Transport Choices in Remote Communities

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Abstract

Ferry services are essential to the wellbeing and quality of life of residents in Scotland’s islands and remote peninsulas. They connect residents with key services and opportunities, and provide affordable access for tourists and visitors. To ensure that the services receive the correct level of public funding, it is important to understand the value that residents and visitors put on these services.

The aim of the study was to develop an up-to-date evidence base that could be used to forecast demand and appraise a variety of options for changes to ferry services. To this end, Stated Preference (SP) research was undertaken on a representative sample of routes across the northern and western seabords of Scotland. This varied from shorter commute and day trip services on the River Clyde to overnight sailings to the Shetland and Orkney Isles. A total sample of 1,350 respondents was achieved, providing a robust basis for the development of new guidance.

The primary research and subsequent data analysis provided insights into how behaviour and choices differ in this rural context from the more traditional urban contexts. The value of time was found to display a strong correlation with distance. Further investigation showed a number of interesting factors at play, including increased incomes, markedly different journey purposes, and the possibility that, for example, a two hour time saving was viewed as a more productive period per minute than an equivalent five minute saving. The infrequent nature of the network also allowed the concept of Schedule Adjustment Time to be investigated, with the possibility of services departing or arriving many hours or later than in the current timetable. Statistically significant relationships of a plausible sign and magnitude were identified on this relatively under-researched topic.

In addition to the more traditional market segment variables of journey purpose and income, the survey also included questions pertaining to attitudes and lifestyles. Subsequent profiling using cluster analysis revealed latent segmentation variables that accounted for difference in taste and preference across the sample. In particular there were differences with regard to whether respondents were native to the island or peninsula served, and the views of residents and visitors alike in preserving a feeling of remoteness and tranquillity.
1 Introduction

Ferry services are essential to the wellbeing and quality of life of residents in Scotland’s islands and remote peninsulas. They connect residents with key services and opportunities, and provide affordable access for tourists and visitors.

In 2006 the Scottish Executive published a National Transport Strategy which included a commitment to carry out a comprehensive review of ‘Lifeline Ferry Services’. This commitment was later reinforced by the Scottish Government who identified the need to:

- develop a shared vision and outcomes for Lifeline Ferry Services;
- analyse the current Lifeline Ferry Services and network, identifying how well it meets the proposed outcomes and how it links to other modal networks;
- inform the long-term strategy for Lifeline Ferry Services, and influence the next round of procurement of ferry services and supporting infrastructure; and
- identify policies to be taken to deliver the long-term strategy, including the planned investment framework.

To support this evidence-based review, new research was commissioned to develop an improved understanding of the value that residents and visitors put on Lifeline Ferry Services, and specifically to:

- develop a set of attribute valuations for the main aspects of Scottish ferry services;
- understand how these values and taste and preference vary by geography, route type, and user characteristics;
- develop guidance and recommendations that are consistent with the principles of Scottish Transport Appraisal Guidance; and
- produce appropriate valuations and recommendations for use in the modelling and appraisal.

This paper describes the specification and analysis of Stated Preference research designed to help meet these aims.

2 Research Design

Residents and visitors accessing remote communities face choices in terms of their trip frequency, choice of mode, choice of destination and choice of service operator. The availability of alternative travel options creates a credible context in which to question survey respondents about their travel preferences. To keep the choice experiment simple and to ensure that all respondents were offered a genuine trade off, the majority of respondents were presented with a choice of alternative ferry services (A and B) but on two specific routes, car travel by bridge was included in order to understand how individuals trade between ferries and other modes.

A ‘long list’ of attributes affecting the demand for ferry travel was drawn-up and prioritised in consultation with eight Lifeline Ferry operators. In order of importance, the attributes were: frequency of sailing (=1st), reliability (=1st), fares (=3rd), vessel type (=3rd), vessel facilities (5th), schedule adjustment time (6th), crossing time (7th), terminal facilities (8th) and timetabling of departures (9th).

Three attributes were selected to be common across the experiment for all surveyed routes (fares, crossing time, and sailings per day or frequency of service) with additional attributes to be included on a route-by-route basis.

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1 Scottish Government in their response to the Scottish Parliament’s Transport Infrastructure and Climate Change Committee (TICCC) in 2008.
Vessel type was included on the majority of the surveyed routes. This required the definition of a series of vessels – A – that are firstly typical of the route in question, and then a second vessel – B – that offered a significant contrast with Vessel A. For the purposes of this research, this was taken to be, where possible, a larger Vessel B as opposed to a smaller Vessel A with differing levels of facilities. These facilities consisted of a trade off between a ‘basic’ and an ‘enhanced’ facilities package. The basic and enhanced packages were the same for all surveyed routes and consisted of a combination of rest rooms, vending machines, shops, snack bars, restaurants, and children’s play areas. All other attributes that could enter the respondent’s decision-making process were controlled through a series of explicit instructions such as “each vessel in these choices is assumed to have the same vehicle-carrying capacity and is assumed to travel between the same two ports as your current journey”. The resulting value placed on the vessel type will combine both the facilities offered and any taste and preference associated with the vessel type itself (ie a bigger vessel). Annex 1 presents the nine vessel types considered within the research.

Adjustment time or Schedule Adjustment Time (SAT) captures the constraint imposed upon the traveller by the current timetable. For example, they may have a preferred departure or arrival time that does not match their ideal time of travel and they are therefore forced to ‘adjust’ their travel arrangements to fit in with sailing times. The concept has been most readily studied in the UK rail industry, but is particularly pertinent where public transport services are spasmodic or drop below certain thresholds of frequency. For the purposes of this research, SAT was included as an attribute on all routes with headways between services of two hours or more. This was presented in terms of a shift (either earlier or later) in the ferry’s departure around the current departure time.

For a number of routes, the days of the week that the ferry service operated was identified as a key attribute in concurrent Lifeline Ferry Review public and stakeholder consultation. As a result, the days per week (and actual days of the week) operated were included on two of the designs. This was expressed in terms of the number of days per week that the ferry operates plus variations in the actual days themselves (eg either a Saturday or Sunday sailing option).

Finally, for frequent routes that operated seven days per week, a different timetable related attribute was included. On higher frequency routes (eg where sailings per day was greater than 20), the influence of a regular, even interval, or clockface timetable (eg 10 and 40 minutes past each hour) was tested against more uneven or irregular spacing of sailing times.

The choice context and response variable (or space) is where the respondent indicates their choice, preference or intention. Whilst a straight discrete choice between alternatives is usually the chosen means, there are some subtle variations that may enrich the experience for the respondent and subsequent model estimation. For this research, the respondent was asked to provide not just their first choice or preference, but also a second choice. Consequently, if both ferry alternatives did not satisfy their requirements and they would choose “not to make this ferry journey” than they still had to state a preference for the two remaining ferry alternatives. Figure 1 illustrates an example choice scenario and response space from one of the final designs.
3  Data

Self completion questionnaires were distributed across 76 routes, sampled by location, length of crossing, and potential user groups. The routes were grouped and classified as:

- Shetland Islands to the mainland;
- Shetland Islands internal;
- Orkney Island to the mainland;
- Orkney Islands internal;
- Western Isles to the mainland;
- Western Isles internal;
- Inner Hebrides to the mainland;
- Inner Hebrides internal;
- Firth of Clyde; and
- Mainland to mainland.

A total of 1,354 responses were received from approximately 3,600 distributed surveys (response rate = 37%). Response rates differed markedly between areas - particularly high response rates were obtained on the Uig-Lochmaddy-Tarbert triangle and Ullapool-Stornoway, the Mallaig-Armadale route, and the pilot route of Brodick to Ardrossan. The lowest response rates were obtained from the internal routes on the Shetlands and Orkney Isles. Noteworthy characteristics of the sample include:
Of the 1,315 respondents who provided details of their home address, 349 (27%) were residents of a ferry dependent island or peninsula and 966 (73%) were visitors.

57% of respondents were visitors who were either starting or returning from an overnight (or longer) stay. 17% of the total sample was visitors making a day trip to an island/peninsula. Amongst island residents, 45% were on a day trip whilst 55% were undertaking an overnight stay or longer.

The majority of respondents (62%) were travelling in the interpeak (09:00 to 16:00), with a very small number sailing on services departing before 05:00 or after 19:00.

Local residents were on a broad mix of journey purposes, with 'visiting friends and family' being the most popular at 20% of all resident journeys. Shopping, commuting, going on holiday and travelling on employer's business all represented 12% to 14% of the resident sample.

As would be expected, non-residents of ferry dependent communities were primarily engaged in holiday, recreational, and visiting friends and family journeys. A small, but significant number (9%), were engaged in employer's business on the surveyed journey.

On average, island and peninsula residents were travelling with another adult and 0.4 children. By contrast, group size was bigger for visitors.

A large number of respondents were travelling on standard single and return tickets (65%), with significant proportions making use of multi-journey or 'Island Hopscotch' tickets which provide a discount on the fare per journey.

Over 50% of residents made the journey at least once a month, compared to less than 10% of visitors. However, amongst the latter there are significant proportions that make quite regular journeys, with approximately 40% making the journey between one and ten times a year.

Over 50% of visitors were making their first journey on the surveyed route.

The majority of respondents (approximately 80% regardless of respondent type or leg of the journey) were using a car for access and egress.

For Scottish residents only, the split was 53% male to 47% female with a broadly representative distribution across age groups.

There is a broad mix of employment status, with the largest proportion (42%) working full-time (> 30 hours a week). Significant proportions are also working part-time (<30 hours a week), or self-employed (full or part time), wholly retired, or 'other'. The latter group encompasses those in full-time education, unemployed, looking after the home or family, or who are permanently sick or disabled.

4 Data Analysis

The data from the SP experiment was analysed under a choice modelling framework. The aim was to develop models that showed the probability that a decision-maker will choose a choice alternative and to quantify how this choice probability is influenced by changes in the attributes of the alternatives. By comparing the relative influence of one attribute against another, it is possible to infer its relative value. For example, by comparing the influence that changes in crossing time have on choice compared with the influence that changes in fare have on choice, it is possible to estimate the implied Value of Time (VoT) in monetary units.

Following conventional choice modelling practice, we undertook the initial analysis using a Multinomial Logit (MNL) model. Further work will extend away from this in order to consider segmentation by geography, respondent type and/or vehicle occupancy levels.

The attributes of the choice alternatives varied between different surveys, whilst some versions offered 'do not make this ferry journey' or a car alternative as the third potential choice in the scenario. It was therefore necessary to specify a series of separate utility functions for each different ferry alternative in
the surveys in order to reflect the attributes that were offered to each respondent. The ferry attributes included:

- fare;
- crossing time;
- sailings per day;
- Schedule Adjustment Time (SAT), in terms of earlier or later departure around their ideal time;
- days per week operated, including capturing the value of potential (or existing) Sunday services on some routes;
- facilities onboard the vessels, expressed as two distinct packages;
- vessel type (although this can only be analysed at a ‘basket’ or route level as the majority of the vessels were restricted to a particular route or basket); and
- regularity of the timetable, expressed as either regular (eg XX:15 minutes past each hour) or irregular (eg ‘departure times vary throughout the day) timetabling.

Where attributes are common to all (or some) of the ferry alternatives in the surveys, a common coefficient can be estimated to explain their influence on taste and preference. Depending on the attribute in question, coefficient estimates are either continuous valuations (ie for a minute of crossing time or x pence change in fare) or constant values (ie for a particular vessel type or a change from ‘basic’ to ‘enhanced’ facilities).

Fare, crossing time and days per week were entered as continuous variables within the utility constructs. Ferry crossing time and car journey times are estimated jointly with one coefficient (\( \beta_2 \)). The number of sailings per day was entered as the difference from the current situation, with (initially) separate coefficients estimated for whether this represented an increase or decrease. This was done in order to test the hypothesis that respondents would value, for example, a reduction of one sailing per day as a greater disbenefit than the corresponding benefit of an increase of one sailing per day. In effect, where normally symmetry is assumed in terms of changes either side of the current situation, the assumption was that for low frequency services, such as many of the surveyed ferry services, this would no longer hold true. In addition, the model was set up such that above a certain threshold (\( \theta_1 \)) of sailings per day the attribute is better considered in terms of the headway (or ‘gap’) between the services. The sailings per day threshold at which this change occurs was estimated using a manual ‘grid search’ method to maximise the overall goodness-of-fit of the model. Both sailings per day and headway were entered into the model as continuous variables.

Schedule Adjustment Time (SAT) was also specified to have separate coefficients dependent upon whether the respondent was presented with a ferry alternative that departed earlier or later than their ideal time. It was hypothesised that the disbenefit of departing later than the ideal time would be greater than the corresponding earlier departure, due to a greater need to reschedule other arrangements, appointments, activities etc. If the departure was earlier, there will also be some potential disbenefit associated with extra wait time or early arrival for the activity in question, but no need to reschedule the activity. In a similar manner to the sailings per day threshold, early SAT was also modelled with a series of thresholds (\( \theta_2 \)) to identify whether there was a point at which early departure began to impose a greater disbenefit per minute than lower adjustment times, ie are respondents willing to accept a departure time that is 15 minutes earlier than ideal as no significant disbenefit, but as soon it goes above that threshold then disbenefit begins to occur. Figure 2 illustrates the concept in diagrammatic form.
The presence, or otherwise, of a Sunday service in the days per week variable was modelled as a separate constant through a series of dummy variables (1 if Sunday service available on route and 0 otherwise). Likewise the presence of an unevenly spaced timetable, as opposed to a base of an evenly spaced timetable, was also modelled as a constant value. The move from a ‘basic’ to an ‘enhanced’ level of facilities and ‘not making the journey’ are also modelled as constant values, ie they have no inherent continuousness.

Where the car alternative was present, the associated fuel cost and journey, or In-Vehicle, Time (IVT) were entered as continuous variables.

The model presented in Table 1, and all subsequent models, were estimated using BIOGEME v1.8 (Bierlaire, 2003). In this model, the two sailings per day coefficients have been conflated into one which just represents the change from the current situation as no discernible effect could be found at the aggregate level between an increase or a decrease.

**Figure 2: Modelling Schedule Adjustment Time**

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Table 1: Results - Motor Vehicle & Motorcycle Passengers Only

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Coef</th>
<th>t-Stat</th>
<th>Implied Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fare ($\beta_1$)</td>
<td>-0.000466</td>
<td>-15.12**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Time ($\beta_2$)</td>
<td>-0.0107</td>
<td>-14.73**</td>
<td>22.96</td>
<td>p/min</td>
</tr>
<tr>
<td>Sailings per day $\theta$ &lt;=8 ($\beta_3$ and $\beta_4$)</td>
<td>0.154</td>
<td>9.63**</td>
<td>-330.47</td>
<td>pence</td>
</tr>
<tr>
<td>Headway $\theta$ &gt;8 ($\beta_5$)</td>
<td>-0.00393</td>
<td>-4.72**</td>
<td>8.43</td>
<td>p/min</td>
</tr>
<tr>
<td>Schedule Adjustment Time – early; 0 to 15 mins ($\beta_{6-1}$)</td>
<td>-0.0143</td>
<td>-2.15**</td>
<td>-30.69†</td>
<td>p/min</td>
</tr>
<tr>
<td>Schedule Adjustment Time – early; &gt; 15 mins ($\beta_{6-2}$)</td>
<td>0.00353</td>
<td>8.58**</td>
<td>7.58†</td>
<td>p/min</td>
</tr>
<tr>
<td>Schedule Adjustment Time – late ($\beta_7$)</td>
<td>-0.00373</td>
<td>-8.97**</td>
<td>8.00</td>
<td>p/min</td>
</tr>
<tr>
<td>Days per Week ($\beta_8$)</td>
<td>0.0618</td>
<td>3.40**</td>
<td>-132.62</td>
<td>pence</td>
</tr>
<tr>
<td>Enhanced Facilities ($\delta_2$)</td>
<td>0.379</td>
<td>8.01**</td>
<td>-813.30</td>
<td>pence</td>
</tr>
<tr>
<td>Sunday Sailing ($\phi$)</td>
<td>0.106</td>
<td>1.82</td>
<td>-227.47</td>
<td>pence</td>
</tr>
<tr>
<td>Car - Fuel Cost ($\beta_9$)</td>
<td>-0.00172</td>
<td>-7.85**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Not Travel ($\epsilon_{NT}$)</td>
<td>-1.79</td>
<td>-23.48**</td>
<td>3841.20</td>
<td>pence</td>
</tr>
</tbody>
</table>

Notes: (1) As the early SAT is entered into the model as a negative value, a positive coefficient will imply a disbenefit to the users and a negative coefficient a benefit. This is the transverse of normal attribute valuation. (2) ** = significant at the 5% level.

Model 1 shows a good degree-of-fit to the data with a Rho squared statistic equal to 0.215. In terms of goodness-of-fit, a Rho-squared statistic of 0.10 or above can be considered ‘good’ with values less than 0.1 common in multinomial logit analysis of SP data, although this is highly dependent upon sample size. The coefficients all have intuitively correct signs and plausible magnitudes, and are generally estimated with a high degree of precision (as measured by their t-stat).

The relative values of the coefficients ($\beta_2 / \beta_1$) indicate that respondents trade time against fare at a rate of 22.96 pence per minute (£13.78/hour), and sailings per day (when eight or under) against fare ($\beta_3 / \beta_1$) at a rate of -£3.30 per sailing, i.e., motor vehicle or motorcycle passengers are willing to pay £3.30 for an additional sailing per day. In this aggregate analysis, no significant variation could be found to suggest that respondents valued gains or losses from the current situation differently. For routes with more than eight sailings per day, the headway variable becomes the more attractive means of capturing
frequency of sailing. On such routes, respondents trade headway against cost ($\beta_3/\beta_1$) at a rate of 8.43p/min, ie a minute of crossing time is valued approximately 2.7 times higher than an equivalent minute of headway (22.96/8.43).

Respondents were asked to consider the fare in terms of the difference from the actual price they had paid for the journey they were undertaking when surveyed. Given the nature of ferry pricing structures and booking systems, this will typically be inclusive of all passengers in a vehicle. In addition to the respondent who completed the survey, some vehicles will have been carrying additional passengers. The average occupancy obtained from the responses of approximately 2.3 passengers per vehicle would imply an aggregate STAG VoT per vehicle of approximately £11.75/hour (2009 values and prices)\(^2\). This is marginally below the estimated VoT of £13.78/hour, and suggests that the SP experiment has produced valuations that are in line with other well established evidence. The effects of occupancy are investigated further in subsequent models.

The move from ‘basic’ to ‘enhanced’ facilities is valued positively at the equivalent of a reduction in the fare of £8.13 or a reduction in the crossing time of 35 minutes. This variable is likely to vary significantly by route/basket/geography and/or crossing time; consequently, this aggregate valuation will not be applicable across all Scottish ferry services. At the aggregate level, no discernible or plausible difference could be found for the vessel type, over and above the effect of the facilities offered and/or valuation of a larger vessel per se.

No statistically significant, or plausible, estimate of the move from an even to an unevenly spaced timetable ($\gamma$) could be found. As a result, this coefficient was excluded from the final version of Model 1. This remained true for all subsequently estimated models, and suggests that respondents are willing to accept this constraint of the timetable.

There remain a number of alternative formulations for modelling Schedule Adjustment Time (SAT). These include treating early and late departures around the ideal time as a continuous variable, or separating out the latter as it may impose a greater disbenefit per minute. There is also prior research evidence which suggests that an earlier departure can, up to a threshold, provide a benefit if it reduces the risk or uncertainty associated with arrival. It is such a formulation which was illustrated in Figure 2. A number of different thresholds were tested for $\theta_2$ (in Figure 2) until 15 minutes earlier was found to be the threshold at which goodness-of-fit of the model was maximised. Early SAT at up to 15 minutes was found to have a positive benefit with a valuation of -30.69p/min, whilst early SAT of 15 minutes plus was valued at 7.58p/min. Later departure had a very similar valuation to the latter at 8.00p/min. It should be noted that these latter two values are almost identical, implying that any significant variation around the ideal time incurs the same disbenefit whether early or late.

Figure 3 illustrates the modelled trend for SAT, which closely matches the prior hypothesis in Figure 2. Further work is required to smooth the modelled curves as they produce unrealistic changes in utility for, for example, moving from a 15 to a 20 minute earlier departure. The slopes seen in Figure 3 were partly a result of the SAT levels presented in the SP experiment, which limit the potential of the model to isolate the exact point at which early departure begins to become a disbenefit.

\(^2\) STAG Unit 9.5.12 recommends a non-working ‘other’ VoT per vehicle occupant of £4.46/hour (2002 values and prices; perceived cost). Uprating the VoT to a 2009 value, using the recommended guidance in STAG Unit 9.5.13, results in a VoT of £5.11/hour per vehicle occupant.
Figure 3: Motor Vehicle & Motorcycle Passengers Utility of Schedule Adjustment Time

'Not making the ferry journey' ($\varepsilon_{NT}$) imposes the monetary equivalent of a £38.41 penalty upon the respondent.

The coefficients presented in Table 1 represent average values for all Scottish Lifeline Ferry services, and will mask significant underlying variation. They are not therefore suitable for modelling and appraisal without further analysis of their functional form, including threshold specification, and appropriate segmentation. However, they do show that, on average, the responses from motor vehicle and motorcycle passengers are producing coefficient estimates of a plausible direction and magnitude. A summary of the outcome of the additional analysis is provided below.

5 Results

Attribute valuations are the heart of the appraisal process; by understanding how changes in service patterns, and other more qualitative aspects of ferry services, are ‘valued’ by users we can quantify any impact for a cost:benefit analysis. This allows different options to be fairly appraised against each other, and solutions to be derived which maximise welfare and user benefits. This section builds on the model described in Section 4 by adapting the coefficient estimates and resultant values so that they are consistent with the evidence base within STAG. Some adaptation is necessary as sample sizes, whilst giving significant coefficient estimates, may not always produce a trend which shows an appropriate relationship between the valuations and the market segmentation employed.

Central to transport scheme appraisal is the notion of equity, whereby valuations should not vary spatially or by population group, thereby ensuring that each member of society receives equal weighting within appraisal processes. Time savings to travellers in their own time typically make up a large proportion of the benefits of transport investment. If values of time for appraisal are based on an individual’s willingness to pay (behavioural values) which are related to income, then strategies and plans will be biased towards those measures which most benefit travellers with higher incomes (which may favour some modes over others). Investment will then be concentrated into high-income areas, and the interests of those on lower incomes, who may already suffer from relatively lower mobility and
accessibility, will be given less weight. For this reason, the appraisal of transport schemes which involves allocating funding across different geographies and population groups should normally adopt the values of time, etc, which differentiate by journey purpose, but are common across all modes and geographic areas.

Table 2 presents a series of valuations (in 2009 values and prices) for all Scottish Lifeline Ferry Services. The valuations take account of:

- the differential between foot and car passenger valuations;
- vehicle occupancy levels, by specifying valuations on a per passenger basis;
- crossing time bands; and
- journey purpose.

The valuation(s) of Sunday sailings are high and may not be reflective of a single journey, but rather the availability of such a service throughout the year, ie the value that individuals are willing to pay for an annual Sunday service. For individual baskets where the option of a Sunday sailing was given, the estimated coefficient was found to be statistically insignificant, with the exception of motor vehicles on Western Isles to Mainland routes and visiting foot passengers on the Orkney to Mainland routes. Due to the general insignificance of the coefficient, and uncertainty with respect to how any valuation could, and should, be applied in practice, we have at this stage excluded from the attribute valuations.
Table 2: Recommended Attribute Valuations by Crossing Time Band and Journey Purpose

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Crossing Time (p/min)</th>
<th>Sailings per day &lt;=8 (pence)</th>
<th>Headway when sailings &gt;8 (p/min)</th>
<th>SAT – early (p/min)</th>
<th>SAT – late (p/min)</th>
<th>Days per Week (pence)</th>
<th>Enhanced Facilities (pence)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motor Vehicle Occupants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 120 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commute &amp; Employer’s Business</td>
<td>19.2</td>
<td>-289.2</td>
<td>7.6</td>
<td>6.0</td>
<td>6.1</td>
<td>-723.9</td>
<td>-115.1</td>
</tr>
<tr>
<td>Leisure</td>
<td>13.9</td>
<td>-209.2</td>
<td>5.5</td>
<td>4.3</td>
<td>4.4</td>
<td>-523.6</td>
<td>-83.2</td>
</tr>
<tr>
<td>120 to 240 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employer’s Business</td>
<td>57.5</td>
<td>-865.9</td>
<td>22.9</td>
<td>17.9</td>
<td>18.4</td>
<td>-2167.6</td>
<td>-344.7</td>
</tr>
<tr>
<td>Leisure</td>
<td>26.8</td>
<td>-403.7</td>
<td>10.7</td>
<td>8.4</td>
<td>8.6</td>
<td>-1010.4</td>
<td>-160.7</td>
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<tr>
<td>240 minutes or greater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Employer’s Business</td>
<td>77.4</td>
<td>-1165.4</td>
<td>30.8</td>
<td>24.1</td>
<td>24.7</td>
<td>-2917.3</td>
<td>-463.9</td>
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<tr>
<td>Leisure</td>
<td>30.5</td>
<td>-458.6</td>
<td>12.1</td>
<td>9.5</td>
<td>9.7</td>
<td>-1147.9</td>
<td>-182.5</td>
</tr>
<tr>
<td><strong>Foot Passengers</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Crossing Time Band</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 60 minutes</td>
<td>4.1</td>
<td>-130.6</td>
<td>4.27</td>
<td>-2.2</td>
<td>1.8</td>
<td>2.5</td>
<td>-130.6</td>
</tr>
<tr>
<td>Greater than 60 minutes</td>
<td>9.3</td>
<td>-450.1</td>
<td>9.65</td>
<td>-4.9</td>
<td>4.2</td>
<td>5.7</td>
<td>-294.9</td>
</tr>
</tbody>
</table>

Notes: Enhanced facilities encompasses the provision of a shop, bar/restaurant, children’s play area and lounge style seating from a base of toilets, vending machines and more rigid back-to-back seating. In addition, there may be some valuation of a larger vessel per se, eg through perceptions of greater seaworthiness. Further research to disaggregate this could be undertaken if required.

6 Conclusions

Market research was undertaken across 24 Lifeline ferry routes throughout Scotland in order to provide an insight into Ferry Service attribute valuation. The research also offered the opportunity to estimate willingness-to-pay (w-t-p) amongst respondents for changes in a variety of ferry related attributes. This w-t-p was captured through a series of attribute valuations that can be used in both demand forecasting and appraisal, and will allow the impact of different options for ferry services to be quantified and compared for their demand and welfare impacts.

The Stated Preference survey achieved a high response rate of 1,354 from 3,615 distributed questionnaires (37% response rate). A good spread of responses was achieved enabling statistically significant coefficients to be estimated for different market segments. The resulting attribute valuations therefore provide a good evidence base for the forecasting and appraisal of all Scottish Lifeline Ferry Services.

Based upon the preferred model forms, the findings and recommendations for attribute valuation and appraisal were:
• as expected, fares were found to be a significant factor affecting the demand for ferry services and travel behaviour. The cost coefficient was significant across all main models;

• crossing times and sailings per day/headway between sailings were also found to be significant factors that affect ferry demand and travel behaviour. The former should be considered in conjunction with (i) behavioural and (ii) absolute thresholds between which the values are assumed to (i) influence demand, and (ii) be applicable;

• values of time ranged from 13.9 to 77.4p/min for motor vehicle passengers, and 4.1 to 9.3p/min for foot passengers, depending on crossing time and journey purpose;

• the value of an additional sailing per day varied from 209.2p to 1165.4p for motor vehicle passengers, and from 4.27p to 9.65p for foot passengers (per journey) depending on crossing time and journey purpose;

• for more frequent sailings (when sailings per day are eight or more), it is appropriate to consider sailings in terms of the headway between services;

• the SP experiment also found no discernible influence from vessel type, over and above that offered by the onboard facilities which are provided and/or valuation of a larger vessel per se (including perceptions of 'seaworthiness');

• similarly, there was no statistically significant effect from irregularity (versus evenly spaced departures) in the timetable;

• where appropriate, there is a statistically significant valuation of offering a service across more days of the week. This value varied from 83.2p to 463.9p per journey for motor vehicle passengers, and 36.3p to 81.9p for foot passengers;

• enhanced facilities also provide a significant benefit for passengers, and this ranged from 523.6p to 2917.3p and 130.6p to 294.9p per journey for motor vehicle and foot passengers respectively, dependent upon the crossing time involved and journey purpose;

• the Sunday sailing clearly remains an emotive issue with some respondents viewing it as a disbenefit and others as a benefit. In addition, it is highly dependent on geography, and it often not statistically significant. This was highlighted in the valuations, but no appraisal guidance can be drawn due to concerns over equity and the reasons for the underlying variation in taste and preference. In addition, the valuation(s) may be for a Sunday sailing all year round (or longer), rather than for the journey in question. Further research is required in this area, potentially using techniques such as contingency valuation and transfer pricing; and

• Schedule Adjustment Time (SAT), in terms of the difference between a traveller’s ideal departure and/or arrival time and that imposed by the timetable, is statistically significant. A series of models identified a relationship whereby a slightly early departure (up to ten or fifteen minutes) provided a positive utility (or benefit) to the traveller for foot passengers. It was hypothesised that this is a result of a possible reduction in the risk or uncertainty associated with departure and arrival times through unreliability and/or poor punctuality. Later or earlier, than the threshold, departure tended to impose equal levels of disbenefit.

References


Annex 1  Vessel Types