Understanding dimensions of telecommuting: Options, choice and frequency of telecommuting in Southern California

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Outline

- Overview of SCAG ABM
- Background of Telecommuting
- Data source and preliminary analyses
- Work At Home
- Telecommuting
- Summary

SCAG ABM

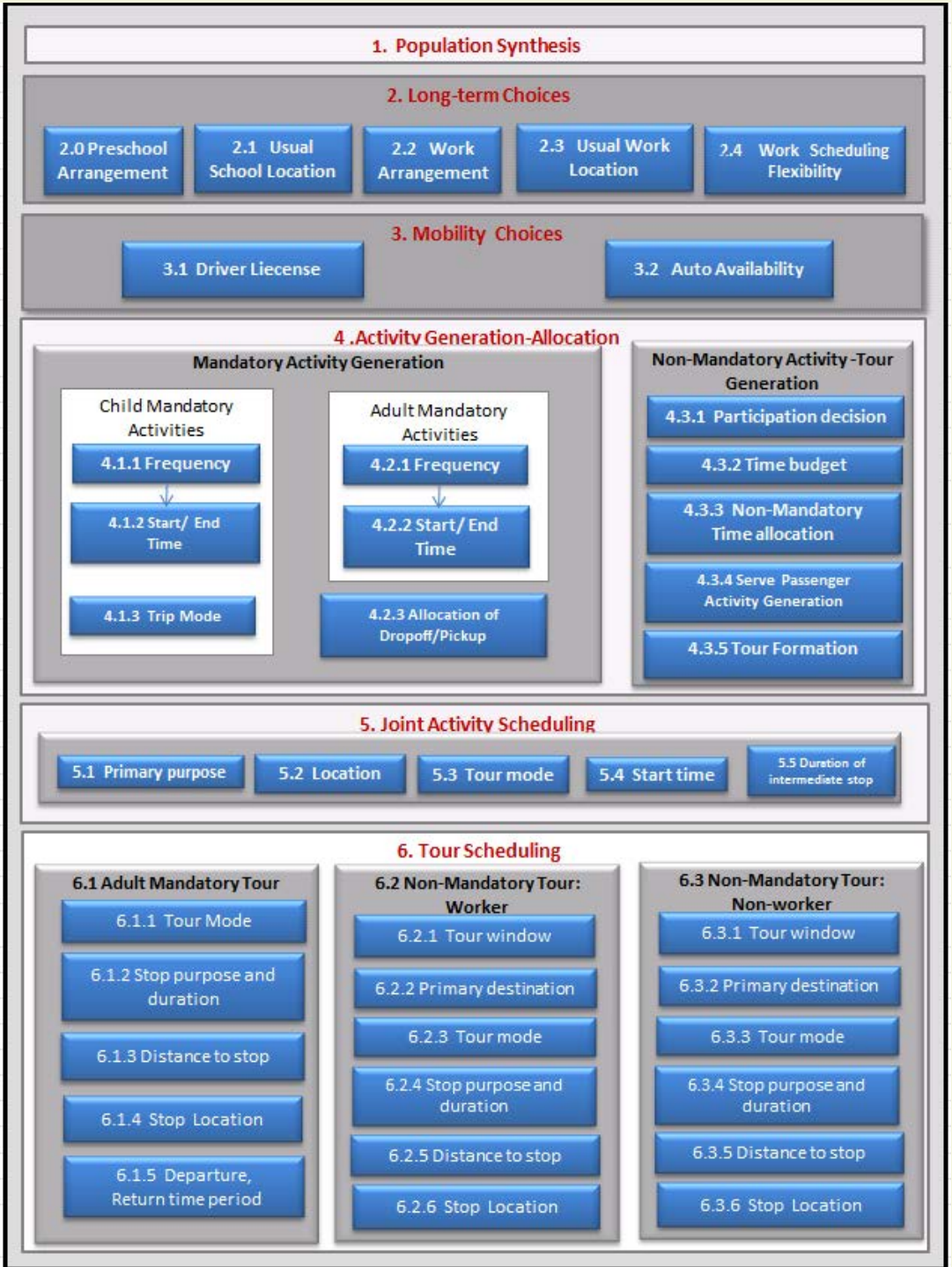
Motivation: RTP Guideline by California Transportation Commission - the largest four MPOs in California are encouraged to transition to activity-based travel demand models

Model Concept: SCAG-ABM is an activity-based, simulates the entire weekday travel pattern of each person in the SCAG region (18+ million):

- derives travel from activity participation decisions
- explicitly accounts for within household interactions
- incorporates spatial and temporal constraints and influences when predicting activity participation and travel
- operates on a detailed representation of the region's population, land use and transportation networks

Model Application:

- Built in new TransCAD 7.0


1. Population Synthesis
2. Long-term Choices
2.0 Preschool Arrangement
2.1 Usual School Location
2.2 Work Arrangement
2.3 Usual Work Location
2.4 Work Scheduling Flexibility
3. Mobility Choices
3.1 Driver Liecense
3.2 Auto Availability
4 .Activity Generation-Allocation
Mandatory Activity Generation
Child Mandatory Activities
4.1.1 Frequency
4.1.2 Start/ End Time
4.1.3 Trip Mode
Adult Mandatory Activities
4.2.1 Frequency
4.2.2 Start/ End Time
4.2.3 Allocation of Dropoff/Pickup
Non-Mandatory Activity -Tour Generation
4.3.1 Participation decision
4.3.2 Time budget
4.3.3 Non-Mandatory Time allocation
4.3.4 Serve Passenger Activity Generation
4.3.5 Tour Formation
5. Joint Activity Scheduling
5.1 Primary purpose
5.2 Location
5.3 Tour mode
5.4 Start time
5.5 Duration of intermediate stop
6. Tour Scheduling
6.1 Adult Mandatory Tour
6.1.1 Tour Mode
6.1.2 Stop purpose and duration
6.1.3 Distance to stop
6.1.4 Stop Location
6.1.5 Departure, Return time period
6.2 Non-Mandatory Tour: Worker
6.2.1 Tour window
6.2.2 Primary destination
6.2.3 Tour mode
6.2.4 Stop purpose and duration
6.2.5 Distance to stop
6.2.6 Stop Location
6.3 Non-Mandatory Tour: Non-worker
6.3.1 Tour window
6.3.2 Primary destination
6.3.3 Tour mode
6.3.4 Stop purpose and duration
6.3.5 Distance to stop
6.3.6 Stop Location

SCAG ABM

Segmentation

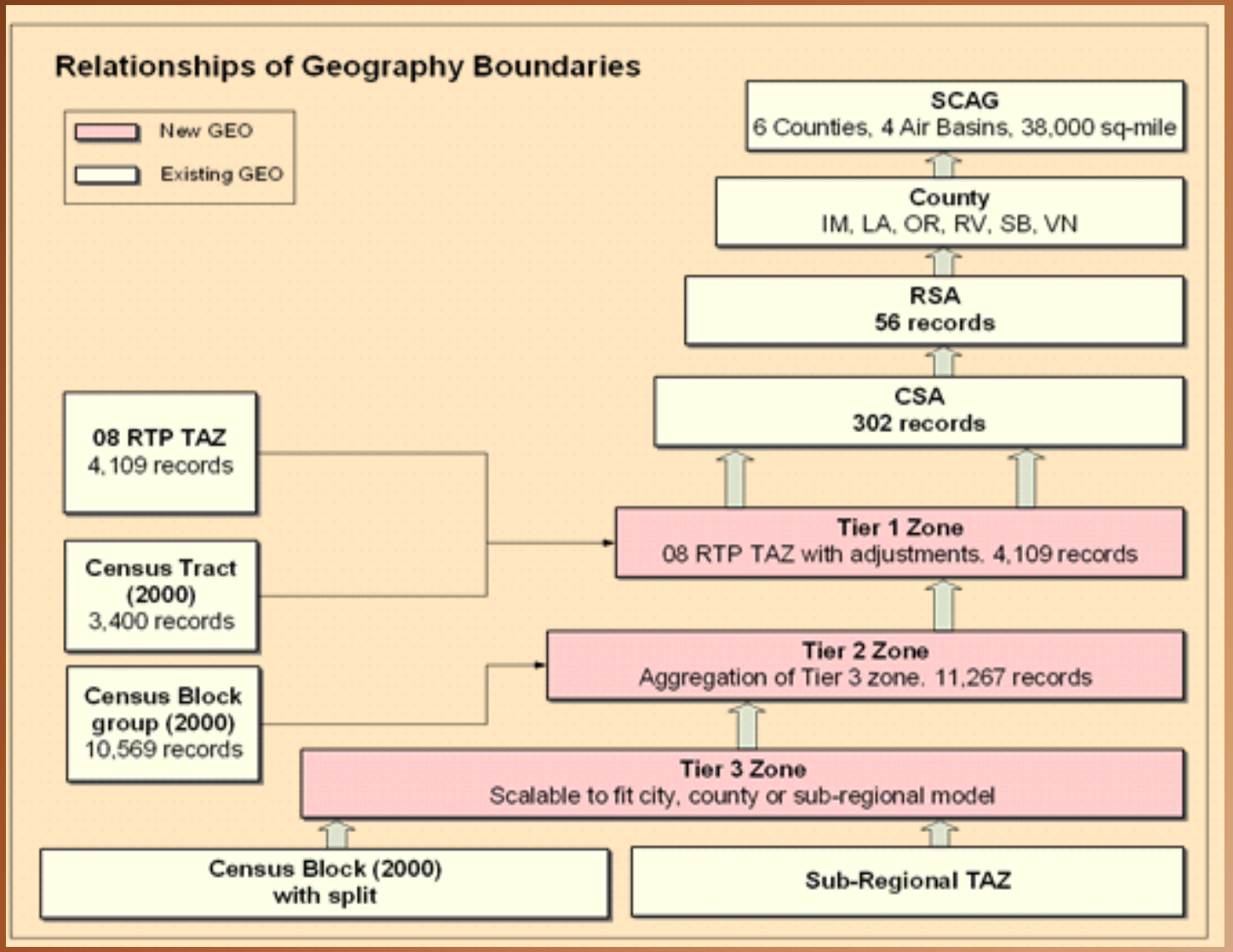
Person types:

Person type	Name	N	%
1	Worker*	6437171	35.7
2	Working college student	540487	3.0
3	Non-working college student	684724	3.8
4	Working HS student	42927	.2
5	Non-working high school student	624696	3.5
6	Adult non-worker	5610073	31.2
7	Children 6-15 years old	2542851	14.1
8	Children 0-5	1482911	8.2
9	dropped out kids (6-15)	40349	.2
	Total	18006189	100.0

Activity types:

- Work
- School/College
- Escort
- Shopping
- Maintenance
- Social
- Entertainment
- Visiting family and friend
- Active recreation
- Eating out
- Work related
- Other

Spatial resolution



Temporal resolution

- Five time periods used for skimming and assignment
  - AM Peak (6:00 AM to 9:00 AM)
  - Midday (9:00 AM to 3:00 PM)
  - PM Peak (3:00 PM to 7:00 PM)
  - Evening (7:00 PM to 10:00 PM)
  - Night (10:00 PM to 6:00 AM)
- 15-minute and 30-minute resolution for scheduling primary activity of a tour, extended to continuous
- Continuous for scheduling all other activities

Time-varying Accessibility Measures

- Earlier attempts to incorporate time varying accessibility measures largely driven by the travel impedance component
- The other equally important component *i.e.* size variable was assumed to remain constant across the entire day
- This simplification is behaviorally incorrect
  - Any activity center has an active time window during which its services are available
  - So, opportunities to pursue different types of activities vary by TOD

Background of Telecommuting

- *Telecommuting* is continuing to very rapidly develop as a normal way of working in the United States (U.S) and elsewhere (e.g. Salomon, 1986; Mokhtarian, 1991; Pendyala et al. 1991; Koenig et al. 1996; Hjorthol and Nossum, 2008)

- An important Travel Demand Management (TDM) action that could reduce roadway congestion and Greenhouse Gases (GHG) emissions, and thus saving energy and improving air quality in the region (Nilles, et al., 1976)

- The actual amount and impact of telecommuting in any particular region, however, will depend on particular travel demand measures in place and other aspects such as local condition and local transportation and land use environment

- Interactions between transportation systems and telecommunications applications
  - *Substitution*- assumes that some demand for travel will be replaced by telecommunications
  - *Modification* - telecommunications technology to increase the use of transportation systems (a shift in timing, location, linking and trip chaining)
  - *Complementarity*-refers to the situation where both transportation and telecommunications systems will enhance the efficiency of each other
  - *Neutrality*- telecommunication has no foreseeable effect on trip making

Defining telecommuting

- There is no common definition of telecommuting

> "*the partial or total substitution of telecommunications, with or without the assistance of computers for the daily work trip*" (Nilles *et al.,* 1976).

- Most of researchers have tried to establish their own definitions of the concepts. Some of the common definitions, on a more general level, are as follows:

“ working at home or at an alternate location and communicating with the usual place of work using electronic or other means, instead of physically travelling to a more distant work site” (AQMD, in Moktharian, 1991)

... the combination of flexiplace, flextime and electronic communication (Kugelmass, 1995, *p. 20)*

Teleworking is defined ... as working at home or a location closer to home than the regular workplace, using information and communication technology (ICT) to support productivity and communication. (Choo et al., 2005, Hjorthol and Nossum 2008)

SCAG-ABM

Type 1

- **Work at home= Home office**
- a person who works exclusively from home

Type 2

- **Telecommute=Teleworker**
- a person who works regularly, but not exclusively, at home.

SCAG ABM:WAH sub-model

Person and Household Characteristics; Industry

Primary work place type

- Home
- Out of home

If home is not the work place

2.3 Usual Work Location

Work at Home Model

	Variable	Beta - Specific to Choice Alternatives	
		0	1 (WAH)
Constant	Constant		-3.440
Gender	Female		-0.070
Age	Less than 35		-0.514
	35-44 (reference)		
	45-54		0.239
	55-64		0.348
	65 and older		0.847
Household Income	50K-100K		0.235
	>100K		-0.283
Industry	Agriculture, Mining		-1.175
	Constuction, Utility		-0.766
	Manufacturing, Wholesale		-0.929
	Retail, Other Service		-0.390
	Information, Business Service		0.201
	FIRE (Finance, Investment, Real Estate)		0.570
	Arts, Entertainment, and Hospitality, Food Service		-0.421
	Public administration		-1.699

Work at home= Home office

Findings:

- The general constant for work from home is large and negative reflecting a fact that working from home is still by far the less frequent alternative

- Female workers are less likely to work-from-home

- There is a clear progression within age group which shows that older age workers are more likely to work from home compared to younger workers. Older workers more frequently hold positions which have greater flexibility of work schedules as compared to younger workers

- Workers from higher-income >100K households are less likely to work from home as compared to lower income groups **

- Workers in Information, Business Service and Finance, Investment, Real Estate industry are more likely to work from home. These job types have more flexibility and options to work remotely (by phone, E-mail, or Internet) compared to other job types.

Type 2: Telecommute

Data sources:	
California Household Travel Survey *February 2012 through January 2013*	2012 SCAG Travel survey (CHTS add-on**)-** 2,486 households

Survey question:	
Does your employer offer an option of working at home instead of going into your work place?	How many times in the last month did you work at home?

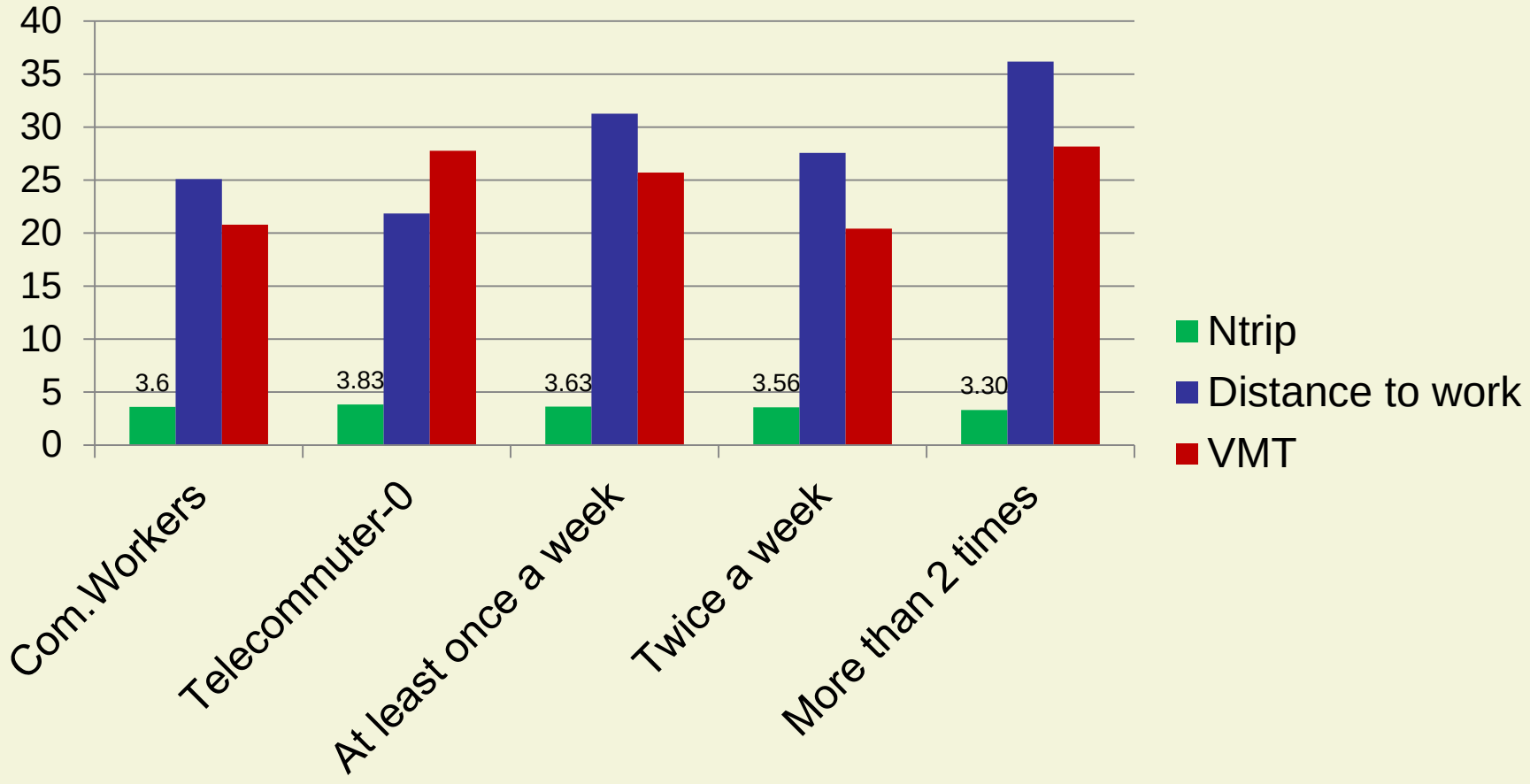
Telecommuting dimensions by AGE

worker who have option to telecommute		
	Yes	No
AGE		
16-24	3%	97%
25-44	20%	80%
45-60	19%	81%
60+	**28%**	72%
Total	19.5%	80.5%

Given the option, “Choice” to telecommute

	Yes	No
AGE		
16-24	2%	98%
25-44	14%	86%
45-60	12%	88%
60+	16%	84%
Total	13%	87%

Daily travel characteristics telecommuters versus commuters



- workers who telecommute have longer commute distance
- workers who telecommute more than 2 days per week –the longest
- VMT- not clear pattern-represent different way of relationship

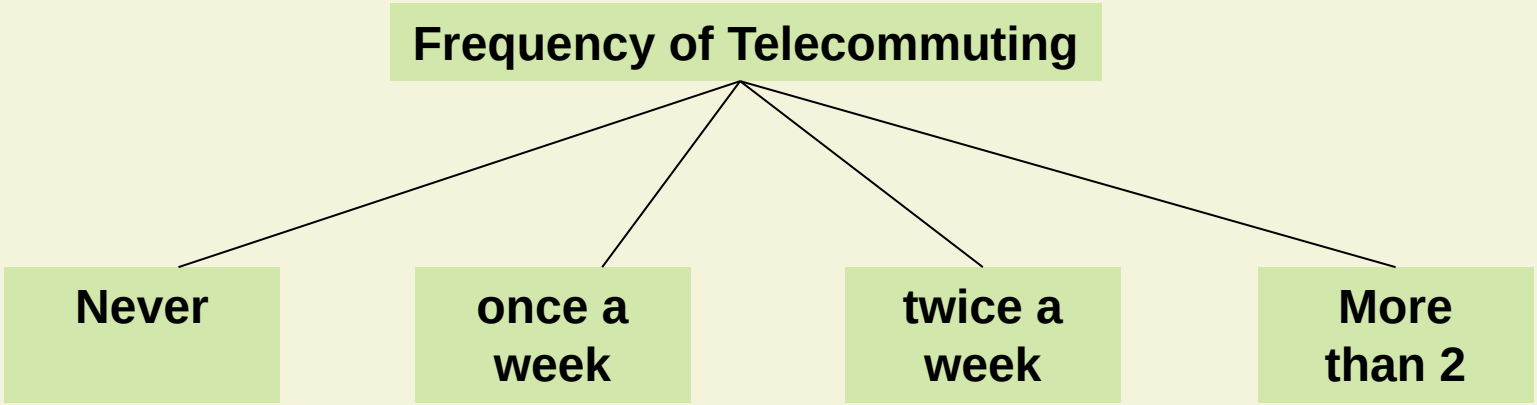
“ Option” to telecommute

Variable	Beta - Specific to Choice Alternatives	
	0	1
Constant		-4.412
Age		
Less than 35		-.411
35-44 (reference)		
45-54		-.506
55-64		-.201
65 and older		-.103
Education : Bachelor and higher		**.653**
Has flexible working schedule		**2.168**
Has compressed working schedule		**.529**
Industry		
Agriculture, Mining		**1.214**
Constuction, Utility		.726
Manufacturing, Wholesale		.148
Retail, Other Service		-.327
Information, Business Service		.991
Education & Health/Social Service		
FIRE (Finance, Investment, Real Estate)		**1.328**
Arts, Entertainment, and Hospitality, Food Service		**.226**
Public administration		-.038

Does your employer offer an option of working at home instead of going into your work place?

Findings: Option of telecommuting

- **Age**: Workers < 25 years old – less likely to have option to telecommute
- Individuals with higher education levels have having the ability to maintain the option to telecommute
- Having flexible working schedule- very strong impact, more likely to have telecommuting option
- **Industry**: Agriculture, Mining and FIRE (Finance, Investment, Real Estate)



Multinomial model structure

Estimation result: Choice of Frequency of telecommuting

	never	once a week	twice a week	More than 2
	1	2	3	4
Constant	1.085		-0.352	0.788
Female	**-0.669**		0.082	0.322
Household income >100K	**-0.826**		-0.146	**-0.558**
Information, Business Service	**-0.385**		**-0.756**	**-0.962**
FIRE (Finance, Investment, Real Estate)	**-0.590**		**-0.745**	**-0.789**
Presence of small children	**-0.615**		**-0.660**	-0.177
Smart phone	-0.608		-0.122	-0.235
Age 50 years old +	**0.422**		-0.172	-0.070
Number of vehicles in a household	**-0.576**		-0.227	-0.112
Jobmix (9 sectors)	**1.561**		0.000	-0.739

Findings

- Given the “Option”, the most workers choice to telecommute at least once a week-- except workers who are *Age 50 years old* + and live *in high job mix area*

- *Once a week*

- *Female workers*- are more frequently to telecommute

Summary

- Work at home and telecommuting are important TDM action that could reduce roadway congestion and GHG.
- Understanding key factors in WAH and telecommuting behavior
- Incorporation in travel models: WAH
- Considers the supply dimension “ Option” of telecommute to analyze telecommuting behavior
- Future Enhancement:
  - More data and sample
  - Consider other factors: land use and technology
  - Incorporation in travel models: Telecommuting

Thank you

Question?

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