The Effect of Attitude on Mode Choice: Evidence from NHTS, 2009

Dr. Mintesnot Woldeamanuel
California State University Northridge
Outline

• Background
• Objectives
• Previous research
• Data
• Modeling results
• Conclusion and recommendations
Background

- Public attitude as a feedback to improve service quality.
- Travelers’ attitude towards a transportation system as an important input in the planning process.
- Traditional choice models have been enriched with inclusion of attitude variables.
Attitude and personality traits can affect individuals choice of transport and other actions of their everyday lives.

- Considering latent variables in mode choice.
- Quantifying the impact of attitudes on shift towards sustainable modes.

Attitude vs choice - well studied; the remaining question is:

- Could choice affect attitude?
- What is the persuasive power of attitude on mode choice?
Objectives of the study

- Analyzing how American’s view some attributes of the transportation system (using NHTS, 2009)
- Examining the effect of attitude on travel mode choice (or vice versa)
- Assessing whether attitude may persuade travelers to make adjustment in their mode preference
DATA

• NHTS 2009
• Home-based work trips
• Dependent Variable: mode choice
• Independent variables:
  – Attitude variables
  – HH-related variables
  – Personal info
DATA: Mode choice

N=77967

Mode of transportation

- Personal Vehicle: 63394
- Public Transportation: 1681
- Walk/bike: 1763
- Other: 11129

Total N=77967
Of the following issues, please tell me which one is the most important to you. Would you say… (ISSUE)

a. highway congestion, 1
b. access to or availability of public transit, 2
c. lack of walkways or sidewalks, 3
d. the price of travel including things like
   transit fees, tolls and the cost of gasoline, 4
e. aggressive or distracted drivers, {or} 5
f. safety concerns, like worrying about being
   in a traffic accident? 6
REFUSED .................................................. -7
DON'T KNOW ............................................. -8
DATA: Attitude on issues

Issues/Concerns

- Highway congestion: 14277
- Access to availability of public transit: 4985
- Lack of walkways or sidewalks: 2175
- Price of travel: 28595
- Aggressive / distracted drivers: 14220
- Safety concerns: 13715

N=77967
• Attitude variables

How much of an issue (previous slide) to you? Would you say...

- A little issue (not a problem)=1
- A moderate issue (a little problem)=2
- A big issue (somewhat of a problem)=3
Issues

- Lack of walkways or sidewalk
  - A little issue: 281
  - A moderate issue: 882
  - A big issue: 1012

- Access or availability of public transit
  - A little issue: 620
  - A moderate issue: 1724
  - A big issue: 2641

- Aggressive/distracted drivers
  - A little issue: 1496
  - A moderate issue: 6150
  - A big issue: 6574

- Price of travel
  - A little issue: 1918
  - A moderate issue: 10054
  - A big issue: 16623

- Highway congestion
  - A little issue: 1428
  - A moderate issue: 6038
  - A big issue: 6811

- Safety concerns
  - A little issue: 2352
  - A moderate issue: 6070
  - A big issue: 5293

N=77967
Mode choice vs attitude towards an issue

N=77967
• Multinomial regression analysis
  – To investigate the effect of attitude on mode choice and/or the effect of mode choice on attitude
Description of data used for the analysis
<table>
<thead>
<tr>
<th>Variables</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of travel</td>
<td>1</td>
<td>4</td>
<td>1.50</td>
<td>1.07</td>
</tr>
<tr>
<td>Safety concerns</td>
<td>0</td>
<td>1</td>
<td>0.18</td>
<td>0.38</td>
</tr>
<tr>
<td>Highway congestion</td>
<td>0</td>
<td>1</td>
<td>0.18</td>
<td>0.39</td>
</tr>
<tr>
<td>Price of travel (fees, tolls and gas)</td>
<td>0</td>
<td>1</td>
<td>0.37</td>
<td>0.48</td>
</tr>
<tr>
<td>Aggressive/distracted drivers</td>
<td>0</td>
<td>1</td>
<td>0.18</td>
<td>0.39</td>
</tr>
<tr>
<td>Access or availability of public transit</td>
<td>0</td>
<td>1</td>
<td>0.06</td>
<td>0.24</td>
</tr>
<tr>
<td>Lack of walkways or sidewalks</td>
<td>0</td>
<td>1</td>
<td>0.03</td>
<td>0.16</td>
</tr>
<tr>
<td>HH race</td>
<td>1</td>
<td>7</td>
<td>1.33</td>
<td>1.11</td>
</tr>
<tr>
<td>Number of drivers in HH</td>
<td>0</td>
<td>9</td>
<td>2.16</td>
<td>0.78</td>
</tr>
<tr>
<td>Derived total HH income</td>
<td>1</td>
<td>18</td>
<td>13.45</td>
<td>4.77</td>
</tr>
<tr>
<td>Count of HH members</td>
<td>1</td>
<td>13</td>
<td>2.83</td>
<td>1.28</td>
</tr>
<tr>
<td>Count of HH vehicles</td>
<td>0</td>
<td>27</td>
<td>2.51</td>
<td>1.18</td>
</tr>
<tr>
<td>Number of workers in HH</td>
<td>1</td>
<td>6</td>
<td>1.75</td>
<td>0.71</td>
</tr>
<tr>
<td>MSA Heavy rail status for HH</td>
<td>1</td>
<td>2</td>
<td>1.82</td>
<td>0.39</td>
</tr>
<tr>
<td>Urban size</td>
<td>1</td>
<td>6</td>
<td>4.20</td>
<td>1.86</td>
</tr>
<tr>
<td>Count of travel day trips</td>
<td>0</td>
<td>27</td>
<td>4.50</td>
<td>2.71</td>
</tr>
<tr>
<td>Highest grade completed</td>
<td>1</td>
<td>5</td>
<td>3.35</td>
<td>1.12</td>
</tr>
<tr>
<td>occupation</td>
<td>1</td>
<td>4</td>
<td>2.87</td>
<td>1.25</td>
</tr>
<tr>
<td>Respondent’s age</td>
<td>18</td>
<td>92</td>
<td>48.45</td>
<td>12.60</td>
</tr>
<tr>
<td>Respondent’s gender-Male</td>
<td>1</td>
<td>2</td>
<td>1.52</td>
<td>0.50</td>
</tr>
<tr>
<td>Distance time ratio</td>
<td>0</td>
<td>750.00</td>
<td>0.55</td>
<td>2.73</td>
</tr>
</tbody>
</table>

N=77967
## Modeling results - attitude variables

<table>
<thead>
<tr>
<th>Attitude variables</th>
<th>Personal car</th>
<th>Public transportation</th>
<th>Walk/bike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety concerns</td>
<td>NA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Highway congestion</td>
<td>NA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Price of travel (fees, tolls and gas)</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
</tr>
<tr>
<td>Aggressive/distracted drivers</td>
<td>NA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Access or availability of public transit</td>
<td>+</td>
<td>+</td>
<td>NA</td>
</tr>
<tr>
<td>Lack of walkways or sidewalks</td>
<td>-</td>
<td>-</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA = statistically insignificant variables, + is a positive relationship, - is a negative relationship

- Respondents who said safety is an issue- Less PT, less walk/bike
- Respondents who said congestion is an issue- Less PT, less walk/bike
- Respondents who said price is an issue- Less PT
- Respondents who said aggressive drivers is an issue- Less PT, less walk/bike
- Respondents who said availability of PT is an issue- More drive, more PT
- Respondents who said lack of walkways is an issue- Less drive, less PT
Modeling results: attitude on mode choice or mode choice on attitude?

<table>
<thead>
<tr>
<th></th>
<th>Safety concerns</th>
<th>Highway congestion</th>
<th>Price of travel (fees, tolls and gas)</th>
<th>Aggressive/distracted drivers</th>
<th>Access or availability of public transit</th>
<th>Lack of walkways or sidewalks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal vehicle</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Public transport</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Walk/Bike</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>NA</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

- Drivers- complained about every issue but price, distracted drivers
- PT users- complained about lack of PT and walkways
- Walkers/bikers- complained about lack of PT and walkways
Modeling results: attitude on mode choice or mode choice on attitude?

<table>
<thead>
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<th>Personal car</th>
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<tr>
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<td>NA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Highway congestion</td>
<td>NA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Price of travel (fees, tolls and gas)</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
</tr>
<tr>
<td>Aggressive/distracted drivers</td>
<td>NA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Access or availability of public transit</td>
<td>+</td>
<td>+</td>
<td>NA</td>
</tr>
<tr>
<td>Lack of walkways or sidewalks</td>
<td>-</td>
<td>-</td>
<td>NA</td>
</tr>
</tbody>
</table>

Eg. respondents who think lack of transit is an issue still use car and probably their dependency on the car gave them that idea.
Modeling results: attitude on mode choice or mode choice on attitude?

<table>
<thead>
<tr>
<th>+, + (perception affect choice and choice affect perception- POSITIVELY)</th>
<th>-, - (perception affect choice and choice affect perception- NEGATIVELY)</th>
<th>+, - or -, + (perception and choice are not affecting each other)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 cases</td>
<td>6 cases</td>
<td>2 cases</td>
</tr>
</tbody>
</table>

So we can conclude that...
Conclusion and recommendation

• As much as attitudes affect mode choice, the travel mode could also be a reason to develop attitude on some issues
• Latent variables are important for transportation demand analysis
• Car being main choice despite negative perception
• Complain about price didn’t persuade car users to change mode
• Newly identified significant variables—indicators for planners to encourage walking and cycling as a sustainable means of transportation
Thank you for your attention