Dealing with on street parking pricing - User reactions towards differentiated parking pricing schemes

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Research overview

Studies on differentiated pricing schemes in road pricing, parking pricing and public transport pricing

Presentation of two studies

1. Laboratory study on differentiated parking pricing schemes

2. Field study at on street parking meters
Pricing scheme structure

- Parking pricing needs to be understood and accepted by the users
- Acceptability as important motivational factor (e.g. Schlag & Teubel, 1997; Rienstra et al., 1999; Jakobsson et al., 2000)
- Otherwise -> no behavioural adaptation (e.g. Hoffmann et al., 2006)
- Cognitive factors influence information processing
**Price structure**

- Influences perception of pricing scheme

- **Even** vs. **Odd** prices (e.g. Schenk, 2007; Diller, 2008)
  
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00€</td>
<td>1.54€</td>
</tr>
</tbody>
</table>

- Even prices

  Easier to understand, to calculate and to memorize
Introduction - User reactions

Examples

Source: www.fhwa.dot.gov

User reactions towards differentiated parking pricing – A. Francke
1. Laboratory Study

- Heterogenous sample (n=79, 62% male, 38% female, MV age=41 years, range=18-81)
- Parking pricing schemes with different degrees of differentiation (5 + 1 introductory scheme)
- Usage of odd vs. even parking durations and prices

Participants had to estimate parking charge

Source: www.theexpiredmeter.com
### Medium Differentiation
(Scheme: medium – even duration)

- **Parking time:** 06:32 am – 01:32 pm

<table>
<thead>
<tr>
<th>Time</th>
<th>Price per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midnight - 7am</td>
<td>........... 1 €</td>
</tr>
<tr>
<td>7am - 4pm</td>
<td>........... 3 €</td>
</tr>
<tr>
<td>4pm - 8pm</td>
<td>........... 2 €</td>
</tr>
<tr>
<td>8pm - Midnight</td>
<td>........... 1 €</td>
</tr>
</tbody>
</table>

Parking charged in 30-minute increments.
Hypotheses

- **Differentiation $\leftarrow \rightarrow$ Scheme Comprehension**
  With increasing degree of differentiation decreases the users scheme comprehension.

- **Odd vs. Even numbers $\leftarrow \rightarrow$ Scheme Comprehension**
  Error rate and latency time are lower when users deal with even than with odd numbers.

- **Perceived Effectiveness $\leftarrow \rightarrow$ Behavioural adaptation**
  The higher the users perceived effectiveness of the pricing scheme is, the higher is the behavioural adaptation.

- **Income $\leftarrow \rightarrow$ Behavioural adaptation**
  The higher the users income is, the lower is the behavioural adaptation.
Results and Discussion

Differentiation – Scheme Comprehension

- Latency time increases with level of differentiation ($p < .001$)

- Degree of differentiation has a significant effect on error rate ($p < .001$)
Results and Discussion

Differentiation – Scheme Comprehension

1- low comprehension – 5- high comprehension
1- low perceived certainty – 5- high perceived certainty

$p<.001$
## Results and Discussion

### Odd vs. Even numbers - Scheme Comprehension

<table>
<thead>
<tr>
<th></th>
<th>Even numbers M (SD)</th>
<th>Odd numbers M(SD)</th>
<th>Significance of difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Error rate</strong></td>
<td>0.70 (.46)</td>
<td>0.75 (.43)</td>
<td>non-significant</td>
</tr>
<tr>
<td><strong>Latency time (s)</strong></td>
<td>106 (60)</td>
<td>133 (77)</td>
<td>* significant</td>
</tr>
<tr>
<td><strong>Comprehension</strong></td>
<td>3.16 (1.12)</td>
<td>2.67 (1.29)</td>
<td>*** highly significant</td>
</tr>
<tr>
<td><strong>Perceived certainty</strong></td>
<td>3.33 (1.193)</td>
<td>2.93 (1.17)</td>
<td>*** highly significant</td>
</tr>
</tbody>
</table>

* p<.05, ** p<.01, *** p<.001

*a* 1-low comprehension – 5-high comprehension

*b* 1-low perceived certainty – 5-high perceived certainty
Differentiation – Scheme Comprehension

- Calculation seems redundant in high-tech era
- User need overview of all possibilities
- Comparison of charges necessary
- Higher comprehension leads to transparency and clarity

Higher acceptability

Behavioural adaptation

source: SF park
Significant effects of perceived effectiveness on behavioural adaptation ($p<.01$)
Income - Behavioural adaptation

- Significant effect of income on behavioural adaptation ($p<.01$)
2. Field Study at parking meters

- Heterogenous convenience sample (n=91, 43% male, 57% female, MV age=43 years, range=18-77)
- Test at two parking meters with same price but different presentation of price/hour in Dresden: Price/20min vs. Price/1 hour

Participants had to estimate price/hour, evaluate parking scheme, evaluate parking situation in general
Setting of the field study
Pictures of parking meters

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**Results and Discussion**

- Significant difference: **37%** vs. **11%** error rate
- Overall the 20min-scheme is perceived more difficult

### Attribute Scores

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Price/20min</th>
<th>Price/1hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearness</td>
<td>2.89</td>
<td>4.31</td>
</tr>
<tr>
<td>Appropriateness of price</td>
<td>2.54</td>
<td>2.58</td>
</tr>
<tr>
<td>Complexity</td>
<td>2.16</td>
<td>1.45</td>
</tr>
<tr>
<td>Fairness of pricing scheme</td>
<td>2.44</td>
<td>2.70</td>
</tr>
</tbody>
</table>

### Graph

- **Axes:**
  - **Y-axis:** 1 - not applicable to 5 - applicable
  - **X-axis:** Attributes: Clearness, Appropriateness of price, Complexity, Fairness of pricing scheme

**Slide 18**

User reactions towards differentiated parking pricing – A. Francke

POLIS, 10/09/2013
General results of the field study

- 60% prefer simple pricing schemes
- 79% prefer payment after usage of parking lot
- 80% prefer a payment per minute (not in certain increments)
- 65% wish a usage-related charges
- 80% prefer an equal price in the whole city
- 40% prefer temporally differentiation
1. Odd numbers put users off

2. Two levels of differentiation seem sufficient

3. Provide users with all information necessary to increase the scheme comprehension

4. Communicate and explain differentiated parking pricing and its objectives

5. Use bunch of measures to address all groups of society
6. Political criteria:

- adapt legal regulations (e.g. for the construction of parking spaces for new buildings)
- keep alternative transportation systems attractive
- impose appropriate fines

long-ranging objective to equalise traffic demand

User decide if differentiated parking pricing scheme work...