CHASING SUSTAINABILITY:

Do new TOD residents adopt more sustainable modes of transportation?

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ABSTRACT

Transit-oriented developments (TOD) are seen as a solution for mitigating the detrimental effect of motor vehicles on society. This type of development is intended to reduce automobile use and urban sprawl as well as to provide communities with more socially, environmentally, and ecoomically sustainable seighborhoods that offer a variety of mobility choices.

This paper attempts to find out whether new TOD residents adopt more sustainable modes of transportation after their relocation.

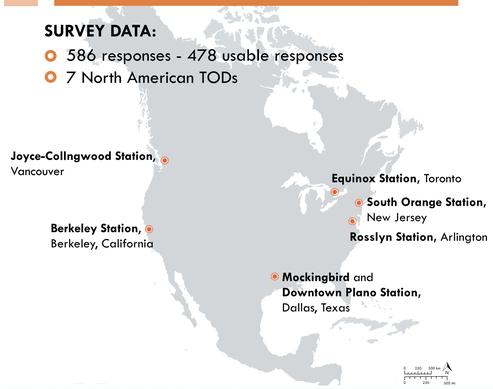
The analysis determines which factors influence travel mode swithing decisions by specifying a multilevel multinomial logistic regression model. Data for the analysis are drawn from a travel behavior survey conducted on residents in seven different North American TODs in 2013.

Our **results** show that new **TOD residents adopt more sustainable modes for amenities and leisure trips, whereas they are less likely to do so for work and shopping trips**. Based on its results, the study develop a set of measures to encourage more sustainable mode of transportation in TODs with the goal of mitigating car usage.

TRAVEL BEHAVIOR SURVEY

SURVEY DATA:

- 586 responses - 478 usable responses
- 7 North American TODs



DATA & METHODOLOGY

UNIT OF ANALYSIS: Trip purpose (n=2459)

Six different trip purposes were analyzed:

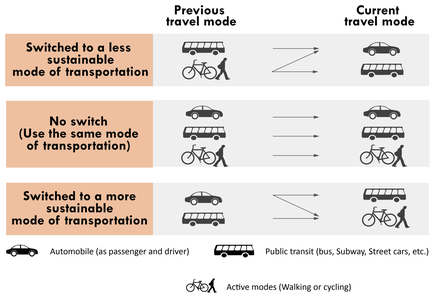
- Trip to work
- Trip to the gym or to indoor recreation
- Trip to a service provider (bank, clinic, pharmacy, etc.)
- Trip to a café, bar, or restaurent
- Trip to the main shopping street or mall
- Trip to entertainments (movie, theater, gallery, etc.)

** Each individual is repreated by the number of different type of trips they reported.*

MODEL USED: Multilevel multinomial logistic regression

- Control for correlation between an individual's responses
- Unordered categorical dependent variable: type of switch

DEPENDENT VARIABLE: Type of switch



DESCRIPTIVE ANALYSIS

TRAVEL MODE CHOICE: before after moving to a TOD by trip's purpose:

	Travel mode choice					
	Automobile		Public transit		Active mode	
Trip purpose	Previous	Current	Previous	Current	Previous	Current
Work	43,85	48,5	37,54	36,21	18,6	15,28
Gym or indoor recreation	40,73	39,51	9,12	5,17	50,15	55,32
Service provider	46,74	41,74	9,78	7,39	43,48	50,87
Café, bar or restaurant	47,39	43,48	9,35	8,91	43,26	47,61
Main shopping street or mall	56,10	56,32	16,49	16,06	27,41	27,62
Entertainment	56,79	49,32	18,55	18,55	24,66	32,13
Total (%)	**49,29**	**46,73**	15,86	14,56	**34,85**	**38,71**

- The proportion of trips traveled by automobile is reduced (-2.6%), while the proportion of people travelling by foot rise significantly (3.9%).
- 45% of respondents switched to a more sustainable mode, 39% switched to a less sustainable mode for at least one of their trip purpose after moving to a TOD.
- 29% of the respondent did not modify their travel mode choice habits after residential relocation.

Compared to the mode used in previous residential location

- 20.4 % of the trips use a more sustainable mode
- 17.4 % of the trips use a less sustainable mode

STATISTICAL MODEL

PROBABILITY OF SWITCHING TO A MORE OR SWITCHING TO A LESS SUSTAINABLE MODE OF TRANSPORTATION

	More sustainable vs No switch				Less sustainable vs No switch			
			Confidence interval (95%)				Confidence interval (95%)	
Independent variables	**RRR**	**Z**	**Lower**	**Upper**	**RRR**	**Z**	**Lower**	**Upper**
Household income >$80,000	0.69	-1.33	-0.92	0.17	1.08	0.24	-0.57	0.73
Household size	**0.74**	**-2.49** **	**-0.54**	**-0.06**	1.09	0.67	-0.17	0.34
Increased in number of vehicle	1.43	0.92	-0.40	1.11	**2.96**	**2.95** ***	**0.36**	**1.81**
New homeowner	1.16	0.52	-0.42	0.72	**2.15**	**2.26** **	**0.10**	**1.43**
Increase in Walk Score	**1.99**	**2.54** **	**0.16**	**1.22**	**0.24**	**-3.85** ***	**-2.14**	**-0.69**
Free parking at work	**0.50**	**-2.16** **	**-1.33**	**-0.06**	**3.73**	**3.30** ***	**0.53**	**2.10**
Reduced transit fare	1.71	1.66 *	-0.10	1.17	**0.26**	**-3.65** ***	**-2.07**	**-0.62**
Environmental impact	**2.45**	**3.07** ***	**0.32**	**1.47**	**0.38**	**-2.82** ***	**-1.63**	**-0.29**
Neighborhood walkability	1.96	1.79 *	-0.06	1.41	0.51	-1.44	-1.60	0.25
Transit more	**0.53**	**-2.05** **	**-1.23**	**-0.03**	1.08	0.21	-0.65	0.80
Reason for moving 1	**4.37**	**2.65** ***	**0.38**	**2.56**	1.95	0.65	-1.37	2.71
Reason for moving 4	**0.15**	**-2.21** **	**-3.57**	**-0.22**	2.01	0.87	-0.88	2.28
Reason for moving 5	**2.39**	**2.73** ***	**0.25**	**1.50**	0.79	-0.62	-0.99	0.52
Walking time to grocery (min)	**0.99**	**-2.77** ***	**-0.02**	**0.00**	1.00	0.66	0.00	0.01
Nearest transit stop (min)	**0.92**	**-2.71** ***	**-0.14**	**-0.02**	1.04	1.33	-0.02	0.10
Shopping trip	**0.37**	**-4.41** ***	**-1.42**	**-0.55**	1.59	1.81 *	-0.04	0.97
Working trip	1.19	0.72	-0.30	0.65	**2.87**	**3.84** ***	**0.52**	**1.59**
Previous mode: automobile	**12.38**	**8.93** ***	**1.96**	**3.07**	0.00	-0.01	-9391.35	9340.21
Constant	0.04	-3.11 ***	-4.22	-2	0.49	-0.69	-1.88	0.48
N= 1941								
LR $chi^2(42)=1045.14$ Pseudo $R^2=0.30$								
	Coeff.	**Z**	**Confidence interval (95%)**					
var(M1[id])	2.93	0.59	1.98	4.36				
var(M2[id])	3.06	0.75	1.89	4.96				
cov(M2[id],M1[id])	-0.32	-0.64	-1.29	0.66				

Notes : No switch means that the person uses the same mode after relocation, and is the reference (Base outcome) of the model.

*** p<.01; **p<.05; *p<.10.

RESULTS FROM THE MODEL

FACTORS THAT INCREASE THE PROBABILITY OF SWITCHING TO:

(1) a more sustainable travel mode:

- Awareness of the environmental impact of each travel mode
- Walkability of the neighborhood & availability of various destination
- Proximity to transit stop
- Access to a reduced transit fare

(2) a less sustainable travel mode:

- Acquisition of a new vehicle
- Larger household size
- Becoming a new homeowner
- Access to a free parking spot at work

CONCLUSION

MAIN FINDING:

The implementation of **TODs can reduce automobile use**, but only for certain trips.

According to the study, TOD newcomers adopt more sustainable modes **for amenities** and **leisure trips**, whereas they are less likely to do so for work and shopping trips.

POLICY IMPLICATIONS:

1. Transit incentives coupled with **workplace parking charges** need to be considered.
2. Mitigate the effects that **having children** or **becomming a new homeowner** have on the probability of opting for less sustainable modes of transportation.
3. Transit agencies should consider how to **accomodate and accompany people** throughout their lives.
4. Planning strategies need to focus on **denser mixed-use developments** with pedestrian- and cycle-friendry infrastructures, and should offer better access to various amenities.
5. Policies that **promote the benefits of sustainable modes** need to target TOD's residents, while educating and informing individuals.

FUTURE RESEARCH:

Change in travel mode choice for shopping trips should be further analyzed to determine which factors would promote the use of active mode of transportation and transit for shopping trips. **Better understand why new TOD residents commute by car** and how we can alter their travel mode choice.

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