How consumers' socio-economic background influences satisfaction: Insights for better utility regulation

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Abstract

Augmenting consumer welfare was a key justification behind the reform of utilities from the 1980s. But, three decades later, evidence is mounting that consumer satisfaction with household utilities is quite uneven. Moreover, governments, regulators and international organizations are increasingly recognizing that consumers from specific socio-economic backgrounds may be less satisfied than those from other backgrounds. To attend to this, instances of demand-side regulation have been implemented, but there remains a lack of empirical research on the precise links between consumers' socio-economic background and their satisfaction. This article contrasts consumers' stated and revealed preferences for three major household utility services (electricity, gas and telecommunications, including internet) across twelve European countries. Contrasting stated and revealed preferences has been applied to policy on transportation, marketing and the environment: this article pioneers the application of this technique to the analysis of satisfaction with household utilities across multiple countries. We find strong evidence that consumers' socio-economic category matters: consumers with lower levels of education, the elderly and those who are not employed exhibit particular expenditure patterns and lower satisfaction levels vis-à-vis some of or all the services under analysis. We conclude by highlighting how our findings may be of use to regulators in the ongoing quest to improve the quality of utility regulation.

Key words

Utilities, regulation, satisfaction, socio-economic background, consumers, stated and revealed preferences.

JEL

L94 Electric Utilities; L96 Telecommunications; L98 Government Policy; D18 Consumer protection.

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1. Introduction

Governments, regulators, firms, consumer associations and international organizations are increasingly recognising that not all consumers are equally satisfied with household utility services, even after the consolidation of a wave of regulatory reform which began in the 1980s (OECD 2010). The core justification behind these reforms was, after all, to augment the efficiency of utility provision and pass the benefits to consumers, through increasing competition and choice, lowering prices, thus augmenting welfare and satisfaction (EC 2004; OECD 2009). Despite policy-makers' claims, Crew and Kleindorfer (2002:8) warned that deregulation was more complex than policy-makers surmised, and argued rent-seeking behaviour might lead to "mischief", whereby the redistribution of monopoly rent could allow powerful interests to gain the upper hand against consumers. Moreover, recent empirical evidence is suggesting that some consumers are less well positioned than others to deal with challenges brought about by deregulation (OECD 2008). This paper shows how different levels of consumer satisfaction with household utilities may be associated with the socio-economic background of consumers.

Mainstream approaches to utility regulation were designed from the supply-side, usually taking the form of means-based subsidies or geographical/product redistribution. Fresh thinking on regulation is emerging, however, which recognises mainstream approaches alone may be inadequate: demand-side regulation is being increasingly introduced as a complement to supply-side methods in Europe, North America, Australia, and beyond. One important development is that governmental agencies are increasingly using the concept of the potentially "vulnerable consumer" to deal with uneven experiences of household utility services in new legislation (examples from the UK include the Energy Act, passed in 2010 and the 2012 draft Water Bill). While applauding efforts to consider potentially vulnerable consumers in utility regulation, consumer associations have argued that firms still exercise great discretion in applying social tariffs (for instance, some energy providers only target pensioners, whilst their rivals also target lower-income families). The concern remains that reductions are not always obtained by those who most need them (see Consumer Focus 2010). In response, efforts are ongoing to clarify and co-ordinate the concept of the potentially vulnerable consumer. It is argued this is a multi-dimensional category, which may be subject to the market in question, and may not necessarily be captured by means-testing alone (OFGEM 2012; Stern 2012; European Parliament 2012).

With new thinking on utility regulation ongoing, there remains the major problem of a lack of evidence on the *precise* interrelationship between consumers' socio-economic background and their satisfaction with utility services. The major policy concern addressed in this paper is whether consumers from particular socio-economic backgrounds are potentially gaining less than others in the current regulatory framework. We do so by examining consumers' socio-economic background and their expenditure decisions on, and satisfaction with, three major household utility services (electricity, gas and telecommunications, including the internet) across twelve European countries. Our approach is to contrast data on consumer satisfaction (Stated Preferences, henceforth, SP) with that on actual household expenditure (Revealed Preferences, RP). Following Whitehead *et al.* (2008), combining the analysis of RP and SP has the advantage of avoiding the potential weaknesses of using just one source alone, as will

be explained. The task of peering into the interrelationship between consumers' socio-economic characteristics, consumer expenditure decisions and satisfaction requires comparable, disaggregated, data on expenditure and satisfaction. In Europe, this data is available through European-wide surveys on consumer satisfaction with household utilities, published in the *Eurobarometer* series, and national and European-level Household Budget Surveys (HBS), collected by the European Statistical Office, EUROSTAT (EUROSTAT 2011). Ideally, consumer satisfaction with and expenditure on utilities could be contrasted over time to permit gauging whether evolving utility regulation was accompanied by greater satisfaction. Unfortunately, until 2006, survey respondents were not asked about their socio-economic background, while non-users were screened out of the survey. The 2006 survey (EC 2007) was a break-through in that consumer background was disaggregated, whilst *non-users' opinions were included* in survey results. Whilst the subsequent consumer surveys (EC 2010a, 2011) disaggregated consumer background, questions were dropped on access and price satisfaction, non-users were again removed from results. This means that, for this analysis, the EC (2007) is used as a unique source where consumer satisfaction (including non-users) on access and price by socio-economic category can be studied.

We examine three major categories associated with potential consumer vulnerability in the literature: age, education and employment status. These categories have been widely associated with potential vulnerability because the elderly (and the very young), the lesser educated and those without exposure to a work environment may be less integrated into knowledge-sharing networks than their peers, and therefore less privileged when interpreting the new complex markets surrounding household services, as we discuss later. We find strong evidence that socio-economic categories are associated with satisfaction patterns. Consumers with lower levels of education are less likely to be satisfied with all three services, most sharply, with telecommunications. Additionally, those who are not employed and the elderly tend to express less satisfaction with telecommunications. On this basis, we suggest a "vicious circle" currently exists for some consumers whose socio-economic background may influence their expenditure on utility services which, in turn, influences their satisfaction with and use of these services. Our results which identify patterns linking satisfaction and socio-economic background provide an empirical basis upon which future demand-side regulation could be designed. Regulation could be established towards a "virtuous circle", whereby not only consumers, but also governments and firms, stand to benefit (Faruqui and Sergici 2011).

The rest of the paper is organised as follows. The second section synthetically describes the increasing attention paid to the relationship between consumer satisfaction and the socio-economic background of consumers in the context of utility reform. The third and fourth section respectively describes the data, and derives the hypotheses and presents the econometric model. The fifth section discusses the findings. Conclusions highlight the key socio-economic variables and related sectors where satisfaction is lower, and suggest it is here where regulators could look in their ongoing quest to improve the quality of utility regulation.

2. Utilities and Consumer Satisfaction

From the 1980s onwards, utilities around the world were subject to a wave of reform – deregulation, competition and privatization (Clifton, Lanthier and Schröter, 2011).

Reforms were justified on the grounds that they would increase the efficiency of utility service provision, principally, through the introduction of competition to activities which had previously been organised as a monopoly (EC 2004). In theory, deregulation would break up monopoly inefficiency, increase consumer choice and lower product prices: it was reasonable to expect consumer satisfaction to increase. Crew and Kleindorfer (2002) pointed out that deregulation could lead to the division and redistribution of monopoly rent, whereby large consumers with greater market power may gain the upper hand against small consumers.

In practise, after an initial period of optimism, policy-makers became concerned that utility reform was proving more complex than first thought. Beyond issues related to introducing competition to the market, specific problems were noted from the consumer perspective related to the growing complexity of utility markets. For instance, household billing procedures could be cumbersome and complex: in the UK, mounting consumer complaints to energy providers led to the creation of Energywatch in 2000 with the passage of the Utilities Bill (HMSO 2000). Energywatch then filed a "super complaint" to the regulator, Office of the Gas and Electricity Markets (OFGEM), accusing firms of obscure and over-complex billing practices. This resulted in the introduction of a Billing Code of Practice and the creation of an Ombudsman for energy and communications, where similar problems were experienced by consumers (OFGEM 2005). Other consumer complaints concerned penalties incurred on those wishing to switch, which had been obscurely described in the "small print" of the contract. Cold-calling or door-to-door sales to consumers by rival providers to persuade consumers to switch became common. Switching, understood as an essential means of disciplining the market, was acknowledged as sometimes being costly from the consumer viewpoint, both in terms of actual information gathering and analysis, but also because they perceived the costs of change were high (Giulietti *et al*. 2005). Switching did not always lead to welfare maximization, as observed by Wilson and Waddams Price (2010). Experimental observations simulating market complexity argued that "choice overload" could, paradoxically, lead to lower consumer satisfaction (Iyengar and Lepper 2000; Haynes 2009). So, whilst competition meant more market entrants, the new market arrangements required clear and accessible communication to consumers to support initial and subsequent consumer decisions.

Traditionally, the regulatory regime which guided utility provision was principally designed from the supply side. Typically, in the cases of telecommunications and energy, policy was justified by the claim it promoted universal provision, through geographical or product redistribution, or via means-tested policies (see Kaserman and Mayo 1994 for a critique of the effects of cross-subsidization). In addition, some governments implemented Light User Schemes, whereby restricted services could be bought for reduced fees, and made available for targeted segments of the population, such as the very elderly or low-income families. Often, these schemes were ill-designed, and ended up having perverse effects. A case in point was the controversy around the UK´s former telecommunications incumbent BT which introduced a "social tariff" scheme which was offered to residents of modest housing: later, it was found that 40 percent of consumers who had benefitted from the scheme were second home-owners, not the low income (OFCOM 2009).

In recent years, governments and organizations have commenced a search for new regulatory approaches to deal with the increased market complexities from the

viewpoint of the consumer. Between 2008 and 2010, the European Commission (EC) organized a series of international conferences on how regulation could be adapted in view of the mounting evidence that consumers were only unevenly satisfied with a range of services and goods: utilities were at the centre of the debate. Agreement was reached among invited representatives from government policy-makers, national institutions and international organizations, including the Australian Government, (2007), the US Federal Trade Commission (2007), the Institute for Government of the UK (2010), the EC (2008, 2010b) and the OECD (2008, 2010) on three major issues. Firstly, though utility reform from the 1980s onwards had been partially successful, the benefits of reform were not perceived by all consumers evenly. Secondly, new thinking was required on how to implement demand-side regulation to target consumers from particular socio-economic groups with a view to improving their use of, and satisfaction with, utility services. Thirdly, they coincided that Behavioural Economics may provide the most useful theoretical base to guide future policy in this field. The fundamental tenets of Behavioural Economics, working from the foundations established by Neoclassical Economics, are well known, as developed by Daniel Kahneman and colleagues. In essence, this school recognises that individuals do not always behave as absolute rational and selfish agents, who maximize their own utility when taking decisions (Mullainathan and Thaler 2000). Instead, actors suffer psychological biases, and take decisions in conditions of "bounded rationality" and "flawed heuristics" (Cooper and Kovacic 2012:45). Insights from Behavioural Economics could be applied to better understand the circumstances influencing consumers' decisions in light of the emerging consensus that the concept of the potentially vulnerable consumer is multi-dimensional, and cannot simply be resolved through "means-testing" (Consumer Focus 2010). If consumers could be helped to become more "active" in different markets, they would act as a more positive force to "discipline" the market (Armstrong and Sappington 2006).

Insights from Behavioural Economics suggest it is important to identify and understand the psychological *and* economic reasons why people fail to systematically maximize utility. Kahneman *et al*. (1982) stressed that decision-making is based on heuristics derived from the environment, which tends to be dominated by uncertainty and complexity. Consumers' social, cultural and economic environment, therefore, may influence behaviour, leading to potentially heterogeneous outcomes. So, Behavioural Economics could be mobilised to explain why consumers belonging to particular socio-economic backgrounds could be thought of as potentially vulnerable in the face of specific consumption decisions. Potentially "vulnerable consumers" has been usefully defined as: those who "are at a disadvantage in exchange relationships where that disadvantage is attributable to characteristics that are largely not controllable by them" (Andreasen and Manning 1990:13). Vulnerability is not directly observable; rather, it is typically associated with particular socio-economic variables which may be representative of it. Moreover, consumers are "potentially" vulnerable: "vulnerability" is not a permanent, fixed assignation, but may be *contingent* on the environment. Hence, scholars and policy-makers tend to identify socio-economic characteristics which are *potentially* associated with vulnerability. Generally speaking, discussions about categories associated with potential vulnerability are quite consistent across the US, Europe and beyond, including, in virtually all cases: 1) age (the very elderly/young); 2) those on low incomes 3) those who do not work 4) the long-term disabled 5) those with lower educational attainments 6) rural dwellers and 7) ethnic minorities (Andreasen and Manning 1990; European Parliament 2012). Though Behavioral Economics can be used

to study how contextual factors may influence *any* decision-making by *any and all* consumers (Institute for Government 2010), the specific context of the increased complexities in utilities markets has led scholars and policy-makers to focus principally on *age*, *income*, *work status*, *disability* and *education* (Office of Fair Trading 1998; OECD 2008).

3. Data and approach

The empirical research is based on the complementary analysis of consumers' SP and RP in regard to electricity, gas and telecommunications services. In a state-of-the-art of the field, Whitehead *et al*., (2008) synthetically explain how combining SP and RP analysis helps maximize the respective strengths of each approach, whilst minimizing their weaknesses, so enriching data interpretation and the results obtained. This approach has been applied across different disciplines, including environmental valuation, transport and marketing, but not yet to analyzing utility services across multiple countries. By so doing, our aim is to contribute to the ongoing research on how to better regulate utilities from the demand side as a complement to traditional supply-side regulation.

Our analysis follows Kahneman and Thaler's (2006) description of the decision-making process which they divide into two steps: firstly, individuals make choices, reflected in RP and, secondly, they obtain a degree of satisfaction, reflected in SP. The socio-economic background of consumers may influence their experience in confronting market complexity, making it more difficult for them than their peers. Regarding SP, we assume that an association between expressions of lower satisfaction and a particular socio-economic category is a concern. As regards RP, we assume that expenditure on a service is derived from a unit price multiplied by a quantity purchased: this can be understood both in quantitative terms (the amount of the service purchased) and in qualitative terms (the quality of the service purchased). By contrasting SP and RP we attempt to interpret this situation by providing three major scenarios: 1) A particular group of consumers is associated with *lower satisfaction* and *lower expenditure* on a service. This could be explained because these consumers purchased a *smaller amount* of that service (for instance, by limiting the number of phone calls) or, because they purchased a *lower quality* service (such as contracting a poorer internet connection). So, this group of consumers may have restricted their consumption in this market, due to their difficulties with and lower confidence in that market, as expressed through their lower levels of satisfaction; 2) A group of consumers is associated with *lower satisfaction* with but *higher expenditure* on a service. This could be explained if these consumers are paying a higher unit price for these services, that is, they took poorer consumption decisions, and thus their difficulties are reflected in lower satisfaction; 3) A group of consumers is *less satisfied* than their peers but have *similar* expenditures. This could be because their satisfaction is inconsistent, or, because they are paying a higher unit cost whilst restricting their consumption in the market, hence the effect on expenditure is ambiguous. Thus, we first analyze SP, to detect which socio-economic groups are associated with lower levels of satisfaction, and then we analyze RP, to assess whether SP are confirmed through expenditure decisions, and how this impacts upon service use.

SP are consumers' self-assessment of their evaluation of, or satisfaction with, a particular product or service. SP allow us to analyze beyond consumers' observed

behavior, as they may help shed light on the *reasons* for their behavior or the *results* they obtain from that behavior. Through stating preferences, individuals evaluate their level of subjective wellbeing by comparing this with that of other people, past experiences and future expectations (Frey and Stutzer 2002). These authors sustain that reported subjective well-being is a valid and empirically adequate measure for human wellbeing, which can be modeled in a micro-econometric function using independent variables such as individual socio-demographic and socio-economic characteristics as possible explanatory factors. Despite this, few attempts have been made to evaluate the regulation of utility services using SP (such as Clifton and Díaz-Fuentes, 2010), so little is still known about how socio-economic characteristics may influence decision-making in this field.

Turning to the data, acknowledging that deregulation could have negative and positive consequences was the reason why the EC, under pressure from various actors and governments, decided to launch specific European-wide *Eurobarometers* surveys on consumer satisfaction with utilities (Clifton, Comín and Díaz-Fuentes 2005). These surveys were published at regular intervals (EC 1997, 2000, 2002, 2003, 2005, 2007, 2010a, 2011). Unfortunately, because the survey design differs in each case, it is not possible to systematically analyze the evolution of satisfaction against regulation. Moreover, as mentioned, because EC (2007) is the only survey which disaggregates respondents' socio-economic background and includes the opinion of non-consumers in the survey results, it is a unique source of information on the link between satisfaction and socio-economic consumer background. For the purposes of this article, the micro-data of EC (2007) are used. This contains a wealth of information on European consumers' opinions on a range of utilities, including use, accessibility, affordability, importance, and so on.

RP provide information on consumers' observable choices in the market, and are a useful complement to SP, as they are commonly understood as constituting more objective information. At the national level, governments compile HBS, which include information about households' expenditure broadly disaggregated, as well as the socio-economic characteristics of the household representative. EUROSTAT collects and homogenizes this national data thus generating a European-wide database on a regular basis. The most recent Europe-wide HBS corresponds to the period 2004-6 (EUROSTAT 2011). Unfortunately, this source does not provide individually disaggregated information on unit price paid and quantity purchased, so the results obtained require interpretation by contrasting those from *Eurobarometer*, as explained.

Traditionally, mainstream economics focused on RP. Following Samuelson (1938), the economic theory of consumer behavior was based on RP, inferred from consumers' expenditure decisions in the market in response to different price combinations. RP reflected in expenditure patterns have been used, in the case of utilities, to evaluate the effect of regulatory reform of the British gas market on households with different socio-economic characteristics (Hancock 1996; Gómez-Lobo 1996) and on internet usage according to consumer socio-economic background (Cardona *et al*. 2009; Glass and Stevanova 2010).

Increasingly, scholars have argued that other approaches should be used as a supplement to RP to better understand behavior. Whitehead *et al*. (2008) synthetically reviewed the contribution to research on consumer behavior by combining RP and SP as complementary sources. The advantage of RP is that they are based on actual choices

(expenditure) whilst their disadvantage is that they rely on historical data (behavior in response to new policies is non-existent). Meanwhile, the advantage of SP is that hypothetical policy scenarios can be tested for (such as non-use values) whilst their major disadvantage lies in their advantage; they may be hypothetical so replies may be unrealistic (Whitehead *et al*. 2008; 875).

Turning to the data, whilst *Eurobarometer* includes information from 25 European countries, the EUROSTAT HBS does not include information on the Czech Republic, Italy, Malta, Poland and Portugal, nor does it include sample weights for Cyprus, Luxembourg, the Netherlands and Slovenia, whilst its information is incomplete regarding the dependent and independent variables required for estimations for Austria, Germany, Sweden and the UK. Hence, our final data set is complete for twelve countries (over 166 million inhabitants), which are representative of Europe in that they include diversity by geographical and socio-political characteristics (Northern, Central, Western, Southern and Eastern countries), size (large, medium and small countries) and economic development (more and less developed countries). Information on the samples is shown in Annex 1.

Stated use of the utility services is presented in Table 1. As they are based on individuals' judgments, SP are subject to some biases (Frey and Stutzer 2002). Taking into account the percentage of bias inherent in SP, we can observe that electricity is universally used, whilst gas is not. As regards telephone services, observed separately, both fixed and cellular telephony are used broadly, but neither are universally adopted. However, when considered together, we can observe that the use of at least one of them is universal. This suggests that, for a considerable part of the population, these technologies have become substitutable (Briglauer *et al*. 2011). Finally, the internet has not been universally adopted. When both "energy" (electricity and gas), "telephone" (fixed and mobile) and "telecommunications" (fixed, mobile and internet) are considered at the aggregate level, however, their use is universal.

As regards stated satisfaction with the price of services, Table 2 organizes total consumer price satisfaction according these four service categories: "electricity", "energy" (electricity and gas), "telephone" (fixed and mobile/cellular) and "telecommunications" (fixed, mobile and internet). Our analysis uses these categories – as opposed to examining all services individually – for two major reasons. Firstly, consumers are often obliged to purchase energy or communications "packages" (telephone plus internet) and it is often not feasible to contract each service independently. Additionally, and, more importantly, some of these individual services are not used universally and their use may be influenced by consumers' socio-economic background). The inclusion or exclusion of these consumers who do not use a particular individual service (such as fixed phone or the internet) but do use other services in the market (that is, telecommunications) would bias the estimators associated with those characteristics if each service was analyzed individually.

The left-hand column one in Table 2 shows the number of services analyzed: under electricity, the percentage of consumers who are dissatisfied versus satisfied (67.7%); under energy, those satisfied with zero, one or both energy services; under telephone those satisfied with zero, one or both fixed and mobile; finally, under telecommunications, those satisfied with zero, one, two or all telecommunications services (fixed, mobile and internet). Interestingly, price satisfaction with "energy" is observed for 40.3% of the population, whilst nearly all those satisfied with the price of gas are also satisfied with the price of electricity. Meanwhile, for telecommunications, nearly half (48.8%) of consumers are satisfied with both fixed and cellular telephony,

but this falls to 33.7% when the internet is included. Analysis of the factors conditioning these expressions of satisfaction is discussed below.

Table 1. Stated use of energy and telecommunications services in 12 European countries in 2006 (EC, 2007)

		Stated Use (%)
	Electricity	95.9
	Gas	53.0
Energy	**(Electricity and/or Gas)**	96.7
	Fixed phone	77.7
	Mobile phone	79.7
Telephone	**(Fixed and/or Mobile phone)**	97.5
	Internet	44.5
Telecommunications	**(Fixed and/or Mobile phone and/or Internet)**	97.7

Source: Computed by authors based on EC (2007).

Table 2. Percentage of stated price satisfaction with energy and telecommunications services, by number of services with price satisfaction in 2006 (EC, 2007).

N. of services	**Electricity**	**Energy**	**Telephone**	**Telecommunications**
0	32.3	28.5	21.8	17.5
1	67.7	31.2	29.4	23.5
2		40.3	48.8	25.4
3				33.7

Source: Computed by authors based on EC (2007).

Expenditure on energy and telecommunications services in the twelve European countries represents more than 3.6% and 3.2% of households' total expenditure respectively (EUROSTAT 2011). This attests to the importance these services have in overall household expenditure. There are significant disparities between countries, most of which are due to political and economic differences, such as the significantly lower expenditure in absolute terms generally observed across the three former members of the Soviet Union. Another difference across countries is expenditure on gas: though this is important in most countries, it is nearly non-existent in others, such as Finland. Differences between and within countries are analyzed in the next section.

4. The Empirical model

To examine possible associations between consumers' socio-economic background, expenditure on and satisfaction with household utilities, the following two hypotheses are proposed:

1. Consumers' socio-economic characteristics condition their satisfaction as regards the price of services. If this is found to be the case, analysis will seek to identify which socio-economic characteristics are related to lower satisfaction.
2. Consumers' socio-economic characteristics related to lower satisfaction with the price of services are also related to their expenditure on services. If this is the case, attention will be paid to whether this has negative or positive expenditure outcomes.

With respect to SP, the dependent variable is, for each service category, a categorical naturally ordered variable (y_i), as described in Table 2, representing the number of services within the same category for whose price a particular consumer is satisfied, namely, electricity, energy, telephone and telecommunications. We opted to analyze each category using the ordered variable (y_i), instead of a binary variable (for instance, "satisfied with zero services within a category" versus "satisfied with one or more of the services", which would mean loss of important information about satisfaction with an intermediate number of services.

We define each dependent variable, for an *m*-alternative ordered model, as:

$$y_i = j \quad if\ \alpha_{j-1} < y_i^* \leq \alpha_j, \quad j = 1,...,m$$

Where:

i is a individual consumer.

m is the number of alternatives in the response, being 3 for energy and telephone (satisfaction with 0, 1 or 2 services) and 4 for telecommunications (satisfaction with 0, 1, 2 or all 3 services). As explained below, electricity, with only two possible responses, is analyzed using a binary probit model.

y_i^* is an unobserved measure of satisfaction, defined as:

$$y_i^* = x_i'\beta + u_i$$

Being x_i a vector of independent variables for the consumer *i*.

And $\alpha_0 = -\infty; \qquad \alpha_m = \infty$

Then, assuming that the regression error *u* is standard normally distributed with $F(.) = \Phi(.)$, we estimate $\Pr(y_i = j)$ from an ordered probit model of the form:

$$\begin{aligned}
&\Pr(y_i = j) = \Pr(\alpha_{j-1} < y_i^* \leq \alpha_j) \\
&= \Pr(\alpha_{j-1} < x_i'\beta + u_i \leq \alpha_j) \\
&= \Pr(\alpha_{j-1} - x_i'\beta < u_i \leq \alpha_j - x_i'\beta) \\
&= \Phi(\alpha_j - x_i'\beta) - \Phi(\alpha_{j-1} - x_i'\beta)
\end{aligned}$$

Thus the regression parameters β and the $m - 1$ threshold parameters α are obtained for energy, telephone and telecommunications. These results are included in Annex 2. From this model, we estimate the marginal effects of changes in each independent variable x_γ on the probability of being satisfied with the price of all the services within a category, described in Table 3, by the following equation:

$$\frac{\partial \Pr(y_i = j)}{\partial x_{\gamma_i}} = \{\Phi'(\alpha_{j-1} - x_i'\beta) - \Phi'(\alpha_j - x_i'\beta)\}\beta_\gamma$$

Where $j = m$.

In the case of electricity, there are only 2 possible responses: satisfaction with the price, 1, or not, 0. Thus, $\Pr(y_i = 1)$ is estimated from a standard binary probit model (results are included in Annex 3) of the form:

$$\Pr(y_i = 1) = \Phi(x_i'\beta)$$

Where the marginal effects of x_γ on $\Pr(y_i = 1)$, described in Table 3, are obtained from the following equation:

$$\frac{\partial \Pr(y_i = 1)}{\partial x_{\gamma i}} = \Phi(x_i'\beta)\beta_\gamma$$

As regards RP, the dependent variable is, for each service category, the logarithm of households' expenditure on them, expressed in Euros per year. Each dependent variable is analyzed from an OLS equation of the form:

$$\ln(EXP_i) = x_i'\beta + u_i$$

Where:

EXP_i is household i expenditure on a category of services.

x_i is a vector of independent variables for household i.

The independent variables (x) have been selected following the literature on potentially vulnerable consumers as discussed. Of those socio-economic variables associated with potentially vulnerable consumers, comparable data available across both the *Eurobarometer* and the HBS includes 1) age 2) employment status and 3) education, whilst data is incomplete or not comparable for low income, disabilities, ethnic minorities and rural dwellers. Our selection of independent variables thus focuses on these three dimensions representative of potential vulnerability: age (the elderly); employment (non-employment) and education (basic). In addition, we include control variables in order to correct for the most important factors which may influence satisfaction with and/or expenditure on utility services: country of residence (capturing the effect of each separated market); household size (capturing the effect of the scale on consumption); and housing occupancy status (differentiating home-owners from those who rent). To analyze RP, we also include household income as a control variable, which is particularly relevant as the dependent variable is expressed in monetary terms.

In the analysis of SP, the three dimensions of consumers' potential vulnerability led to the following independent variables (x): employment, the non-employed (*NOOCUP*) compared with the employed; age, those over 64 and those over 74 (*FROM65TO74* and *MORE74*) versus the middle-aged and the young; and education, the lesser-educated (*EBASIC*) versus those with higher education (category of reference). Control variables include: the country, France being the category of reference; household size, a two-person household being the category of reference; and housing occupancy status, comparing non-owners (*NOHOUSEPR*) with owners. We assume a problem exists when consumers with a particular socio-economic background are less satisfied than their peers. Next, we evaluate if this is also reflected in expenditure patterns and, if so, how.

Regarding RP, we focus on the same dimensions to represent consumers' potential vulnerability: employment: those households where no members are employed (*NONEOCUP*) versus those with two or more employed members (category of

reference); the age of the reference person, comparing those over 64 and over 74 (*RP FROM65TO74* and *RP MORE74*) versus the middle-aged and the young; and the education of the reference person, comparing the lesser-educated (*RP EBASIC*) with those with higher education (category of reference). Control variables include the country, with France as the category of reference; household size, by the number of household members and this variable squared; housing occupancy status, comparing non-owners (*NOHOUSEPR*) with owners; and the logarithm of a household's total equivalent expenditure, according to the OECD scale (*lnSPENDEQ*).

5. Estimation results

Estimations for satisfaction and household expenditure on services are shown in Tables 3 and 4. Our discussion of the results is organized by considering the three categories associated with consumers' potential vulnerability: educational attainment; employment status and age.

Table 3. Marginal effects on satisfaction with the price of all the services

		Electricity	**Energy**	**Telephone**	**Telecomm.**
	Variable	Marg. Eff.	Marg. Eff.	Marg. Eff.	Marg. Eff.
Country	*BELGIUM*	0.112***	0.172***	0.201***	0.169***
		(0.018)	(0.021)	(0.019)	(0.020)
	DENMARK	0.161***	0.031*	0.258***	0.229***
		(0.017)	(0.018)	(0.018)	(0.020)
	ESTONIA	0.033	-0.033*	0.052**	-0.027
		(0.021)	(0.019)	(0.021)	(0.018)
	FINLAND	-0.256***	-0.269***	0.040**	0.034**
		(0.023)	(0.013)	(0.019)	(0.017)
	GREECE	0.195***	0.068***	0.272***	0.145***
		(0.017)	(0.019)	(0.019)	(0.019)
	HUNGARY	0.032	0.111***	0.121***	0.007
		(0.021)	(0.023)	(0.021)	(0.018)
	IRELAND	0.002	-0.051***	0.155***	0.043**
		(0.022)	(0.019)	(0.021)	(0.019)
	LATVIA	0.066***	0.050**	-0.039*	-0.105***
		(0.020)	(0.020)	(0.020)	(0.016)
	LITHUANIA	0.252***	0.342***	0.187***	0.128***
		(0.012)	(0.018)	(0.020)	(0.020)
	SLOVAKIA	0.145***	0.296***	0.217***	0.033*
		(0.018)	(0.022)	(0.020)	(0.018)
	SPAIN	0.087***	0.153***	0.133***	0.082***
		(0.021)	(0.023)	(0.023)	(0.021)
Employment	*NOOCUP*	-0.017	-0.031*	-0.045**	-0.045***
		(0.018)	(0.017)	(0.018)	(0.015)
Age	*LESS35*	0.009	0.010	0.046**	0.070***
		(0.021)	(0.019)	(0.021)	(0.019)
	FROM50TO64	-0.016	-0.016	0.003	-0.023
		(0.023)	(0.021)	(0.024)	(0.019)
	FROM65TO74	-0.011	-0.019	-0.061**	-0.110***
		(0.030)	(0.028)	(0.029)	(0.022)
	MORE74	-0.022	-0.013	-0.109***	-0.147***

		(0.035)	(0.032)	(0.031)	(0.021)
Education	*EBASIC*	-0.042*	-0.043**	-0.098***	-0.125***
		(0.021)	(0.020)	(0.021)	(0.016)
	ESECONDARY	-0.035*	-0.034**	-0.024	-0.055***
		(0.019)	(0.017)	(0.019)	(0.016)
Control variables	*ONEPERS*	-0.019	-0.017	-0.053***	-0.050***
		(0.021)	(0.020)	(0.020)	(0.016)
	THREEPERS	-0.023	-0.016	0.037	0.051**
		(0.023)	(0.021)	(0.023)	(0.020)
	FOURPERS	-0.060**	-0.025	0.020	0.039*
		(0.025)	(0.022)	(0.024)	(0.022)
	MOREFOURP	-0.039	-0.042*	0.019	0.019
		(0.028)	(0.025)	(0.027)	(0.023)
	NOHOUSEPR	-0.101***	-0.059***	-0.108***	-0.096***
		(0.019)	(0.018)	(0.018)	(0.015)
N		12,263	12,263	12,263	12,263
Wald chi2		889.40	1,652.71	817.00	972.99
Prob > chi2		0.000	0.000	0.000	0,000

Notes: Standard errors in parenthesis. Statistical significance at 1% (***), 5% (**), 10% (*).

Source: Computed by authors based on EC (2007).

Table 4. Estimates on households' expenditure on household services

		Electricity	**Energy**	**Telecomm.**
	Variable	Coeff.	Coeff.	Coeff.
	Constant term	1.219***	1.575***	-4.430***
		(0.100)	(0.094)	(0.126)
Country	*BELGIUM*	-0.198***	0.146***	-0.895***
		(0.024)	(0.023)	(0.031)
	DENMARK	0.022	-0.059***	-0.155***
		(0.021)	(0.019)	(0.026)
	ESTONIA	-1.327***	-1.359***	0.189***
		(0.045)	(0.042)	(0.057)
	FINLAND	-0.689***	-0.897***	0.064**
		(0.021)	(0.020)	(0.026)
	GREECE	-0.808***	-0.921***	0.522***
		(0.017)	(0.016)	(0.021)
	HUNGARY	-0.269***	0.152***	0.783***
		(0.023)	(0.021)	(0.029)
	IRELAND	-0.639***	-0.487***	0.160***
		(0.027)	(0.025)	(0.034)
	LATVIA	-1.430***	-1.266***	0.098**
		(0.037)	(0.035)	(0.047)
	LITHUANIA	-1.225***	-1.114***	0.032
		(0.032)	(0.030)	(0.040)
	SLOVAKIA	-0.816***	-0.508***	-0.219***
		(0.029)	(0.027)	(0.036)
	SPAIN	-0.679***	-0.427***	0.077***
		(0.012)	(0.011)	(0.015)
Employment	*ONEOCUP*	0.021*	0.012	-0.049***
		(0.011)	(0.010)	(0.014)
	NONEOCUP	0.017	0.003	-0.203***
		(0.015)	(0.014)	(0.018)

Age	*RP LESS35*	-0.150***	-0.152***	0.101***
		(0.013)	(0.012)	(0.016)
	RP FROM50TO64	0.125***	0.125***	0.109***
		(0.011)	(0.011)	(0.014)
	RP FROM65TO74	0.140***	0.166***	0.090***
		(0.016)	(0.015)	(0.021)
	RP MORE74	0.122***	0.178***	0.071***
		(0.018)	(0.016)	(0.022)
Education	*RP EBASIC*	0.025**	0.029**	-0.175***
		(0.012)	(0.011)	(0.015)
	RP ESECONDARY	0.025**	0.036***	-0.031**
		(0.012)	(0.011)	(0.015)
Control Variables	*NMEMBERS*	0.456***	0.431***	0.604***
		(0.010)	(0.009)	(0.013)
	NMEMBERS2	-0.030***	-0.028***	-0.041***
		(0.001)	(0.001)	(0.002)
	NOHOUSEPR	-0.316***	-0.268***	-0.001
		(0.010)	(0.009)	(0.013)
	lnSPENDEQ	0.456***	0.443***	1.003***
		(0.009)	(0.009)	(0.012)
N		71,124	71,124	71,124
F		1,221.66	1,216.69	1,266.59
Prob > F		0.000	0.000	0,000

Notes: RP means reference person. Standard errors in parenthesis. Statistical significance at 1% (***), 5% (**), 10% (*).

Source: computed by authors based on EUROSTAT (2011).

Education. Consumers with basic levels of education are less satisfied with prices of all the services under analysis when compared to consumers with higher education. However, the "satisfaction gap" is much larger between consumers with basic education and the most educated in the cases of telephone and telecommunications prices (the less-educated have a -9.8% and -12.5% probability of being satisfied, respectively), whereas for electricity and energy prices, this gap among the less and more educated, is -4.2% and -4.3%, respectively. Regarding expenditure, consumers with basic education spend slightly *more* on electricity and energy (+2.5% and +2.9%, respectively) than their counterparts, whilst they spend much *less* on telecommunications (-17.5%). Contrasting this data on telecommunications, we observe that the difficulties experienced by the less-educated, reflected in markedly lower satisfaction levels, are translated into a reduced participation in these markets. As for why this might be so, it is possible that market complexity, such as product packages and associated contracts, may act as a deterrent for these consumers. On the other hand, less marked, but still lower satisfaction levels for energy translate into higher expenditure: intuitively, this could be explained by poor decisions taken by these consumers as regards energy-saving strategies.

Employment status. Consumers who are not employed are associated with lower satisfaction with both telephone and telecommunications prices (-4.5%) and also with energy prices (-3.1%), though results obtained considering electricity alone are not significant. Turning to RP, households with no employed members spend *much less* on telecommunications (-20.3%) than the category of reference. So, consumers who are not employed exhibit particular difficulties in telecommunications markets, reflected in their lower satisfaction, which may be leading them to restrict their participation in

these markets. It is important to note that this creates a vicious circle for this group, since they may require fast and reliable telecommunications services in the quest to find employment. As for energy, those not employed spend similar amounts to their peers: we could surmise that their lower satisfaction could be either an inconsistency or that they are paying higher unit cost than their peers, whilst restricting their consumption.

Age. Consumers over 64 and, particularly, those over 74, express *much lower* satisfaction with the price of the category telephone (-6.1% and -10.9% for these groups, respectively): this is sharper still for telecommunications (-11% and -14.7%, respectively). As regards expenditure on telecommunications, those between 65 and 74, and the over 74s, spend *more* (respectively, +9% and +7.1%) than consumers between the ages of 35 and 49. Higher expenditure, coupled with expressed lower satisfaction, suggest that this group of consumers face particular difficulties in these markets and that they are taking poorer consumption decisions (for instance, they may be paying a higher unit price), when compared with consumers between 35 and 49. To illustrate, it is possible that consumers in this category are more likely to demonstrate inertia *vis-à-vis* new telecommunications services, using, for instance, a fixed phone to call a cellular one, and may not consider using newer, cheaper communications technologies provided through the internet. Interestingly, though the over 65s express less satisfaction than consumers between 50 and 64, expenditure by both groups is similar. Either the results here are inconsistent, or, they may be because the over 65s take poorer market decisions, such as paying more for a more restricted range of services. In the case of energy services, age does not appear to influence price satisfaction, so we surmise that differences observed in expenditure are due to consumption and lifestyle preferences.

With respect to other socio-economic characteristics, price satisfaction with telecommunications is lower in households with one member. Additionally, price satisfaction with both energy and telecommunications services is lower among those who do not own their home. Finally, income elasticity is observed to be much lower for electricity and energy than for telecommunications.

The estimations offer other interesting results derived from country differences. Isolating the effects of the socio-economic categories, there are greater differences in expenditure in energy than on telecommunications. This implies that, whilst the differences detected previously as regards consumers' socio-economic background are more important in the telecommunications than in the energy services sector, country differences affect expenditure on energy more than on telecommunications. Moreover, examining country effects on expenditure and satisfaction, in the case of energy, there is no relationship, that is, levels of consumer satisfaction in a given country do not seem to be influenced by the relative expenditure in that country in comparison to other countries. However, in the case of telecommunications, there is a slight relationship in that in countries where expenditure is comparatively lower, satisfaction with price tends to be higher. There are several possible explanations for this. One explanation may be that progress towards an integrated market in telecommunications has gone further than in energy: telecommunications has become a more homogeneous market across Europe as regards price and market conditions, whereas energy markets remain fragmented. Another possible, and related, reason could be that consumers in general are more "savvy" as regards information about telecommunications than energy prices, because they have enjoyed a longer period of competition and deregulation in this sector than in the energy sector.

6. Conclusions

When policy-makers implemented far-reaching reform of the utilities from the 1980s, a key justification was that the introduction of competition, deregulation and privatization would inject greater levels of efficiency into these sectors. Consumers would be major beneficiaries since they would receive higher quality services, whilst enjoying lower prices and greater choice (EC 2004). It followed that consumer satisfaction would increase: indeed, many of these reforms were accompanied by the introduction of consumer satisfaction surveys, such as the *Eurobarometer*. However, as survey results were analysed, governments, international organizations and regulators increasingly recognized that consumer satisfaction was not even. Concern grew that lower consumer satisfaction may be associated with particular socio-economic groups, and that not all consumers were in an optimum position to benefit from the changes and potential benefits opened up by utility reform. At the same time, new thinking on utility reform emerged, which argued demand-side approaches could be useful complements to traditional supply-side methods. Moreover, increased attention was focused on the concept of a potentially vulnerable consumer, understood as a multi-dimensional entity, not necessarily addressed adequately by means-testing alone (European Parliament 2012).

Despite these developments, relatively little empirical analysis had been dedicated to establish what precise links may exist between socio-economic characteristics and consumer satisfaction. The aim of this paper was to contribute to this knowledge gap by analysing this relationship for three household utilities across twelve European countries. To do so, SP and RP were contrasted: though combined analysis had been applied to other fields, this had not been used to examine consumer satisfaction with utilities in multiple countries. Hence, this paper constitutes the first study to do so, using EUROSTAT (2011) data and contrasting this with EC (2007). Empirical knowledge on this topic could help to avoid concerns over regulator bias, also explained using insights from Behavioural Economics (Cooper and Kovavic 2012: 56). We examined three major categories which are commonly associated with potentially vulnerable consumers: the elderly, those not employed, and those with a basic level of education. We found significant results for all three categories. As regards education, we found lesser-educated consumers are less satisfied with the prices of all services analysed than their counterparts, though the satisfaction gap is much sharper for telecommunications than energy. Meanwhile, because the less educated spend relatively more on energy and much less on telecommunications than their counterparts, different explanations for their lower satisfaction were offered using concepts of poor decision making and reduced market participation. Those not employed exhibited slightly lower satisfaction as regards energy and telecommunications prices than their counterparts, whilst households with no employed members spent much less on telecommunications than the category of reference, which may be explained by restricted participation in the market, or an under-use of these technologies. One possible explanation is that market complexity may be off-putting to this group of consumers. Regarding age, consumers over 64 and, particularly, those over 74, express sharply lower satisfaction rates with telecommunications than their younger counterparts, whilst they also spend more than consumers between 35 and 49. We surmise consumers over 64 may be more likely to take poorer quality decisions in this market. Age does not seem to influence price satisfaction with energy.

This study is important for several reasons. Insights from Behavioural Economics could be mobilized to identify particular socio-economic characteristics of consumers which may be associated with potential consumer vulnerability. However, without testing for the relationship between particular socio-economic variables and satisfaction in a particular market, a regulator is overwhelmed with multiple possibilities potentially requiring regulation. The literature on potential consumer vulnerability includes a range of variables, including age, education, place of residence, disability, ethnic group and so on. Because vulnerability is only "potential", it does not follow that each variable in each market will necessarily need regulatory attention, whilst over-regulation, or disproportionate regulation, are undesirable. Hence, it is of interest to test for the relevance between different socio-economic variables with satisfaction data, to identify whether a relationship exists and, if so, how significant that relationship may be. Evidence found in this study could be used to "rank" priorities for regulators when considering where to introduce demand-side regulation, as results show satisfaction "gaps", and also, the associated expenditure patterns (more or less than peers). Finally, because the publication of household budget surveys and variants of consumer satisfaction surveys can be found around the world, this approach to uncovering relative priorities for demand-side regulation could be conducted relatively easily at the international level, and applied to other fields, most urgently perhaps, financial regulation and consumer satisfaction by socio-economic characteristics.

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Annex 1. Sample size and population of the countries included in the analysis.

Country	**Sample size**		**Population size, thousands (2006)**
	Eurobarometer	**EUROSTAT HBS**	
Belgium	1,057	3,550	10,511
Denmark	1,021	2,447	5,427
Estonia	1,000	3,432	1,345
France	1,034	10,240	63,230
Finland	1,013	4,007	5,256
Greece	1,000	6,555	11,125
Hungary	1,002	9,058	10,077
Ireland	1,000	6,884	4,208
Latvia	1,002	3,774	2,295
Lithuania	1,025	7,586	3,403
Slovakia	1,103	4,710	5,389
Spain	1,006	8,881	43,758
TOTAL	**12,263**	**71,124**	**166,024**

Source: EC (2007) and EUROSTAT (2011).

Annex 2. Estimates from ordered probit models on satisfaction with the price of services

		Energy	**Telephone**	**Telecomm.**
	Variable	Coeff.	Coeff.	Coeff.
Country	*BELGIUM*	0.437***	0.520***	0.443***
		(0.054)	(0.053)	(0.050)
	DENMARK	0.079*	0.687***	0.592***
		(0.047)	(0.053)	(0.051)
	ESTONIA	-0.086*	0.130**	-0.076
		(0.051)	(0.052)	(0.051)
	FINLAND	-0.847***	0.100**	0.092**
		(0.050)	(0.047)	(0.045)
	GREECE	0.175***	0.726***	0.381***
		(0.047)	(0.055)	(0.048)
	HUNGARY	0.281***	0.306***	0.019
		(0.057)	(0.054)	(0.050)
	IRELAND	-0.135**	0.395***	0.118**
		(0.052)	(0.054)	(0.051)
	LATVIA	0.127**	-0.098*	-0.317***
		(0.052)	(0.051)	(0.051)
	LITHUANIA	0.898***	0.482***	0.336***
		(0.054)	(0.053)	(0.052)
	SLOVAKIA	0.765***	0.566***	0.089*
		(0.060)	(0.056)	(0.050)
	SPAIN	0.392***	0.335***	0.223***
		(0.058)	(0.059)	(0.057)
Employment	*NOOCUP*	-0.081*	-0.112**	-0.124***

		(0.043)	(0.044)	(0.042)
Age	*LESS35*	0.026	0.116**	0.192***
		(0.050)	(0.053)	(0.051)
	FROM50TO64	-0.041	0.007	-0.064
		(0.055)	(0.059)	(0.055)
	FROM65TO74	-0.049	-0.154**	-0.328***
		(0.073)	(0.074)	(0.070)
	MORE74	-0.034	-0.277***	-0.457***
		(0.084)	(0.080)	(0.074)
Education	*EBASIC*	-0.113**	-0.248***	-0.361***
		(0.052)	(0.053)	(0.049)
	ESECONDARY	-0.089**	-0.061	-0.154***
		(0.044)	(0.047)	(0.044)
Control variables	*ONEPERS*	-0.044	-0.132***	-0.142***
		(0.051)	(0.050)	(0.047)
	THREEPERS	-0.042	0.093	0.138**
		(0.054)	(0.058)	(0.055)
	FOURPERS	-0.065	0.049	0.106*
		(0.059)	(0.060)	(0.059)
	MOREFOURP	-0.110*	0.047	0.052
		(0.066)	(0.068)	(0.064)
	NOHOUSEPR	-0.155***	-0.272***	-0.275***
		(0.047)	(0.046)	(0.044)
	Cut 1	-0,611	-0,791	-1,166
		(0,065)	(0,070)	(0,069)
	Cut 2	0,242	0,072	-0,406
		(0,065)	(0,069)	(0,067)
	Cut 3			0,306
				(0,066)

Notes: Standard errors in parenthesis. Statistical significance at 1% (***), 5% (**), 10% (*).

Source: Computed by authors based on EC (2007).

Annex 3. Estimates from a binary probit model on satisfaction with the price of the service

		Electricity
	Variable	Coeff.
Country	*BELGIUM*	0.345***
		(0.060)
	DENMARK	0.530***
		(0.064)
	ESTONIA	0.096
		(0.062)
	FINLAND	-0.662***
		(0.060)
	GREECE	0.660***
		(0.067)
	HUNGARY	0.092
		(0.062)
	IRELAND	0.004
		(0.061)
	LATVIA	0.196***
		(0.061)
	LITHUANIA	1,010***
		(0.071)
	SLOVAKIA	0.467***
		(0.065)
	SPAIN	0.252***
		(0.063)
Employment	*NOOCUP*	-0.048
		(0.050)
Age	*LESS35*	0.024
		(0.058)
	FROM50TO64	-0.044
		(0.064)
	FROM65TO74	-0.030
		(0.084)
	MORE74	-0.062
		(0.095)
Education	*EBASIC*	-0.117**
		(0.059)
	ESECONDARY	-0.097*
		(0.052)
Control variables	*ONEPERS*	-0.053
		(0.059)
	THREEPERS	-0.065
		(0.063)
	FOURPERS	-0.164**
		(0.066)
	MOREFOURP	-0.108
		(0.076)
	NOHOUSEPR	-0.277***

	(0.052)
Cons	0,549***
	(0,074)

Notes: Standard errors in parenthesis. Statistical significance at 1% (***), 5% (**), 10% (*).

Source: Computed by authors based on EC (2007).