Switching Energy Suppliers: It's Not All About the Money[1]

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Abstract

Liberalised retail energy markets present an apparent puzzle: when offered the chance to buy a homogeneous product at a lower price, many consumers appear to leave 'money on the table'. We observe the decisions made by over 7,000 consumers in a collective switching exercise and find that seemingly suboptimal consumer behaviour may be understood better if a sufficiently rich range of non-monetary 'switching costs' are identified. We discuss some policy implications for the expectations of consumer response in designing and regulating markets.

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1. Introduction

We observe the decisions made by a large group of consumers offered a lower price for their domestic energy. Although these consumers had already provided details of their energy consumption, had opted to receive such an offer, and needed to make little further effort to accept it, only a minority did so, even when the saving was a significant amount of money and constituted a sizeable proportion of their energy bill. We find a number of non-monetary factors which seem influential and which help to explain apparently weak consumer response to savings opportunities in this context, suggesting that price competition for this seemingly homogeneous product may have less power than is often assumed.

Consumers have not taken full advantage of extensive savings offered, either in US States which have opened retail energy markets (Hortaçsu et al., 2017), or where energy markets are relatively mature, as in the UK (Competition and Markets Authority, 2016). Governments and regulators have intervened in various ways over the past decade to address consumer 'inertia' but with disappointing results, as many consumers seem to remain 'disengaged'. Such disengagement does not sit easily with a utility-maximising model where a consumer can purchase a homogeneous product at a lower price, and there are concerns for households in hardship who pay more than necessary for a commodity that absorbs a significant proportion of their income. Our observations and analysis explore why one group of active and apparently well-motivated consumers were surprisingly resistant to offers of lower energy prices and reduced bills.

In the Spring of 2012, *Which?* (a subscription-based consumer organisation[2]) and 38 Degrees (a campaigning group) advertised an open invitation for consumers to join The Big Switch (TBS), the largest collective energy switching exercise ever conducted in the UK. Participants provided information about their energy consumption[3] which was passed on in aggregate form to the energy companies bidding in the auction. After the auction, each participating consumer received a personalised offer based on the bid made by the winning company (Cooperative Energy – henceforth, Co-op) and was invited to accept it, but with no obligation to do so. If, for any particular consumer, there happened to be a cheaper deal available from another company, the consumer was shown that deal as well as the offer from Co-op[4].

When presented with the offer(s), participants had to provide little additional information to complete a switch[5]. Yet only just over a quarter of those who were presented with positive savings took the small step necessary to accept the offer. Even for savings of over £300 per year (around a third of the average bill), fewer than half switched, despite the fact that these participants had already actively opted in to TBS, faced no additional search costs and often had characteristics usually associated with

[2] *Which?* is the trading name of the British Consumers' Association.

[3] This information mirrored that required by price comparison websites to identify the best offer for a consumer.

[4] In the UK market there are regional variations that mean the Co-op bid (which, under the rules of the auction, had to be the same for all regions) was not always cheaper than some local tariffs. This also meant that a small number of participants already had a deal which TBS could not improve upon: these latter observations have been excluded from the present analysis.

[5] This was simple personal information such as name, address and date of birth; and bank details so that payment could be arranged.

market engagement. We explore why so many consumers chose not to switch even when offered substantial savings in a benign switching context.

Our analysis combines energy characteristics and decision data from nearly 87,000 households, with survey data for a subset of just under 7,500 participants who provided additional information about their personal characteristics and attitudes. Linking these sources of data provides a unique opportunity to observe on a large scale the decisions which consumers made about whether or not to switch.

Our data allow us to investigate switching decisions separately from the search process which is often faced by consumers when contemplating changing supplier[6]. Low rates of switching are often attributed to the deterrent effects of having to search: even with online price comparison sites available, it requires some determination to set time aside to search among many somewhat complex tariffs when ex ante the benefits of the search are uncertain. In the present study, the focus upon the 'accept or decline offer' stage of TBS enables the isolation of a 'pure' switching decision: since very little extra effort was required to accept the offer, we interpret any barriers to taking this final step as 'pure switching costs'.[7]

We find a wide range of factors influence a consumer's decision about whether or not to switch. The offer of a substantial monetary saving alone is insufficient to ensure switching, even for those who said that they had opted into the auction with monetary savings as a motivating factor. Other broad factors which influence the switching decision include uncertainty about various aspects of the offer(s), preferences over non-price characteristics, concerns about the switching process itself and time pressures. Many of the factors identified can be located within a rational decision making framework, suggesting the perceived net benefit from switching may be much less than that suggested by looking solely at the magnitude of potential monetary savings. Consequently, switching rates are likely to be substantially lower than we might initially expect, even in favourable conditions. An important policy implication is that energy markets need to be designed with such barriers in mind and in the knowledge that switching rates may be difficult to raise above a modest level.

While much of the behaviour might be understood within a rational choice framework, TBS also provided some evidence of behaviour that may not fit standard models so well. For example, some participants saw two offers: the one from the Co-op and another (cheaper) offer that was the best from any other company on the *Which?* price comparison website. Simply being shown two offers rather than one reduced the probability of switching, all other things being equal.

The rest of the paper proceeds as follows. Section 2 provides an overview of the literature regarding consumer behaviour in energy markets. Section 3 gives a detailed description of the data and a range of descriptive statistics. Section 4 explains the econometric methods used. In section 5, we present results. Section 6 concludes and suggests some implications of our results for policy makers.

[6] The importance of distinguishing between search costs and switching costs is emphasised by Wilson (2012).
[7] See Klemperer (1987, 1995) for additional detail regarding different types of switching cost.

2. Literature Review

The importance of consumer switching for the healthy functioning of markets has long been recognised (for example, see Waterson (2003) and McFadden (2006)). In the energy market, the increasing emphasis given to consumer behaviour and aggregate switching rates by regulators and politicians is evidenced by the escalating number of policy reports on the topic: for example, Competition and Markets Authority (2016) and Council of European Energy Regulators (2017).

Consumer switching behaviour in energy markets has been investigated in a number of survey-based academic studies. For example, Ek and Söderholm (2008), Juliusson et al. (2007), Gamble et al. (2009) and Weber et al. (2009) report survey data for parts of continental Europe, while in the UK, survey based papers include Waddams Price and Bennett (1999), Waddams Price (2004), Giulietti et al. (2005), Flores and Waddams Price (2013) and Waddams Price and Zhu (2016). These studies each identify anticipated monetary gains from switching as a key driver of search and switching, consistent with a rational model of consumer choice, where individuals allocate their time to different tasks according to the expected gains available. Nevertheless these studies also find that factors beyond monetary savings influence the likelihood of switching. For example, Flores and Waddams Price (2013) and Waddams Price and Zhu (2016) report that the experience of switching in other markets positively influenced switching behaviour in the electricity market. While such surveys explore consumer motivations and expectations, they rely on respondents' ability to recall and report accurately their thoughts and actions at a previous switching event. In the present study, recall issues are reduced as the switching decision is directly observed and billing information, switching behaviour and the offers received by participants are recorded contemporaneously in the switching dataset.

In terms of combining billing information with socio-economic information, Kleit et al. (2012) and Hortaçsu et al. (2017) are the closest papers to the current study. Kleit et al. investigate switching behaviour in Pennsylvania following the removal of residential rate caps in 2010. However the authors rely on area level socio-economic information, rather than combining billing information with individual-level data. They find that households are more likely to switch, and do so faster, in areas with a more educated population, lower unemployment rates and higher median household incomes. A similar approach is employed by Hortaçsu et al. (2017) for the Texan electricity market between 2002 and 2006. Hortaçsu et al. find that the percentage of potential energy savings realised by consumers is positively related to an area's education level and negatively related to its level of poverty.

Several papers estimate search and switching costs using aggregate price data rather than the decisions of individual consumers, including Giulietti et al. (2004), Salies (2005) and Giulietti et al. (2014). Giulietti et al. (2014) use a sequential search model to estimate the extent to which price dispersion in the marketplace can be explained by search costs. Wilson and Waddams Price (2010) show that consumers may struggle to make 'good' decisions in the UK electricity market, i.e. switching to the cheapest supplier; while Zhu (2013) cautions that non-switching in the presence of monetary savings can still be consistent with rational behaviour if consumers have a preference for their existing suppliers.

In the UK, the Department for Energy and Climate Change (2013) provides a broad overview of the performance of collective switching schemes, detailing the outcomes of 31 projects which received funding from the Cheaper Energy Together fund at the end of 2012. However, the data reported are mainly descriptive, with no quantitative analysis of the reasons for the considerable variation in the switching rates achieved (from 5.5% to 23.1%). Deller et al. (2017) find a similarly low typical response to opt-in collective switching schemes, which themselves are mainly small scale, in their more thorough international review. Regarding consumer aggregation exercises in the US, Littlechild (2008) reviews the performance of a municipal aggregation scheme in Ohio, while Loxley and Salant (2004) describe the choice of an auction mechanism used to select the default service provider in New Jersey. The current paper therefore provides the first econometric investigation of consumer switching behaviour as part of a collective switching/consumer aggregation exercise, in conjunction with substantial complementary individual survey data.

3. Data

Our data combine observations of actual switching decisions from TBS with additional survey responses from a large sample of TBS participants contacted about nine months later. Complete records of energy bill details and the offer(s) each person received as part of TBS in May 2012 were obtained for 139,644 people. Then in Spring 2013, half of this group, randomly selected, were sent a follow up survey to elicit information about factors which might have affected the probability of each individual switching energy supplier, generating 15,329 complete responses.

We focussed our analysis upon a subset of participants whose circumstances were least complicated and who might have been considered, *ex ante*, as those most likely to switch. Our strategy was to take cases which give a conventional switching model its 'best chance' and examine behaviour among this 'upper bound' group. To this end we applied three filters, retaining those: (a) for whom the auction outcome offered a monetary saving over their existing supply deal; (b) who had a single energy supplier at the time of the auction; and (c) who had opted to take part in the online Direct Debit[8] auction. These criteria reduced the 2012 sample from 139,644 to 86,904. For those who subsequently participated in the 2013 survey, a further filter was applied to include only respondents who identified 'to save money' as one of their motivations for taking part in TBS. This left us with 7,367 survey respondents who met all four criteria.

The following summary statistics describe the characteristics of those used in the present analysis.

[8] Direct Debit is the predominant payment method in Great Britain, and involves monthly deductions from a bank account to spread the estimated cost of the energy evenly over the year, with an annual reconciliation from metered consumption. Note that members of this group were not necessarily paying by Direct Debit for their pre-TBS energy supply.

Table 1: Summary statistics on energy bills and TBS savings

Variable	Participants with Complete Data from 2012	2013 Survey Respondents
% Switching supplier at TBS	27.1	41.9*
Median bill size (actual and estimated) (£)	1168	1162
% Using estimated bill[3]	28.8	20.2*
% Facing an exit fee	12.8	16.5*
Median saving offered by best supplier (£)[1]	112.5	106.67
Median saving as % of existing bill[1]	10.3	9.9
% Shown two offers	50.7	49.0*
% Paying for their electricity by Direct Debit[2]	96.4	97.3*
% Single supplier households on a Dual Fuel tariff[4]	87.9	87.8
Total Number of Observations	**86,904**	**7,367**

* Indicates that the mean for the survey respondents is significantly different at the 5% level from the mean for the 2012 sample. For the statistics listed as medians, tests comparing the two samples have not been performed.

[1] The median saving was calculated based only on participants who were offered a positive saving as part of TBS.

[2] These are households who were paying by Direct Debit before TBS.

[3] This percentage combines respondents who entered a 'round amount' for their bill, suggesting they may have estimated their bill, and respondents who had their bill estimated by Which? on the basis of their dwelling's characteristics. Other respondents are assumed to have used their actual bills.

[4] Single supplier households either only had an electricity connection or received both their electricity and gas from a single supplier before TBS. A 'Dual Fuel' tariff applies where consumers buy both their electricity and gas from a single supplier as part of a combined deal.

Column 1 includes TBS participants who were supplied by a single supplier before the auction, entered the direct debit auction and were offered a positive saving in the auction. Column 2 includes a subset of this group who responded to the survey (send to half of all participants) and gave saving money as one of the top three reasons for participating.

The first column of the first row of Table 1 shows that only 27.1% of those participants who were offered a positive saving went on to switch, despite the fact that the median saving, reported in absolute and relative terms in the fifth and sixth rows, was over £100 in the first year, representing just over 10% of those participants' pre-TBS energy bill. Given the ease of switching once the offer had been received, and the relative sophistication of TBS survey participants[9], such a low take-up may seem surprising.

[9] Table A3.1 in the Appendix shows that those who participated in the survey were older, more highly educated and more likely to own their own home (or have a mortgage) than the typical British household.

The survey respondents (in the second column of Table 1) were different from the larger sample in certain respects that are consistent with a higher likelihood of switching. That they took time and effort to respond to the survey might suggest the relatively small amount of time and effort required to switch after receiving TBS offer was a less significant cost for them, even though the two activities are somewhat different. In addition, they were more likely to have referred to their actual bills (arguably a sign of their greater financial awareness) and had specifically mentioned money-saving as part of their motivation for participating in TBS. Even so, almost 6 in 10 survey respondents still did not switch.

Table 2 provides a selection of summary statistics drawn from the survey responses which allow comparisons between those who did not switch and those who did.

Table 2: Comparisons between non-switchers and switchers from 2013 survey

Variable	Non-switchers	Switchers
Household Characteristics		
Age group containing median age[1]	55-64	55-64
% Male	72.1	72.3
% Respondents with first degree or higher	59.8	64.0*
% Respondents who fully or partly own home	93.2	94.4*
% Households with at least one person working full/part-time	53.4	55.5
Financial and Non-financial Factors		
Category containing median income[2]	£30,000-34,999	£35,000-39,999
Median bill size (£)	1162	1161
Median saving (£)[3]	90.55	124.55
Median saving (% of existing bill)[3]	8.7	11.3
% With current exit fee	23.9	6.0*
% Strongly Agree/Agree that 'Timing of TBS was an especially busy period'	23.0	8.4*
% Happy with pre-TBS supplier customer service	82.1	73.6*
% Prefer offered supplier over existing supplier re: ethics/environment	23.7	55.9*
% Prefer offered supplier over existing supplier re: tariff type	8	41.4*
Total Number of Observations	4,279	3,088

* Indicates a significant difference at the 5% level between the mean statistic for Switchers and Non-Switchers. Figures that are 'medians' have not been subject to statistical testing.

[1] Based on the 4,666 observations for which age information was available.

[2] Based on the 7,064 observations for which income information was available.

[3] These figures relate solely to people offered a positive saving as part of TBS.

The upper five rows of Table 2 show that in terms of household characteristics, switchers and non-switchers are reasonably similar, although switchers are more likely to be graduates and home owners. The lower rows indicate that although switchers have a somewhat higher median income, median bill sizes are much the same. As is to be expected if there is at least some sensitivity to price, offered savings in both absolute and relative terms were higher for those who switched than for those who did not; and, unsurprisingly, exit fees were more prevalent among non-switchers.

On the non-financial front, non-switchers were more likely to report other claims on their time during TBS period. In terms of the qualities of suppliers, those who switched were more likely to have a preference for the Co-op's perceived ethical/environmental/tariff type profile. Also, fewer switchers were happy with their pre-TBS supplier's customer service. We now utilise econometric analysis to identify more robustly the factors associated with switching.

4. Econometric Method

To analyse the switching decision we used a Probit model. The dependent variable, Y_i, takes a value of 1 when an individual accepted the TBS offer and a value of 0 when an individual did not accept it. For each individual the probability, p_i, of acceptance was modelled as:

$$p_i = Prob(Y_i = 1|\boldsymbol{x_i}) = F(\boldsymbol{x_i}'\boldsymbol{\beta}) \qquad (1)$$

Here p_i is the probability that accepting was observed conditional on the vector of explanatory values for individual *i*, $\boldsymbol{x_i}$. For the Probit model, $F(.)$ is the Normal cumulative distribution function. We assume that when deciding whether to accept the offer (for which we use the shorthand 'switch'), individual *i* compared the utility of switching (U_{iS}) to the utility of not switching (U_{iNS}); the probability of observing a switch by individual *i* equalled the probability that, for individual *I,* the utility from switching exceeded the utility from not switching:

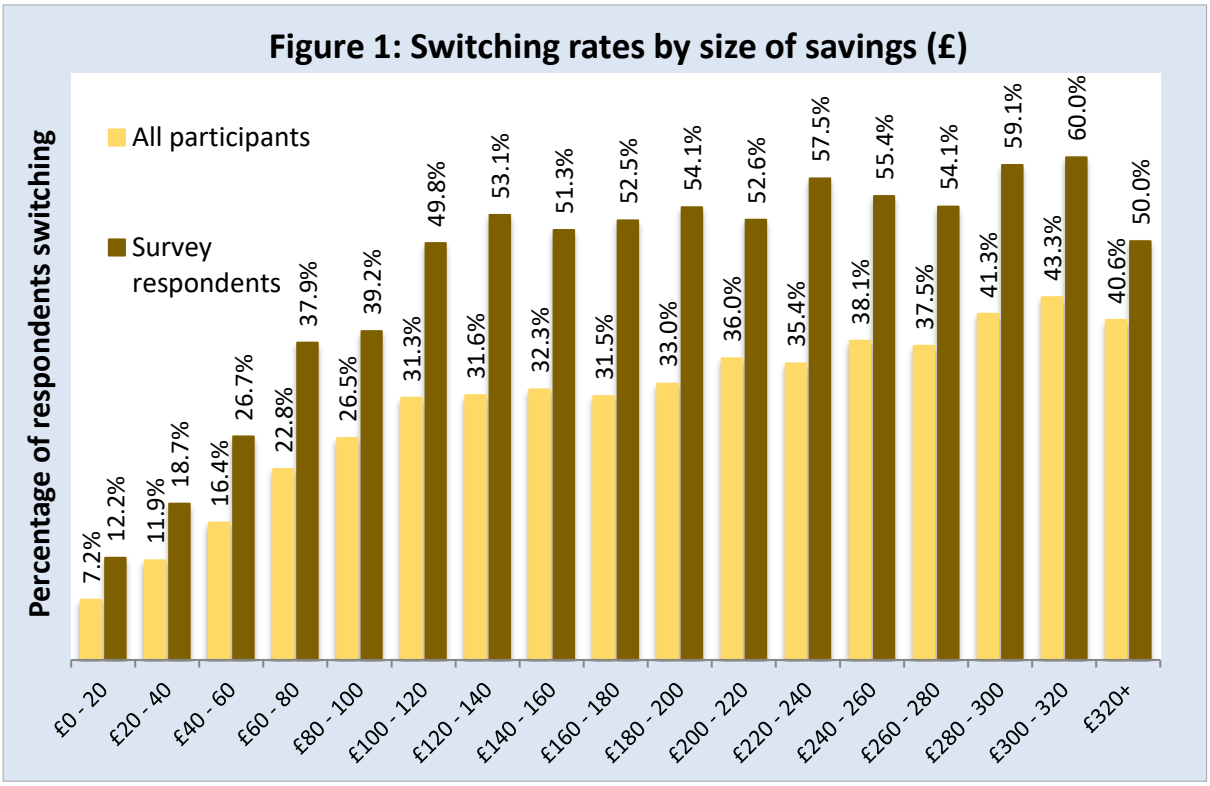
$$Prob(Y_i = 1) = Prob(U_{iS} > U_{iNS})$$

We assume the unobservable utility associated with the two options could be captured by the observable variables included in the vector of explanatory variables $\boldsymbol{x_i}$ and therefore modelled the difference in utility derived from switching and not switching by a set of individual-specific characteristics (e.g. gender and education), choice-specific characteristics (e.g. the respondent's view of the new supplier's environmental and ethical credentials) and characteristics which vary across both individuals and choices.

Our analysis was based on the extensive set of variables included in the 2013 survey. However, it is clear that those who responded to the survey were a self-selecting subsample of those who took part in TBS, leading to important potential differences between the main and survey samples. To check for any self-selection bias associated with the decision to take part in our survey, we calculated the Inverse Mills Ratio (IMR) for the probability of taking part in our survey and included this in our main regression[10]. We found no evidence of a statistically significant distortion arising from self-selection.

[10] Details of the regression resulting in the IMR are given in table A3.2.

A preliminary analysis of the relationship between the frequency of switching and the amount of savings offered is shown in Figure 1.



For both the main sample and for the survey sample, there is a clear correlation between the size of saving offered by TBS and the likelihood of switching. However, the rate of increase in the percentage of respondents switching slows at savings offered above the category of £100-120. For the main sample, moving from the category of £0-20 in savings to that of £100-120 increases the probability of switching by 24.1 percentage points, while moving from the category of £100-120 to that of £300-320 increases the probability by only 12 percentage points. The corresponding figures for the survey sample are 37.6 and 10.2 percentage points respectively. This led us to adopt a quadratic specification for the (continuous) saving variable in our Probit model.[11] The average marginal effects presented in Table 3 have been calculated taking into account the quadratic treatment of this variable.

In addition to the savings offered as part of TBS process, we also included the minimum amount of savings which our respondents said they had required in order to switch. While including such information helped us to understand the cost-benefit evaluation undertaken by our respondents, the inclusion of the minimum required saving variable created an endogeneity problem, as it is conceivable that unobserved factors which affected their decision to switch in 2012 might also affect the required savings to switch stated in 2013. These factors could, for instance, include their attitude towards the uncertainty associated with moving to a different supplier. Indeed one might expect that

[11] The respondents' current energy bill and the alternative energy cost offered by the new TBS offer were initially included separately in the regression, but a test on the restriction of equal coefficients for these two variables revealed it was possible to use their difference (which we label saving amount) directly in our Probit model.

individuals who are more 'cautious' to be both less likely to switch and require more money to be persuaded to switch.

Due to the potential endogeneity of the minimum required saving variable, our Probit model was estimated using conditional maximum likelihood estimation, an instrumental variable[12] method. This method involves the joint estimation of two equations, the first of which has the potentially endogenous variable as the dependent variable. To account for any endogeneity bias, we chose a set of 'instrumental variables' to be included as regressors in the first equation. The instrumental variables need to be correlated with the minimum saving required to switch, but should be unrelated to the decision to switch supplier. The main instrument chosen was the method we used for asking the respondents to report the minimum required saving to switch[13]. While this variable is a highly significant predictor of the minimum required saving (see Table A3.3) the random assignment of individuals between different methods for reporting the amount means reporting method cannot be a predictor of switching. Given that the minimum required saving can be shifted simply by the question format and that the survey was conducted about one year after the date when the switching decision was made, we treated the minimum required saving as a variable providing information about an individual's underlying propensity to switch rather than a literal saving amount above which the individual will always switch.

The predicted values of the endogenous variable were included as regressors in the main Probit model (i.e. as part of $\boldsymbol{x_i}$ in equation (1)). Following this procedure to correct for potential endogeneity, the magnitude and sign of the main estimated effects were not substantially affected compared to the simple Probit model with no correction for endogeneity, but we have included the correction in the regression reported in Table 3.

Lastly, it seemed possible that unobserved factors might affect both the probability of being presented with two (rather than just one) offers and the decision to switch. In order to account for this possibility we used a recursive Probit model where in a first stage we modelled the probability of being presented with two offers and then we modelled the probability of switching conditional on the number of offers made to the participant, in addition to all the other factors which could have affected the switching decision[14].

[12] See Greene (2011) section 9.2

[13] Due to research questions beyond the scope of this paper the data for this variable was obtained from questions in six different treatments. Respondents were allocated to each treatment randomly. First, half the sample was reminded of the saving they were offered at TBS and half did not receive this reminder. Second, within each subsample there were three variations in the way respondents were asked to record the saving they required: (i) on a grid with assigned values, (ii) using a slider with a maximum value of £500 and (iii) using a slider with a maximum value of £1,000.

[14] In Appendix 2, we report the results of separate regressions for those shown one or two offers at TBS; although a likelihood ratio test indicated that separate regressions should be run for those shown one offer and those shown two offers, the main results are not qualitatively different.

5. Results

The econometric approach described in the previous section was used to address the apparent puzzle of savings 'left on the table' by exploring the role of a wide range of financial and non-financial variables in individuals' switching decisions. We present the variables in broad categories which might affect the likelihood of switching, but which sit largely within a rational choice framework: non-price preferences, uncertainty on the part of the participant, concerns with the switching process, time pressures and characteristics of the participant themselves. Each of these categories is discussed following Table 3, which summarises the key results.

Table 3 Selected average marginal effects on the probability of switching energy supplier at TBS

Switching Factor	Variable	Average Marginal Effect
Monetary Savings	1. Saving amount of the best offer (£10 units)	0.014***
	2. Has an Exit Fee	-0.173***
	3. No other penalty/loss of benefits if switch supplier	0.067***
	4. Top 3 factor persuading to switch: Large enough saving	-0.049***
Non-Price Preferences	5. Electricity/energy supplier before TBS: Co-Operative Energy	0.138***
	6. Prefers existing supplier re: tariff type	-0.166***
	7. Prefers offered supplier on ethical/environmental grounds	0.126***
	8. Prefers offered supplier re: tariff type	0.196***
	9. Prefers offered supplier for 'Other' reason	0.125***
	10. Top 3 factor to switch : ethical/environmental reasons	0.041***
Uncertainty/Preparedness	11. Confidence in accuracy of TBS saving (continuous scale 0 to 1)	0.071***
	12. Energy bill estimated by Which	-0.074***
	13. Respondent states bill as 'Round' amount	-0.044**
	14. Unsure if other penalty/loss of benefits if switch supplier	-0.062***
	15. Top 3 factor to switch: confidence in getting best deal	0.047***
	16. Shown two offers	-0.057***
Concerns with Switching Process	17. Worried something might go wrong with switching process	0.046***
	18. Worried re: 'Other' issues	-0.118***
	19. Additional help wanted: phone support	-0.083***
	20. Additional help wanted: simpler switching process	-0.147***
	21. Additional help wanted: something else	-0.083***
	22. Top 3 factor to switch: Quick & easy switching process	0.036***
Time Pressures	23. Worried switching would be time consuming	0.025**
	24. TBS was a very busy period: Strongly Agree	-0.251***
	25. TBS was a very busy period: Agree	-0.121***
	26. TBS was a very busy period: Disagree	0.048***
	27. TBS was a very busy period: Strongly Disagree	0.023
	28. Hard to find Time for Switching: Strongly Disagree	-0.054***
Respondent Characteristics	29. Number of people in household: One	0.048***
	30. Highest Educational Qualification: Masters/PhD	0.023**
Other	31. IMR for survey response	0.102
N		**7,363**

Notes: * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level. The current table focuses on variables that were statistically significant. A wide range of additional variables were included in the regression, including: payment method before TBS, respondent gender, household tenure, employment status of household members, the instrumented minimum required saving to switch, whether in receipt of a fuel related benefit and communication with existing supplier triggered by TBS. In particular, dummy variables for electricity supply regions, electricity/energy supplier before TBS and median household income in a respondent's postcode area were included and generally found to be statistically insignificant. Additional dummies for extra options beyond those listed in the current table were included for: factors that would persuade a respondent to switch, preferences between previous and offered suppliers, worries about the switching process, additional help wanted, number of household members and highest educational qualification obtained. Details of the complete regression results are available on request.

Default categories for reported dummy variables. 2: No Exit Fee; 3 and 14: Has a penalty/loss of benefits if switch; 4, 10, 15 and 22: Listed factor not in the top 3 factors that would persuade the respondent to switch in the future; 5: Electricity/energy supplier before TBS - British Gas; 6 to 9: Indifferent between existing and offered supplier on stated dimension; 12 and 13: Respondent used actual bill and stated 'Non-Round' amount; 16: Shown one offer; 17, 18 and 23: Not worried about stated issue; 19 to 21: The form of additional help stated was not required; 24 to 27: Neither agree nor disagree with the statement 'TBS was a very busy period'; 28: Neither agree nor disagree with the statement 'It is hard to set aside the time to switch'; 29: Two people in household; 30: Highest educational qualification - first degree or equivalent;.

Observations dropped by regressions: No observations were recorded for Utilita, Spark Energy, Sainsbury's Energy or the postcode area income category £75,000-80,000. 3 observations for Green Energy UK and Good Energy were dropped as they perfectly predicted non-switching. 1 observation for npower National Trust was dropped as it perfectly predicted switching.

Table 3 reports the average marginal effects of key explanatory variables on the probability of switching energy supplier, using information from the original TBS data and from our survey[15]. That people left money on the table by not switching appears much less of a 'puzzle' when we take account of the perceived uncertainties and other non-financial considerations involved in the switching decision.

Dealing with each category in turn, monetary savings continue to exert an important influence on the probability of switching. However, it is clear that an offer of monetary savings alone is insufficient to guarantee switching. An increase of £10 in the saving offered at TBS is associated with a 1.4 percentage point increase in the probability of switching.[16] The presence of an exit fee from a consumer's existing energy supplier, which may represent a (significant) reduction in realised savings, is associated with an average reduction in the probability of switching of 17.3 percentage points. The non-linear nature of the model makes it difficult to make direct comparisons between the average marginal effects, but it seems that the presence of an exit fee (on average about £50[17]) has a disproportionate deterrent effect on switching, perhaps reflecting 'loss aversion'. Variable 4 relates to a question asking about factors which would induce switching in the future. A respondent who reported that one of these factors was a 'large enough saving' may have indicated that they required a particularly large saving to switch supplier, and/or that the saving presented at TBS was insufficient. So we see that headline

[15] The marginal effects of only those variables available from the TBS exercise itself for these respondents are reported in Table A1.1.

[16] The reported marginal effect of the saving amount reflects the quadratic treatment of this term in the Probit model.

[17] While some companies were charging up to £100 exit fees, £25-£30 was more typical, see: http://www.thisismoney.co.uk/money/bills/article-2934318/Don-t-let-exit-fee-switching-energy-deals-50-levy-potential-savings-eye-popping.html .

monetary savings themselves may have been moderated by other considerations, including exit fees and other penalties and the respondent's own evaluation of financial rewards.

A variety of non-financial preferences and characteristics are captured by variables 5 to 10. Although in comparison with other consumer goods energy may appear to be a homogenous good, it is clear that respondents had preferences over suppliers beyond the price charged. For example, preferring the ethical/environmental stance of an offered supplier to that of the respondent's existing supplier is associated with an increase in switching probability of 12.6 percentage points (compared to the base case of indifference between suppliers regarding this factor). Since the Co-Op had a positive ethical and environmental reputation at the time of TBS, it is not surprising that those who were influenced by ethical and environmental reasons (variable 10) were more likely to accept the offer (although it may be hard to separate this entirely from the fact that consumers already with the Co-Op were effectively only switching to a different tariff and faced reduced uncertainty about the service they would receive)[18].

Consumers who were uncertain about the size of saving were less likely to switch for a given 'expected' gain, and this is reflected in variables 11 through 16. Greater confidence in the accuracy of the offered savings increases the chances of switching, while not knowing the exact amount of the bill or whether any exit penalties exist may be interpreted as lower confidence in the accuracy of any saving offered, and may thereby have negative relationships with the probability of switching.

We have also included under uncertainty the negative effect of being shown two offers in TBS rather than one. We interpret the result as the presentation of two offers introducing some uncertainty into the outcome for the recipient: for example, being shown two reasonably similar offers may have prompted some participants to wonder whether there might be other (possibly better) deals in the wider market, either now or in the near future, encouraging postponement of a decision.

There may have been uncertainties not just about the gains to be realised, but also about the switching process itself, and these are captured by variables 17 to 22. With the (small) exception of variable 17, this group of variables suggest that higher 'anxiety' and/or effort costs are associated with a lower probability of switching at TBS.

Another explanation for not switching, even when offered substantial savings and sent several reminders, is pressure on consumers' time such that even the small amount of time and attention needed to accept the offer felt excessive at that moment. The effects of variables 24 to 28, taken together, are as might be expected in a rational choice framework, with individuals who reported greater time pressure around TBS being less likely to switch: for example, strongly agreeing that TBS came during a busy period is associated with a 25 percentage point reduction in switching probability. The sign of the coefficient for variable 23 is unexpected, but its magnitude is small, especially compared with those for variables 24 and 25. Thus we conclude that time pressure contributes to understanding unresponsiveness to money saving offers.

[18] Of the 22 analysed survey respondents who were already with Co-Op before TBS and switched through TBS, 18 remained with Co-Op after TBS. At least 3 of these individuals chose Co-Op even though a larger saving was available from an alternative supplier. That an existing Co-Op customer would switch through TBS can be explained by the fact that Co-Op offered a special deal in TBS auction, so these customers effectively switched tariff but not supplier through TBS.

Once the specific characteristics and contexts of respondents' choice decision are controlled for, few socio-economic characteristics are associated with the probability of switching[19]. Gender, housing tenure, receipt of fuel related benefits, regional location and median income in the respondents' postcode area all have statistically insignificant relationships with the probability of switching. The 4.8 percentage point increase in the probability of switching associated with being a single person household might reflect the greater simplicity of decision making when there is no need to reach agreement with other household members. Moreover, a single individual can more easily identify the benefits that would accrue to them personally from switching and balance these against the (individually incurred) efforts involved.

To assess the combined gain in understanding from including the non-monetary variables from the survey in our model, we compared the switching predictions from the model reported in Table 3 with the equivalent predictions of a model which includes only the (energy related) variables available from TBS process itself[20] (now referred to as TBS-only model) for the same participants. Comparing the predicted probability of a given individual switching at TBS with the actual switching decisions observed[21] shows a clear improvement in fit when the survey data are included in the model. The TBS-only model successfully predicts 74.8% of non-switches, but only 57% of switches. In contrast, the model including survey responses successfully predicts 86.8% of switches and 75.9% of non-switches.

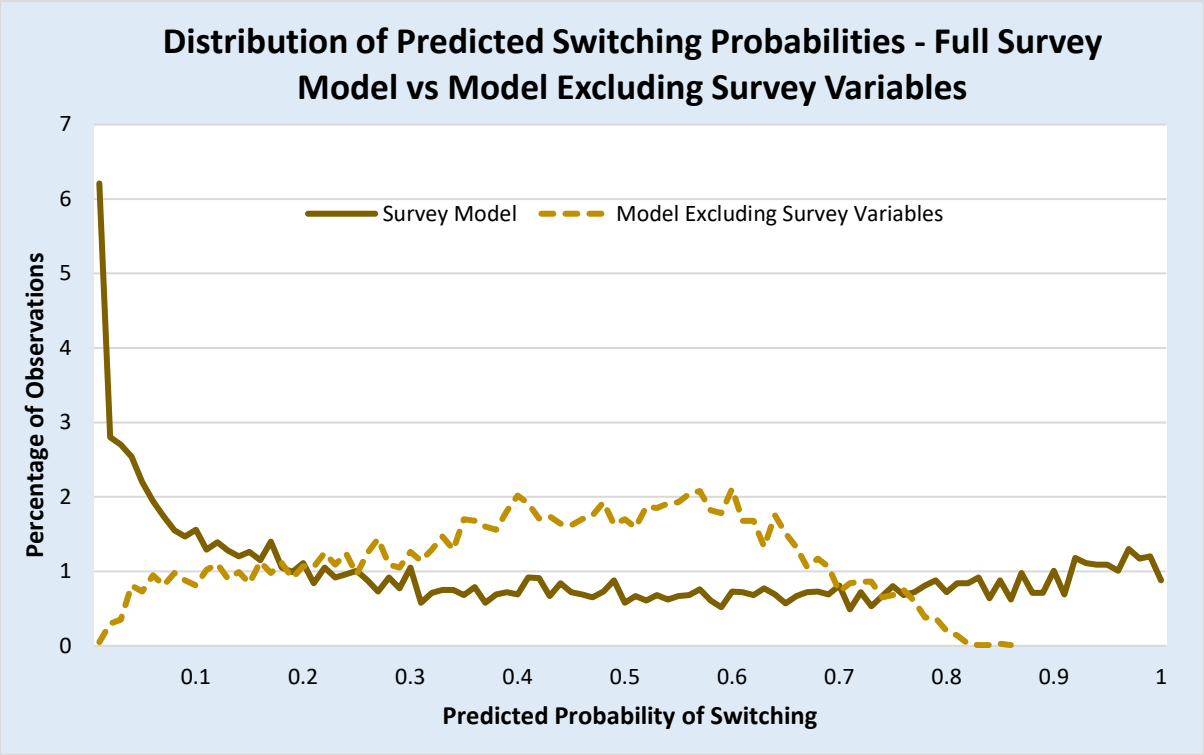
The overall distribution of predicted switching probabilities are shown in Figure 2, where the model fitted to the TBS-only variables generates the distribution shown as a dashed line. Compared with the richer, survey-based model, the TBS-only model appears a poorer fit for the underlying data: the proportion of individuals who have a predicted probability of switching above 0.8 is negligible. In contrast, the model incorporating the survey responses (shown by the solid line), generates a much broader distribution of predictions, covering the full probability range from below 0.01 to above 0.99.

[19] However, recall that our sample is far from representative of the population as a whole, where variations in socio-economic characteristics are likely to be larger and hence may have effects on the probability of switching which we do not see in our more self-selected sample.

[20] Table A1.1 reports the regression results of this model.

[21] Such comparisons inevitably provide a somewhat crude indicator, since they interpret a predicted probability below 0.5 as predicting non-switching and a predicted probability above 0.5 as predicting switching.

Figure 2: Predicted probabilities of switching for those in the online Direct Debit auction



We summarise the story told by these results as follows: when all we have are data about monetary savings and penalties, even when supplemented by a limited set of variables that proxy uncertainty or lack of confidence, there appears to be a puzzle about the extent to which households 'leave money on the table' in the UK retail energy market. But once a wider range of factors is taken into account, such as non-price preferences, time pressures and concerns about the switching process itself, consumers' behaviour appears much less puzzling. The 'enhanced' survey respondent model is not perfect and there are likely to be influences from variables we have not identified – including, perhaps, some heuristics or biases that might be conventionally regarded as 'irrational'. Nevertheless, the survey respondent model manages to predict, overall, more than 80% of the observed decisions, suggesting that a rational model of consumer behaviour can go quite a long way towards explaining why financial rewards alone may fail to induce switching, even among people who are well-educated and more engaged than most with the retail energy market.

6. Conclusion

TBS provided a unique opportunity to observe the detailed decisions and circumstances of a large group of energy consumers faced with a real choice of providers in the residential energy market. These consumers were generally more pro-active in this market than the average householder, as demonstrated by their participation in TBS, and within this group we have focused on those who joined the exercise to save money. Consequently our findings could be viewed as an upper bound on engagement in the UK energy market. The sample is self-selected, as individuals took several active steps to participate in the auction and respond to the survey, suggesting that they possess underlying traits making them more active/engaged than the general population. While lower income consumers might have more incentive to switch, they generally display lower than average engagement rates (Competition and Markets Authority, 2016).

While we find that switching is positively correlated with the savings offered to participants, the raw data clearly demonstrate that the prospect of substantial savings is not by itself sufficient to induce a majority of participants to switch, despite the small additional effort required and several reminders from Which?. A range of non-price factors – various sources of uncertainty, the non-monetary characteristics of different offers, concerns about the switching process and time pressures when TBS occurred – are all associated with the switching decision. Some other features, such as the seemingly disproportionate weight attached to exit fees and the negative impact of seeing two offers rather than one, may have elements of behavioural bias, but most of the factors we identify are consistent with consumers making a largely rational decision when choosing not to switch, even if this results in monetary savings being left on the table.

Our findings have some important implications for policy makers. The first is that significant pure switching costs exist in the energy market, even after all search costs are eliminated (TBS auction process removed search costs for individual consumers). These costs mean that switching cannot be relied on to put all consumers on the cheapest deal for them. Indeed, our results suggest that some consumers consciously choose to remain with more expensive suppliers due to non-price preferences.

These non-price preferences mean that consumers do not regard energy as a homogeneous product, despite the view of many analysts. So our second policy conclusion is that forcing consumers to switch to a particular supplier may reduce utility for at least some consumers, since they do not regard suppliers as completely interchangeable.

Third, opt-in collective switching processes, such as TBS, do not deliver a panacea in getting a wide variety of consumers to switch to cheap energy deals. These collective switches also rely on consumer engagement, both to 'opt in' to the process and to accept the auction offer. Those who opted into this auction displayed characteristics which are typically associated with higher engagement (e.g. Competition and Markets Authority, 2016), but they still 'left money on the table' by not switching after the offer had been made.

Nevertheless, despite the limited overall response to monetary savings observed in TBS, we do find that financial savings are associated with switching, so policies which restrict available savings are likely to reduce the switching rate. On the other hand, the proportion of TBS participants still not switching suggests that relying on consumers to drive margins down to competitive levels is likely to prove disappointing. If even the well-educated, highly-engaged, savings-seeking TBS participants did not behave like the model consumers envisaged in an idealised homogeneous product market, policymakers should lower their expectations about the power of consumer engagement to promote competition.

7. References

Department for Energy and Climate Change (2013), 'Helping Customers Switch: Collective Switching and Beyond', available at: https://www.gov.uk/government/publications/helping-customers-switch-collective-switching-and-beyond

Deller, D., Bernal, P., Hviid, M. and Waddams Price, C. (2017), 'Collective Switching and Possible Uses of the Disengaged Consumer Database', Centre for Competition Policy, available at …….

Ek, K. and P. Söderholm (2008), 'Households' switching behavior between electricity suppliers in Sweden', Utilities Policy, 16(4), pp. 254-261

Competition and Markets Authority (2016), Energy Market Investigation Final Report. https://assets.publishing.service.gov.uk/media/5773de34e5274a0da3000113/final-report-energy-market-investigation.pdf

Council of European Energy Regulators (2017), Consumer Empowerment , available at: http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/White%20Papers/Positions/CEER_WP-3_ConsumerEmpowerment_Final_2017_05_30_PUBLIC_AE-%20Clean%20V.pdf

Flores, M. and C. Waddams Price (2013), 'Consumer behaviour in the British retail electricity market', Centre for Competition Policy, Working Paper 13-10

Gamble, A., E. A. Juliusson and T. Gärling (2009), 'Consumer attitudes towards switching supplier in three deregulated markets', The Journal of Socio-Economics, 38(5), pp. 814-819

Giulietti, M., J. Otero and M. Waterson (2004), 'Supply competition and price behaviour in the UK electricity supply industry', Working paper

Giulietti, M., C. Waddams Price and M. Waterson (2005), 'Consumer Choice and Competition Policy: a Study of UK Energy Markets', Economic Journal, 115(506), pp. 949-968

Giulietti, M., M. Waterson and M.R. Wildenbeest (2014), 'Estimation of search friction in the UK electricity market', Journal of Industrial Economics, forthcoming

Greene, W. H. (2011) Econometric Analysis, seventh edition, Pearson

Hortaçsu, A., S. A. Madanizadeh, and S. L. Puller (2017), 'Power to choose? An Analysis of Consumer Inertia in the Residential Electricity Market', American Economic Review: Economic Policy, 9(4), pp. 192-226

Juliusson, E. A., A. Gamble and T. Gärling (2007), 'Loss aversion and price volatility as determinants of attitude towards and preference for variable price in the Swedish electricity market', Energy Policy, 35(11), pp. 5953-5957

Kleit, A. N., A. V. Shcherbakova and X. Chen (2012), 'Restructuring and the retail residential market for power in Pennsylvania', Energy Policy, 46, pp. 443-451

Klemperer, P. (1987), 'Markets with consumer switching costs', Quarterly Journal of Economics, 102(2), pp. 375-394

Klemperer, P. (1995), 'Competition when consumers have switching costs: An overview with applications to industrial organization, macroeconomics, and international trade', Review of Economic Studies, 62(4), pp. 515-539

Littlechild, S. (2008), Stephen Littlechild, 2008, 'Municipal aggregation and retail competition in the Ohio energy sector', Journal of Regulatory Economics, Springer, vol. 34(2), pp 164-194

Loxley, C. and D. Salant (2004), 'Default Service Auctions', Journal of Regulatory Economics, 26(2), pp. 201-229

McFadden, D. (2006), 'Free markets and fettered consumers', American Economic Review, 96(1), pp. 3-29

Ofgem (2014),'Retail Market Review – Baseline Consumer Sruvey'

Salies, E. (2005), 'A Measure of Switching Costs in the GB Electricity Retail Market', MPRA Paper No. 28255.

Waterson, M. (2003), 'The role of consumers in competition and competition policy', International Journal of Industrial Organization, 21(2), pp. 129-150

Weber, S., A. Baranzini and E. Fragniere (2009), 'Consumers' choices among alternative electricity programmes in Geneva – an empirical analysis', International Journal of Global Energy Issues, 31(3), pp. 295-309.

Waddams Price, C. (2004), 'Spoilt for Choice? The Costs and Benefits of Opening UK Residential Energy Markets', Centre for Competition and Regulation

Waddams Price, C. and M. Bennett (1999), 'New gas in old pipes: opening the UK residential gas market to competition', Utilities Policy, 8(1), pp. 1-15

Waddams Price, C., and M. Zhu (2016), Empirical Evidence of Consumer Response in Regulated Markets, Journal of Competition Law and Economics, 12, 1,113-149

Wilson, C. M. (2012), 'Market frictions: A unified model of search costs and switching costs', European Economic Review, 56(6), pp. 1070-1086

Wilson, C. M. and C. Waddams Price (2010), 'Do consumers switch to the best supplier?', Oxford Economic Papers, 62(4), pp. 647-668

Zhu, M. (2013), 'Searching and Switching Across Markets: Is Consumer 'Inertia' the Result of a Mistake or a Preference?', Chapter 4 in Mehta, J. (ed.), 'Behavioural Economics in Competition and Consumer Policy', ESRC Centre for Competition Policy: Norwich, Norfolk, pp. 63-69

8. Appendices

Appendix 1 – Switching probabilities

Table A1.1 Selected average marginal effects on the probability of switching energy supplier at TBS for respondents included in Table 3, using TBS data only

Switching Factor	Variable	Average Marginal Effect
Monetary Savings	1. Saving amount of the best offer (£10 units)	0.019***
	2. Has an Exit Fee	-0.294***
Uncertainty or Preparedness	3. Energy bill estimated by Which	-0.148***
	4. Respondent states bill as 'Round' amount	-0.078***
Other	5. Shown two offers	-0.122***
N		**7,363**

Notes: * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level. Dummy variables for electricity supply regions and electricity/energy supplier before TBS, payment method before TBS and purchasing from the incumbent supplier were also included as controls in the regressions but are not reported. These additional dummy variables did not show a consistent pattern of significance. Details of the complete regression results are available on request.

Null categories for reported dummy variables: 2. No Exit Fee; 3. Not on a Dual Fuel tariff; 4. and 5. 'Non-Round' energy bill figure entered by participant; 7. Shown one offer; 8. Bill before TBS paid by Fixed Direct Debit.

Observations dropped by regressions: 1 observation for Green Energy UK and 2 observations for Good Energy were dropped as they perfectly predicted non-switching. 1 observation for npower National Trust was dropped as it perfectly predicted switching.

Appendix 2 – One vs Two Offers

In this appendix we present some additional analysis used to explore the finding that being shown two offers is associated with a lower probability of switching.

In table A2.1 the main demographic and socio-economic descriptive statistics are split by those who received one offer and those who received two offers. Table A2.1 reveals that the differences in respondent characteristics between the one and two offer groups are generally small in magnitude.

Table A2.1: Demographic and socio-economic characteristics of those receiving one and two offers

Statistic	One Offer	Two Offers
Age group containing median age [1]	55 - 64	45 - 54
% Male	72.4	71.9
% Respondents with first degree or higher	61.5	61.7
% Respondents who fully or partly own their home	93.8	93.6
% Households containing at least one person who is employed (part-time or full-time)	54.2	54.4
% Respondents receiving a disability benefit	7.9	7.6
% Respondents receiving an energy related benefit (excluding Winter Fuel Payments)	8.4	8.5
Income category containing median income [2]	£30,000 - 34,999	£35,000 - 39,999
Total Number of Observations	**3,754**	**3,613**

[1] Based on the 4,666 observations for which age information is available.

[2] Based on the 7,064 observations for which income information is available.

Table A2.2 shows that those receiving two offers had a higher median bill and were offered larger savings in both absolute and percentage terms.

Table A2.2: Financial information for those receiving one and two offers

Statistic	One Offer	Two Offers
Financial Factors		
Median size of bill (£)	1131.00*	1209.00*
Median size of saving (£) [1]	103.82*	110.07*
Median saving as percentage of existing bill [1]	9.8*	10.2*
% Existing energy deal includes an exit fee	16.2	16.7
Total Number of Observations	**3,754**	**3,613**

* Indicates a statistically significant difference at the 5% level.

Average marginal effects for separate one and two offer regressions are reported in Table A2.3 below. While most variables remain highly significant in both the one and two offer regressions, there are some notable exceptions. For example, Co-Op as a respondent's existing energy supplier loses

statistical significance in the one offer model and is only significant at the 10% level in the two offer model.[22]

Using the two models in Table A2.3 it is possible to estimate the predicted probability of switching for those shown one offer and those shown two offers. The mean predicted probability of switching for those shown two offers is 12.4 percentage points lower than for those shown one offer (35.1% vs 47.5%). However, this does not control for the fact that those shown two offers have different characteristics from those shown one offer. This issue can be overcome by calculating the mean predicted probability of switching for all survey respondents using the one offer model and comparing this against the mean predicted probability of switching for all survey respondents using the two offer model. This latter approach still yields a lower average predicted probability of switching associated with two rather than one offer; however, the magnitude of the effect is reduced to only 2.7 percentage points (39.4% vs 42.1%).[23]

[22] Due to the reduced sample sizes of the separate one and two offer regressions compared to the combined regression it is difficult to know if the loss of significance is due to using two separate regressions being a more accurate model of respondents' choice decisions or just a loss of statistical power.

[23] Both of the reported differences in predicted switching probability are significant at the 1% level. That there is a statistically significant drop in the predicted probability of switching when shown two offers is robust to removing variable 35 in Table A2.3 (the difference between offers) from the two offer regression.

Table A2.3 Selected average marginal effects on the probability of switching (separate 1 vs 2 offer regressions)

Switching Factor	Variable	Average Marginal Effect - One Offer	Average Marginal Effect - Two Offers
Monetary Savings	1. Saving amount of the best offer (£10 units)	0.016***	0.014***
	2. Has an Exit Fee	-0.192***	-0.145***
	3. No other penalty/loss of benefits if switch supplier	0.068***	0.054**
	4. Top 3 factor persuading to switch: Large enough saving	-0.041**	-0.046***
Non-Price Preferences	5. Electricity/energy supplier before TBS: Co-Operative Energy	0.097	0.162*
	6. Prefers existing supplier re: tariff type	-0.167***	-0.166***
	7. Prefers offered supplier on ethical/environmental grounds	0.137***	0.104***
	8. Prefers offered supplier re: tariff type	0.226***	0.144***
	9. Prefers offered supplier re: payment method	-0.023	0.095***
	10.Prefers offered supplier for 'Other' reason	0.192***	0.067*
Uncertainty/Preparedness	11. Confidence in accuracy of TBS saving (0 to 1)	0.109***	0.025
	12. Energy bill estimated by Which	-0.047*	-0.099***
	13. Respondent states bill as 'Round' amount	-0.026	-0.061**
	14. Unsure if other penalty/loss of benefits if switch supplier	-0.041	-0.102***
Concerns with Switching Process	15. Worried something might go wrong with switching process	0.038**	0.048***
	16. Worried re: 'Other' issues	-0.134***	-0.112***
	17. Additional help wanted: phone support	-0.076***	-0.071***
	18. Additional help wanted: simpler switching process	-0.140***	-0.131***
	19. Additional help wanted: something else	-0.081***	-0.079***
Time Pressures	20. Worried switching would be time consuming	-0.009	0.052***
	21. TBS was a very busy period: Strongly Agree	-0.228***	-0.280***
	22. TBS was a very busy period: Agree	-0.109***	-0.140***
	23. TBS was a very busy period: Disagree	0.050***	0.045***
	24. TBS was a very busy period: Strongly Disagree	0.017	0.035
	25. Hard to find Time for Switching: Strongly Agree	-0.018	0.073**
	26. Hard to find Time for Switching: Agree	0.036**	-0.006
	27. Hard to find Time for Switching: Disagree	-0.033**	-0.009
	28. Hard to find Time for Switching: Strongly Disagree	-0.046**	-0.075***
TBS Specific Factors	29. Top 3 factor persuading to switch: Confidence in getting best possible deal	0.038***	0.057***
	30. Top 3 factor persuading to switch: Ethical/environmental reasons	0.062***	0.026
	31. Top 3 factor persuading to switch: Quick and easy switching process	0.044**	0.026
Respondent Characteristics	32. Number of people in household: One	0.058***	0.032*
	33. Highest Educational Qualification: Masters/PhD	0.018	0.026
	34. Gender: Male	0.030**	-0.002
Other	35. Saving of best offer less saving of the Co-Op	-	-0.001***
	36. IMR for survey response	0.535*	-0.280
N		3,742	3,611

Notes: * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level. The table focuses on statistically significant variables and those reported in Table 7. A wide range of additional variables were included in the regression, but are not reported for brevity. These variables include: payment method before TBS, household tenure, employment status of household members, whether in receipt of a fuel related benefit and interactions with existing supplier triggered by TBS. In particular, dummy variables for electricity supply regions, electricity/energy supplier before TBS and median household income in a respondent's postcode area were included and generally found to be statistically insignificant. Additionally, dummies for extra options beyond those listed in the current table were included for: factors that would persuade a respondent to switch, preferences between previous and offered suppliers, worries about the switching process, additional help wanted, number of household members and highest educational qualification obtained. Details of the complete regression results are available on request.

Null categories for reported dummy variables: 2. No Exit Fee; 3. and 14. Has a penalty/loss of benefits if switch; 4. and 29. to 31. Listed factor not in the top 3 factors that would persuade the respondent to switch in the future; 5. Electricity/energy supplier before TBS - British Gas; 6. to 10. Indifferent between existing and offered supplier on stated dimension; 12. and 13. Respondent used actual bill and stated 'Non-Round' amount; 15., 16. and 20. Not worried about stated issue; 17. to 19. The form of additional help stated was not required; 21. to 24. Neither agree nor disagree with the statement 'TBS was a very busy period'; 25. to 28. Neither agree nor disagree with the statement 'It is hard to set aside the time to switch'; 32. 2 people in household; 33. Highest educational qualification - first degree or equivalent; 34. Female.

Observations dropped by regressions: One offer regression: No observations were recorded for Utilita, Spark Energy, Sainsbury's Energy and a median household income of £75,000-80,000. 8 observations for median household income of £70,000-75,000, Green Energy UK and Good Energy were dropped for perfectly predicting non-switching. 4 observations for Ecotricity, npower National Trust and LoCO2 Energy were dropped for perfectly predicting switching. Two offer regression: No observations were recorded for Green Energy UK, Utilita, npower National Trust, Spark Energy, Sainsbury's Energy and a median household income of £75,000-80,000. 2 observations for Good Energy and LoCO2 Energy were dropped for perfectly predicting non-switching.

Appendix 3 – Supporting Materials

Table A3.1 Comparison of Analysed group with average UK household characteristics

Characteristic	Analysed group	Equivalent figure for GB[3]
Age group containing median age[1]	55-64	35-44
% male	72.2*	48.3
% with first degree or higher	61.6*	23
% who rent their home	6.2*	35.5
% households receiving disability benefit	7.7	9.8[4]
Category containing median household income[2]	£35,000-£39,999	£35,000-£39,999
Total number of observations	**7,367**	

*Indicates the statistic for the analysed sample is significantly different from that for GB at the 5% level.

[1]Age information was only available for 4666 of the analysed survey group.

[2]No specific question about income was asked in the survey. These figures are based on the median income of inhabitants of the six digit post code area where the respondent lived. Such income information was available for only 7,064 individuals among the analysed group.

[3]These statistics are based on tables available in Ofgem (2014).

[4] This is the percentage of respondents having responsibility for members of the immediate family with long-standing illness, physical or mental health problems or disability.

Table A3.2: Average marginal effects for statistically significant variables predicting survey response by TBS participants

Variables	Average Marginal Effect
1. Saving amount of the best offer (£10 units)	-0.001***
2. Energy expenditure before TBS	0.000**
3. Energy bill estimated by Which	-0.047***
4. Respondent states bill as 'Round' amount	-0.011***
5. Has an Exit Fee	0.019***
6. Doesn't know if has an Exit Fee	-0.004*
7. Bill before TBS paid by Cash	-0.024***
8. Shown two offers	-0.008***
9. Method/venue where participant joined TBS known	0.013***
10. Reminder email sent as part of TBS phase II	-0.020***
11. Reminder email sent as part of TBS phase III	0.007**
12. Electricity/energy supplier before TBS: Atlantic	0.011*
13. Electricity/energy supplier before TBS: The Utility Warehouse	-0.024**
14. Electricity/energy supplier before TBS: EBICo	0.053***
15. Electricity/energy supplier before TBS: first:utility	0.024***
16. Electricity/energy supplier before TBS: SSE	0.021**
17. Electricity/energy supplier before TBS: Co-Operative Energy	0.041***
18. Both gas and electricity from one supplier: either British Gas or the incumbent electricity supplier	-0.005*
N	**84,595**

Notes: * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level. Dummy variables for electricity supply regions, other electricity/energy suppliers before TBS, other payment types, being on a Dual Fuel tariff and purchasing from the incumbent supplier were also included as controls in the regressions but are not reported. Details of the complete regression results are available on request.

Null categories for reported dummy variables: 3. and 4. 'Non-round' energy bill stated by respondent; 5. and 6. No Exit Fee; 7. Bill before TBS paid by Fixed Direct Debit; 8. Shown one offer; 9. Method/venue where participant joined TBS not known; 10. Reminder email not sent as part of TBS phase II; 11. Reminder email not sent as part of TBS phase III; 12. to 17. Electricity/energy supplier: British Gas; 18. Does not receive all energy solely from British Gas or solely from the incumbent electricity supplier.

Observations dropped by regressions: No observations were recorded for Utilita. 19 observations for Spark Energy and Sainsbury's Energy were dropped for perfectly predicting non-response to the survey.

Table A3.3 Coefficients for potential instrumental variables from the regression estimating the minimum saving required to switch

Potential Instrumental Variable	Regression Coefficient
1. Before TBS: On a Dual Fuel Tariff	10.849***
2. Respondent reminded of saving they were offered in TBS	7.092***
3. Respondent states saving needed using a slider covering the range £0 to £1,000	29.155***
4. Respondent states saving needed using a slider covering the range £0 to £500	15.513***
5. Household member receives disability benefit	5.427*
6. With the incumbent supplier(s) for electricity (and gas where applicable)	-1.930
7. Both gas and electricity from one supplier: either British Gas or the incumbent electricity supplier	0.605
8. Top 3 factor persuading to switch: Confidence that the switching process will be problem free	-2.398
9. Top 3 factor persuading to switch: Having spare time to devote to switching supplier	-12.368*
10. Top 3 factor persuading to switch: Confidence that deal will remain relatively good for more than a year	3.257
N	**7,363**

Notes: * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level. The variables listed were treated as potential instruments as they were only included in the regression modelling the minimum saving needed to switch. The dependent variable for the regression is "Smallest amount of saving per year I would have needed to persuade me to switch (£)". Details of the complete regression results are available on request.

Null categories for reported dummy variables: 1. Not on a Dual Fuel tariff; 2. Respondent not reminded of saving offered in TBS; 3. and 4. Respondent types 'saving needed' into a free text box with no upper limit; 5. No household member receives disability benefit; 6. At least one of gas or electricity is with a non-incumbent supplier; 7. Does not receive both gas and electricity from a single supplier which is either British Gas or the incumbent electricity supplier; 8. to 10. Listed factor is not in the top three factors that would persuade a consumer to switch energy supplier in the future.