Improving the Residential Location Model for the New York Metropolitan Region

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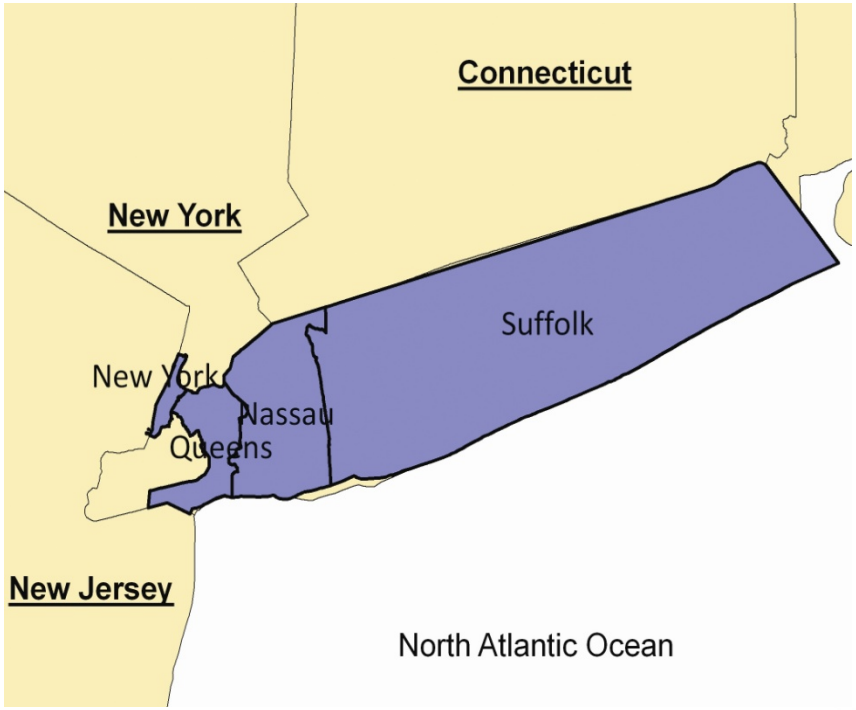
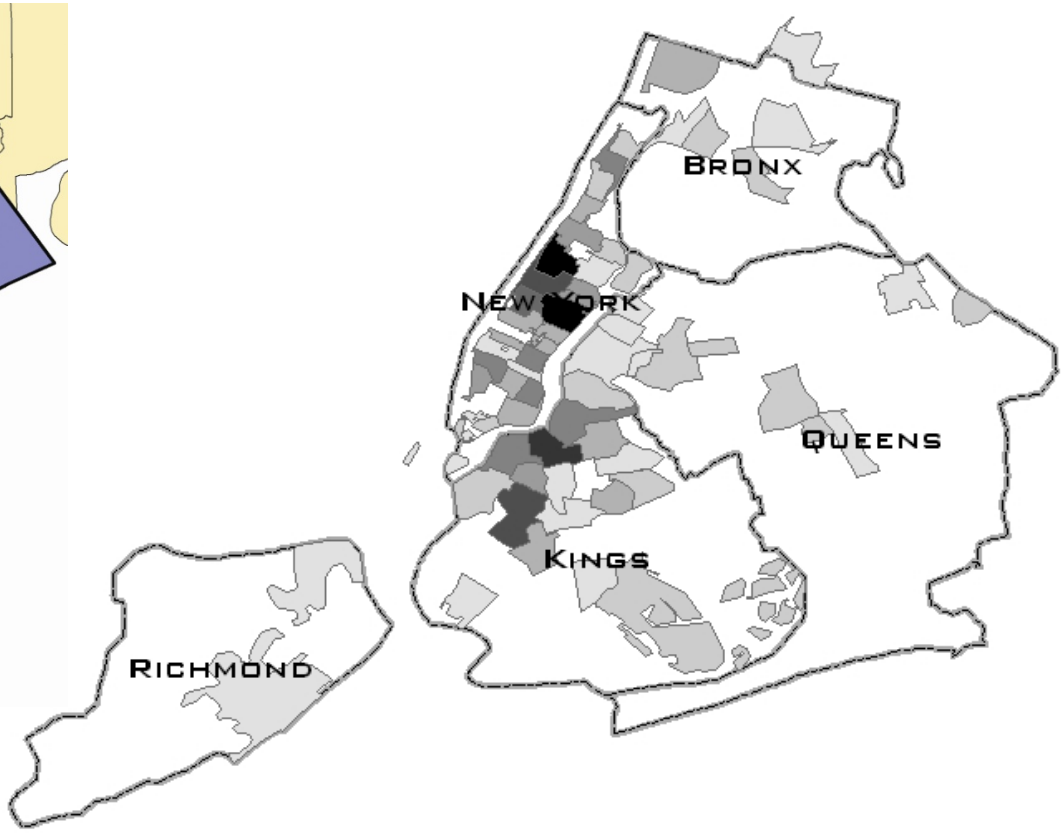
Outline

- Introduction
- Motivations and Research Questions
- Datasets
- Hypotheses
- Methods
- Project Findings
- Benefits to Regional Planning

Introduction





Survey Target Counties

Interview Target Counties

Motivations

- Land use model ⇨ Residential location choice model
- Household travel survey
- Regional travel planning

Research Questions

- How does one's past location experience affect the preferences in the current location decision?
- How does the search process impact the location decision?

Dataset 1: Survey of prior residential locations experiences

- 269 households relocated 2007-2009
- Chosen counties: Manhattan, Queens, Nassau, Suffolk
- Information collected
  - Three prior locations with longest times of staying
    - Childhood location
  - Most recent prior location
  - Current location

Characteristics of Survey Respondents

Homeownership	Owner Occupied		Renter Occupied	
	Num.	% in sample	Num.	% in sample
	209	77.7	69	22.3
% of child-bearing HH.	49.0		42.1	
Average Household Size	2.90		2.63	

Gender		Male	Female
	% in Sample	40.1	59.9
Ethnicity	% of White	72.0	65.7
Education	Less than complete College	26.9	21.4
	Complete college degree	29.2	34.2
	completed graduate degree	43.9	44.4
Average Age		42.54	41.16

Prior Location Influence: Hypotheses

- Influenced by spatial experience
- Not limited to most recent prior
  - Dated back to growth period (0-18 yrs old)
  - Varied effects at different periods
- Modified by location's properties
  - Number of years lived in there (duration)
  - Number of years from current (recency)
- Cumulated over multiple prior locations

Times in prior locations

Mean Duration & Recency of Stay by Ranking of Duration (yrs)						
	Buyer			Renter		
	N	Duration	Recency	N	Duration	Recency
Longest	201	16.1	13.9	59	16.4	15.0
2nd Longest	190	7.8	9.8	57	6.7	7.7
3rd Longest	160	4.5	10.6	50	3.8	8.9

Total Reported Duration of All Prior Locations (yrs)										
	Buyer					Renter				
	N	Mean	Std. Dev.	Min	Max	N	Mean	Std. Dev.	Min	Max
Age	208	42.1	11.6	21	79	60	41.6	11.4	23	78
Total Reported Duration	207	27.8	11.3	4.0	61.9	59	27.5	13.0	2.5	69.5

Utility Function—Accounting for Prior Location Influence

- Total utility function

$$U_j = V_j + \varepsilon_j = \sum_l \beta_l \times f(x_{j,l}) + \varepsilon_j$$

- Popular assumption of β_l: constant
- Accounting for prior location influence:

$$\beta_l = \alpha_{l1} + \alpha_{l2} \frac{\partial f(x_{n,a,l})}{\partial x_{n,a,l}} = \alpha_{l1} + \alpha_{l2} \frac{\partial \log(x_{n,a,l})}{\partial x_{n,a,l}} = \alpha_{l1} + \alpha_{l2} \frac{1}{x_{n,a,l}}$$

Where,

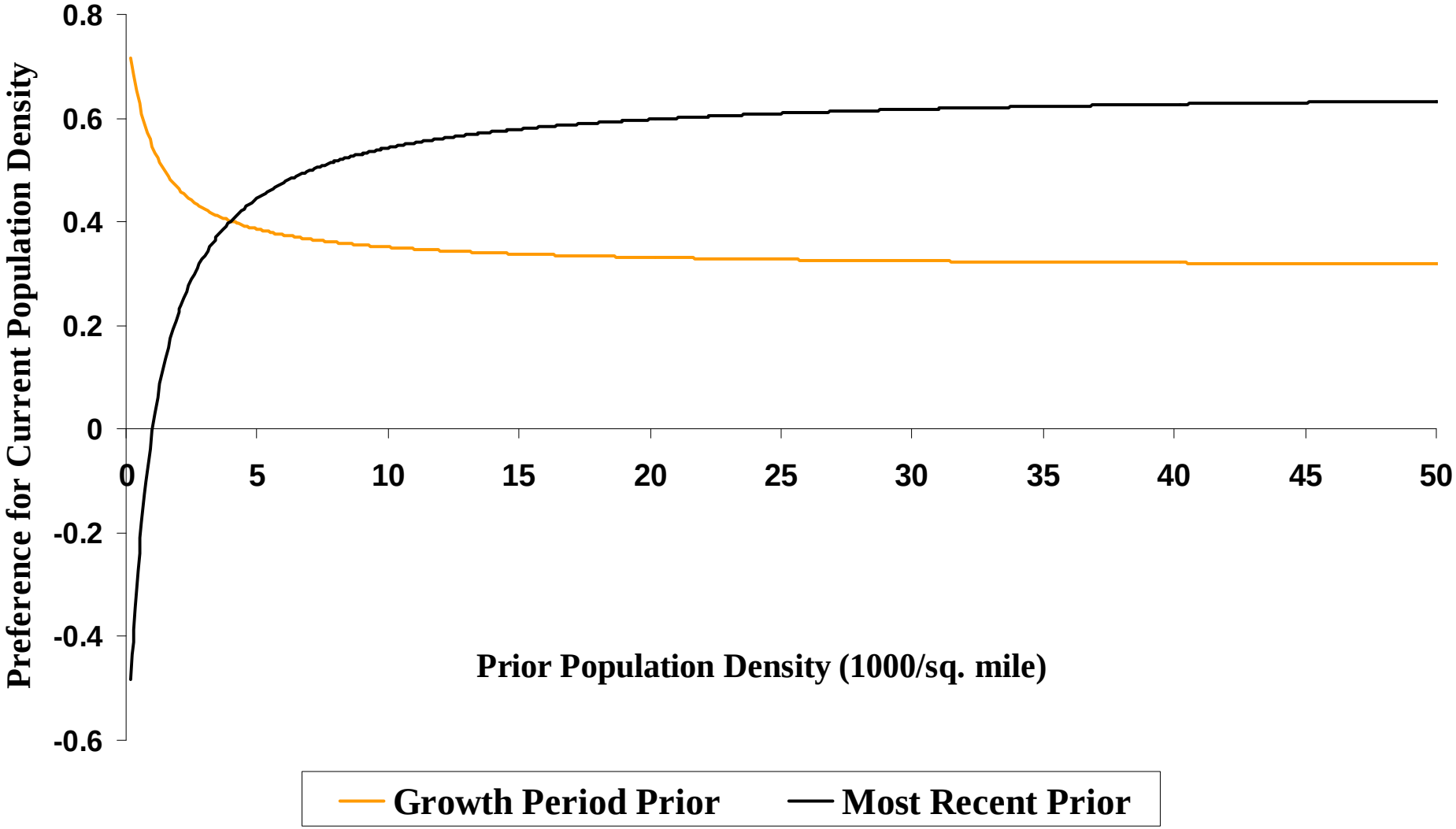
β_l: parameter of the *lth* attribute,

α_{l1} : base parameter for β_l,

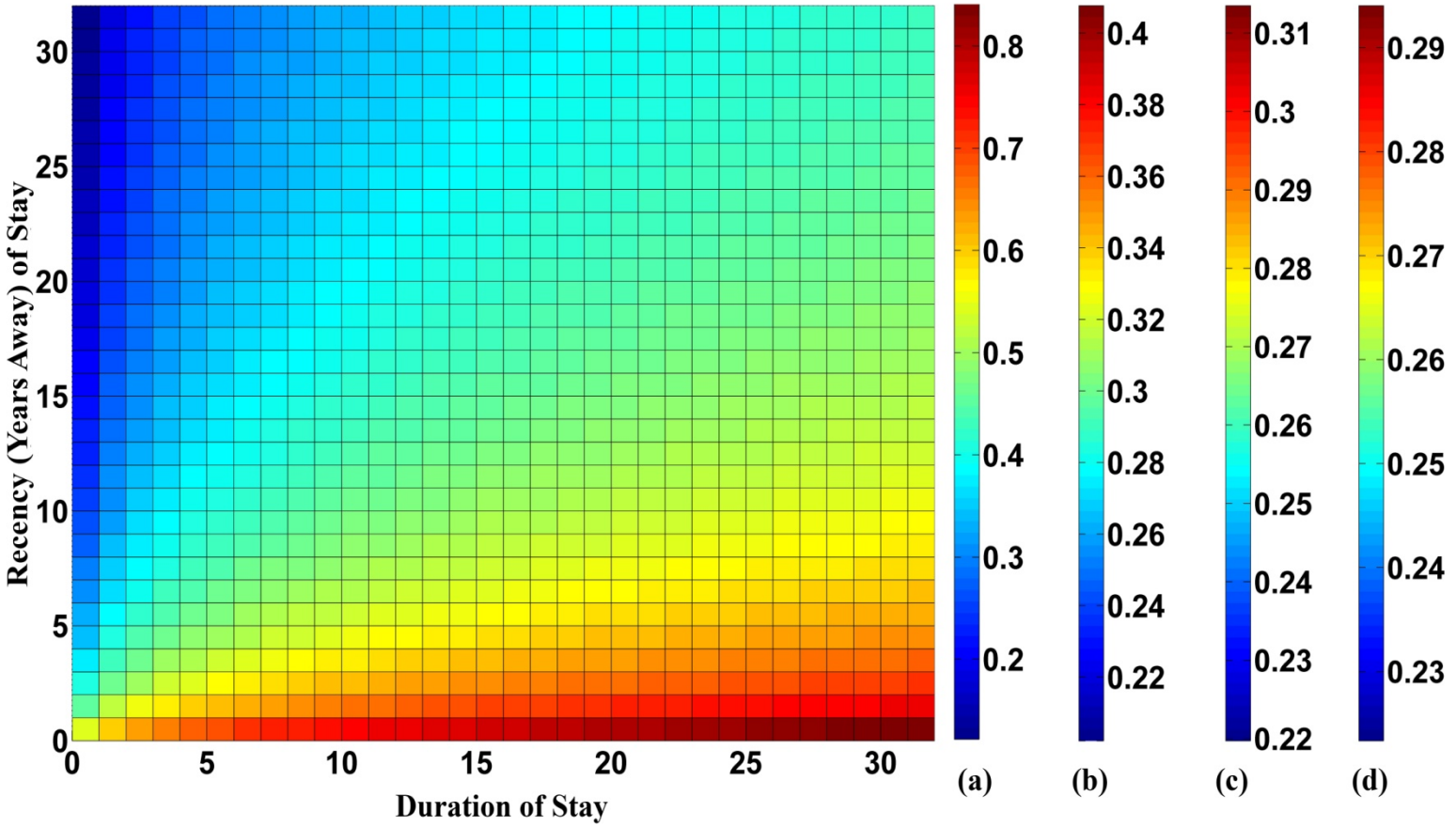
α_{l2} : adjustment parameter for β_l,

$x_{n,a,l}$: *lth* attribute for household *n* in prior location *a*.

Growth Period vs. Most Recent Prior Locations

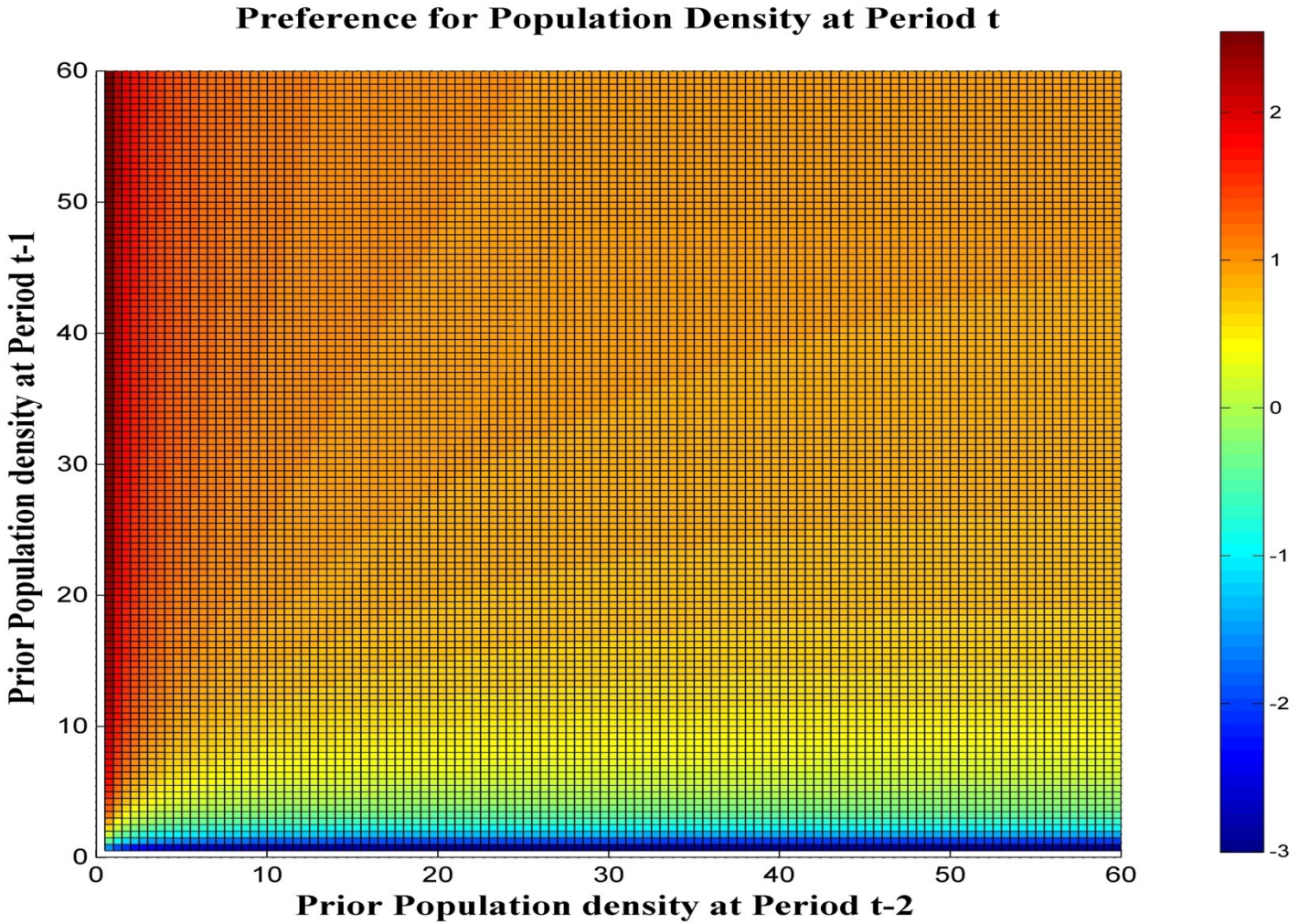


Modified by Duration and Recency



(a) Prior Population Density= 5 k/Sq. Mile
(b) Prior Population Density=20 k/Sq. Mile
(c) Prior Population Density=45 k/Sq. Mile
(d) Prior Population Density=60 k/Sq. Mile

Cumulative Effects from Multiple Prior Locations



Dataset 2: Interview on search process

- 221 households searched for a home 2004-2008
- Chosen counties: Manhattan, Queens, Brooklyn, Bronx, Stain Island, etc.
- Information on
  - All locations that were seriously considered
    - Zip-code
  - Most recent prior location
  - Current location

Characteristics of Searchers

	Buyers			Renters		
Number of observations	138			83		
	Mean	Min	Max	Mean	Min	Max
Searchers' age	36.65	22	73	29.65	18	58
number of children	0.28	0	3	0.22	0	5
buy/rent budget ($)	664k	80k	2.50 m	2,649	1,000	20k
buy/rent price ($)	639k	58k	2.65 m	2,275	640	12k
Search duration in month	7.62	1	36	3.89	1	13
percentage of female	49.17			54.73		
percentage of single person search	26.09			21.69		

Characteristics of Search

- Measurements characterize a search
  - Distance to prior home: first searched location
  - Total “drift” distance
- Search space

	Buyers		Renters	
	N	Mean	N	Mean
Drift 1 (prior-SN1)	92	1.63	46	1.42
Drift 2 (SN1-SN2)	92	1.33	46	1.06
Drift 3 (SN2-SN3)	31	1.86	23	1.18

Search Process: Hypotheses

- Search space varies with socio-economic status
  - Couple households vs. single adult households
  - Single female households vs. single male households
- Search space relates to investment amount
  - Homebuyers vs. renters
- Search space relates to distance to prior home
  - A small step away from prior home
  - A big step away from prior home

Buyer's Model	Model 1		Model 2	
	d_{p1}		d_{1f}	
Variables	Parameter Estimate	t Value	Parameter Estimate	t Value
constant	1.628*	4.59	1.163*	3.00
buyers' budget	-0.387	-1.46	-0.658*	-3.02
have at least one member work at home	0.094	0.25	0.680*	2.14
internet	0.595*	2.28	0.157	0.75
Socio-demographics				
single male household	**-0.297**	-0.68	**-0.258**	-0.78
single female household	**0.925***	2.26	**0.930***	2.86
Intra-household dynamics				
agree on neighborhood	**-0.679***	-2.41	**-0.539***	-2.32
equal role in decision process	**0.829***	2.68	**0.318**	1.28
Number of neighborhoods	N/A	N/A	0.502*	5.39
Number of Observations Used	106		130	
R-Square	0.20		0.37	

Model Results

- Models results
  - A larger step away from prior home leads to larger search space
  - Single males search in smaller spaces then couple households
  - Single females search in larger spaces then couple households
  - Homebuyers search in larger and more discontinuous spaces then renters

Major Findings on Prior Location Influence

- Past home location experiences have an impact on preferences for current residential location choice
  - Most recent prior location matters
  - Other prior locations matter
  - Time of stay in prior location matters
    - Total years of stay
    - Years from current of stay
    - (Life-cycle) period when stay
  - Cumulative effects from multiple locations

Major Findings on Search Process

- Households search in a limited number of locations that are mostly close to prior home
- Search spaces
  - Vary with socio-economic status (SES)
  - Vary with investment amount
  - Are smaller if searchers start from a location closer to prior home than those further away

Benefits to Regional Planning

- Improvements on the utility function for location choice
  - Incorporate prior location attributes
  - Add in distance to prior location as an attribute
  - Add in interactions between SES and distance to prior
- Recommendations of additional questions to be asked within the current household travel survey framework
  - Prior locations
    - Most recent prior
    - Additional: growth period; long duration
  - Move reasons

Acknowledgement

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Thank you!

Questions or comments?