



yay!



Flexibility of Work Schedules and Transportation Behavior at UC Berkeley

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SafeTREC-UCTC Seminar
May 2, 2014

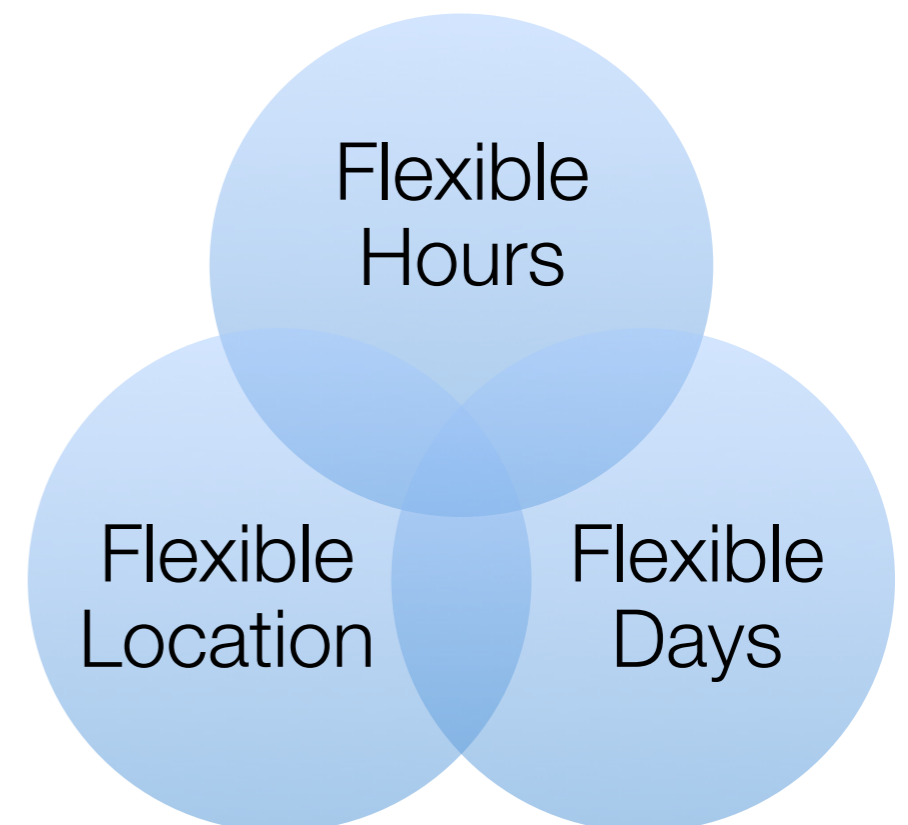
What is Flexible Work Schedule?

Alternative Work Schedules

- Designated hours and days
- Compressed work schedule (80 hr < 10 days)

Telecommuting

- When work is performed off-campus



Benefits of Flexible Work Schedules

For Employees

- Reduce commuting time
- Decrease fuel costs and commute expenses
- Less congestion at workplace

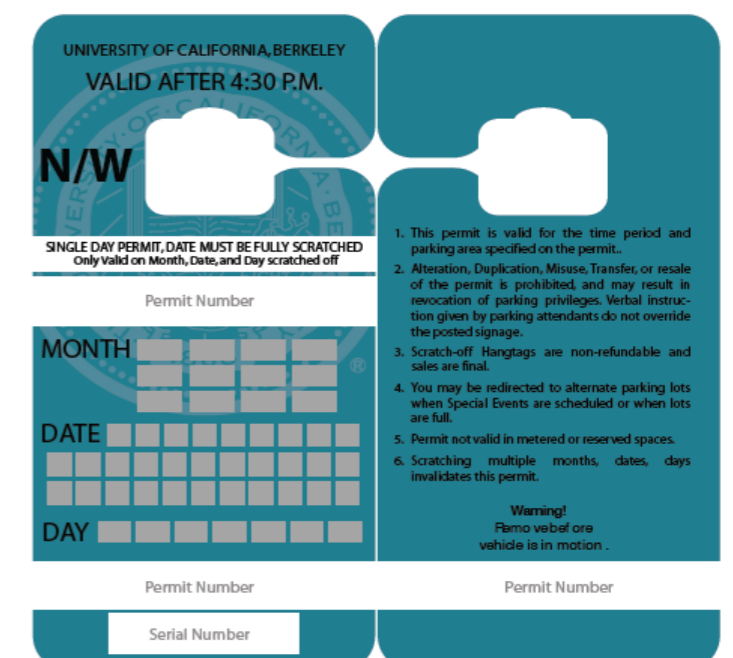
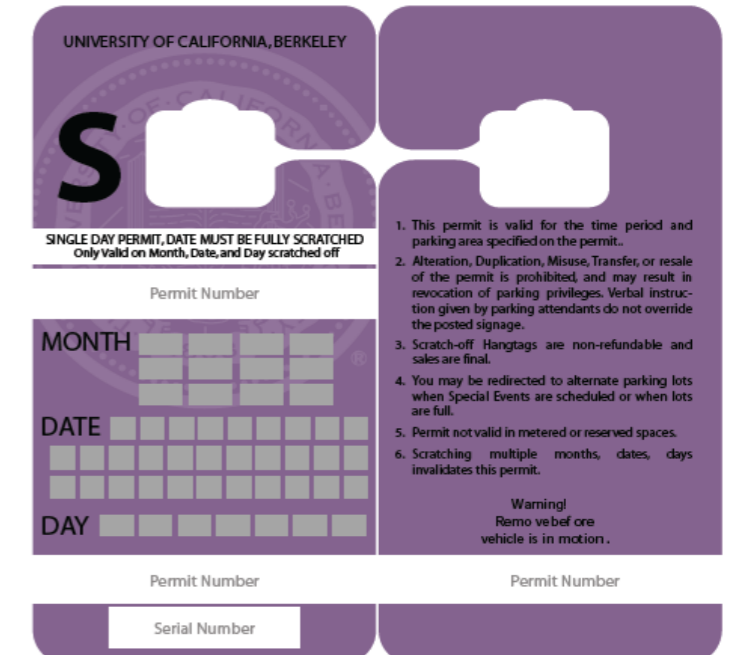
For Employers

- Transportation demand management tool - complementary to modal shifts
- Reduce emissions to meet climate goals
- Better management of limited parking resources

UC Berkeley Campus Study Site

- Wide range of employment types and job characteristics
- Located in a region with several transportation alternatives
- Scarce land resources and high parking construction costs
- Fixed cost parking permit pricing
- Flexible work schedules are not encouraged in general

UC Berkeley Daily Parking Hangtags



Current Studies

Flexibility of work schedules in transportation studies

- Peak period congestion
- Road pricing
- Road infrastructure utilization
- Transit services peak and off-peak utilization
- Departure time for work

Few studies on transportation mode and parking location choices

- Mode shift occurred due to work schedule when parking prices increased (Miller and Everett, 1982)
- Parking duration is lower for individuals with high flexibility of work hours (Gillen, 1978)

Limited definition of flexible work schedules

- Time of travel

This Study's Definition of Flexibility

Commute Time

- Arrival time to campus
- Departure time from campus

Duration of stay on campus

- Number of hours per day

Frequency of trip to campus

- Number of days per week

Location

- Availability of second office on or off campus

Methods and Data Collection

Case Selection

- UC Berkeley Employees

Preliminary Interviews

- May - Sept 2013, n = 86

Focus Group Discussion Sessions

- Nov - Dec 2013, 10 sessions, n = 113

Transportation and Parking Survey

(Revealed and Stated Preferences Data for Discrete Choice Analysis)

- Dec 2013, n = 4,188 (Response Rate \approx 30%)

Transportation Mode Choice Question

We have asked questions that are relevant to your most recent commute trip so far. However, we are also interested in knowing more about your transportation mode choices for different days of the week.

How did you travel to campus last week? Please select one primary mode of transportation for each day of the week. For days when you were not on campus and not working from home, you may select "Not On Campus" in the table below.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Car, Truck, or Van (Drive Alone Only)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Carpool or Vanpool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motorcycle, Moped, or Scooter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bus (e.g. AC Transit)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Train (e.g. BART)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bike	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walk Only	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work From Home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not On Campus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Parking Choice Question Example

In the following question, you will be shown four types of parking options and you will be asked to indicate which one of the four options would you choose, assuming that these are the only paid parking options available. *You may select "None of the Options" if you choose not to drive to campus or drive but park elsewhere.*

Option A: A monthly campus parking permit with unlimited access. If you are carpooling, a **carpool** permit costs **34%** of the cost of parking shown in the table below, which is comparable to the current campus parking pricing for each carpool user.

Option B: A monthly restricted campus parking permit for parking **3 days a workweek** (unlimited on weekends). If you are carpooling, a **carpool** permit costs **34%** of the cost of parking shown in the table below, which is comparable to the current campus parking pricing for each carpool user.

Option C: A daily campus parking permit, **without any restriction** on the number of permits that can be purchased annually. Daily permits can be purchased from parking machines at any campus parking garage/lot.

Option D: Hourly parking at an off-campus location with **no time limit enforcement**.

	Option A	Option B	Option C	Option D
Cost of Parking	\$180/month	\$108/month	\$9/day	\$0.60/hour
Parking Fee Refund for Days Not Parked	\$1/day	0	0	0
Free Monthly Pass for AC Transit and BART	Yes	No	No	No
Walking Time from Parking Space to Office	8 min	8 min	3 min	18 min

Which one of the four parking options would you choose?

Option A

Option B

Option C

Option D

None of the Options

Discrete Choice Analysis: Multinomial Logit Model

Utility Function

$$U_{in} = \beta_i X_{in} + \varepsilon_{in}$$

U_{in} = utility of the i th alternative for the n th individual

β_i = vector of unknown parameters (estimated from data)

X_{in} = vector of known variables (include attributes and characteristics)

ε_n = random utility component

Mode Choice Example

$$U_{\text{CAR}} = \beta_1 + \beta_{\text{TIME}} (\text{TIME}) + \beta_{\text{TT_CAR}} (\text{TT_CAR}) + \beta_{\text{TC_CAR}} (\text{TC_CAR}) + \beta_{\text{WKTM}} (\text{WKTM}) + \dots \varepsilon_n$$

Parking Choice Example

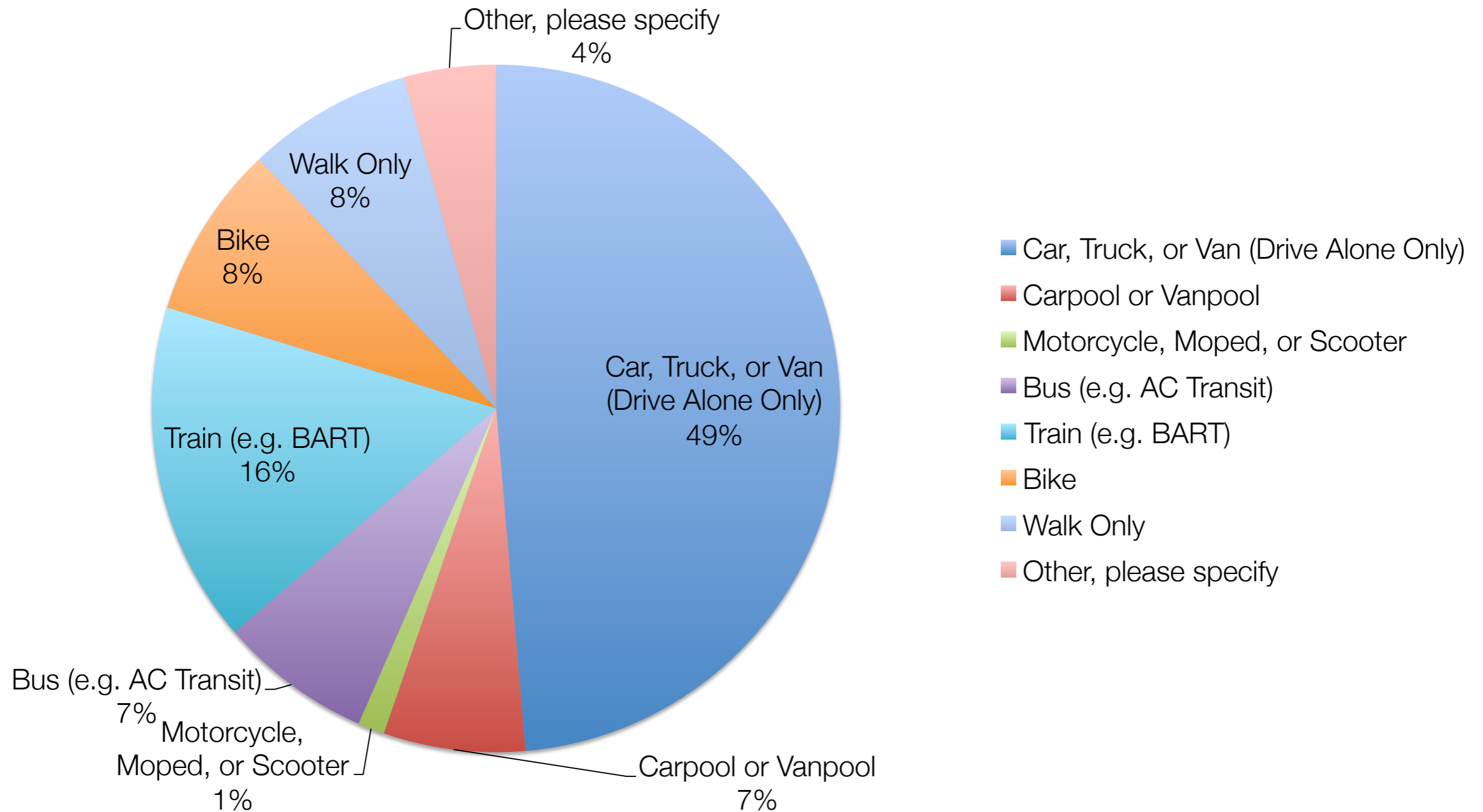
$$U_{\text{PA}} = \beta_1 + \beta_{\text{SP_PKCOSTA}} (\text{SP_PKCOSTA}) + \beta_{\text{SP_REF}} (\text{SP_REF}) + \beta_{\text{SP_PASSA}} (\text{SP_PASSA}) + \beta_{\text{PASS_BART}} (\text{PASS_BART}) + \beta_{\text{SP_WK_TMA}} (\text{SP_WK_TMA}) + \dots \varepsilon_n$$

Logit Probabilities

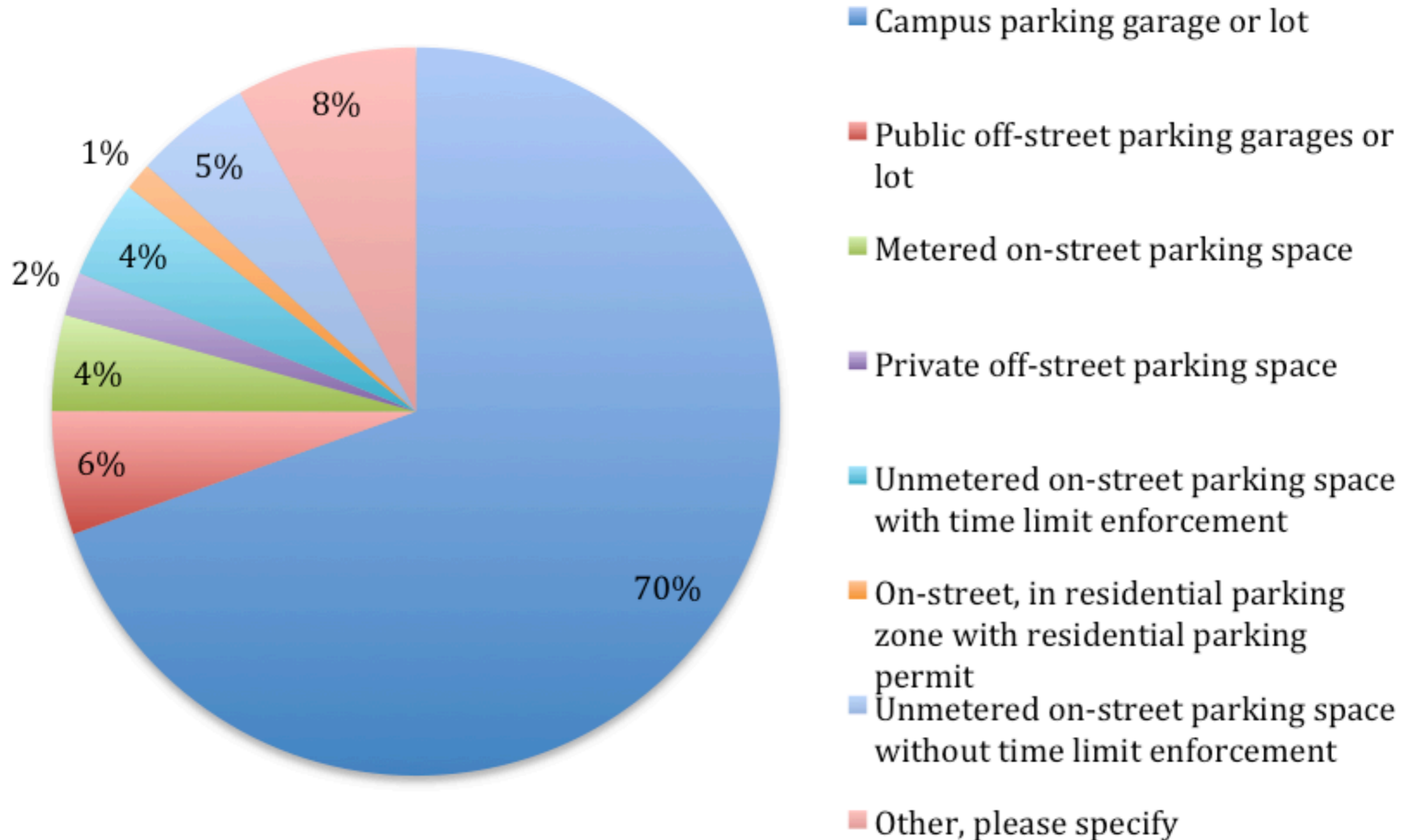
$$P_{ni} = \frac{e^{\beta' X_{ni}}}{\sum_{j \in C_n} e^{\beta' X_{nj}}}$$

C_n = choice set available to the n th individual, which is constructed by J_n alternatives

Survey Results – Mode Choice



Survey Results – Parking Choice



Survey Results – Arrival Time on Campus

Arrival Time

- Peak arrival time to campus = between 8:00AM and 8:59AM
- 84% of respondents are on campus by 10:00AM
- Higher percentage of train riders before noon
- Higher percentage of carpoolers before 9:00AM

Mode Choice

- ↑arrival time, ↑driving alone (0.39)

Survey Results – Departure Time from Campus

Departure Time

- 60% of respondents depart from campus between 5:00PM and 5:59PM
- The later the departure time, the lower the percentage of train riders

Mode Choice

-  departure time,  driving alone and parking on campus (-0.15)

Survey Results – Duration of Stay

Number of hours on campus per day

- Average = 8.21 hours
- 40% of respondents are on campus 9 hours/day
- 25% are on campus for more than 9 hours/day

Mode Choice

- ↑duration of stay, ↑driving alone (0.21)

Parking Choice

- ↑duration of stay, ↑utility to choose conventional parking (0.03)

Survey Results – Frequency of Trips

Number of days on campus per week

- Mean = 4.45 (including weekends)
- 88% of respondents are on campus at least 5 days/week
- 30% are on campus at least 4 days/week
- Mean = 4.22 (excluding weekends)

Mode Choice

- ↑frequency of trips, ↑driving alone (0.29)

Parking Choice

- ↑frequency of trips, ↑utility to choose conventional parking (0.22)

Survey Results – Availability of a Second Office

Availability of a Second Office on or off campus

- 14% of respondents

Mode Choice

- Availability of second office  driving alone (0.40)

Parking Choice

- Availability of second office  utility to choose conventional parking (-0.44)

Heterogeneity of Individuals

Mode Choice

- Faculty drive alone less than staff (-0.25)

Parking Choice

- Faculty choose conventional parking less than staff (-0.31)

Response Rate by University Affiliation

Variable	Count	Percent	Total Responses
University Affiliation			3,253
Professor / Associate Professor	252	7.75%	
Assistant Professor	41	1.26%	
Adjunct Professor	20	0.61%	
Visiting Faculty / Scholar	17	0.52%	
Lecturer	97	2.98%	
Other Faculty / Academic	232	6.39%	
Management and Senior Professionals / Senior Management Group	251	7.72%	
Professional Staff	1,121	32.06%	
Operational / Technical Staff	130	4.00%	
Staff (classified and represented)	872	26.81%	
Contract	34	1.05%	
Postdoctoral Scholar	186	5.72%	

Job Description and Work Schedule

Faculty members are more flexible than staff

- Less hours on campus
- Less trips to campus per week
- Less rigid work related activities

Faculty members' schedules differ across disciplines (in general)

- Dependence on campus resources vary according to discipline
- Work culture within departments is just as important
- Personal preference is key to degree of flexibility

Certain job categories have less flexible schedules

- Employees with managerial roles
- Jobs that require physical presence on campus
- Jobs that rely on campus resources

“It is possible for me to work from home. I have a home office, which is better and bigger than my office at the department. I would prefer to work from home but there are things that can be done better on campus, e.g. teaching or meeting students, but writing is better off campus.”

- **Faculty Member**

“Professors in my department are on campus every day, unlike my friend in the language department, who works more from home.”

- **Faculty Member**

“The University has a written policy on when is it appropriate and when not to telecommute and as a manager, I allow working from home for my staff, but it is harder for me to do so myself.”

- **Staff Member**

Conclusions

- Flexibility of work schedules affect mode choice and has the potential to reduce solo driving commute trips
- In addition to work schedules, personal schedules can also affect mode and parking choices
- Flexible work schedules should be encouraged by the University as part of its various transportation and environmental goals

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Thank You

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Perks Of Working At Home