

# Discrete choice modelling

## Methods for understanding why people make the choices that they do

In many fields, the choices made by individuals will determine the effectiveness of policy. Understanding what drives people's choices and how these choices may change is critical for developing successful policy. **Discrete choice modelling** provides an analytical framework with which to analyse and predict how people's choices are influenced by their personal characteristics and by the different attributes of the alternatives available to them.

### Learning from real-life choices

In an ideal situation we would build discrete choice models using information from choices that people are observed to make, i.e., revealed preference (RP) information. From these data we can quantify the influence of particular variables in the real choice context; for example, how important is price in the decision to travel by train? There are, however, potentially a number of problems with these data:

- the range and variation of the explanatory attributes may be limited; for example, in highly competitive situations there may be little price variation across alternatives;
- the attributes may be very highly correlated; for example, the best quality alternatives may always be the most expensive;
- the attributes may include measurement errors;
- it is not possible to observe choices for alternatives that do not yet exist; for example, new technologies.

### Using experiments to overcome data deficiencies

In cases where the data limits the information provided by real choices it may be appropriate to collect stated preference (SP) data, which is information on preferences provided from hypothetical choice situations.

A number of procedures for eliciting stated responses exist, but modern practice focuses on the use of discrete choice experiments (DCE), which involve the presentation of hypothetical choice situations to survey respondents. In SP DCE each alternative is described by its relevant attributes, e.g., the quality of the service, the cost of the service, future characteristics, etc. Each of the attributes in the experiment is also described by a number of levels, e.g., low cost versus high cost. The

### Choice modelling: Research projects

#### Transport sector

- Development of discrete choice travel demand models reflecting choice behaviour of travellers
- Value of time studies to assess travellers' willingness-to-pay for travel time reductions
- Appraisal of transport infrastructure, including High Speed Rail services
- Understanding and quantification of behavioural responses as a result of tolls

#### Health sector

- Understanding and quantifying patients' preferences for treatment alternatives
- Evaluating patients' willingness to use alternative healthcare providers

#### Postal sector

- Quantification of postal service characteristics, including reliability

#### Valuation studies

- Quantification of the value of the outputs of public sector services, e.g., adult social services
- Willingness-to-pay for rural post offices

#### Labour market models

- Understanding entry and exit variables influencing recruitment and retention

#### Consumer demand

- Quantification of demand for new products and services, e.g., future-generation mobile phones, digital television, lottery products

attribute levels are combined using principles of experimental design to define different packages of goods or services, which individuals then compare in surveys (for an illustration, see Figure 1).

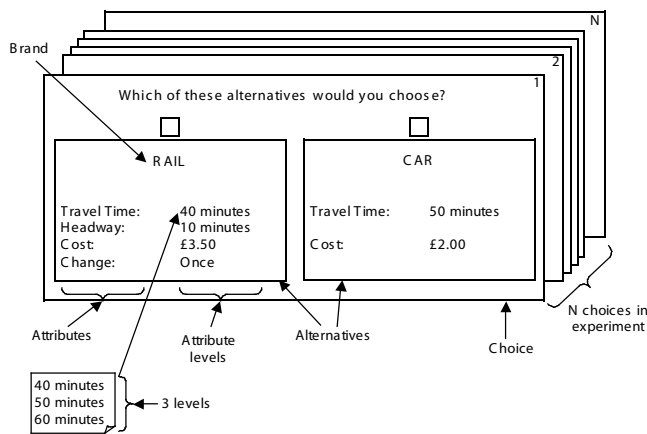
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**Figure 1: Structure of a SP Discrete Choice Experiment**



There are many benefits of SP hypothetical choice experiments:

- choice experiments can reduce correlation between explanatory attributes, since the analyst controls the experimental design;
- they provide an efficient means for collecting data, since more than one choice observation can be collected from each respondent;
- stated preference data are particularly useful for evaluation of future policies, for which no revealed preference data exists.

The main drawback is that they are hypothetical.

**Combining data sources to improve understanding**

Both revealed preference and stated preference data have strengths and weaknesses. For this reason, when possible, it is desirable to use RP and SP data together. In pooling these two types of data, the main information concerning the relative importance of specific attributes comes from the SP data, while information concerning the overall likelihood that a person will choose a particular alternative is derived from the RP data. RAND Europe has pioneered procedures for combining RP and SP data to exploit the strengths of each of the data types to best advantage.

**Quantifying drivers of choice**

The outputs from discrete choice models can be used to improve understanding of the drivers of people’s choices, including:

- estimates of the relative importance of each of the product or service attributes;
- identification of different choice behaviour by different groups within society;
- estimates of the trade-offs or marginal rates of substitution that people are willing to make between attributes, providing indirect measurements of willingness-to-pay;
- estimates of consumer surplus, i.e., monetary valuation of the benefits obtained from different services.

In obtaining estimates of willingness to pay, stated preference techniques, using a discrete choice approach, are preferred to open-ended (contingent valuation) techniques, where the respondent is simply asked to estimate how much he would pay for specific services. Such open-ended questions can be subject to significant bias if respondents feel that they can make a political statement through their response. In SP techniques, the variable of interest is treated as one of a number of important variables in which the respondent trades, which tends to reduce this type of bias. SP choice responses are also closer to the types of decisions that people have to make in real life, and are therefore deemed as being a more reliable means of eliciting preferences.

**Forecasting future behaviour**

The outputs from discrete choice models can also be used to develop predictive models to gain insight into how people’s choices may change under differing circumstances. Using these models is particularly useful for policy makers to demonstrate the likely impacts of a policy. The models can provide estimates of both the overall changes in demand for services, as well as insight into how a policy may impact different groups within society. These models can also quantify how individual attributes influence demand, thereby providing estimates of elasticities. When deriving forecasts and elasticities, it is necessary to quantify the absolute scale or sensitivity of choice responses and in this respect, RP data are required.

**Further reading**

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