Arlington County Travel Model

MWCOG/TPB TFS
20 November 2020

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Advancing Infrastructure

New Travel Model for Arlington County

- Focused model, like others in Northern Virginia
  - Loudoun, Prince William, Stafford, Spotsylvania
- Covers MWCOG modelled area, and greater detail in Arlington
  - 141 zones ⟶ 425 zones
  - Includes local roads
- Motivated by Amazon development

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Schedule

- Phase 1: May – October 2019
- Delay due to Bentley acquisition of Citilabs
- Phase 2 started May 2020
- Completion due February 2021

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Approach

- Completely new model
- Simplified tour-based structure (STM)
  - Advancement over four-step
  - Not as complicated as ABM
- Uses round-trip tours
  - Model *every* tour
  - Logit models to get choice probabilities
  - Monte Carlo simulation
- Try to use MWCOG input data

STM Advantages

- Versus four-step
  - More accurate definition of travel (purpose, tour behavior)
  - More sensitive to HH attributes
  - Improved estimation of NHB travel behavior
  - No NHB garbage can
- Versus ABM
  - Easier to understand
  - Much faster run time
  - More flexible definition of tours

STM Process

- HH synthesis
- Tour frequency
- Destination choice
- Mode choice
- Intermediate stops
- Stop locations
- Time of day
- Assignment (including feedback)

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Keeping Some MWCOG Features

- HH income quartiles
- 4 time period definitions
- Area type model
- Transit mode definitions, line files
- Highway network, zonal data
  - Except in Arlington Co.

New Features

- Simpler model interface
  - Fewer input files
  - Easier to use
- Model School (K-12) and University trip purposes
  - Include both types of enrollment by zone
- Arlington highway network
  - Control device model
  - Integrated bike network
  - True shape display
- Looking at telecommuting
- Include autonomous vehicles
- Weighted highway assignment
- Modified transit network analysis

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Transit Processing

- Use Cube *Public Transport* module
- No drive-access coding
- Simpler station / PnR lot coding
- Rethinking “percent walk to transit”
- Advanced transit assignment
  - Multi-path process
  - Handles sub-mode and path choice
  - Capacity constraint
  - PnR lot constraint

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Household Synthesis

- Estimate the attributes of each HH
- Based on Census data (ACS, PUMS)
- Simple, fast method
- Attributes:
  - Size (1-5)
  - Income (1-4)
  - Vehicles (0-3+)
  - Workers (0-3+)
  - Life cycle (retired, kids, neither)
  - Autonomous vehicles (0-3+)

Tour Frequency

Purpose	Tours/HH
HBW	0.94
SCH	0.34
HBU	0.04
HBS	0.51
HBO	1.22
ATW	0.18
Total	3.23

Tours/HH	Percent of HH
0	7.1
1	20.8
2	21.5
3	15.0
4	11.6
5	7.3
6	5.4
7	3.7
8	3.0
9	1.4
10+	3.2

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Example: HB Shop Tour Frequency Model

- Tour choices: 0, 1, 2, 3+
- Up to 10 tours/HH allowed
- Key variables:
  - 3+ worker dummy (+)
  - Income 1 dummy (-)
  - Retired HH dummy (+)
  - Work tours (-)
  - School/university tours (-)
  - Vehicles (+)
  - Composite accessibility to employment (+)
  - Zonal income ratio (+)
  - HH size (+)
  - 5-person dummy (-)

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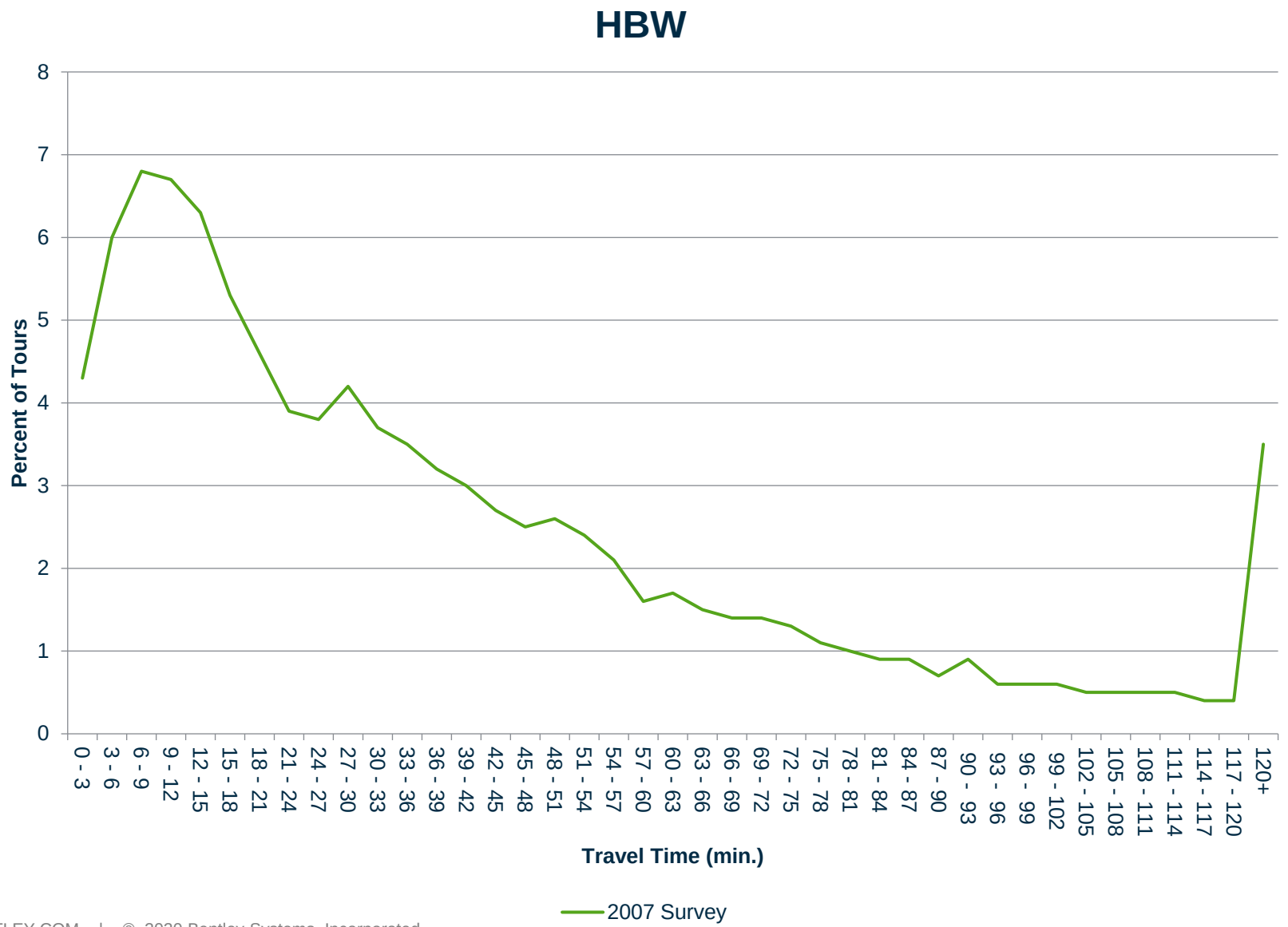
Destination Choice



Purpose	Avg. Tour Time
HBW	38.2
SCH	7.3
HBU	16.6
HBS	9.3
HBO	11.2
ATW	6.3

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Mode Choice

- EU / AUS approach
  - Simpler mode choice
  - Transit sub-mode / path choice handled in assignment
- Use FTA coefficients
- Explicit non-motorized mode
  - Looking at scooter / e-bike rental
  - Bike assignment
- Taxi / TNC mode

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Different Structure

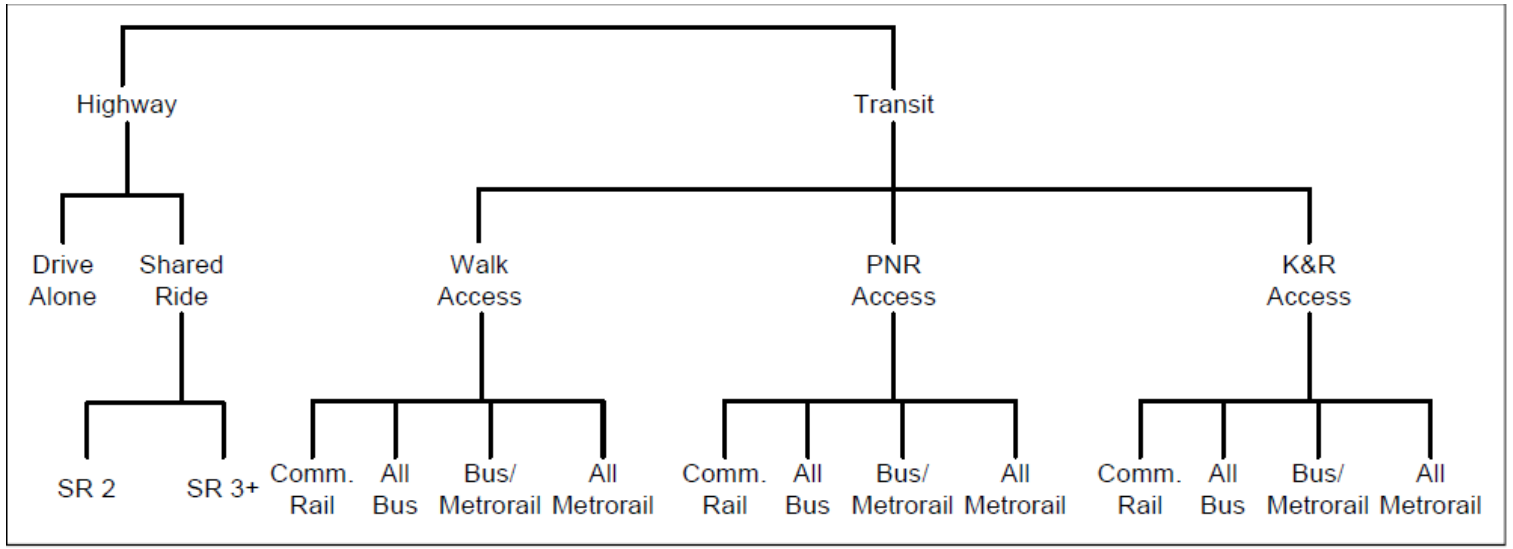
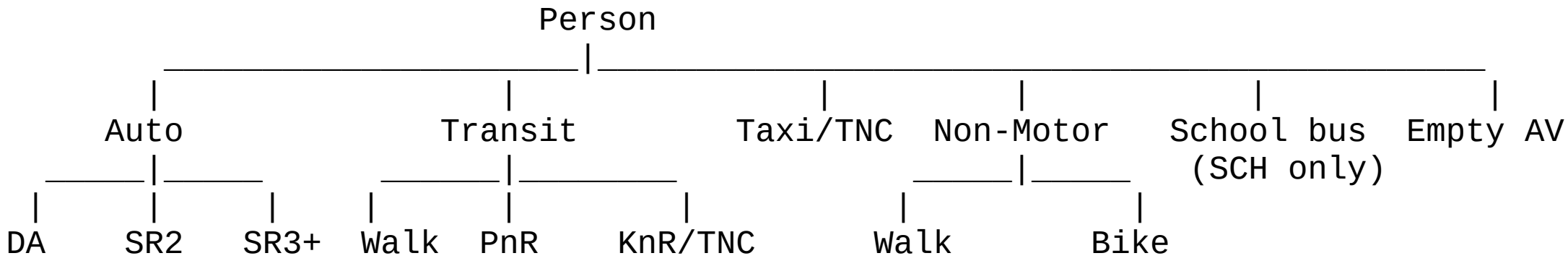


Figure 13 Nesting structure of the nested-logit mode choice model in the Version 2.3 travel model



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Stop Frequency

Purpose	Avg. Stops/Tour, 1st Half	Avg. Stops/Tour, 2nd Half
HBW	0.19	0.42
SCH	0.09	0.23
HBU	0.34	0.42
HBS	0.43	0.38
HBO	0.22	0.34
ATW	0.18	0.14
	home to destination	destination to home

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Model Calibration

- Estimate from 2007-08 Household Travel Survey
- Validate to 2019, mainly in Northern Virginia
- HH synthesis and logit models are finished
  - Tour frequency
  - Destination choice
  - Mode choice
  - Intermediate stop
  - Stop location
  - Time of day

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Next Steps

- 2019 validation
- Forecast
- Documentation
- Training

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