0-6766-P2

WORKSHOP PRESENTATION

_TxDOT Project 0-6766: A Generic Mode Choice Model Applicable for Small and Medium-Sized MPOs_

DECEMBER 2013

Performing Organization:
Center for Transportation Research
The University of Texas at Austin
1616 Guadalupe, Suite 4.202
Austin, Texas 78701

Sponsoring Organization:
Texas Department of Transportation
Research and Technology Implementation Office
P.O. Box 5080
Austin, Texas 78763-5080

Performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.
INTRODUCTION AND OVERVIEW

On December 18, 2013, the research team hosted a workshop at CTR to gather feedback on and generate discussion of the mode choice model that was developed.

Attendees included the project monitoring committee (PMC) and TTI personnel who staff a help desk for TxDOT’s Transportation Planning and Programming Division.

At the same time the PMC and research team followed up with a close-out meeting for the project.

Following are the PowerPoint slides presented at the session.
Project Introduction

The goal of this project was to

- Incorporate a mode choice component into the Texas Package Suite of Travel Demand Model
- Develop an operational stand-alone generic mode choice model

Why Mode Choice is needed?

- With population growth projections increasing, it has become necessary to examine mult-modal solutions to manage growing auto travel demand
- Allows for evaluation and prioritization of multimodal projects at the regional level
Mode Choice Models

- Analyze alternative transportation modes of the area (i.e. carpooling, public transportation, bicycling/walking)
- Can be estimated at
  - Disaggregate level
    - Individual Decision-maker Choices
  - Aggregate level
    - TAZ to TAZ Modal Shares

Data Requirements

Demographic Variables
- Household Size
- Income Levels

Trip Variables
- Purpose of Trip
  - Focus on Home-based Work Trips
- Mode of Trip
  (Walk, DA, SR_2, TR, Bike)
- Origin-Destination of Trip at TAZ Level

Travel System Variables
- Total Travel Time
- Out-of-Vehicle Travel Time
- In-Vehicle Travel Time
- TAZ-TAZ Distance
- Total Travel Cost
Create IVTT DA & SR

Generating IVTT Skims for different Mode using TRANSCAD

• Drive Alone and Shared Ride
• Transit (Tricky one!)

Create OVTT Skims

Generating OVTT Skims for different Mode using TRANSCAD

• Drive Alone and Shared Ride (Area based assumption)
• Bike and Walk (restrict freeways and highways)
• Transit (Measure the distance to stop from centroid)
Create Distance Skim

Generating Distance Skims for different Mode using TRANSCAD

- Drive Alone and Shared Ride (Based on shortest path)
- Bike and Walk (Based on shortest path)
- Transit (Can use straight line distance based on coordinates)

Create Cost Skim DA, SR & Transit

Generating Cost Skims for different Mode using TRANSCAD

- Drive Alone and Shared Ride (Assume per mile gas cost)
- Transit (Available from bus operators website)
Assumptions

Typical OVTT Value for DA/SR

Generating OVTT Skims for DA/SR Mode

- Drive Alone and Shared Ride

<table>
<thead>
<tr>
<th>Workplace location area type</th>
<th>MPO</th>
<th>MPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central business district (CBD)</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Other business districts</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Residential</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Rural</td>
<td>0.75</td>
<td>2.0</td>
</tr>
</tbody>
</table>
CAMPO Assumption

Generating OVTT Skims for DA/SR Mode

• Drive Alone and Shared Ride

<table>
<thead>
<tr>
<th>Area Type</th>
<th>MPO</th>
<th>CAMPO MPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central business district (CBD)</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>CBD Fringe</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>Urban and Suburban</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

IVTT Transit

Generating IVTT Skims for Transit Mode

• We use the travel times reported at bus operators website
Assumption (OVTT Transit)

Generating OVTT Skims for Transit Mode

- Distance between centroid and stop
- Get the time using average walking speed (3 mph)

Assumption (OVTT Walk and Bike)

Generating OVTT Skims for Walk and Bike

- Restrict highway links
- Get the shortest path
- Get the time using average walk (3 mph) and bike (11 mph) speed
Distance DA/SR

- Using Multiple Shortest path in TRANSCAD
- Concurrent generation of distance skim during time skim generation

Distance Transit

- We used the straight line distance based on coordinates
- Network file needs to be more detailed
Travel Cost Skim

- Assumed per mile gas cost: $0.25 for DA/SR
- For transit, values were obtained from bus operators website
- Longview: $1.25
- Lubbock: $1.75

Model Estimation Examples

- Developed mode choice models for two Texas MPOs based on data availability
  - Lubbock
    - Medium-Sized MPO
  - Longview
    - Medium-Sized MPO
Modal Share for HBW trips

<table>
<thead>
<tr>
<th>Mode</th>
<th>Lubbock</th>
<th>Longview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Drive Alone</td>
<td>1556</td>
<td>944</td>
</tr>
<tr>
<td></td>
<td>98.05</td>
<td>97.72</td>
</tr>
<tr>
<td>Shared Ride (2)</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Transit</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bike</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>0.06</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0.31</td>
<td>0.31</td>
</tr>
</tbody>
</table>
Transit Route Description

- Lubbock
  - 9 Bus Routes
  - Average of 5 stops per route
- Longview
  - 5 Bus Routes
  - Average of 5 stops per route

Mode Choice Model

- MNL model
- Explanatory Variables:
  - Household size (1, 2&3, >4), Income (<20K, 20K-50K, >50K)
  - In-Vehicle travel time, Out of Vehicle Travel time, Travel cost, Travel Distance
- Mode: Walk, Drive Alone, Shared Ride(2), Transit, Bike
## Modal Share for HBW trips

<table>
<thead>
<tr>
<th>Mode</th>
<th>Lubbock</th>
<th>Longview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Drive Alone</td>
<td>1550</td>
<td>98.05</td>
</tr>
<tr>
<td></td>
<td>944</td>
<td>97.72</td>
</tr>
<tr>
<td>Shared Ride(2)</td>
<td>30</td>
<td>1.89</td>
</tr>
<tr>
<td>Transit</td>
<td>1</td>
<td>0.06</td>
</tr>
<tr>
<td>Bike</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.31</td>
</tr>
</tbody>
</table>

## Longview

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Wall</th>
<th>Drive Alone</th>
<th>Shared Ride</th>
<th>Transit</th>
<th>Bike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Specific Constant</td>
<td>0.420 (0.89)</td>
<td>-3.71 (-4.42)</td>
<td>-0.000 (-0.72)</td>
<td>-0.222 (-0.99)</td>
<td></td>
</tr>
<tr>
<td>Household Annual Income (Less Than 30K is the base category)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income between 30K and 50K</td>
<td>1.400 (1.04)</td>
<td>1.400 (1.04)</td>
<td>-0.000 (-0.72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income between 50K and 75K</td>
<td>1.100 (10.55)</td>
<td>1.600 (10.55)</td>
<td>-2.100 (-2.22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income greater than 75K</td>
<td>1.200 (21.70)</td>
<td>1.200 (21.70)</td>
<td>-2.300 (-2.91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-Vehicle Travel Time (Min)</td>
<td>-0.300 (-0.25)</td>
<td>-0.000 (-0.00)</td>
<td>-0.000 (-0.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out-of-Vehicle Travel Time (Min)</td>
<td>-0.000 (-0.24)</td>
<td>-0.000 (-0.00)</td>
<td>-0.000 (-0.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel Distance (Miles)</td>
<td>-1.000 (-3.73)</td>
<td>-1.000 (-3.73)</td>
<td>-1.000 (-3.73)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel Cost (Dollars)</td>
<td>-1.300 (-1.05)</td>
<td>-1.300 (-1.05)</td>
<td>-1.300 (-1.05)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Value of Travel Time

- Lubbock: 24.34 dollars/hour
- Longview: 27.23 dollars/hour

Forecasting Tool

- Works at group (household size and income group) and TAZ level
- Calculate share for each household size and income combination
- Take the weighted average to get the TAZ level mode share
Forecasting Tool Demonstration

Thank you for your time, we will now take

QUESTIONS
A Generic Mode Choice Model
Applicable for Small and Medium-Sized MPOs
December 18, 2013
Final Meeting

Objective

• To develop an operational stand-alone generic mode choice model for Texas urban regions
(1) Identify the circumstances in which the implementation of a mode choice model in an urban area would be appropriate
(2) Develop an operational generic mode choice model that includes a blueprint of estimation steps as well as application steps for the MPOs that are supported by TPP in model development efforts
TASKS

Task 1: Synthesize the available literature on mode choice models and develop an approach to assess the appropriateness of implementing a mode choice model.

Task 2: Develop forecasting approach and overall model design recommendations incorporating mode choice component.

Task 3: Identify available sources for data, and develop protocols for generating data.

Task 4: Prepare data for mode choice estimation in one small-sized urban area and one medium-sized urban area.

Task 5: Estimate multinomial logit (MNL) and nested logit (NL) mode choice models for the two MPOs identified in Task 4.

Task 6: Develop a stand-alone generic mode choice model and build a prototype of this model within Excel.

Task 7: Conduct a workshop to present the mode choice model estimation techniques and model application procedure.

Project Schedule and deliverables

• Time frame: November 2012 – December 2013
  • August 2013: framework development (Task 1-3)
  • December 2013: framework application and workshop (Tasks 4-7)

• Deliverables
  • Excel file and user documentation guide
  • Workshop (Nov-Dec 2013)
  • Final reports: February, 2014
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Questions?

THANKS.