The value of reliability in freight transport: Evidence from an SP study

Workshop on travel time reliability, TRB meeting 2011
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Background

- Value of reduced variability in transport not included in cost-benefit assessment practice in Norway
  - Concerns both personal transport and freight
  - Exception: Delays in rail transport valued higher than scheduled travel/transport time
- Scarce empirical evidence internationally (de Jong et al 2004)
- Also, lack of consensus on how to value freight transport time savings (VFTTS), see Vierth (2010), Bruzelius (2003)
Norwegian freight survey

- Stated preference (SP) survey with choice experiments (CEs) involving time, variability and delays
  - CE design similar to that used in the Norwegian valuation for personal travel (Ramjerdi et al 2010)
- Web questionnaire with choice experiments integrated
- External programming contractor with self-developed software
  - Convenient because of complex questionnaire and choice experiment (CE) design
- Respondents recruited via e-mail, no previous contact
  - Response rate 5-10 per cent (of all firms contacted)
Sample:

- 505 shippers which buy transport services from others
  - OK sample size
  - Many sectors represented
- 117 transport companies
  - Small sample
  - Includes both companies which do and which do not carry out transports themselves (e.g. truck firms and forwarding agents)
- 114 firms which transport their own goods
  - Mainly used for comparison
- Generally: High degree of heterogeneity with respect to distance, transport mode, type of goods, transport cost etc.
Choice experiments: VFTTS

Other things being equal, which transport would you choose?

- Definitely A
- Probably A
- Probably B
- Definitely B

Time and cost levels based on reference transport/shipment (See Halse et al 2010, appendix B for details.)
### Choice experiments: Variability

#### Transport A
- **Cost:** 1290 NOK
- **Variation in transport time:**
  - Assume that the five transport times have an equal chance of occurring
  
  - 29 hours
  - 30 hours
  - 30 hours
  - 34 hours
  - 36 hours

#### Transport B
- **Cost:** 1000 NOK
- **Variation in transport time:**
  - Assume that the five transport times have an equal chance of occurring
  
  - 27 hours
  - 28 hours
  - 30 hours
  - 38 hours
  - 51 hours

**Other things being equal, which transport would you choose?**
- Definitely A
- Probably A
- Probably B
- Definitely B
Expected delay

<table>
<thead>
<tr>
<th>Transport A</th>
<th>Transport B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost:</strong> 1000 NOK</td>
<td><strong>Cost:</strong> 1196 NOK</td>
</tr>
<tr>
<td><strong>Arrival:</strong></td>
<td><strong>Arrival:</strong></td>
</tr>
<tr>
<td>9 hours delayed with 10% probability</td>
<td>On time with 100% probability</td>
</tr>
<tr>
<td>On time with 90% probability</td>
<td></td>
</tr>
</tbody>
</table>

Other things being equal, which transport would you choose?

- Definitely A
- Probably A
- Probably B
- Definitely B
## Results, road transport

<table>
<thead>
<tr>
<th>Sample</th>
<th>Shippers buying transp. services</th>
<th>Own-account freight</th>
<th>Transport companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>Shipment</td>
<td>Vehicle</td>
<td>Vehicle</td>
</tr>
<tr>
<td>Choice exp. 1</td>
<td>VFTTS, USD*/hour</td>
<td>9.85</td>
<td>56.19</td>
</tr>
<tr>
<td>Choice exp. 2</td>
<td>Value of average transport time, USD/hour</td>
<td>17.15</td>
<td>62.82</td>
</tr>
<tr>
<td></td>
<td>Value of variability, USD/hour st. dev.</td>
<td>11.71</td>
<td>Not significant</td>
</tr>
<tr>
<td>Choice exp. 3</td>
<td>Value of expected delay, USD/hour</td>
<td>67.57</td>
<td>230.90</td>
</tr>
<tr>
<td>Average weight (approx.)</td>
<td>3.8 tons</td>
<td>3.6 tons</td>
<td>12 tons</td>
</tr>
<tr>
<td># of firms in sample (CE1)</td>
<td>395</td>
<td>112</td>
<td>107</td>
</tr>
</tbody>
</table>

*April 2010
Results

- **Shippers:**
  - Value of mean transport time/value of standard deviation
    \[ \frac{11.73}{17.18} = 0.68 = "reliability ratio" \]
    - Shippers value a change in the standard deviation by 0.68 times a unit change in average transport time

- **Transport companies:** No statistically significant effect of the standard deviation on choice of alternative
  - Might be derived from value of delay (de Jong et al 2009)
  - Significant for some subsamples (e.g. wholesale, retail)
Results, continued

- The socioeconomic value of reduced variability should include both
  1. the economic value of more reliable delivery of the goods
  2. the reduction in transport costs due to less variability

- In principle, we cover both, but:

- Transport companies’ willingness to pay (WTP) for faster and more reliable transport seems to depend on characteristics of the shipment
  - Cannot necessarily add shippers’ and carriers’ WTP together
  - However: Average VFTTS (carriers) of $75.51 very close to official value (based on driving costs) used by the NPRA in Norway
Further studies, recommendations

- Limit the sample or divide into more homogenous subsamples
- Adjust CE design carefully in order to provide meaningful trade-offs
- Assisted computer interviews (at least for testing)
- If presenting CE exercises to transport companies, need to specify what they are to take into account in their choices
- Provide theoretical foundation for socioeconomic values
See also


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