Effects of Congestion Pricing on Traveler Behavior:
Evidence from Panel Studies in the Seattle SR-520 Corridor and Atlanta I-85 Corridor
Study Motivation

- Since UPA/CRD are demonstration programs, strong emphasis on evaluation and learning
  - FHWA-sponsored evaluation at all six UPA sites, plus in-depth household surveys in Seattle and Atlanta to study impacts on traveler behavior
- Survey addresses the impacts of tolling on:
  - Route and mode choice
  - Trip departure times
  - Origin-destination patterns
  - Overall VMT and daily travel time budgets
  - Carpooling
  - Telecommuting
  - Equity
Outline

- Survey Methodology Summary
- Key Findings: Seattle
- Key Findings: Atlanta
- Discussion / Future Work
Approach and Methodology

- **Household Panel Study**: same households before and after tolling
  - 2-day travel diary plus questions on demographics, typical commute, technology ownership, attitudes and values

- **Sample corridor users**
  - Drivers: license plate capture during AM and PM peak, with match to registered address; mail study invitations to households
  - Transit intercept in-person
  - Vanpool members: via email to vanpool participants

- **Invite ALL adult members of household to participate**

- **Online survey with option to take by phone**

- **Pilot Study**

- **Incentives** ($15/$30 Amazon gift card)

- **Panel maintenance**

- **Focus groups in Seattle to get initial impressions of tolling & refine Wave 2 survey**

- **Weighting of data to adjust for stratified sampling approach**
Survey Invitation

- Advance notification postcard
- Introductory letter
- FAQs

- Memory Jogger
- Reminder postcards and emails
## Overall Response and Sample Size Summary

<table>
<thead>
<tr>
<th></th>
<th>Seattle</th>
<th>Atlanta</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net Survey Invitations</strong></td>
<td>31,873</td>
<td>37,888</td>
</tr>
<tr>
<td><strong>Wave 1 Completed Households (Entire Survey Completed by All Adult Household Members)</strong></td>
<td>3356</td>
<td>2412</td>
</tr>
<tr>
<td><strong>Wave 1 Response Rate (As Share of Initial Contacts)</strong></td>
<td>10%</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Households Retained in Wave 2</strong></td>
<td>2063</td>
<td>1655</td>
</tr>
<tr>
<td><strong>Wave 1 to Wave 2 Panel Retention Rate</strong></td>
<td>61%</td>
<td>69%</td>
</tr>
<tr>
<td><strong>Overall Response Rate (as Share of Initial Contacts, by Mode)</strong></td>
<td>6%</td>
<td>4%</td>
</tr>
</tbody>
</table>
Sample Demographics

- Panels were demographically similar to other survey samples of their regions/corridors

- However, compared to the Census, there were higher levels of education and income; more respondents from middle age groups
Seattle
SR-520 Project Overview
SR-520 Project Overview

- Weekday toll schedule as of spring 2012:

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Toll Tag</th>
<th>Pay by Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6 AM:</td>
<td>$1.60</td>
<td>$3.10</td>
</tr>
<tr>
<td>6-7 AM:</td>
<td>$2.80</td>
<td>$4.30</td>
</tr>
<tr>
<td>7-9 AM:</td>
<td>$3.50</td>
<td>$5.00</td>
</tr>
<tr>
<td>9-10 AM:</td>
<td>$2.80</td>
<td>$4.30</td>
</tr>
<tr>
<td>10 AM - 2 PM:</td>
<td>$2.25</td>
<td>$3.75</td>
</tr>
<tr>
<td>2-3 PM:</td>
<td>$2.80</td>
<td>$4.30</td>
</tr>
<tr>
<td>3-6 PM:</td>
<td>$3.50</td>
<td>$5.00</td>
</tr>
<tr>
<td>6-7 PM:</td>
<td>$2.80</td>
<td>$4.30</td>
</tr>
<tr>
<td>7-9 PM:</td>
<td>$2.25</td>
<td>$3.75</td>
</tr>
<tr>
<td>9-11 PM:</td>
<td>$1.60</td>
<td>$3.10</td>
</tr>
<tr>
<td>11 PM – 5 AM:</td>
<td>Free</td>
<td>Free</td>
</tr>
</tbody>
</table>
External Factors

- Gasoline prices: increased 35% from Wave 1 ($3.06) to Wave 2 ($4.13)
- Transit fares: base Metro bus fare up $0.25 per ride since Wave 1
- Employment levels: total nonfarm employees in region about 3% higher in Wave 2
Results: Overall Travel

- Significant drop in overall corridor travel, especially on SR-520
- Not offset by any increase in off-corridor travel
- Diary data consistent with respondents’ self-estimates of “typical” weekly travel

<table>
<thead>
<tr>
<th></th>
<th>Trip Count</th>
<th>Imputed VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Corridor</td>
<td>-18%</td>
<td>-23%</td>
</tr>
<tr>
<td>SR-520</td>
<td>-43%</td>
<td>-50%</td>
</tr>
<tr>
<td>I-90</td>
<td>-13%</td>
<td>+1%</td>
</tr>
<tr>
<td>Non-Corridor</td>
<td>-13%</td>
<td>-9%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>-14%</td>
<td>-17%</td>
</tr>
</tbody>
</table>

“I do what I can to avoid the premium rate and any travel to Seattle that isn't necessary, i.e. I used to hop over to the U-Village or City People's on a regular basis. Not any more.”
Mode Choice

- Transit mode share on corridor rose from 15% to 18%
- Share of commuters reporting transit as a “typical” commute mode rose 1.5 percentage points
- Avoiding tolls was common motivation for switching to transit (45%) but respondents also mentioned reduced stress (44%) and gasoline costs (39%); few cited improved bus service (8%)

“I have also been taking the bus with some frequency. I expected to be inconvenienced by these changes, but surprisingly, I do not feel that way. I enjoy my new travel arrangements.”
Route Choice

- SR-520’s share of corridor trips fell, while shares for I-90 and SR-522 both increased.
- 86% of those who switched from SR-520 to I-90 or SR-522 cited avoiding the toll as a motivation; no other factor came close.
Summary of Lake Wash. Corridor Trips by Route/Mode

Wave 1
- I-90: 46%
- SR 520: 31%
- SR 522: 2%
- Transit: 15%
- Other: 6%

Wave 2
- I-90: 49%
- SR 520: 21%
- SR 522: 4%
- Transit: 18%
- Other: 7%
### Trip Purpose

<table>
<thead>
<tr>
<th>Biggest Drops in VMT, Wave 1 to Wave 2</th>
<th>Most Stable, Wave 1 to Wave 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shopping</td>
<td>Social/rec.</td>
</tr>
<tr>
<td>-29%</td>
<td>+1%</td>
</tr>
<tr>
<td>Dining</td>
<td>Child care</td>
</tr>
<tr>
<td>-29%</td>
<td>-1%</td>
</tr>
<tr>
<td>Pick-up/Drop-off</td>
<td>Return home</td>
</tr>
<tr>
<td>-27%</td>
<td>-14%</td>
</tr>
<tr>
<td>School</td>
<td>Go to work</td>
</tr>
<tr>
<td>-26%</td>
<td>-17%</td>
</tr>
</tbody>
</table>

“We have greatly reduced our trips to the eastside, except for our child, who takes a school bus now.”
Vehicle Occupancy

- Mean private vehicle occupancies rose slightly on corridor, 1.48 to 1.56
- On SR-520, rose from 1.42 to 1.61; solo trips fell from 76% to 69%
- However, no indications of a major shift to carpooling for commuting; held steady at 13%-14%
Telecommuting

- Two measurements: recorded telecommuting on assigned travel days & self-reported typical telecommuting
- Both showed no significant change from Wave 1 to Wave 2
- About 15% of employed respondents telecommuted during at least part of one assigned travel day
- In follow-up questions, any changes to telecommuting patterns were most frequently attributed to work-related factors, not transportation- or toll-related

“It has motivated us to take transit or telecommute as much as possible, but that's not always do-able.”
Trip Departure Time

- Little net change in the peak vs. off-peak distribution of trips in the corridor
  - On I-90, peak share fell from 61% to 56%
  - On SR-520, peak share rose from 53% to 57%

“Because traffic has increased on the I-90 bridge due to the 520 tolling, I leave 15 minutes earlier from both home and work to try to beat the congestion on Mercer Island.”

“Decreased traffic means I can sleep in later in the morning and get to/from work faster.”
Origin-Destination Patterns

- Cross-lake travel declined slightly more than overall travel (-18% vs. -14%)
- Open-ended comments frequently mention staying on own side of Lake Washington
  - Otherwise, there do not appear to be other large shifts in overall O-D patterns
  - We are analyzing in GIS in more detail
Tracking the Choices of SR-520 Users

- Among those using SR-520 as their primary route in Wave 1:
  - 55% were still using it in Wave 2
  - 24% switched to I-90
  - 7% switched to SR-522
  - 8% switched to transit
  - 4% switched to another route/mode
  - 1% no longer crossed the lake regularly

- Those who switched to I-90 were more likely to be male, lower-income, with less schedule flexibility
Trip Satisfaction Ratings

- There was a significant increase in trip satisfaction levels on SR-520
  - For example, for peak-period trips, mean score on satisfaction with travel speed on SR-520 rose from 3.4 to 5.2 (on 7-point scale)
- Satisfaction with I-90 trips fell slightly, especially among existing I-90 users
- On transit, satisfaction was mixed: up slightly for travel time, down slightly for seating availability
Equity Issues and Toll Payment

- Transponder ownership and use of pay-by-plate were both correlated with higher incomes

- Higher income HHs generally paying more tolls
  - Highest income HHs (> $200K) recorded about $3 in tolls paid over 2-day period, vs. about $1 for HHs under $50K
  - Avg. toll paid was roughly equal (c. $3) – difference was in the number of trips

- Lower-income HHs cut back on travel much more
  - HHs below poverty level: VMT down 48%, cross-lake trips down 38%
  - HHs over 10 times poverty level: VMT down 14%, cross-lake trips down 19%
Recap of Key Survey Findings

- Significant decline in overall Lake Washington corridor travel, particularly on SR-520
- Diversion to toll-free alternative routes & transit
- Small increases in vehicle occupancy on SR-520
- Some small variations in trip-making behavior by purpose and destination
- Little to no change in telecommuting
Recap of Key Survey Findings

- Demographic differences between those who stayed with SR-520 vs. switched to I-90
- Significant increase in trip satisfaction levels for trips on SR-520
- Differences in response to tolling among income groups
Atlanta

- HOV-2 to HOT-3 conversion on 15-mile stretch of I-85 northeast of Atlanta

- Variable (dynamic) pricing; toll prices presented to travelers on dynamic messages signs prior to access points for the Express Lanes

- Electronic collection (Peach Pass) & automated enforcement

- Enhanced express bus service & new park-and-ride facilities
Overall Results: Mode and Route Choice

- The large majority of respondents continue to drive alone in the corridor
  - But there is a slight increase in carpool trips (2+ persons)
  - A slight but non-significant uptick in transit share (3.1% to 3.5 %)
- Share of corridor trips on I-85 rose a bit compared to nearby arterials
- Overall, vehicle occupancy on I-85 increased slightly, from 1.13 to 1.17
  - Average occupancy fell dramatically in the HOV/Express Lane, from approx. 2.2 to 1.2
  - Rose from 1.1 to 1.2 in the General Purpose (GP) lanes
Overall Results: Lane Usage

- Share of I-85 trips in the GP lanes fell from 94% to 85%
  - In other words, Express Lane sees more usage than former HOV lane
- In Wave 2, usage of Express Lane was primarily by solo drivers paying toll:
  - 82% solo driver paying toll
  - 4% two-person carpools paying toll
  - 9% HOV-3 or more
  - 5% alternative fuel vehicle or motorcycle
Equity: Express Lane Usage by Household Income
Among those making 1+ trips/week on I-85

[Bar graph showing usage percentages across different income brackets and trip frequencies]
Recap of Findings

- I-85’s share of corridor travel grew slightly, though overall trips were down in Wave 2
- Mode choices were largely unchanged:
  - Large majority of respondents continue to drive alone for their I-85 trips;
  - Slight increase in 2+ person trips across the survey waves
  - Use of transit fairly consistent
Recap of Findings (2)

- Trip diary data confirms that Express lane trips make up a significantly greater share of all reported trips than did HOV trips (15% vs. 7%)
- Large share (82%) of Express lane trips are solo drivers who pay a toll
- No decline in overall vehicle occupancy across the survey waves – decline in vehicle occupancy in the Express lanes offset by an increase in vehicle occupancy in the GP lanes
- Drivers are somewhat more satisfied with their Express Lane trips, post tolling
Planned Future Work

- GIS-based analysis of changes in origin-destination patterns
- Archiving of anonymized survey data for use by other researchers
Thank you!

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