

# Center for Teaching Old Models New Tricks (TOMNET)

## A USDOT Tier 1 University Transportation Center

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### PROJECT PROPOSAL

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**Title:** The Impact of Non-Transportation Attitudes, Preferences, and Personality Characteristics on Residential Location and Travel Choices

**Principal Investigator:** Deborah Salon, Assistant Professor, School of Geographical Sciences and Urban Planning, Arizona State University

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### 1. Introduction/Problem Statement

Transport-related preferences and attitudes have been found to be important determinants of travel choices, given an already-chosen residential location (e.g. Vredin Johansson, Heldt, & Johansson, 2006). The hypothesis we will test in the proposed research is that attitudes, preferences, and personality characteristics *that are unrelated to transport* substantially influence travel choices through their impact on residential location choices.

People make choices about where to live based on many factors that are unrelated to transportation. In fact, prior research indicates that transportation-related features of prospective homes are often not a priority in the home choice process (Bina, Kockelman, & Suescun, 2006; Chatman, 2009; Kestens et al., 2004).

Despite the lack of attention to transport by some movers, their choice of residential location leads them to travel certain ways by restricting their daily travel choice set. Some people like to live downtown to be in the center of it all. They may not care about using alternative modes of transportation, but they end up using them because that's what makes sense when you live downtown. Other people want more space, a less expensive home, less noise, better schools, or access to natural areas. They may not love driving, but they end up driving considerable distances each day because that's what makes sense when you live in places that have these other amenities.

The existing literature has addressed closely related questions. There is an extensive literature that looks at the relationship between built environment characteristics and travel choices by modeling travel choices including built environment characteristics and sometimes attitudes as explanatory variables (e.g. Schwanen & Mokhtarian, 2005; Bento et al., 2005). This literature aims to shed light on the practical question of how much changing our built environment in existing neighborhoods will affect travel.

There are also smaller literatures that look at residential location choice and feature aspects of the transportation context as explanatory variables (e.g. Lee, Waddell, Wang, & Pendyala, 2010; Liao, Farber, & Ewing, 2015), and that jointly model residential location and travel choices (e.g. Pinjari, Pendyala, Bhat, & Waddell, 2007; Salon, 2009). Our proposed work aims to contribute here by estimating the effect of residential location attitudes on location and transportation choices.

## 2. Project Objectives

The work proposed here builds upon our Year 1 TOMNET project *Assembling Integrated Data Sets for Analyzing Connections between Travel Behavior, Attitudes, and the Built Environment*, as well as our Year 2 TOMNET project *The role of transport in how we choose where to live*, and the joint TOMNET project that is the multi-University collaborative survey effort. In Year 1, we merged three survey data sets that focused on travel choices and attitudes with detailed information from the Zillow corporation about the neighborhoods and specific residences that survey respondents chose to live in. The survey data sets included the 2012 ASU Travel Survey, the 2011 Northern California Commuter Multitasking Survey, and the 2015 California Millennials Survey. In Year 2, we conducted a qualitative study of how recent homebuyers chose their homes, and the TOMNET survey was planned to include residential location choice questions.

In this project, our objective is to use these enriched datasets and the TOMNET survey data to gain an understanding of the relative impact of attitudes on residential location and travel choices. We will focus on attitudes and preferences that primarily influence residential location choice, and attempt to shed light on their indirect influence on travel choices.

Our approach will be to estimate statistical models using these datasets, and identify common threads in our findings that indicate generalizability of results. The model formulations we propose are described below.

## 3. Proposed Methodology and Data

Our primary model specification will follow Liao et al. (2015) to estimate a hybrid-choice latent-class model of the choice of residential location that incorporates attitudinal variables. While Liao et al. estimated their model using stated preference data, we will be using revealed preference home and neighborhood choices from the datasets we assembled with Year 1 TOMNET funding.

For both the ASU Travel Survey and the Northern California Commuter Multitasking Survey datasets, we have only neighborhood-level geographic identifiers for each household, which means that the key covariates will be neighborhood averages of home characteristics. For the California Millennials dataset and the TOMNET survey dataset, we have a sizable sample with exact home addresses, and can model the choice of the specific home.

The proposed model framework allows us to identify latent classes among survey respondents in each dataset based on their responses to a variety of attitudinal questions as well as sociodemographic characteristics. Then, for each latent class identified, we can estimate the tradeoffs between transport-related features of their home or neighborhood choice, such as commute time, and non-transport-related home features, such as home size. Liao et al. (2015) found large differences in their estimates of home feature tradeoffs between two latent classes of home choosers. The differences in these tradeoffs are a way to quantify the differences between latent classes in how they prioritize home features. As an extension to this base model, we will add the joint choice of vehicle miles traveled (VMT) category (low, mid, or high) for at least one of these datasets. The ASU Travel Survey dataset includes a 24-hour trip diary with the VMT for each trip already calculated. The TOMNET survey includes a direct question about annual VMT for each household vehicle. Estimating a hybrid-choice latent-class model of this *joint* choice will allow us to directly estimate the relationship between, say, preferences for a large home or high-quality schools, and amount of daily (or annual) driving.

Most researchers estimate travel behavior models using just one dataset for a particular geographic context. It is clear that the results are not necessarily generalizable to other contexts, but

subsequent researchers investigating similar research questions with different datasets will often compare their results with what has come before. Unfortunately, these comparisons often have the “apples-to-oranges” problem, as invariably both the base data collection and the model estimation structures are different.

Thus, an additional contribution of this work will be to utilize three distinct-but-similar attitudinal surveys of travel choices with the same modeling approach so that results can be (more) directly compared across the survey contexts. If we find points of substantial agreement among the results, therefore, we can start to claim that perhaps we have identified some insights into the relationship between attitudes, home location choice, and travel behavior.

#### 4. Work Plan (Project Tasks)

##### Task 1: Data exploration and preparation

The first task will consist of multivariate data exploration using R, Stata, and/or Python to thoroughly understand the basic contours of the datasets and the bivariate relationships between key variables, and data enhancement for implementation of a set of discrete choice models. These models require data to be created for alternatives that were *not* actually chosen by the individuals and households surveyed. For instance, we will estimate commute time for each employed individual in our dataset by calculating the commute time between both their chosen home and their workplace *and* between each of the not chosen alternative homes in our model and their workplace. Having these data will allow us to estimate the importance that the person places on commute time when deciding where to live.

##### Task 2: Program the model(s) and explore results

The models to be estimated in this project are complex, requiring specialized software and/or original code to estimate. We propose to use either Biogeme open source software, a purpose-built R package, or Python to estimate the hybrid-choice latent-class models described above.

##### Task 3: Write one or more papers for journal submission based on these analyses

We expect that this research will result in novel findings that we can publish in peer-reviewed academic journals.

#### 5. Project Schedule

	2019					2020						
Task	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
1												
2												
3												→

## **6. Relevance to the Center Theme/Mission**

This project is directly relevant to the TOMNET Center mission. We will be looking specifically at the role of under-explored attitudes and preferences – those that directly influence residential location choices – in determining travel behavior.

## **7. Anticipated Outcomes and Deliverables**

We anticipate that this research will produce new insights regarding the relationships between a variety of attitudes, residential location choices, and travel behavior. We expect that these relationships will be markedly different for different types of people, and we aim to uncover these typologies using attitudinal data. Understanding these typologies may help policymakers to better target policies to encourage residential location efficiency, reducing regional traffic congestion and other negative externalities of urban automobile use.

Our main deliverables will be written accounts of our work and results.

## **8. Research Team and Management Plan**

The research team for this project will include Matthew Wigginton Conway and Deborah Salon. Conway is a 2<sup>nd</sup> year PhD student in the School of Geographical Sciences and Urban Planning at ASU, and Salon is both a faculty member in the School and Associate Director of TOMNET.

Conway has experience in transportation planning, accessibility modeling, and computer programming, as well as travel behavior research. Salon has experience in travel behavior research and analysis. Both team members have substantial experience working intensively with varied transportation-related datasets.

Salon and Conway will meet regularly to ensure timely delivery of the project.

## **9. Technology Transfer Plan**

We expect this project will result in at least one peer-reviewed journal article, and likely more than one. If funds permit, these articles will be published as open access and/or deposited into the ASU Digital Repository (<https://repository.asu.edu>) to facilitate application and reuse outside of the academic realm.

In addition, we will present results as part of a TOMNET seminar/webinar series that will be open to the public.

## **10. Workforce Development and Outreach Plan**

One of the main team members on this project will be Conway, who is a PhD student in the School of Geographical Sciences and Urban Planning at ASU. Conducting this data analysis will provide useful training for him, and may become part of his PhD dissertation work. So that other graduate students in SGSUP may benefit from the project, we will share progress with a transportation research working group that meets weekly during the academic year.

Once the data are analyzed, we plan to present findings at major transportation and geography conferences, as well as through a public TOMNET seminar or webinar (as specified above).

## **11. References**

- Bento, A.M., Cropper M.L., Mobarak, A.M., & Vinha, K. (2005). The effects of urban spatial structure on travel demand in the United States. *Review of Economics and Statistics*, 87(3), 466-478.
- Bina, M., Kockelman, K. M., & Suescun, D. (2006). Location Choice vis-a-vis Transportation: The Case of Recent Homebuyers.

- Chatman, D. G. (2009). Residential Choice, the Built Environment, and Nonwork Travel: Evidence Using New Data and Methods. *Environment and Planning A: Economy and Space*, 41(5), 1072–1089. <https://doi.org/10.1068/a4114>
- Kestens, Y., Sol, U.D., Et, A., Ménages, P.D., Sur, E., Choix, L., ... Propriétés, V.D. (2004). Land Use, Accessibility and Household Profiles: Their Effects on Residential Choice and House Values.
- Lee, B.H.Y., Waddell, P., Wang, L., & Pendyala, R.M. (2010). Reexamining the influence of work and nonwork accessibility on residential location choices with a microanalytic. *Environment and Planning A: Economy and Space*, 42(4), 913–930. <https://doi.org/10.1068/a4291>
- Liao, F.H., Farber, S., & Ewing, R. (2015). Compact development and preference heterogeneity in residential location choice behaviour: A latent class analysis. *Urban Studies*, 52(2), 314–337. <https://doi.org/10.1177/0042098014527138>
- Pinjari, A.R., Pendyala, R.M., Bhat, C.R., & Waddell, P.A. (2007). Modeling residential sorting effects to understand the impact of the built environment on commute mode choice. *Transportation*, 34(5), 557–573. <https://doi.org/10.1007/s11116-007-9127-7>
- Salon, D. (2009). Neighborhoods, cars, and commuting in New York City: A discrete choice approach. *Transportation Research Part A: Policy and Practice*, 43(2), 180–196. <https://doi.org/10.1016/j.tra.2008.10.002>
- Schwanen, T. & Mokhtarian, P.L. (2005) What affects commute mode choice: neighborhood physical structure or preferences toward neighborhoods? *Journal of Transport Geography*, 13(1), 83-99.
- Vredin Johansson, M., Heldt, T., & Johansson, P. (2006). The effects of attitudes and personality traits on mode choice. *Transportation Research Part A: Policy and Practice*, 40(6), 507–525. <https://doi.org/10.1016/j.tra.2005.09.001>

## 12. Qualifications of Investigators

**DEBORAH SALON, Ph.D.**

**Assistant Professor, School of Geographical Sciences and Urban Planning,**

**Arizona State University, Tempe, AZ 85287-3005. Ph: (480) 965-7475; Email: [deborah.salon@asu.edu](mailto:deborah.salon@asu.edu)**

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### EDUCATION

- University of California at Davis, Davis, CA, USA
  - Ph.D., Agricultural and Resource Economics, May 2006
- Carleton College, Northfield, MN
  - B.A., Physics, June 1994

### PROFESSIONAL EXPERIENCE

- Arizona State University
  - Assistant Professor, School of Geographical Sciences and Urban Planning, 2014-present
  - Graduate Faculty, School of Sustainability, 2016-present
  - Senior Sustainability Scientist, Global Institute of Sustainability, 2014- present
- University of California, Davis, Institute of Transportation Studies
  - Professional Researcher, 2008-2014
- The Earth Institute at Columbia University
  - Post-Doctoral Fellow, 2006-2008

### RELEVANT REFEREED PUBLICATIONS (Total: 26 Refereed Publications)

1. Salon, Deborah. (2015) Heterogeneity in the relationship between the built environment and driving: Focus on neighborhood type and travel purpose. *Research in Transportation Economics*, 52, 34-45.
2. Cook, Jonathan, James Sanchirico, Deborah Salon, and Jeffrey Williams. (2015) Empirical distributions of vehicle use and fuel efficiency across space: Implications of asymmetry for policy analysis. *Transportation Research Part A: Policy and Practice*, 78, 187-199.
3. Salon, Deborah, Marlon Boarnet, Susan Handy, Steven Spears, and Gil Tal. (2012) How do local actions affect VMT? A critical review of the empirical evidence. *Transportation Research Part D* 17(7): 495-508.
4. Salon, Deborah. (2009) Neighborhoods, cars, and commuting in New York City: A discrete choice approach. *Transportation Research Part A: Policy and Practice* 43(2): 180-196.

### RELEVANT RESEARCH PROJECTS (Total Sponsored Research: ~ \$800,000)

- *A Spatial Analysis of Housing and Transportation Affordability in Los Angeles County*, University of California Transportation Center, 2012-2015
- *Quantifying the effect of local government actions on VMT*, California Air Resources Board, 2010-2014

### JOURNAL EDITORIAL ACTIVITIES

- CO- EDITOR OF SPECIAL ISSUE, *RESEARCH IN TRANSPORTATION ECONOMICS* (ELSEVIER), 2015
- EDITORIAL BOARD, *JOURNAL OF TRANSPORTATION GEOGRAPHY* (ELSEVIER), 2016-present
- EDITORIAL BOARD, *TRANSPORTATION RESEARCH PART D* (ELSEVIER), 2017-present

### EDUCATION AND STUDENT ADVISING

- Thesis/Dissertation Major Advisor/Chair: 1 PhD student in progress; 4 MS (Thesis) students completed
- Thesis/Dissertation Committee Member: 2 PhD students completed; 1 PhD student in progress; 6 MS (Thesis) students completed

### 13. Budget Including Non-Federal Matching Funds

Institution: Arizona State University

Project Title: The impact of non-transportation attitudes, preferences, and personality characteristics on residential location and travel choices

Principal Investigator: Deborah Salon

Budget Period: 8/1/2019 - 07/31/2020

CATEGORY	Budgeted Amount from Federal Share	Budgeted Amount from Matching Funds	Explanatory Notes; Identify Source of Matching Funds
Faculty Salaries	\$ 4,556.43	\$ 8,655.61	Salon 5% AY + 0.5 summer month
Other Staff Salaries	\$ -	\$ -	
Student Salaries	\$ 13,000.00	\$ -	PhD student AY + summer salary
Fringe Benefits	\$ 2,002.74	\$ 2,337.01	ERE for above
<b>Total Salaries &amp; Benefits</b>	\$ 19,559.17	\$ 10,992.62	
Student Tuition Remission	\$ 8,500.00	\$ -	PhD student 1 semester graduate tuition
Operating Services and Supplies	\$ -	\$ -	
Domestic Travel	\$ -	\$ -	
Other Direct Costs (specify)	\$ -	\$ -	
Other Direct Costs (specify)	\$ -	\$ -	
<b>Total Direct Costs</b>	\$ 28,059.17	\$ 10,992.62	
F&A (Indirect) Costs	\$ 11,148.73	\$ 6,265.79	
<b>TOTAL COSTS</b>	\$ 39,207.89	\$ 17,258.42	

**Grant Deliverables and Reporting Requirements for UTC Grants (November 2016)**  
**Exhibit F**

<b>UTC Project Information</b>	
Project Title	The impact of non-transportation attitudes, preferences, and personality characteristics on residential location and travel choices
University	Arizona State University
Principal Investigator	Deborah Salon
PI Contact Information	deborah.salon@asu.edu
Funding Source(s) and Amounts Provided (by each agency or organization)	TOMNET: \$39,208 ASU, SGSUP: \$17,258
Total Project Cost	\$56,466
Agency ID or Contract Number	
Start and End Dates	8/1/2019-7/31/2020
Brief Description of Research Project	<p>The work proposed here builds upon Year 1 and Year 2 TOMNET projects.</p> <p>Our objective here is to use these insights and datasets to gain an understanding of the relative impact of attitudes on residential location and travel choices. We will focus on attitudes and preferences that primarily influence residential location choice, and attempt to shed light on their indirect influence on travel choices.</p>
Describe Implementation of Research Outcomes (or why not implemented)	TBD
Place Any Photos Here	
Impacts/Benefits of Implementation (actual, not anticipated)	TBD
Web Links <ul style="list-style-type: none"> <li>• Reports</li> <li>• Project Website</li> </ul>	TBD