

A Survey to Estimate the Consumers' Surplus of Maritime & Amateur Aviation Radio Users

Introduction

This talk will describe research undertaken to estimate the consumers' surplus of maritime and amateur aviation radio users in the UK. The talk will provide an outline of the work done and the results obtained, focusing on the issue of bias, and the measures taken to contain it.

The survey was to establish the consumers' surplus of the following groups of radio-users:

- Commercial ship operators
- Harbour and port operators
- Businesses with private maritime channels
- Marinas and boating clubs
- Private boat owners
- Private pilots of powered aircraft
- Glider pilots and balloon captains

Thus there were two broad groups of respondents: businesses using radio for commercial purposes, and private individuals using radio in their leisure time. Previous experience and discussions with the Agency had alerted us to the potential sensitivity of this research among licence holders. Bias is always a concern in survey design, but it was clear that it would be a specific concern in this work.

The potential for bias

Bias in survey work can occur under several headings:

- Sampling bias;
- Response bias, because the cross section of respondents who reply is biased, even in the absence of sampling bias;
- Survey instrument bias, or, more plainly, bias deriving from the wording of questions or the tasks respondents are asked to carry out;
- Analytic bias, due to poor analytic or weighting procedures.

The first and last of these are of less concern in this talk. Sampling bias was minimised because of the availability of a complete list of licence holders from which a random sample could be drawn. The analysis method was the estimation of logit choice models using maximum likelihood, with re-weighting to provide expansion to the full market based on the known numbers of licence holders.

It is the second and third topics that this talk will focus on: response bias, or more correctly, *non-response bias*, and survey instrument bias of a particular kind, known as *policy response bias*.

Non-response bias

'Non-response bias' is bias resulting from response-rates being lower among certain groups than others, leading to these groups being under-represented in the results. The potential for this type of bias varies depending on the nature of the research, and the survey methodology. In this study we had a target population who shared a common interest in the research topic, and therefore at least some incentive to respond.

Steps taken to reduce non-response bias

The main survey instrument was a postal questionnaire, followed up by telephone for certain segments. The tone of the questionnaire and covering letter was designed to be open about the nature of the research and to encourage people to participate. Respondents were invited to contact SDG by phone or e-mail with any questions or comments, and space was provided on the questionnaire for respondents to make comments. Respondents were re-assured about the confidentiality of their responses. They were asked to indicate if they wanted the Agency to be able to match up their identity to their responses – the reverse of what is typically on questionnaires, where people are asked to tick a box if they do NOT want their name to go on the distribution list, etc.

All questionnaires were tested before the main mail-out, in order to understand the language of each group of radio-users, and the context of their radio-use. For private boat-owners, face-to-face interviews were undertaken at a marina. For the other segments, interviews were done face-face or by telephone.

The questionnaires were designed to look smart and reasonably easy to complete. Experience shows that an awkward question requiring reference to files or a calculator can reduce the response-rate to a survey. For this reason it was made clear that careful estimates of radio system costs were sufficient, and the SP choice exercises were kept simple and clear. There were no calculations for respondents to complete.

Policy-response bias

'Policy-response bias' is the term used to describe the type of bias that results from respondents drawing their own conclusions about the intentions behind the research, and responding in such a way as to influence policy-makers' decisions in their favour. For instance in public works projects like Metro schemes respondents might overstate their willingness to use a new service if they hope to influence the decision makers to build it. In the context of this particular study, the objective was to determine the willingness to pay of radio users for what they already have. Thus it was considered that there was potential for respondents to deflate their stated willingness to pay, since they already have their radio systems, and they probably feel that they are already paying enough for their use of radio. Those who are in reality willing to pay more, would probably fear that if this were known, they might be required to do just that.

Steps taken to reduce the Policy-Response bias

Stated Preference (SP) questions ask respondents to choose between competing products and services, described in terms of their 'attributes' and price. Typically these descriptions will mix familiar attribute values and prices with others that are new. In this study, respondents were asked to choose between pairs of competing products, with a third option of rejecting both. We aim to reduce response bias by:

- Constructing choices so that the underlying purpose of the research is not too apparent;
- Constructing choices so that it is not clear to respondents how they could influence the outcome of the research by the answers they give.

In turn, these are achieved by:

- Offering combinations of improvements and worsenings in attributes and costs;
- Varying costs that were not under the control of the Radiocommunications Agency (ie the licence fees were *not* varied); and
- Using decoy questions that are not part of the underlying design and are not used in the analysis.

It is probable that some groups are less prone to response bias than others. Those for whom radio is not essential, or who have an alternative to radio, may be of this type. Among private boat owners, for instance, 70% of those responding carried a mobile phone as an alternative to their radio.

Outcomes

A total of 4,482 questionnaires were sent out by post. Response rates were highest in the private boating and aviation segments; 30% of questionnaires were returned. They were rather lower for commercial ship radio and coastal station radio, with about 10% of questionnaires being returned by the cut-off date. The estimated consumer surplus figures are given in Table 1.

Table 1: Consumers' surplus

Segment	Licences	Capital cost (£)	CS (£)	Life-span (yrs)	CS (£ pa)	Total CS (£ pa)
CSR marina	1,149	£849	£128	10	£13	£14,746
CSR (Int'l)	921	£2,090	£734	13	£56	£52,037
CSR UK	930	£3,216	£838	12	£70	£64,903
Private boat owners	56,001	£947	£293	11	£27	£1,493,630
Ships (no satellite)	6,399	£2,249	£2,827	9	£314	£2,009,665
Ships (satellite)	600 ¹				£2,514	£1,507,919
Gliders	2,146	£952	£328	14	£23	£50,348
Aircraft (<= £2000)	2,169	£997	£348	13	£27	£58,077
Aircraft (> £2000)	2,334	£11,932	£876	16	£55	£127,777
Grand total						£5,379,103

¹ The estimate of the number of ships with satellite systems is based on a random sample of ships that were checked on the INMARSAT web-site.