (0.053)
<b>Mortgage</b>	0.333*** (0.078)	0.314*** (0.073)	0.260 (0.165)	0.286*** (0.061)
<b>Current bank account</b>	0.089 (0.058)	0.091* (0.046)	0.148 (0.107)	0.073* (0.038)
<b>ALL</b>	0.194*** (0.031)	0.243*** (0.029)	0.250*** (0.038)	0.210*** (0.026)

Standard errors calculated using delta method in parentheses.

\*\*\*, \*\*, \* represents 1, 5 and 10% significant difference from zero respectively.

**Table A6: Marginal effects of gain (additional £/month) by market**

<b>Market</b>	<b>Marginal effect on probability of:</b>			
	<b>Search</b>	<b>Switch</b>	<b>Switch-given-search</b>	<b>Search and switch</b>
<b>Electricity</b>	0.006** (0.003)	0.009*** (0.003)	0.007*** (0.002)	0.008*** (0.003)
<b>Mobile phone</b>	0.008*** (0.003)	0.009*** (0.003)	0.005*** (0.002)	0.008*** (0.003)
<b>Fixed phone line</b>	0.007** (0.004)	0.008*** (0.003)	0.008** (0.004)	0.007*** (0.003)
<b>National/ overseas calls</b>	0.008*** (0.003)	0.012*** (0.002)	0.012*** (0.003)	0.009*** (0.002)
<b>Broadband internet</b>	-0.002 (0.005)	0.004 (0.004)	0.006 (0.005)	0.001 (0.003)
<b>Car insurance</b>	0.003** (0.002)	0.008*** (0.002)	0.008*** (0.002)	0.007*** (0.002)
<b>Mortgage</b>	0.002** (0.001)	0.003*** (0.001)	0.004*** (0.001)	0.002*** (0.001)
<b>Current bank account</b>	0.004*** (0.002)	0.003*** (0.001)	0.003 (0.003)	0.003*** (0.001)



#### **Appendix 4: A comparison of results from the random parameter model and the bivariate probit model**

The mean estimates of the coefficient on expected gain are more significant (both economically and statistically) in the random parameter model than those in the bivariate probit model.

The mean estimates of the coefficient on expected switching time is negatively significant in all three models, an effect which is not found in the bivariate probit model.

In the random parameter model that the positive effect of expected gain is more significant with people of higher income, similar to those found in the bivariate probit model.

We find similar effect of expected gain interacted with education with both models: more educated people are less likely to search/switch for potential gains.

In terms of effect of age, while the significant U-shaped relationship is also found in the bivariate probit model with searching (but not switching given searching), we find that in the random parameter model the U-shaped relationship is even more significant, with both searching and switching.

We also find significant effect of gender in the random parameter models which is not found in the bivariate probit model.

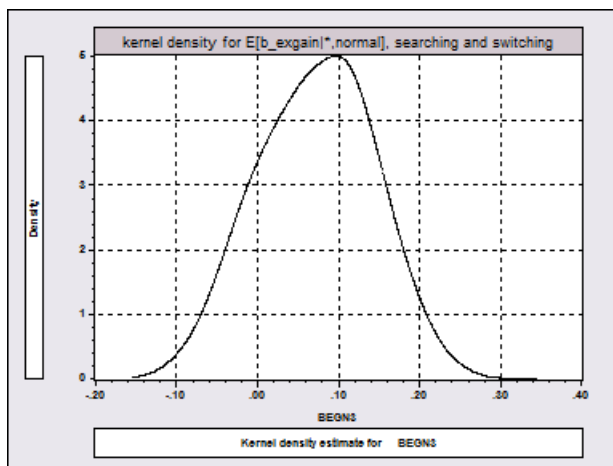
The effects of market dummies are similar comparing the two models: other things being equal consumers are less likely to search/switch in fixed line phones and calls, and mortgage market than they are for electricity.

Similar interactive effects of expected gain with market dummies can also be found in both model estimates. However, unlike the bivariate probit model which suggests that the effect of an additional expected pound's gain on searching and switching differ weakly across markets, the random parameter suggests that effect of expected gains is likely to differ significantly across markets

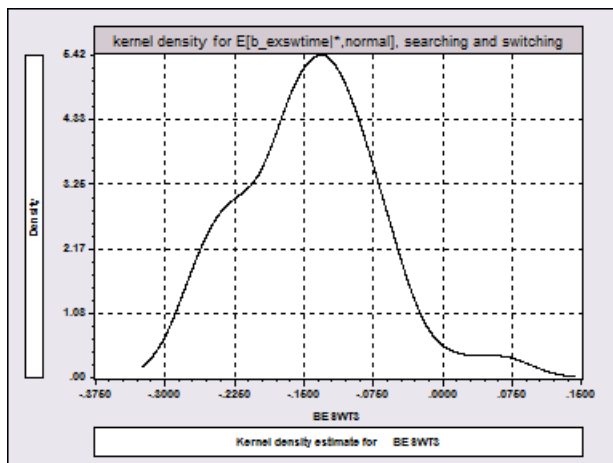
Switching experience in other markets has a greater effect on activity in the fixed phone line, national and overseas calls, car insurance and mortgage markets, which is consistent with the bivariate model. Switching experience has less effect in other markets, particularly the mobile phone market, and among people who have lower income and are older, which are not found in the bivariate probit model.

Comparing to the bivariate probit model, we find large variations of estimated random parameters of expected gain, switch time and switched other across markets based on individual-specific mean estimates<sup>24</sup>. But the general pattern in terms how one market is different from the other is consistent with the pattern shown in the bivariate probit model estimates. The following figures further illustrate how the coefficient on expected gain differs across individuals:

**Figure A2: Distribution of the random parameter of expected gain (denoted as BEGN) in the search-and-switch model:**

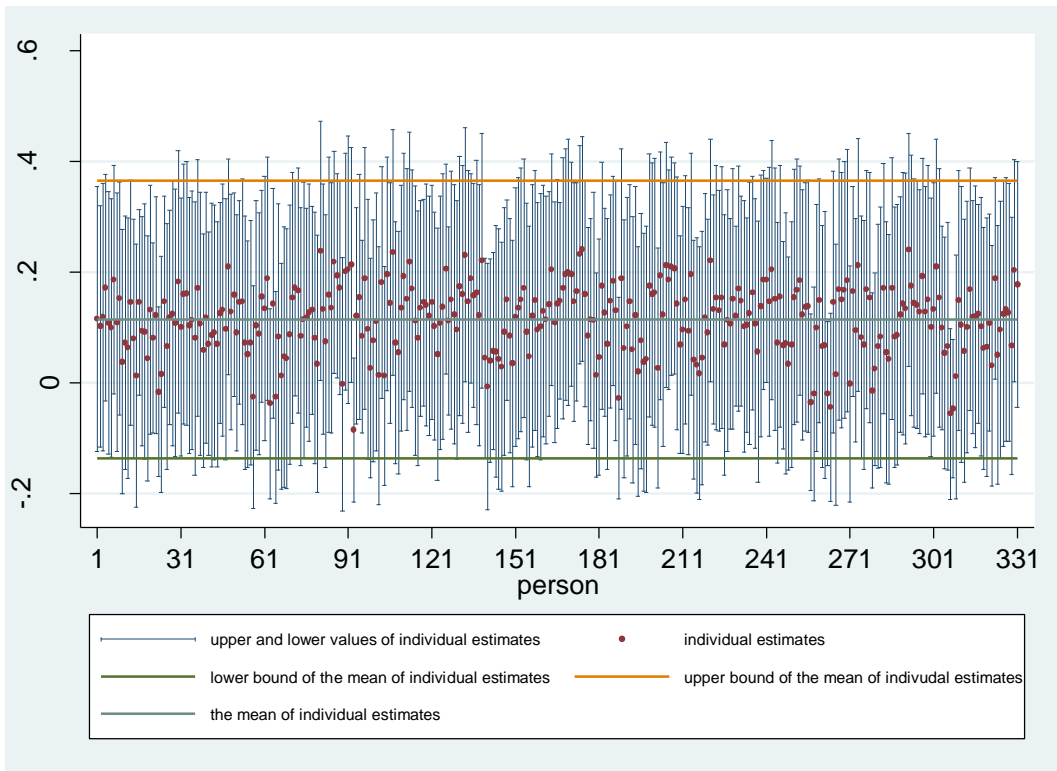


**Figure A3: Distribution of the random parameter of expected switching time (denoted as BESWT) in the search-and-switch model:**

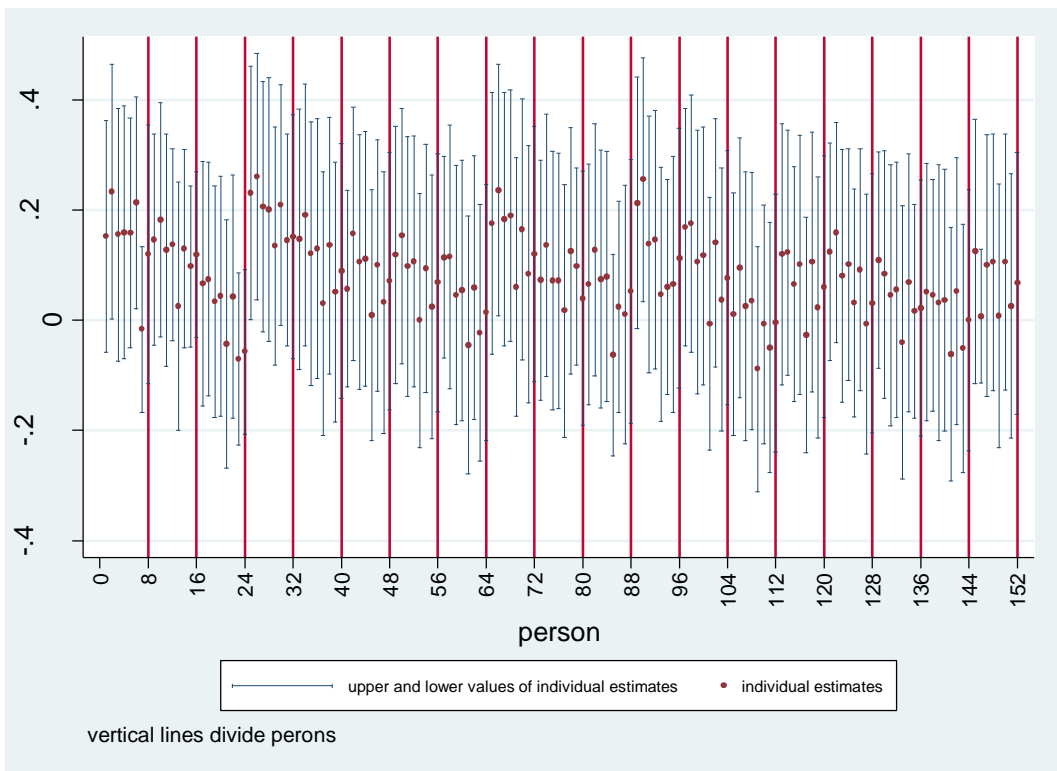


pped from the model.e means (and standard deviations) of individual-specific conditional estimates of coefficients and should be differentiated with marginal effects reported in Table A5 and A6 (which are assumed to have fixed parameters across individuals within a market in the bivariate probit model)

**Figure A4 Random parameter of expected gain in search model by individual in electricity market**



**Figure A5 Random parameter of expected gain in the searching model for 19 persons present in all 8 markets**



## Appendix 5: Selection issues

**Table A7: Differences between those who are responsible and aware and those who are not:**

Variable		Responsible and aware	Not responsible and/or aware	Two-tailed sig.
AGE	Mean	44.10	37.75	0.000
	S.D.	15.48	18.74	
	Obs	8878	2702	
GENDER	Female (%)	4652 (52.40)	1409 (52.15)	0.817
	Total	8878	2702	
INCOME	Mean	26.85	28.34	0.020
	S.D.	18.68	20.07	
	Obs	4943	1161	
EDUCATION	Mean	12.79	12.25	0.000
	S.D.	2.53	2.13	
	Obs	8878	2702	
SWITCHED OTHER	Yes (%)	3889 (43.80)	907 (33.57)	0.000
	Total	8878	2702	
RELUCTANT TO MATCH	Yes (%)	1333 (15.01)	114 (17.19)	0.131
	Total	8878	663	
TRUST IMPORTANT	Yes (%)	8189 (92.24)	576 (86.88)	0.000
	Total numbers	8878	663	

**Table A8: Differences between those who are missing any variables used in the estimation and those who are included** (amongst those who consume, are responsible for product and aware of choice only).

Variable		In estimation sample	Not in estimation sample (i.e. at least one missing)	Two-tailed sig.
AGE	Mean	40.74	45.48	0.000
	S.D.	13.59	16.10	
	Obs	1836	7705	
GENDER	Female (%)	880 (47.93)	4176 (54.20)	0.000
	Total	1836	7705	
INCOME	Mean	26.99	26.33	0.448
	S.D.	18.09	18.93	
	Obs	1836	3425	
EDUCATION	Mean	12.89	12.73	0.059
	S.D.	2.43	2.55	
	Obs	1836	7705	
SWITCHED OTHER	Yes (%)	1001 (54.52)	3087 (40.06)	0.000
	Total	1836	7705	
RELUCTANT TO MATCH	Yes (%)	270(14.71)	1177 (15.28)	0.541
	Total	1836	7705	
TRUST IMPORTANT	Yes (%)	1717 (93.52)	7048 (91.47)	0.004
	Total	1836	7705	
EXPECTED GAIN	Mean	13.59	10.61	0.001
	S.D.	25.35	19.92	
	Obs	1836	1556	
EXPECTED SEARCH TIME	Mean	13.54	13.97	0.531
	S.D.	24.46	26.01	
	Obs	1836	4636	
EXPECTED SWITCH TIME	Mean	13.42	14.96	0.035
	S.D.	25.93	27.68	
	Obs	1836	4690	
SEARCHED	Yes (%)	817 (44.50)	1317 (17.09)	0.000
	Total	1836	6388	
SWITCHED	Yes (%)	686 (37.36)	899 (11.85)	0.000
	Total	1836	7585	
Total numbers		1836	7042	

**Table A9: Expectation differences between active and inactive consumers**

Variables	(1) Yes			(2) No			Mean difference	
	Obs.	Mean	Std. Err.	Obs.	Mean	Std. Err.	t-test	d.f.
<b><u>Searched</u></b>								
Expected maximum gain ( <i>exgainmax</i> : £ per month)	1321	17.033	0.800	2071	9.154	0.386	8.871***	1937
Expected search time ( <i>exsetime</i> : in hours)	1897	12.741	0.558	4575	14.308	0.386	-2.309**	3778
Expected switch time ( <i>exswtime</i> : in hours)	1932	10.516	0.533	4594	16.212	0.420	-8.390***	4365
<b><u>Switched</u></b>								
Expected maximum gain ( <i>exgainmax</i> : £ per month)	1110	18.924	0.906	2268	8.978	0.374	10.147***	1497
Expected search time ( <i>exsetime</i> : in hours)	1476	12.236	0.610	4996	14.325	0.370	-2.757***	6470
Expected switch time ( <i>exswtime</i> : in hours)	1536	9.341	0.573	4990	16.121	0.401	-9.695***	3171

*N.B.:*

1. The number of observations is for the panel ( $I \times K$ ) of individuals ( $i$ ) across markets ( $k$ ).
2. The mean difference  $t$ -tests were conducted for the base variables without interaction terms.
3. Equal variances were not assumed for all tests other than expected search time (switchers *v.* non-switchers) where the population variances are not significantly different according to Levene's test.
4. For those tests where equal variances were not assumed, we report Satterthwaite's degrees of freedom.
5. \*, \*\*, \*\*\* imply  $t$ -statistics that have two-tailed significance at the 10%, 5% and 1% levels respectively.

**Table A10: Levels of awareness and activity**

<b>Market</b>	<b>Number responsible*</b>	<b>% of number responsible</b>		
		<b>Aware</b>	<b>Searched</b>	<b>Switched</b>
Electricity	1,585	92	28	24
Mobile phone	1,551	97	30	24
Fixed phone line	1,404	87	14	9
National/international calls	1,307	89	18	13
Broadband	567	95	24	16
Car insurance	1,028	96	40	30
Mortgage	608	96	23	14
Current bank a/c	1,491	96	8	5
<b>Average across markets</b>		<b>93</b>	<b>22</b>	<b>17</b>

\*Respondents who are mainly or jointly responsible for the product in households that consume the product; percentages are of current market participants, including those who are unaware of choice.

Our sample exhibits considerable differences in switching activity across markets, consistent with contemporaneous levels in the UK.<sup>25</sup>

<sup>25</sup> For example, we found that 92% of electricity consumers were aware of choice and 24% had switched provider. The corresponding figures from Ofgem for the period were 93% (Ofgem, 2004, p.22) and 29% of customers (calculated from various Ofgem reports on the domestic retail market).