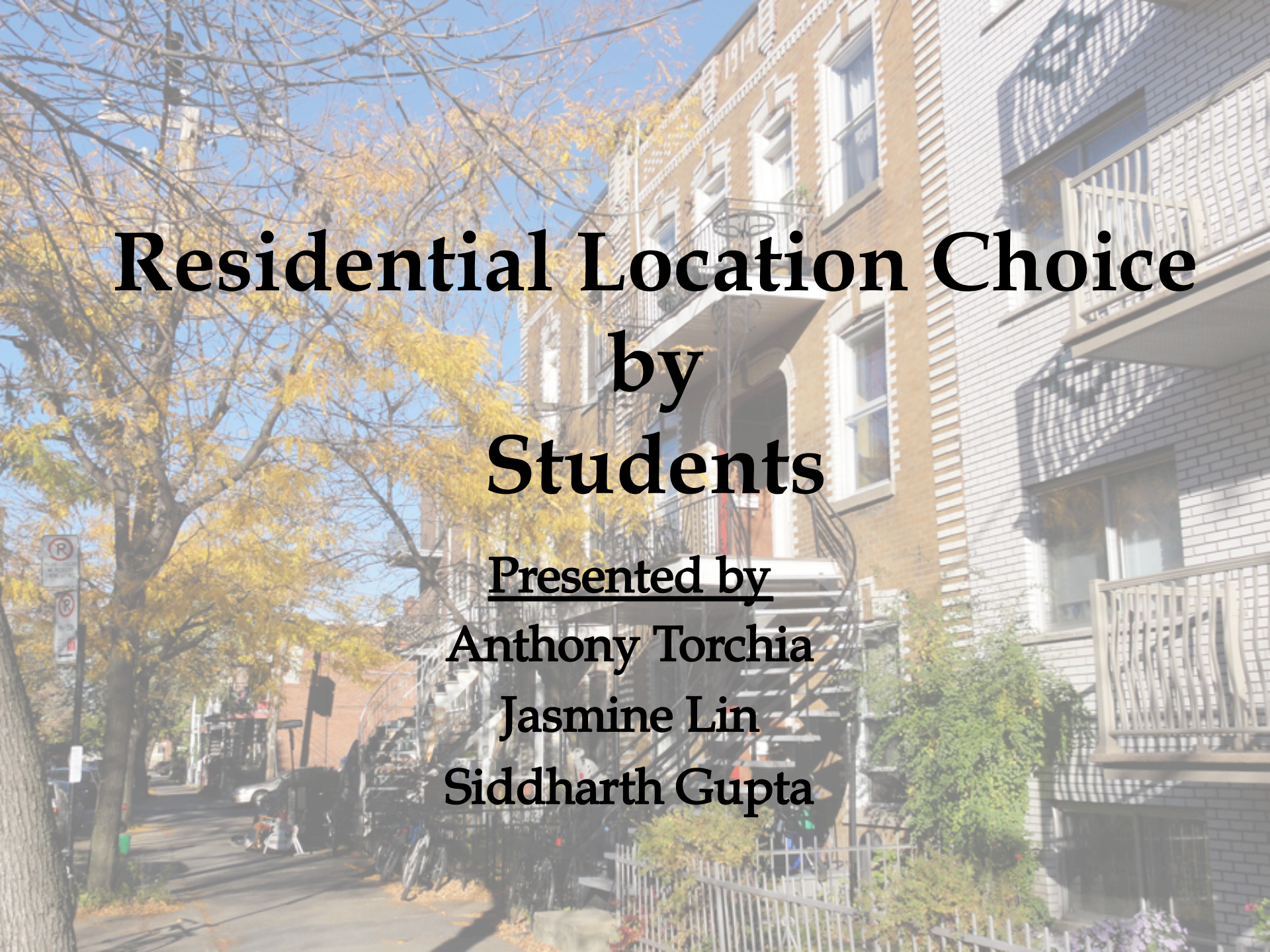


Residential Location Choice by Students

Presented by

Anthony Torchia

Jasmine Lin

Siddharth Gupta

Study Objectives

- **To understand what factors affect the choices students make when deciding where to live.**
  - Criteria:
    - Quality of living space
    - Location
    - Price
    - Friends or Roommates
    - Travel Time
    - Type of Transport
    - Amenities…

Research Papers consulted

- Bednar-Friedl, B., Koland, O., & Steininger, K. N. (2011). Urban sprawl and policy responses: A general equilibrium analysis of residential choice. Journal of Environmental Planning & Management, 54(1), 145-168. doi:10.1080/09640568.2010.502766

- Frenkel, A., Bendit, E., & Kaplan, S. (2013). Residential location choice of knowledge-workers: The role of amenities, workplace and lifestyle. Cities, 35, 33-41. doi:10.1016/j.cities.2013.06.005

- Ibeas, Á., Cordera, R., dell'Olio, L., & Coppola, P. (2013). Modelling the spatial interactions between workplace and residential location. Transportation Research Part A: Policy & Practice, 49, 110-122. doi:10.1016/j.tra.2013.01.008

- Jae, H. K., Pagliara, F., & Preston, J. (2005). The intention to move and residential location choice behaviour. Urban Studies (Routledge), 42(9), 1621-1636. doi:10.1080/00420980500185611

- Poitras, C. (2009). Designing sustainability for whom? recent housing developments in southwest Montreal. *Local Environment, 14*(6), 515-528. doi:10.1080/13549830902903856

- Sener, I. N., Pendyala, R. M., & Bhat, C. R. (2011). Accommodating spatial correlation across choice alternatives in discrete choice models: An application to modeling residential location choice behavior. Journal of Transport Geography, 19(2), 294-303. doi:10.1016/j.jtrangeo.2010.03.013

- Sickler, S., & Roskos, B. (2013). Factors that play a role in first-year students' on-campus housing decisions. Journal of College & University Student Housing, 39/40(2), 10-31.

Significance of the study

- People's choice of where to live, changes the way the city around them is shaped.
- Understanding this choice can help us to reorganize modern cities, especially transportation infrastructure and reduce risks associated with urban sprawl
- Classic models stipulate that home-work journey cost and time are the basic factors explaining household location choice.
- Overall however, household residential location choice is a complex function of a wide range of housing, location and person attributes

Attributes prior to focus group

Parameter	Option 1	Option 2	Option 3	Option 4	Option 5
Distance from University	5 to 15	15 to 30	30 to 45	>45	
Cost (heat, water, electricity)	300-400	400-500	500-600	600+	
Room Mates	0	1	2	3	>3
Size	Studio	1 bedroom	2 bedrooms	3 bedrooms	3+ bedrooms
Building Type	Walkup	Under 5 floors	>5 floors	House	Duplex
Vicinity to transit	1 to 5 mins	5 to 10 mins	10 to 20 mins	20 to 30 mins	30+
Proximity to Amenities	5 to 10 mins	10-20 mins	20-30		

Focus Group

- Qualifying characteristics:
  - Participants must be University Student
  - Have lived in a rented apartment

  or

  Have gone through the process of renting an apartment

  or

  Are currently looking for an apartment
- Objective:
  - Determine characteristics important to them
  - Get their perception of attribute levels
  - Get their opinion about the non-overlapping attributes

Attributes and levels after Focus Group

Parameter	1	2	3	4	5
Distance from University	5 to 10	10 to 20	20 to 30	30-45	>45
Cost (heat, water, electricity)	350-400	400-450	450-500	500-600	600+
Room Mates	0	1	2	3	>3
Building Type	Walkup	Under 5 floors	>5 floors	House	Suite
Proximity to Transit (mins)	1 to 5	5 to 10	10 to 15	15 to 20	20+
Proximity to amenities (mins)	5 to 10	10 to 20	20 to 20		

Survey Design

- Use reasonable number of attribute levels to prevent Factorial Design from becoming too large
  - Maximum of 3 levels per attribute
  - Ensure that ranges are not dominant

  Note: Proximity to amenities was dropped in this step
- Fractional Factorial design was performed using 'Sawtooth'.
- A total of $3^5 = 243$ test conditions possible
- 81 choice tasks were chosen.
- These were divided into 3 versions of survey- each with 9 choice tasks with 3 conditions apiece.

- Final 3-level design for each attribute

Parameter	Level 1	Level 2	Level 3
Distance to University by Metro	5	25	45
Cost	400	500	600
Room Mates	0	1	2
Building Type	Walkup	Under 5 floors	>5 floors
Distance to Metro by Foot	5	15	25

Note:

1. Some combinations of attribute levels are not physically possible but do help in capturing how people make choices
2. The location attributes were standardized in terms of the most preferred mode- metro

Sample Choice Set

Apartment Characteristics	Choice 1	Choice 2	Choice 3	None
Distance to University by Metro	5 minutes	25 minutes	45 minutes	
Cost	$500	$500	$600	
Roommates	0	0	2	☐
Building Type	> 5 floors	> 5 floors	> 5 floors	
Proximity to Metro by Foot	25 minutes	5 minutes	15 minutes	
	☐	☐	☐	

Other data collected

- Person Characteristics
  - Gender
  - Age: 17-19 yrs, 20-22 yrs, >22 yrs
  - Annual Income: <12k, 12-15k, 15-20k, 20-25k, >25k
  - Years of Study: 1, 2, 3, 4, 5, 5+
  - Category- In-province/Out of province/ International
- Ideal preferences
  - All 5 attributes
  - Roommate situation/gender/age
  - Mode

Performing Survey

- Form: Paper
- Method:
  - Randomly selected students
  - Stratified to a certain degree to ensure participation from international students, students from different years of study and majors
  - Different locations
  - Different times of day
- Number of participants- 60
  - Roughly equally distributed among the three versions

Data Analysis- Data Munging

Conversion from choice codes to actual values

- Continuous variables-
  - Cost, Time to metro, Time by metro to University, Roommates
- Dummy variables for person/apartment characteristics and their **references**
  - Annual Income: **<12k**, 12-15k, 15-20k, 20-25k, >25k
  - Student Category- **Canadian**/International
  - Age: **18**, 21, 25
  - Gender: **Male**, Female
  - Apartment type: Walkup/>5floors/**<5floors**
- Dedicated rows for each choice set and columns for chosen choice task

Intuitive Signs and Reasoning

Choice Characteristics

- **Cost: -ve,** ceteris paribus, a cheaper apartment should be the preferred choice
- **Walking Time to Metro: -ve,** ceteris paribus, an apartment closer to the university should have greater utility
- **Time to University by Metro: -ve,** ceteris paribus, an apartment should be preferable if the travel time to school by metro is lower
- **Apartment Type:** Anticipation based on Focus Group and intuition. Ceteris paribus, Walk-ups are preferred over all others. Mostly, low rise apartments are chosen over high rise

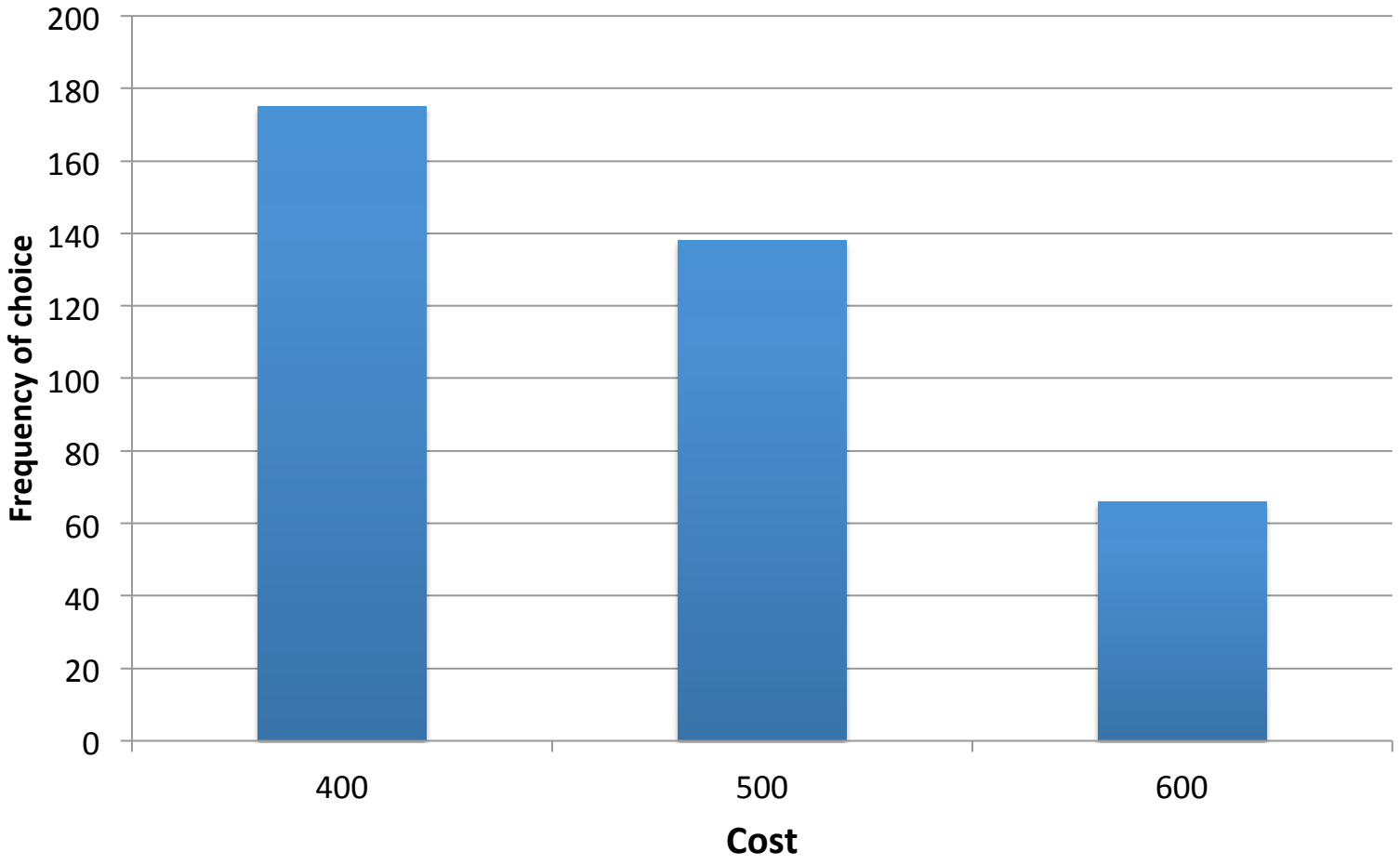
Intuitive Signs and Reasoning

Person Characteristics

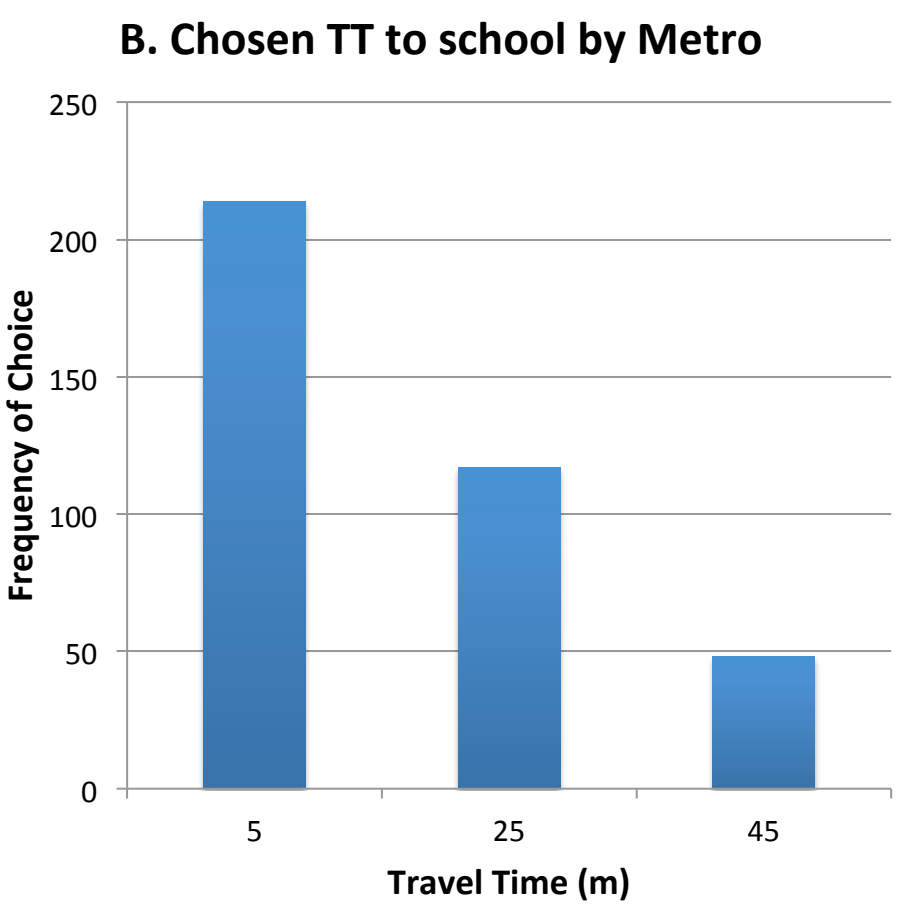
- **Income:** An individual earning more is likely to associate a greater utility to any apartment choice. With the lowest income category as reference, the expected sign is +ve
- **Student Category:** International students due to a likely 'shortage' of local connection are more likely to associate greater utility with any choice especially during early years of school (+ve sign)
- **Age:** We expect a more experienced person to be more picky while making a choice. (-ve sign)
- **Gender:** Men are likely to be more flexible in their choice than women. With men as the reference, the sign is expected to be negative

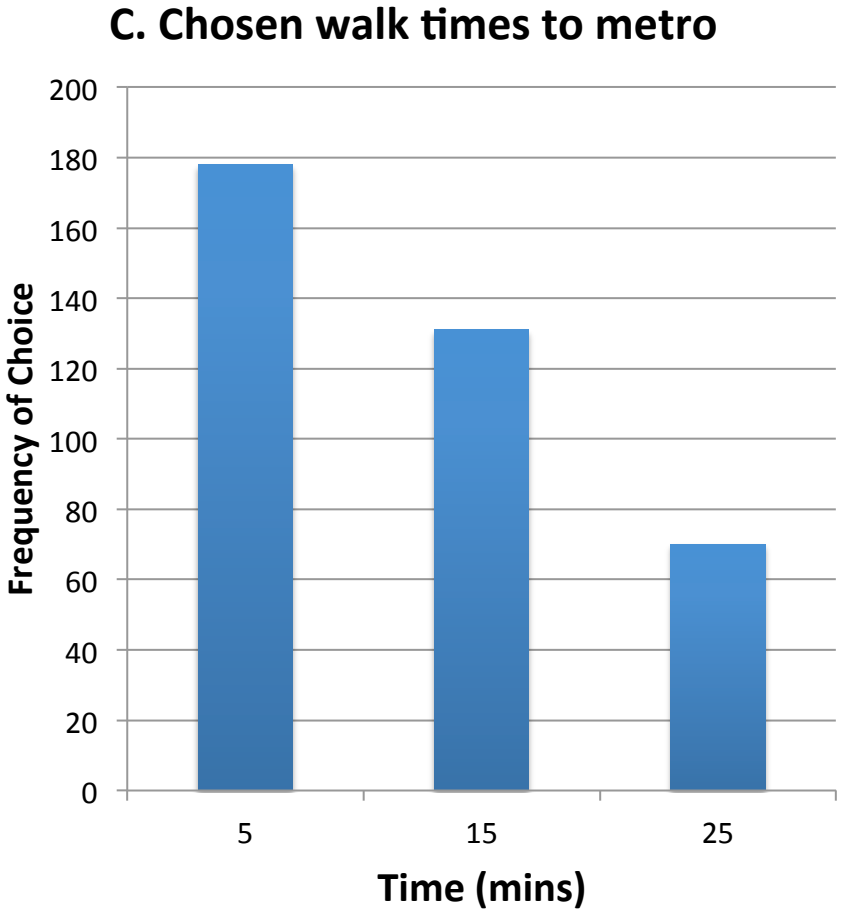
Exploratory Graphs

A. Observed variation of Chosen cost

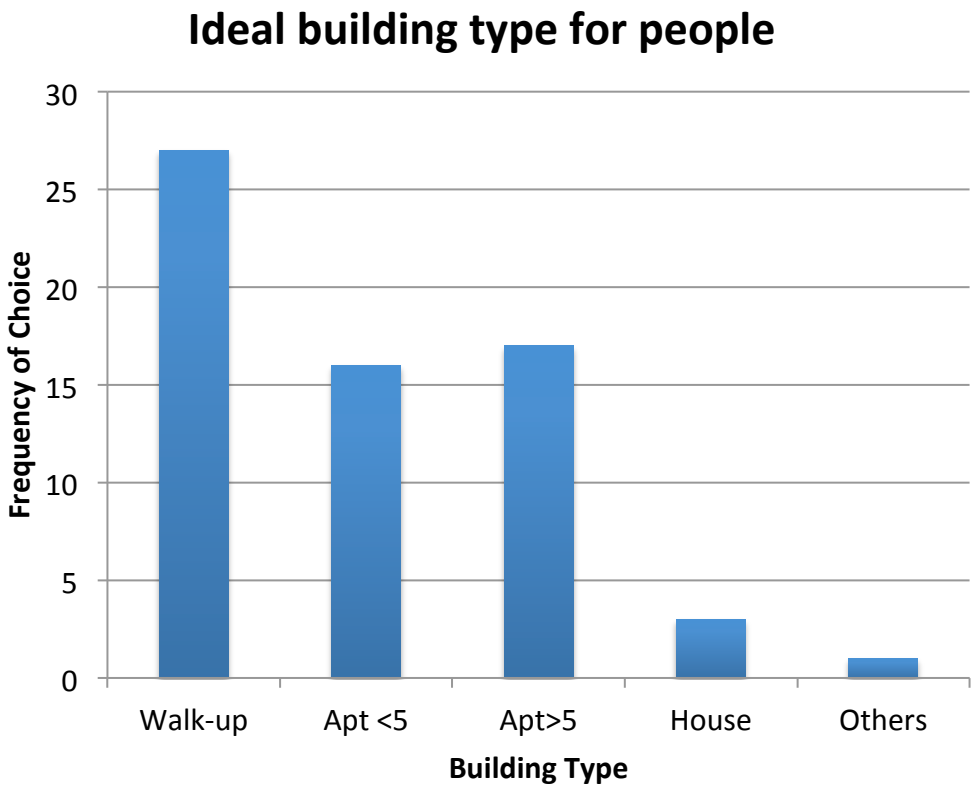


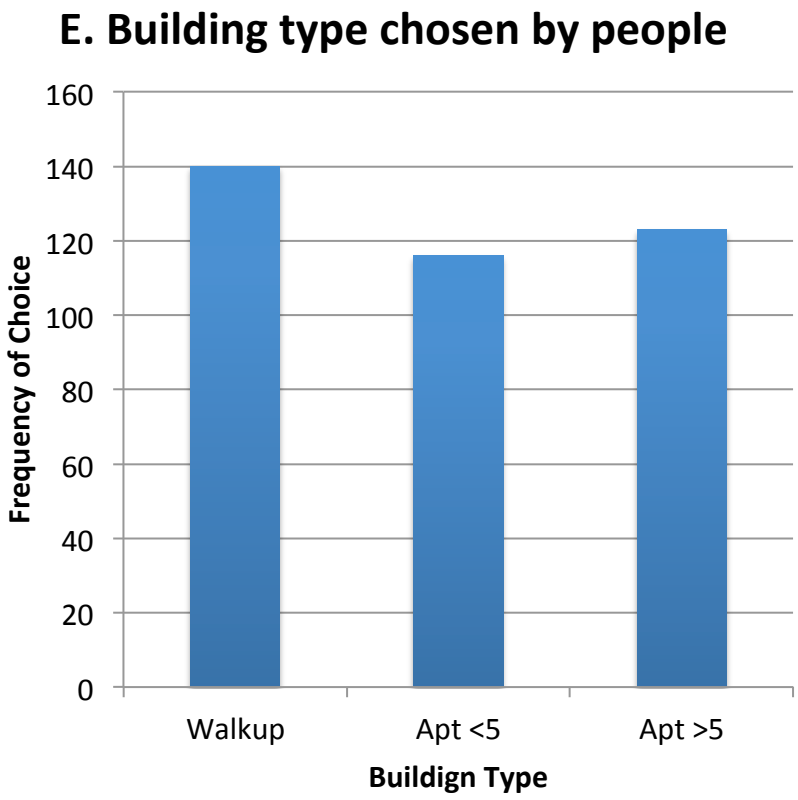
Exploratory Graphs





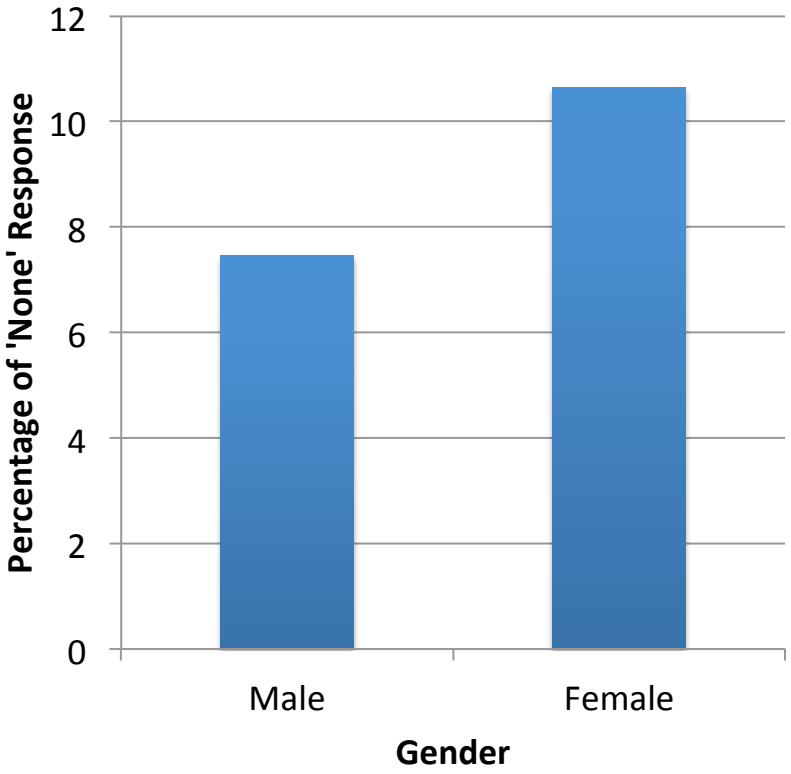
Exploratory Graphs



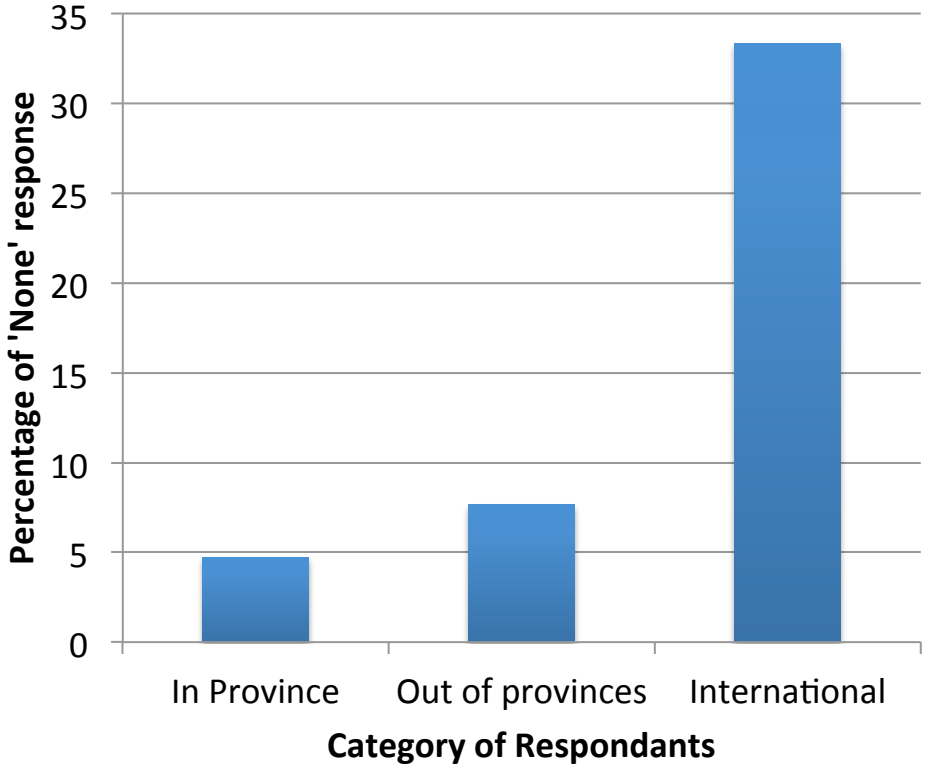


Exploratory Graphs

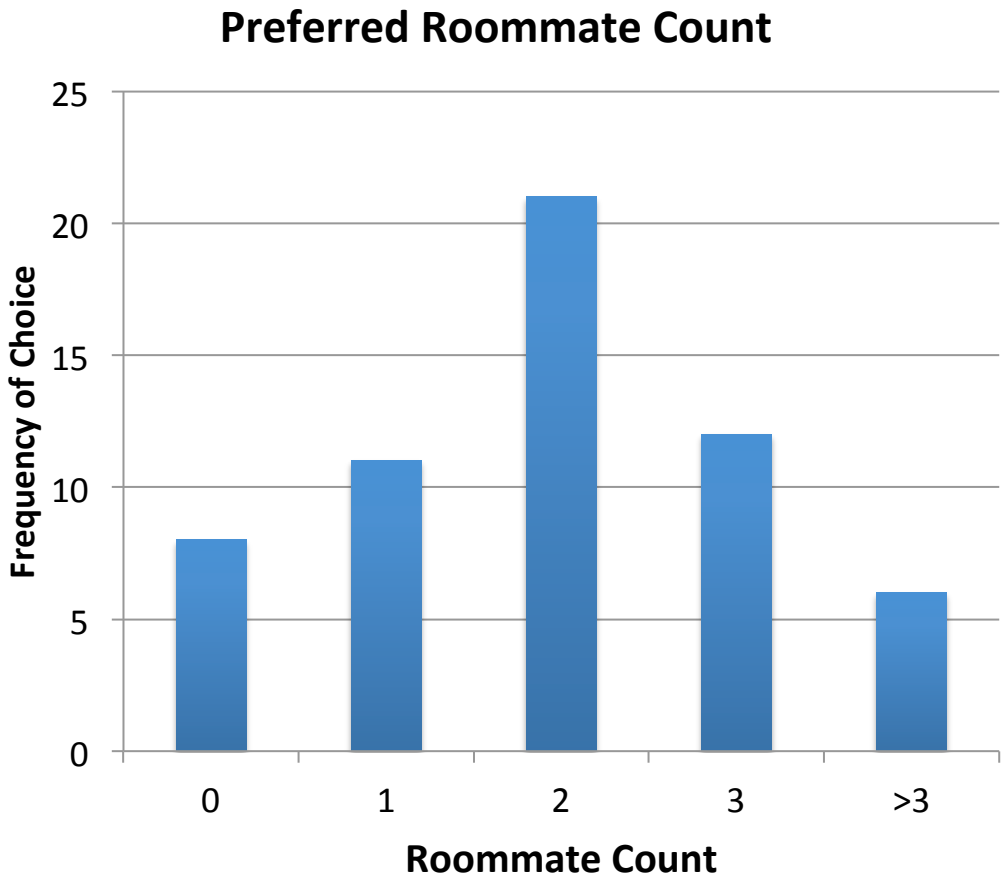
F. Gender-wise distribution of people choosing 'None'

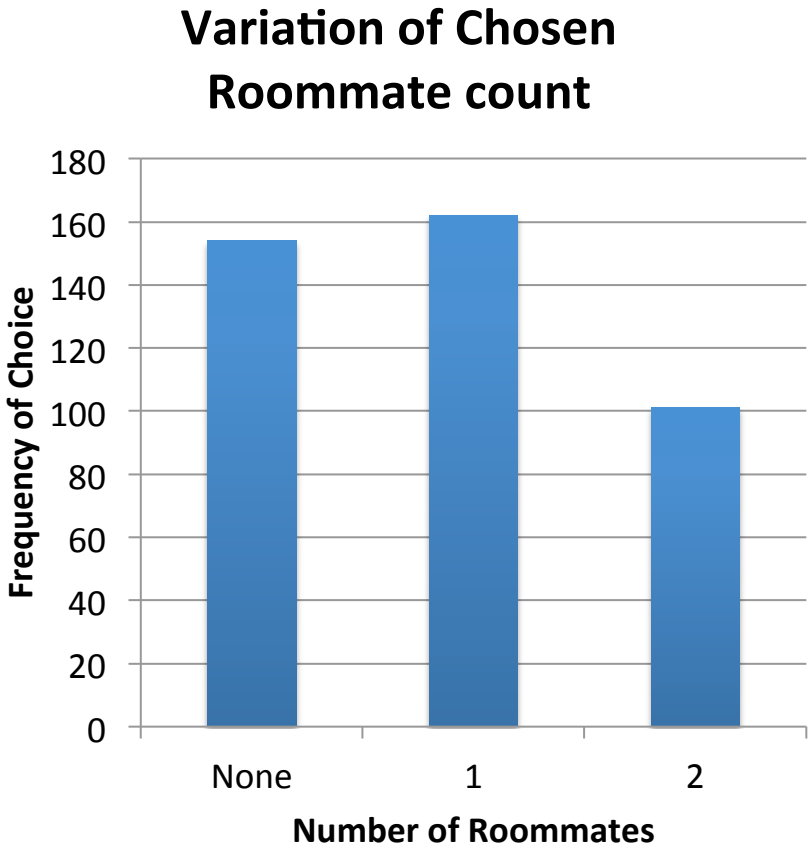


G. Category-wise distribution of people choosing none



Exploratory Graphs





Exploratory Analysis- Choice Matrix

Cost/TUM	5	25	45	Grand Total
400	98	57	20	175
500	78	41	19	138
600	38	19	9	66
Grand Total	**214**	**117**	**48**	**379**

Building models

- Primary model consisted of:
  - Travel time to University by Metro
  - Walking time to Metro
  - Cost
  - **Roommates**
  - **Building type**
  - Income
  - Age
  - **Gender**
  - **Category**

Lost significance due to only 3 levels?

Final Model

Name	Value	Std err	t-test	p-value	Robust Std err	Robust t-test	p-value
BETA_COST	-0.00653	0.000892	-7.32	0.00	0.000906	-7.21	0.00
BETA_TIME_METRO	-0.0622	0.00906	-6.87	0.00	0.00860	-7.23	0.00
BETA_TUM	-0.0416	0.00437	-9.52	0.00	0.00449	-9.26	0.00

Init log-likelihood:	-416.374
Final log-likelihood:	-295.526
Adjusted rho-square:	0.278

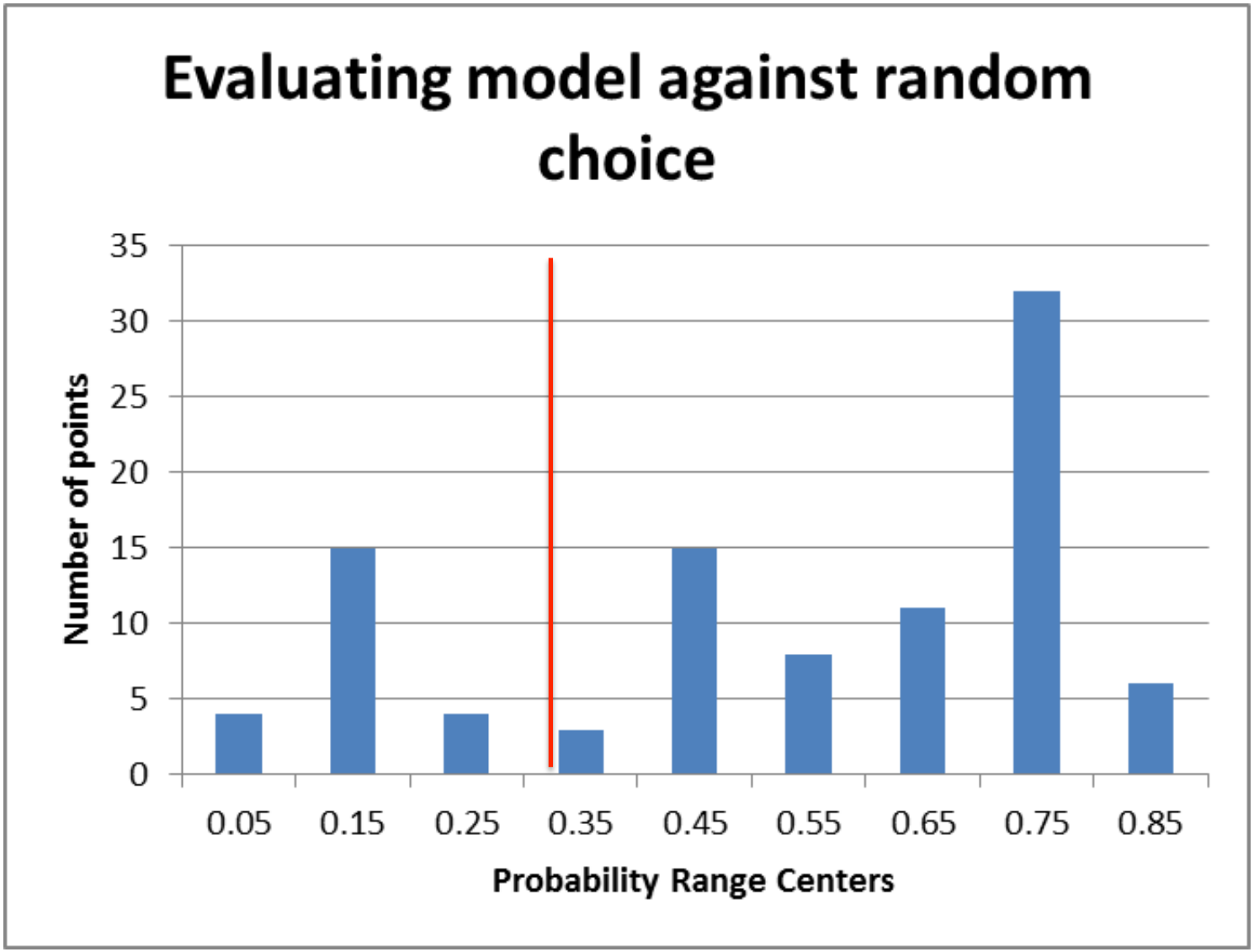
Interpretation of Coefficients

- The odds of an option being chosen decrease by a factor of exp(-0.00653) for each dollar increase in cost
- The odds of an option being chosen decrease by a factor of exp(-0.0622) for each minute increase in walking time to metro
- The odds of an option being chosen decrease by a factor of exp(-0.0416) for each minute increase in travel time to school by metro

Other Observations

- Richer people are more likely to get a satiable option: Odds of a person earning $17.5k of making a definitive choice are higher than those for a person earning <$12k by exp(0.0473)
- Older means more selective: The odds of a person >22 years in age choosing one of the available options choice are lower than those for an 18 year old by a factor of exp(-0.0319)


Model Performance
45
40
35
30
25
20
15
10
5
0
Count
1
2
3
Choice
Observed
Simulated


Evaluating model against random choice
Number of points
35
30
25
20
15
10
5
0
0.05
0.15
0.25
0.35
0.45
0.55
0.65
0.75
0.85
Probability Range Centers

Policy Analysis and Conclusion

- Our model reveals that University Students associate high utility with apartments that are low cost; in close proximity to the metro; and within close travel distance to the University by the metro.
- Students are willing to pay close to $10 for each minute decrease in walking time to metro and $6.5 for each min decrease in travel time to school by metro
- Even though several apartment listings meet these location criteria, many of them do not fit the bait for cost.
- This may help landlords to equip their apartments optimally to be able to cater to a broader category of students.
- The presence of the ‘required’ type of housing at the appropriate location can be a means to reducing environmental footprint of University Students

Thank You!