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Using a Discrete Choice Experiment to Estimate Willingness to Pay for Location Based Housing Attributes

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USING A DISCRETE CHOICE EXPERIMENT TO ESTIMATE WILLINGNESS TO PAY FOR LOCATION BASED HOUSING ATTRIBUTES

by

Kristopher C. Toll

A thesis submitted in partial fulfillment
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of

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Approved:

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ABSTRACT

Using a Discrete Choice Experiment to Estimate Willingness to Pay for Location Based Housing Attributes

by

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Utah State University, 2019

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In 2012 Research Systems Group Inc conducted a statewide Utah Travel Study on the behalf of metropolitan planning agencies in Utah. The main objective of the Utah Travel Study was to understand land use and travel patterns in Utah. It was done in conjunction with the Wasatch Front Regional Council and six other metropolitan planning organizations located in Utah. The Utah Travel Study's purpose is to form a basis of understanding for long-term regional and statewide transportation planning for the state of Utah. As part of the Utah Travel Study, a series of seven surveys were administered to Utah residents.

One of the surveys, the Residential Choice Stated Preference survey, examined preferences for housing location attributes. This was done using a stated preference experiment. Each survey respondent was given a series of ten hypothetical choice comparisons between two homes. Each home was presented with seven location-based attributes of varying levels. Using the data gathered from the Residential Choice Stated Preference survey metropolitan planning organizations can make inferences about land-

use patterns and transportation. Data from the survey will be used to inform long-range land-use planning and transportation planning.

Following Random Utility Theory, we used multinomial logistic regression to determine which location-based housing attribute levels are more preferable. Additionally, two methods were developed to estimate the marginal willingness to pay for each attribute level. Method one will use house and rent prices to estimate changes in utility with increases in price in the regression model. The coefficient estimate is then used as a divisor to obtain a marginal willingness to pay value for each attribute level. Method two will use percentage increases in price to determine changes in utility for its regression model. Again, that coefficient estimate was used as a divisor to calculate the marginal rate of substitution for other attribute levels. A marginal willingness to pay value will be found by multiplying ten percent of the home or rent value to the marginal rate of substitution. It was found that method two produces more sensible and relatable results. These results can be used to understand how residents perceive home value in dollar terms in the context of location-based attributes for homes.

(62 pages)

PUBLIC ABSTRACT

Using a Discrete Choice Experiment to Estimate Willingness to Pay for Location Based Housing Attributes

Kristopher C. Toll

In 1993, a travel study was conducted along the Wasatch front in Utah (Research Systems Group INC, 2013). The main purpose of this study was to assess travel behavior to understand the needs for future growth in Utah. Since then, the Research Service Group (RSG), conducted a new study in 2012 to understand current travel preferences in Utah. This survey, called the Residential Choice Stated Preference survey, asked respondents to make ten choice comparisons between two hypothetical homes. Each home in the choice comparison was described by different attributes, those attributes that were used are, type of neighborhood, distance from important destinations, distance from access to public transport, street design, parking availability, commute distance to work, and price. The survey was designed to determine the extent to which Utah residents prefer alternative household attributes in a choice selection. Each attribute contained multiple characteristic levels that were randomly combined to define each alternative home in each choice comparison. Those choices can be explained by Random Utility Theory. Multinomial logistic regression will be used to estimate changes in utility when alternative attribute levels are present in a choice comparison. Using the coefficient estimate for price, a marginal willingness to pay (MWTP) for each attribute level will be calculated. This paper will use two different approaches to obtain MWTP estimates.

Method One will use housing and rent price to recode the price variable in dollar terms as defined in the discrete choice experiment. Method Two will recode the price variable as an average ten percent change in home value to extrapolate a one-time payment for homes. As a result, we found that it is possible to obtain willingness to pay estimates using both methods. The resulting interpretations in dollar terms became more relatable. Metropolitan planning organization can use these results to understand how residents perceive home value in dollar terms in the context of location-based attributes for homes.

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Kristopher C. Toll

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1. Introduction

In 1993, the Utah Travel Study (UTS) was conducted along the Wasatch front in Utah (Research Systems Group Inc, 2013). The purpose of the study was to assess household travel behavior to better understand the needs for future growth in Utah. Since then, a new study was conducted by Research Service Group (RSG) in 2012 in order to understand current travel preferences along the Wasatch Front. The study was done in conjunction with the Wasatch Front Regional Council (WFRC) (Research Systems Group Inc, 2013).

The UTS was conducted with the intention of forming the basis for travel modeling activities, and to inform regional and statewide transportation planning for the state of Utah (Research Systems Group Inc, 2013). Data provided by the UTS was also intended to help inform the Wasatch Choice 2040 long-range development and transportation plan (Wasatch 2040 Plan). The Wasatch 2040 Plan is a collaborative approach involving multiple agencies interested in understanding Utah's transportation needs, and in identifying current and future funding priorities (Wasatch Front Regional Council, 2019).

As part of the UTS, Utah households were invited by first-class mail to participate in the study. Participating households were instructed to complete a single-day travel diary for any trips made on a pre-selected Tuesday, Wednesday, or Thursday in 2012. Data was collected at household, individual, and trip levels. Additionally, participants in the UTS were invited to fill out one or more of seven complementary surveys. A simple description of the surveys is found in Table 1. Households completed their travel diaries and participated in the surveys using an online survey instrument, or by phoning a toll-

free number and speaking with a trained operator (Research Systems Group Inc, 2013). As an incentive, participants were awarded a $10 Amazon.com gift card.

Table 1 – Utah Travel Study Surveys

Survey(s)	Topics	Dataset(s) Level:	Sample size
Household Travel Diary	Household, person, and trip characteristics	Household Person Trip	9,155 households 18,171 adults 8,875 kids 101,404 trips
Long Distance Debrief AND Long Distance Standalone (identical surveys	40+ mile trips	Household Person Trip	4,386 households (631 took the survey twice) 8,652 adults 25,698 trips
College Travel Diary	Person and trip characteristics	Person Trip	7,923 students 32,272 trips
Bike/Pedestrian Debrief and Bike/Ped Barriers	Biking and walking travel behavior; physical barriers to increased biking and walking	Person	5,071 adults
Attitude Debrief	Opinions about and attitudes towards land-use and transportation issues	Person	5,266 adults
Dixie (SunTran) On Board	Tripe origin and destination; customer satisfaction	Person	558 adults
Residential Choice Stated Preference	Residents' preferences for housing and neighborhood attributes	Person	2,795 adults

The survey of interest for this paper is the Residential Choice Stated Preference (RC) survey. Following standard choice-experiment format, the survey instructed respondents to make choice comparisons between two randomly chosen sets of hypothetical home and neighborhood amenities. Each set in the choice comparison was distinguished by different attributes, including type of neighborhood, home's distance from important destinations, home's distance from access to public transport, street design, parking availability, commute distance to work, and home or rent cost (full details on the various attributes are provided in Section 3). The survey was designed to

determine the extent to which Utah residents prefer alternative household and neighborhood amenities.

We conceptually model household choices in the context of random utility theory (RUT), and empirically estimate the model using the multinomial logistic framework (Hensher, Rose, & Greene, 2015). These frameworks ultimately enable us to estimate marginal values that different types of households exhibit for housing and neighborhood attributes. Two methods are used in this study to obtain marginal value estimates for the various housing and neighborhood attributes. Alternative methods are necessitated by the fact that the pricing attribute in the choice experiment was expressed as a ten percent change in housing price rather than a specific dollar value.

Thus, in order to obtain marginal willingness to pay (MWTP) estimates expressed in dollar terms an adjustment to the original pricing attribute is necessary. The first method (Method 1) substitutes stated house values directly in the data for each respondent's choice comparisons. These values are the current home or rent prices estimated by the respondents themselves, which they provided in the demographic information section of the survey. A given respondent's stated home value is then multiplied by the corresponding original price attributes randomly assigned in the given choice alternatives to effectively transform the original price attribute into its equivalent continuous, dollar-denominated price change. We provide a simple example of this method in Section 4.

The second method (Method 2) does not adjust the original price attribute directly in the data as is done via Method 1. Rather, the price attribute is retained as is, which ultimately compels us to estimate a marginal rate of substitution (MRS) measure of value.

The MRS provides us with a tradeoff between a given change in a housing or neighborhood attribute and a 10 percent increase in the respondent's stated home or rent value. We then multiply this MRS by 10 percent of the median home value from our homeowner subsample to obtain a corresponding MWTP for the subsample's average household.

Section 5 contains the empirical results of the paper. Renters and homeowners have a large difference in what actual prices they compare with the hypothetical price attributes they are presented within the experiment. For example, the median monthly rental price is roughly $650, the median home value is roughly $200,000. We therefore split the sample between these two groups and thus obtain separate empirical results for the two groups. We find that Method 1 produces noticeably higher MWTP estimates than Method 2 for the renter subsample. Method 1 results for homeowners may be greatly exaggerated while Method 2 results produce theoretically and econometrically appealing results. Together, the results across the renter and homeowner subsamples may suggest that Method 1 produces upwardly biased MWTP estimates.[1] This can be attributed to skewness in the data for rental price and home value[2]. We therefore report our Method 2 empirical results for both renters and homeowners[3].

We find that renters exhibit MWTP up to $30 per month to avoid commute distances of five to 20 miles or more to work. Renters also show MWTP up to nearly $27

[1] The homeowner results using Method 1 are likely attributable to the typical homeowner not being fully informed about the true values of his home.
[2] A Shapiro-Wilk normality test provides evidence at the 1% significance level that rent and home value does not follow a normal distribution (Royston, 1982). See **Error! Reference source not found.** and **Error! Reference source not found.** located in the appendix.
[3] Results for method one are reported in the appendix

per month to avoid traveling distances of 10 ten miles or more to local destinations. If a transit stop for bus or rail is located more than ten miles away, the average renter would be willing to pay $21 per month to avoid that distance. Renters are willing to pay more to live in neighborhoods where single-family homes are situated on larger lots sizes. They also prefer to reside in neighborhoods where the streets are not solely designed for cars, but also for pedestrians and cyclers. For parking, renters express a MWTP between $21 and $28 per month to have access to a personal driveway or parking garage.

We observe that homeowners express a (one-time) MWTP of up to $13,580 to avoid a commute to work of more than 20 miles. Owners' express a MWTP of $13,600 to also avoid having to travel more than 10 miles to local destinations, nearly $6000 to avoid having a transit stop located more than 10 miles away, and between $25,000 and $32,000 to avoid not having a personal driveway or garage. Owners are willing to pay roughly $7,400 to have access to a street designed for cars, pedestrians and cyclers, rather than just cars. Homeowners are also willing to pay roughly $13,900 more for half-acre lot neighborhoods with only single family homes. When the lot sizes are a half acre in a mixed neighborhood, owners are willing to pay $4,400. Interestingly, homeowners are willing to pay $12,600 *less* for lot sizes of one acre or more relative to half-acre lots of single family housing neighborhoods.

The next section provides a brief review of the literature. Section 3 describes in more detail how and what data was collected for the RC survey. Section 4 outlines the theoretical frame work of this paper, and provides more detail on Methods 1 and 2 described above. Empirical results are discussed in Section 5. Section 6 concludes.

2. Literature Review

Previous studies have used stated and revealed preferences to determine housing preferences. Earnhart (2002) employed discrete-choice RUT and multinomial logit estimation to estimate household preferences. This was done by gathering data based on actual and hypothetical purchases of residents in Fairfield, CT. The dataset includes both revealed- and stated-preference data. Both types of data were used separately and combined to determine housing preferences. Individual household characteristics from the residents, such as household income, were interacted with attribute coefficients to measure the extent to which utility differs across income levels (Earnhart, 2002). Earnhart (2002) also interacted additionalhousehold characteristics with housing attributes. This was to identify more influential parameters among the revealed- and stated-preference data. Households select combinations of housing attributes that reflect their own demographic characteristics. For example, households are more likely to select a newer house or a house with more bathrooms, more interior space or larger lot sizes on a per person basis (Earnhart, 2002).

Other studies have followed similar methods using discrete choice experiments and multinomial logistic models, but with different variables to predict housing choice. Wang and Li (2004) used dwelling and neighborhood attributes to estimate housing preferences following housing reforms in Beijing, China. Based upon stated-choice data collected in Beijing, it was found that neighborhood variables have larger impacts on housing choice than dwelling attributes (Wang & Li, 2004). Two similar studies have been undertaken in Santiago, Chile evaluating preferences for housing accessibility, location, rent, distance to work and education (Ortuzar, Martinez, Varela, Zar, & Marti,

2010; Pe & Martı, 2003). Ortuzar (2010) found that individuals will consider tradeoffs in time traveling to activities with changes in rent price. In other words, distance and commuting times are important when selecting a dwelling. Pe & Marti (2003) found that found that individuals consider short-run benefits associated with less travel time when comparing monthly rents.

A study in Belfast, United Kingdom examined housing choices in relation to energy trade-offs as a result of explicit energy policy measures (Cooper, Ryley, & Smyth, 2001). The authors found that in order to realize potential energy saving, consumer will only accept policies that for energy-efficient heating systems, improved public transport, densification policies and road charging if there is some form of financial compensation of the consumer. Bullock, Scott, & Gkartzios (2011) examined rural residential preferences in Ireland using a discrete choice experiment. In some countries, counter-urbanization has been observed as people have desired to live further away from urban centers in an effort to seek rural views and peace and quiet (Bullock, Scott, & Gkartzios, 2011). Bullock (2011) has found evidence that individuals who are moving into rural areas will consider social and physical characteristics of a rural area followed by physical characteristic of a home that may include “rural idyll”. These include a single rural house surrounded by ample space elevate views, and high quality of exterior and interior design (Bullock et al., 2011).

Additional studies have examined how the intention to move can be influenced by rent, dwelling attributes, and location in the UK (Kim, Pagliara, & Preston, 2005; Walker, Marsh, Wardman, & Niner, 2002). In these studies, a nested multinomial logit model was used to estimate a household’s intention to move and preferred location (Kim

et al., 2005). It was found that there is a tradeoff between transport and amenities that can drive people to change residential location. Individuals prefer residential locations with shorter commuting time, lower transport cost, lower density, and higher school quality. Based on samples gathered from local authorities in England in 1999-2000, Walker et al. (2002) similarly conducted a stated-preference experiment to understand how price can affect housing choice. Participants were asked to choose between a number of alternative dwellings with different combinations of attribute levels. Each estate is defined by five attributes so as to make the choice selection simpler (Walker et al., 2002). The study was designed to understand how rent changes affect choice behavior in the context of public housing. It was found that tenets are unlikely to move when the home is in a worse condition than their current home despite an offer of reduced rent (Walker et al., 2002).

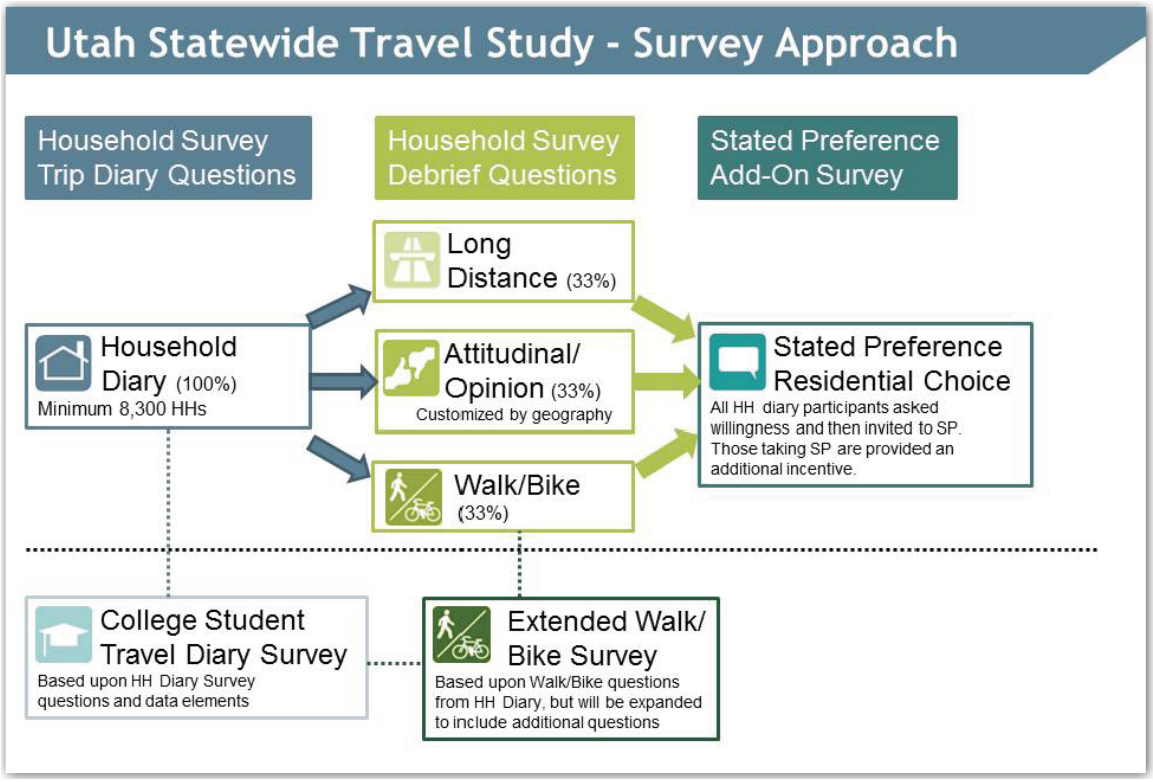
3. Survey and Data

RSG conducted the survey on behalf of Utah's stakeholder groups mentioned in Section 1. Overall, 9,155 households were invited to complete a travel diary as part of the UTS. The diary required respondents to record each trip made by each individual in the household for one assigned day. Respondents were asked to record their household's trips on an assigned Tuesday, Wednesday, or Thursday between March 27 and May 15, of 2012. The households were also asked to participate in one of three debrief surveys. The three debrief surveys are, the Long Distance Debrief survey, Bike/Pedestrian Debrief survey, and Attitude Debrief survey. For completing the travel diary and one of the three assigned debrief surveys, participants were awarded a $10 Amazon.com gift card.

As part of the UTS, four other surveys were administered. One was the College Student Travel Diary. Another was an extension of the Bike/Ped Debrief where

respondents were asked to report “problem areas” such as unsafe intersections or insufficient infrastructure. The Dixie On-Board Transit Survey was administered to passengers aboard the SunTran buses in the Dixie Metropolitan region. Lastly, the RC survey examined stated- and revealed-preferences or alternative housing scenarios. Figure 1 (Research Systems Group Inc, 2013) depicts the structure and flow of each survey and how the surveys relate to one another.

Figure 1 – Survey Approach



For this paper, the only relevant survey is the RC survey. As mentioned earlier, this survey provides a more in-depth look into housing and neighborhood preferences. It seeks to answer the following questions:

- When deciding where to live, what is more important: House size or neighborhood characteristic? Commute distance or home/rent price?

- How do preferences differ between groups of people? What about if you live in a rural area versus downtown Salt Lake City? If you have children? What about age, gender, income?
- How do ideal housing preferences compare to where respondents live now?

The RC was administered online through the same website created for the UTS. Each participant was given a unique password to login onto the survey homepage. Participants had the option to leave the survey at any point and were able to log back on to complete the survey. Only one adult per household was invited to complete the survey. The frame of reference for the RC survey was the household. Thus, no data was collected at the individual or trip levels, unlike for the travel diary. Travel diary respondents were invited to participate in the RC two weeks after completing their diaries. The RC Survey was administered in two different batches. The first batch was sent out on May 11, 2012. Another was sent out on June 6, 2012. Reminder emails were sent out to both batches six or seven days after the original invitation to participate was received.

The RC survey gathered stated-preference data on what housing choices respondents made in the discrete-choice experiment. It also gathered revealed-preference data on where respondents currently lived and where they would ideally like to live. RSG borrowed questions from the 2011 Community Preference Survey by the National Association of Realtors, the 2007 Growth & Transportation Survey for the Nation Association of Realtors, and RSG's previous research work for TCRP projects for the National Academies of Science were used in the residential choice survey (Belden Russonello & Stewart LLC & Belden Russonello & Stewart, 2011; Research Systems

Group Inc, 2013; Smart Growth America, n.d.). Approximately 200 different variables were created from what questions were asked and can be categorized into four sections.

1. Current home location
2. Ideal home location
3. State-preferences for housing and neighborhood attributes
4. Attitude/debrief questions

Current home location questions asked whether employment was obtained before the current home or vice versa. Additionally, they were asked who had an active role in choosing their current home and the reasons for their choice. Respondents were then shown a list of 16 factors that impact housing choice. They were asked to rate each factor on a five-point scale of how important that factor was in choosing their current home.

Respondents were asked to indicate whether they rent or own their home. They estimated their lot size, and if they felt it was too large, too small, or about right, and the type of parking available. To understand what kind of neighborhood the respondent lived in, several questions were asked about their neighborhood and distances to other places. Respondents chose from a list of what kind of housing was found within a half mile of their home. Additionally, approximate distance from homes to nearby transit centers, work, and commercial and recreation amenities were obtained. If the respondent owned a home, they were asked to give the approximate current value of the home if it were sold in the current month. Renters were asked to give their best estimate of their monthly rent.

The ideal home location questions are designed to understand what home a respondent would prefer to own or rent. Respondents were asked to consider their ideal home and the importance of home size and neighborhood amenities. On a five-point

scale, they were asked to indicate the importance of walking distance to certain amenities. A list of types of home and neighborhoods were presented to the respondents and they were instructed to pick the most preferable. Lastly, respondents were asked whether they anticipated moving within the next three years.

In the stated-preference experiment section of the RC survey, respondents were asked to compare two hypothetical housing and neighborhood alternatives. Each respondent was provided a series of ten choice situations (each situation comprised of two randomly chosen alternatives). In each choice situation, the respondent would indicate which of two alternatives was preferred. Each alternative was defined by variations in the levels of the different attributes mentioned in Section 1. The order of the presentation of the attributes in each alternative was randomized. The respective attributes and their levels are provided in Table 2.

Table 2 – Location Based Housing Attributes

Housing Composition:	Parking availability and cost:
• There is a mix of single-family detached houses (on ¼ acre lots), townhomes, apartments, and condominiums within a half-mile of your home • There is a MIX of single-family detached houses (on ½ acre lots), townhomes, apartments, and condominiums within a half-mile of your home • There are only single-family houses on ½ acre lots within a half-mile of your home • There are only single-family houses on 1+ acre lots within a half-mile of your home	• Parking in your own driveway and/or garage • Parking on-street or in a lot near your home (free parking) • Parking is off-street (lot and/or garage) near your house (monthly rental). (Excluded with housing levels 3 and 4).

Destinations: • Local destinations (such as shopping, a restaurant, a public library, and a school) are within walking distance of your home. (Excluded with housing level 4). • Local destinations (such as shopping, a restaurant, a public library, and a school) are within 3 miles of your home • Local destinations (such as shopping, a restaurant, a public library, and a school) are within 10 miles of your home • Local destinations (such as shopping, a restaurant, a public library, and a school) are 10+ miles away	Proximity to transit: • RAIL STATION AND BUS STOP are within walking distance of your home • BUS STOP is within walking distance and rail station is a 5-mile drive from your home • RAIL STATION AND BUS STOP are a 5-mile drive from your home • RAIL STATION AND BUS STOP are a 10-mile drive from your home
Street design/Accessibility for pedestrians and bicycles: • The streets are designed primarily for cars • The streets are designed to accommodate cars, pedestrians, and bicycles	Proximity to work: • Your one-way commute to work is less than 3 miles • Your one-way commute to work is 5 miles • Your one-way commute to work is 10 miles • Your one-way commute to work is 20 miles
Home/Rent prices: • Home prices/rent in this neighborhood are/is 20% less compared to your current neighborhood • Home prices/rent in this neighborhood are/is 10% less compared to your current neighborhood • Home prices/rent in this neighborhood are/is the same compared to your current neighborhood • Home prices/rent in this neighborhood are/is 10% more compared to your current neighborhood • Home prices/rent in this neighborhood are/is 20% more compared to your current neighborhood	

A screenshot of how a hypothetical choice situation was presented to respondents is presented in Figure 2. Prior to the series of ten choice comparisons, respondents are instructed to select the option that is most preferable. They are also instructed to assume that the only differences between home locations in any choice comparison are accounted

for in the choice alternatives themselves. We emphasize that only two alternatives are present in each hypothetical choice situation. There is no opportunity for a respondent to indicate indifference between the two choices or if their current housing situation (the status quo) is preferred. As such, each choice comparison is admittedly incomplete (Manski, 1999). This limitation manifests itself when predicting a respondent's behavior, which is based on only partial information about what alternatives a respondent could potentially choose in a more realistic choice comparison (Manski, 1999). We presume respondents nevertheless exhibited their preferences coherently and honestly given this limitation.

Figure 2 – Choice Comparison Example

	Option 1	Option 2
Housing types within 1/2 mile of your home:	**Mix** of single family detached houses (on **1/2 acre** lots), townhomes, apartments, and condominiums	**Only single family houses** on **1/2 acre lots**
Distance from home to destinations such as shopping, restaurant, public library, school:	**Less than 10 miles**	**10+ miles**
Transit distance and type:	**Rail station and bus stop** are a **10-mile drive** from your home	**Rail station and bus stop** are a **10-mile drive** from your home
Street design:	Primarily for **cars**	**Cars, pedestrians, and bicycles**
Parking:	**On-street** or in a lot near your home (free parking)	**On-street** or in a lot near your home (free parking)
Distance to work:	**Less than 3 miles**	**10 miles**
Home prices compared to where you live now:	**10% more**	**20% less**
I prefer:	○	○

The final section of the RC survey is attitude/debrief questions. Respondents were asked to indicate how much they agreed or disagreed on a seven-point scale on statements about their current neighborhood. They were also asked on the same scale about a future/ideal neighborhood if they were to move. The last set of questions asked respondents to indicate which statements most closely fit their opinions on transportation and land use planning.

Additionally, demographic variables on income level, gender, education, and employment status were also collected for this survey. Residents were asked questions

about the length of home occupancy, number of adults over and under 18 in the household, number of motor vehicles and bicycles owned. Variables used in this paper are contained in Table 3 and

Table 4.[4]

Table 3 – Summary Statistics

Variable name	Count	Average(Standard Deviation)	Median	Max(Min)
Rent Price	671	702 (300)	650	2500(50)
Home Price	1,948	245,569 (284208)	200,000	8,400,000(21,500)

Table 4 – Summary Statistics Continued

Variable Name	Count	Percent of Sample
Rent or Own		
-Renters	671	25.6%
-Owners	1948	74.4%
Education		
-High School or Less	133	5.1%
-Some College or Voc/Tech Training	565	21.6%
-Associates	229	8.7%
-Bachelors	1012	38.6%
-Graduate/Post Doc	680	26.0%
Employment		
-Self, Part, or full-time employment	1704	65.1%
-Student	245	9.4%
-Homemaker	326	12.4%
-Retired	259	9.9%
-Not Currently Employed	85	3.2%
Age		
-18 to 34	904	34.5%
-35 to 54	989	37.8%
-55 or older	726	27.7%
gender		

[4] These statistics are based off a subsample of what was used in the UTS. All rent values that were less than $50 per month and home values less than $20,000 or greater than $10,000,000 were removed due to likely measurement error. This dropped a total of 75 renters and owners. Also, 62 and 39 respondents, respectively, who indicated “other” or “prefer not to answer” when asked about their rent or own status, were dropped.

-Male	1328	50.7%
-Female	1291	49.3%
Home Region (by Utah Counties)		
-Cache	225	8.6%
-WFCRMAG (Davis, Salt Lake, Utah, Weber)	1971	75.3%
-Dixie	142	5.4%
-Utah Other	281	10.7%
-Curr place type (Type of Neighborhood the respondent lives in)		
City Downtown Resident and /or Commercial mix	829	31.7%
-Suburban Resident and/or Commercial Mix	1411	53.9%
-Small Town	270	10.3%
-Rural	109	4.2%
Curr Res Type (Type of Home the respondent lives in)		
-Single Family Detached Home	1868	71.3%
-Townhome/Multi-Family 3 or less home	292	11.1%
-Building	431	16.5%
-Mobil/Dorm/other(boat/rv/van ect)	28	1.1%

4. Theoretical and Empirical Methods

How choices are made in our choice experiment can be described by a random utility model (Hensher et al., 2015). Individual i selects the alternative in each choice situation that yields the highest conditional indirect utility,

$$\max_j U_{ij}(w_{ij}), \quad (1)$$

where indirect utility $U_{ij}(w_{ij})$ is a function of explanatory variables $w_{ij} = (x_i, z_{ij}), j = 1,2$ alternatives. The vector (x_i, z_{ij}) contains x_i individual-specific characteristics (e.g., demographic variables) and z_{ij} alternative-specific attributes and their corresponding levels. To allow for preference heterogeneity, the individual-specific characteristics are interacted with the alternative-specific attributes (Caplan, Grijalva, & Jackson-Smith, 2007). Following Caplan et al. (2007), we represent (1) in linear form:

$$U_{ij}(w_{ij}) = \beta_{1j} z_{ij} + \beta_{2j} x_i * z_{ij} + \varepsilon_{ij} \quad (2)$$

where vectors β_{1j} and β_{2j} represent the coefficient estimates. The beta coefficients are interpreted as changes in marginal utilities associated with the different attribute levels present in a given choice comparison. The random component ε_{ij} accounts for the econometrician's uncertainty associated with estimating a respondent's utility. For estimation purposes, ε_{ij} is assumed to be independently and identically distributed accorss all individuals *i* and alternatives *j* and to be uncorrelated with x_i and z_{ij}. Equation 2 is estimated using multinomial logistic regression with the mlogit package available for R software (Croissant, 2003).

RSG (2013) has reported results from a multinomial logistic regression of the RC data. In order to predict utility across different demographics models were estimated on subsamples of that demographic. For example, a separate model was run on subsamples of males and females in order to understand gender differences. My paper improves on this approach by accounting for interactions occurring between different demographic groups and the choice experiment's attributes, rather than subdividing the data by demographic group and thus limiting statistical power in estimating separate subsamples.

Degrees of freedom for the choice experiment is found by taking the number of different alternatives designed for the study and multiplying this number by (*j* -1) alternatives (Hensher et al., 2015). Accordingly, there are 200 degrees of freedom available for our regression analysis.[5] Given the relatively large number of different attributes and attribute levels for this study, we must run separate models for each demographic characteristic of interest, rather than including each characteristic

[5] RSG chose a fractional factorial design resulting in a total of 200 different choice situations.

(interacted with each attribute) in one giant model. For example, the gender variable is fully interacted with the full set of attributes and their levels in a separate model from the income variable (or set of income-interval dummy variables), which are likewise interacted with the full set of attributes and their levels.

As described in Section 1, this paper tests two different approaches for obtaining marginal valuation measures for the different attributes and their levels. For both methods we first recode the original price variable in the choice experiment to reflect what numerical conversions the survey respondent made. In specific, the original price variable is expressed as a percentage change: 20% less, 10% less, same, 10% more, and 20% more compared to the respondent's current home or rent value. To convert these percentage changes to corresponding expressions for use in calculating MWTP, each percentage-change value was converted to its numeric equivalent as follows: 20% less to 0.8, 10% less to 0.9, "same" to 1, 10% More to 1.1, and 20% More to 1.2. We henceforth call this transformed variable "numeric change".

Before the choice experiment was administered to the survey respondents, the respondents were asked to report the value of their home or rent. For renters, survey respondents were asked to state their monthly rent. If the respondent was unsure, they were asked for their best estimate. Homeowners were asked for the approximate current value of their home. If the homeowner was unsure, they were asked to give their best estimate for what they think the value would be if their home were sold in the current month.

For Method 1, numeric change is multiplied by the household's stated rent or home price to create a numeric value of the price attribute. Doing so allows inference to

be made as to what actual dollar calculations the survey respondents were actually using in each choice comparison. Taking this newly created price variable and subtracting the stated rent or home value creates what we call the "Relative Change in Price" variable. This variable is then used in place of the original price variable from the RC. What this conversion looks like for a reported home value of $100,000 is shown in Table 5.

Table 5 – Variable Conversion Example

Original Price Variable	Numeric Change	Numeric Change x home value	Relative Change in Price
20% Less	0.8	$80,000	-$20,000
10% Less	0.1	$90,000	-$10,000
Same	1	$100,000	0
10% More	1.1	$110,000	$10,000
20%	1.2	$120,000	$20,000

Using our newly created "Relative Change in Price" variable, it is possible to obtain MWTP estimates. The coefficient estimate for "Relative Change in Price" in our regression analysis can now be interpreted as the marginal utility of house price. MWTP estimates for each level m of attribute k (for average respondent i) are then obtained according to:

$$MWTP = \frac{\beta_{km}}{\beta_p} \tag{3}$$

where β_{km} represents the coefficient estimate for (non-monetary) attribute k's level m, and β_p is the coefficient estimate for Relative Change in Price (p).

When interaction terms are included in the model, additional coefficients are added to the numerator and denominator in equation (3). For example, to estimate the extent to which females might have a different MWTP for having to commute five miles to work (*commute5miles*), the coefficient for females interacted with p (*females x p*) is

added to the denominator. In the numerator, we similarly include the coefficient for the interaction term (*commute5miles x females*). Thus, our MWTP estimate becomes:

$$MWTP = \frac{\beta_{commute5miles} + \beta_{commute5miles\ x females}}{\beta_p + \beta_{females\ x\ p}} \quad (4)$$

MWTP estimates for all other interaction effects are calculated in the same manner.

We continue to use the numeric change variable to estimate a household's MRS under Method 2. A coefficient estimate(s) for this variable is then obtained directly from equatoins (3) and (4) (e.g., denoted as β_{MRS}) which indicates the estimated change in utility associated with a ten percentage point change in home price. In other words, β_{MRS} is used in place of the price coefficient (β_p) in equations (3) and (4), which result in estimates of the marginal rate of substitution (MRS) with respect to 10 percent change in home price. To calculate a corresonding measure of the average household's MWTP for a given attribute, we then multiply our estimate of MRS by ten percent of our sample's median home value. If the model used interaction terms to estimate demographic effects, equation (4) is used to calculate the MWTP.

5. Empirical Results

We begin with a discussion of our results for the renter models, presented in Table 6.[6] A positive coefficient estimate for a given attribute indicates an increase in the average respondent's utility level, i.e., that the attribute is favorable relative to the base value for that attribute. To the contrary, a negative coefficient estimate signifies that the attribute is unfavorable relative to its base value.

[6] Only statistically significant coefficient estimates are reported in this and all ensuing tables.

Beginning with the results from the parsimonious model (without any interaction effects), it is observed that longer commute distance to work is less favorable compared to being within a walkable distance to place of employment. Each coefficient is negative and progressively gets more negative with longer commute distances. This same negative trend can be generally seen across all variables that measure the distance to either work, transit, or local neighborhood destinations. The “numeric change” variable created with method two is negative, which signifies that increases in rent value lessen the utility of a renter. For the levels of the parking attribute, it can be seen that there are decreases in utility when renters do not have access to a personal driveway or garage. Renters also exhibit a preference for streets that are designed for cars, as well as pedestrians and cyclers. Additionally, renters also indicate increasing utility for living in neighborhoods with single-family homes on larger lot sizes.

Interactions for income level and gender are also shown in Table 6. It can be seen that renters with a higher level of income may not lose as much utility and in some cases gain utility when commute distances are longer. Female renters exhibit a stronger preference for personal driveways or garages than males. Models with other demographic interactions are in the appendix.

Table 6 – Renter Models

Renter Models

	Dependent variable:		
	choice		
	Parsimonious Model	Interactions with Income	Interactions with Gender
	(1)	(2)	(3)
2:(intercept)	0.022	0.026	0.025
	(0.028)	(0.029)	(0.028)
Commute 5 Miles	-0.101*	-0.109*	-0.103
	(0.055)	(0.064)	(0.076)
Commute 10 miles	-0.373***	-0.411***	-0.393***
	(0.055)	(0.064)	(0.077)
Commute 20 Miles	-0.898***	-0.905***	-0.891***
	(0.054)	(0.064)	(0.074)
Destinations Less than 3 Miles	-0.120*	-0.151**	-0.209**
	(0.063)	(0.073)	(0.087)
Destinations Less than 10 Miles	-0.375***	-0.368***	-0.417***
	(0.060)	(0.070)	(0.084)
Destinations 10 Miles or more	-0.821***	-0.854***	-0.840***
	(0.057)	(0.067)	(0.079)
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	0.269***	0.243***	0.256***

	(0.047)	(0.056)	(0.066)
Homes Only single fam 1/2 acre lots	0.304***	0.251***	0.312***
	(0.054)	(0.064)	(0.075)
Homes Single Fam 1+ acre Lots	0.411***	0.446***	0.337***
	(0.057)	(0.067)	(0.078)
Parking On-street or free parking	-0.645***	-0.594***	-0.565***
	(0.044)	(0.051)	(0.061)
Parking Off-street or Paid Parking	-0.832***	-0.832***	-0.714***
	(0.057)	(0.067)	(0.077)
Streets For Cars, Pedestrians, and cyclers	0.405***	0.411***	0.380***
	(0.039)	(0.046)	(0.054)
Transit Bus stop within walking distance and Rail 5 miles away	-0.149**	-0.102	-0.160*
	(0.060)	(0.071)	(0.083)
Transit Rail and bus 5 miles away	-0.367***	-0.346***	-0.351***
	(0.060)	(0.070)	(0.083)
Transit Rail and Bus 10 miles Away	-0.619***	-0.542***	-0.689***
	(0.062)	(0.073)	(0.086)
Numeric Change	-1.944***	-2.013***	-1.803***
	(0.133)	(0.386)	(0.321)
Commute 20 Miles X Income High		1.422**	
		(0.709)	
Parking On-street or free parking X Income Mid		-0.203*	
		(0.110)	
Parking On-street or free parking X Income High		-1.156*	
Transit Rail and Bus 10 miles Away X Income Mid		-0.345**	
		(0.152)	
Parking On-street or free parking X Gender female			-0.172*
			(0.088)

Parking Off-street or Paid Parking X Gender female			-0.256**
			(0.114)
AIC	7723	7397	7737
Observations	6,710	6,400	6,710
R^2	0.173	0.177	0.175
Log Likelihood	-3,844.263	-3,648.401	-3,834.455
LR Test	1,610.418*** (df = 17)	1,571.965*** (df = 50)	1,630.034*** (df = 34)
Note:			*p**p***p<0.01

Table 7 shows renter MWTP estimates for the parsimonious model. Confidence intervals with a 95% bound were estimated using a simulation method proposed by Krinsky and Rob (Krinsky & Robb, 1986). A negative value indicates that a renter will need to be compensated or will otherwise pay to avoid for a home when a particular attribute level is present. Positive values indicate that they would pay in a dollar amount for a home with that particular attribute level. It can be observed that renters exhibit negative MWTP for longer commute distance to work (up to $30 per month for having to commute 20 miles). For longer distances to local destinations (up to almost $28 per month for residing 10 miles or more from main destinations). With longer distances to transit (slightly over $20 per month for transit stops 10 miles or more away). Also, renters exhibit higher MWTP if homes in the neighborhood exist on larger acre lots and consit of single family homes. Renter will also pay for streets are not only designed for cars[7].

[7] If it is desired to calculate the MWTP for renters across demographics, the reader is invited to use equation 4 and apply it to the coefficients located in Table 13 in the appendix

Table 7 – Renter MRS and MWTP from the Parsimonious Model

Renter MRS and MWTP from the Parsimonious Model

	MRS	2.50%	97.50%	MWTP
2:(intercept)	0.011	-0.016	0.04	0.715
Commute 5 Miles	-0.052	-0.111	0.003	-3.38
Commute 10 miles	-0.192	-0.252	-0.137	-12.48
Commute 20 Miles	-0.462	-0.549	-0.392	-30.03
Destinations Less than 3 Miles	-0.062	-0.13	0.001	-4.03
Destinations Less than 10 Miles	-0.193	-0.263	-0.13	-12.545
Destinations 10 Miles or more	-0.422	-0.511	-0.351	-27.43
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	0.138	0.089	0.192	8.97
Homes Only single fam 1/2 acre lots	0.156	0.101	0.217	10.14
Homes Single Fam 1+ acre Lots	0.212	0.152	0.277	13.78
Parking On-street or free parking	-0.332	-0.398	-0.277	-21.58
Parking Off-street or Paid Parking	-0.428	-0.516	-0.355	-27.82
Streets For Cars, Pedestrians, and cyclers	0.208	0.163	0.262	13.52
Transit Bus stop within walking distance and Rail 5 miles away	-0.077	-0.136	-0.016	-5.005
Transit Rail and bus 5 miles away	-0.189	-0.253	-0.128	-12.285
Transit Rail and Bus 10 miles Away	-0.318	-0.395	-0.252	-20.67

Results for homeowners are displayed in Table 8. Starting with the parsimonious model, homeowners' exhibit many of the same preferences as renters. Longer commute distances to work, local destinations, and transit take away utility. Interestingly,

homeowners gain more utility from a home on a half-acre lot than on a home with one or more acres or less than half an acre or if the neighborhood includes apartments, condos and townhomes. As expected, increases in numeric change take away utility from a homeowner. However, when income levels are included as interaction terms, it can be seen that high income earners do not lose nearly as much utility for higher prices compared to mid and low income earners. Females exhibit greater losses in utility when commute to work is greater than 20 miles and distance to local destinations are more than ten miles. Additionally, females lose more utility when the available parking is off street or a paid for parking garage.

Table 8 – Owner Models

Owner Models

	Dependent variable:		
	choice		
	Parsimonious Model	Interactions with Income	Interactions with Gender
	(1)	(2)	(3)
2:(intercept)	0.020	0.032	0.019
	(0.020)	(0.021)	(0.020)
Commute 5 Miles	-0.064	0.009	-0.011
	(0.041)	(0.083)	(0.061)
Commute 10 miles	-0.208***	-0.132*	-0.146**
	(0.040)	(0.080)	(0.060)
Commute 20 Miles	-0.606***	-0.563***	-0.528***
	(0.038)	(0.077)	(0.057)
Destinations Less than 3 Miles	-0.028	0.00003	-0.061
	(0.045)	(0.092)	(0.066)
Destinations Less than 10 Miles	-0.277***	-0.209**	-0.314***

	(0.043)	(0.088)	(0.063)
Destinations 10 Miles or more	-0.608***	-0.597***	-0.514***
	(0.042)	(0.083)	(0.061)
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	0.196***	0.120*	0.184***
	(0.034)	(0.069)	(0.051)
Homes Only single fam 1/2 acre lots	0.619***	0.450***	0.567***
	(0.040)	(0.079)	(0.059)
Homes Single Fam 1+ acre Lots	0.562***	0.297***	0.492***
	(0.041)	(0.082)	(0.060)
Parking On-street or free parking	-1.152***	-1.063***	-1.124***
	(0.032)	(0.065)	(0.048)
Parking Off-street or Paid Parking	-1.398***	-1.362***	-1.314***
	(0.042)	(0.086)	(0.062)
Streets For Cars, Pedestrians, and cyclers	0.331***	0.296***	0.304***
	(0.028)	(0.058)	(0.042)
Transit Bus stop within walking distance and Rail 5 miles away	-0.032	-0.039	-0.070
	(0.043)	(0.085)	(0.064)
Transit Rail and bus 5 miles away	-0.146***	-0.201**	-0.145**
	(0.043)	(0.086)	(0.064)
Transit Rail and Bus 10 miles Away	-0.248***	-0.239***	-0.328***
	(0.045)	(0.091)	(0.066)
Numeric Change	-0.892***	-1.070***	-0.749***
	(0.094)	(0.188)	(0.139)
Price Percent X Income High		1.038**	
		(0.413)	
Homes Single Fam 1+ acre Lots X Income Mid		0.309***	
		(0.097)	

Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos X Income High		0.272*	
		(0.153)	
Homes Only single fam 1/2 acre lots X Income High		0.601***	
		(0.175)	
Homes Single Fam 1+ acre Lots X Income High		0.499***	
		(0.174)	
Parking On-street or free parking X Income Mid		-0.128*	
		(0.078)	
Commute 20 Miles X Gender female			-0.138*
			(0.077)
			(0.086)
Destinations 10 Miles or more X Gender female			-0.182**
			(0.083)
Parking Off-street or Paid Parking X Gender female			-0.159*
			(0.084)
AIC	14946	13651	14949
Observations	13,840	12,630	13,840
R^2	0.223	0.226	0.224
Log Likelihood	-7,456.211	-6,776.334	-7,441.573
LR Test	4,271.172*** (df = 17)	3,953.665*** (df = 49)	4,300.448*** (df = 33)
Note:			*p**p***p<0.01

Table 9 shows the homeowner MWTP calculated with the parsimonious model. As shown, homeowners are willing to pay upwards of nearly $14,000 to avoid longer commutes to work. Similarly, homeowners will pay nearly $13,500 to avoid living in a home where local destination are ten miles away. Homeowners will also pay more to live in a home on a half-acre lot instead of a home on larger acre lot or in a neighborhood

consisting of apartments, condominiums and townhomes. A positive one-time payment of $7,420 is observed for streets that are designed for car, pedestrians and cyclers. Homeowners will pay between $25,000 and $32,000 to avoid not having a personal driveway or garage. In addition, homeowners will pay $5,600 to avoid having a transit distance more than ten miles away.[8]

Table 9 – Owner MRS and MWTP from the Parsimonious Model

Owner MRS and MWTP from the Parsimonious Model

	MRS	2.50%	97.50%	MWTP
2:(intercept)	0.022	-0.022	0.071	440
Commute 5 Miles	-0.072	-0.171	0.018	-1440
Commute 10 miles	-0.233	-0.335	-0.145	-4660
Commute 20 Miles	-0.679	-0.872	-0.543	-13580
Destinations Less than 3 Miles	-0.032	-0.137	0.068	-640
Destinations Less than 10 Miles	-0.31	-0.441	-0.206	-6200
Destinations 10 Miles or more	-0.682	-0.884	-0.538	-13640
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	0.22	0.14	0.321	4400
Homes Only single fam 1/2 acre lots	0.694	0.556	0.893	13880
Homes Single Fam 1+ acre Lots	0.63	0.499	0.813	12600
Parking On-street or free parking	-1.292	-1.634	-1.069	-25840
Parking Off-street or Paid Parking	-1.567	-1.991	-1.288	-31340
Streets For Cars, Pedestrians, and cyclers	0.371	0.28	0.493	7420
Transit Bus stop within walking distance and Rail 5 miles away	-0.036	-0.13	0.061	-720
Transit Rail and bus 5 miles away	-0.164	-0.264	-0.071	-3280
Transit Rail and Bus 10 miles Away	-0.278	-0.403	-0.176	-5560

[8] If it is desired to calculate the MRS for other demographics in the owner subsample, the reader is invited to use equation 4 and apply it to the coefficients located in **Error! Reference source not found.** in the appendix.

5. Summary and Conclusions

In 2012, the RSG, Inc. conducted a statewide survey on travel preferences in Utah. This survey was in collaboration with the Wasatch Front Regional Council and other metropolitan planning organizations. The purpose of the survey, called the Utah Travel Study, was to estimate household travel preferences in order to plan for continued growth in Utah. The study consisted of several surveys administered to Utah residents. One of the surveys contained a stated-preference choice experiment.

The results of this survey can be used by metropolitan planning organizations (MPOs) to better understand what drives housing choices. As such, discussions about how cities and towns in Utah should grow in relation to the Wasatch Choice 2040 Plan will be better informed (Research Systems Group Inc, 2013). MPOs play a large role in regional planning decisions. Having an understanding of what determines housing preferences will assist MPOs in long-range land-use and transportation planning (Research Systems Group Inc, 2013). In particular, MPOs will be able to determine if current development plans are in line with future growth or depart from it.

The choice experiment asked respondents to choose between a series of choice comparisons regarding alternative housing and neighborhood attributes. Each choice comparison randomly alternated the levels of the attributes. Multinomial logistic regression would be used to estimate changes in marginal utility associated with selecting an alternative set of housing and neighborhood attributes in the choice comparisons. Of importance, the attribute for housing price was not monetary-denominated. The original design of the study did not allow for the variable to be monetary-denominated. Thus, we

needed to convert what is otherwise a marginal rate of substitution (MRS) measure to its equivalent marginal willingness to pay (MWTP) using stated home price responses provided by respondents as part of the demographic portion of the survey.

It was found that by altering the attribute for the price with the self-reported rent and home price it is possible to obtain estimates of MWTPs. To do this two methods were developed. One method resulted in potentially upward biased estimates. We report results for the method that produced both theoretically and econometrically appealing estimates. Metropolitan planning organization can use these results to better understand the extents to which renters and homeowners perceive housing and neighborhood value in the context of different location-based attributes.

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Appendix

Table 10 – Owner and Renter Models that Used Method One for Price

Owner and Renter Models That Used Method One for price

	Dependent variable:	
	choice	
	Owner Model	Renter Model
	(1)	(2)
2:(intercept)	0.022	0.023
	(0.020)	(0.028)
Commute 5 Miles	-0.070*	-0.118**
	(0.041)	(0.054)
Commute 10 miles	-0.198***	-0.355***
	(0.040)	(0.055)
Commute 20 Miles	-0.600***	-0.880***
	(0.038)	(0.054)
Destinations Less than 3 Miles	-0.029	-0.125**
	(0.045)	(0.062)
Destinations Less than 10 Miles	-0.276***	-0.382***
	(0.043)	(0.059)
Destinations 10 Miles or more	-0.607***	-0.820***
	(0.042)	(0.056)
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	0.195***	0.263***
	(0.034)	(0.047)
Homes Only single fam 1/2 acre lots	0.617***	0.298***
	(0.040)	(0.054)
Homes Single Fam 1+ acre Lots	0.557***	0.406***
	(0.041)	(0.057)
Parking On-street or free parking	-1.150***	-0.636***

	(0.032)	(0.044)
Parking Off-street or Paid Parking	-1.395***	-0.821***
	(0.042)	(0.057)
Streets For Cars, Pedestrians, and cyclers	0.334***	0.413***
	(0.028)	(0.039)
Transit Bus stop within walking distance and Rail 5 miles away	-0.024	-0.120**
	(0.043)	(0.059)
Transit Rail and bus 5 miles away	-0.139***	-0.345***
	(0.043)	(0.060)
Transit Rail and Bus 10 miles Away	-0.245***	-0.595***
	(0.044)	(0.061)
Relative Change Price	-0.00000***	-0.002***
	(0.00000)	(0.0002)
AIC	14963	7754
Observations	13,840	6,710
R^2	0.222	0.170
Log Likelihood	-7,464.607	-3,860.012
LR Test (df = 17)	4,254.381***	1,578.920***
Note:		*p**p***p<0.01

Table 11 – Renter's MWTP for Method One

Renter's MWTP from Method One

	MWTP	2.5%	97.5%
2:(intercept)	9.907	-13.163	33.934
Commute 5 Miles	-50.152	-100.537	-5.281
Commute 10 miles	-150.542	-200.767	-106.185
Commute 20 Miles	-373.143	-448.549	-313.304
Destinations Less than 3 Miles	-53.042	-109.161	-2.781

Destinations Less than 10 Miles	-161.954	-221.199	-110.974
Destinations 10 Miles or more	-347.769	-425.667	-287.611
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	111.478	71.110	156.874
Homes Only single fam 1/2 acre lots	126.163	79.934	176.985
Homes Single Fam 1+ acre Lots	171.915	123.962	227.301
Parking On-street or free parking	-269.632	-327.285	-223.357
Parking Off-street or Paid Parking	-348.091	-423.210	-287.626
Streets For Cars, Pedestrians, and cyclers	175.074	136.640	220.663
Transit Bus stop within walking distance and Rail 5 miles away	-50.701	-99.902	-1.494
Transit Rail and bus 5 miles away	-146.086	-198.720	-96.367
Transit Rail and Bus 10 miles Away	-252.426	-315.723	-197.119

Table 12

Owner's MWTP from Method One

	MWTP	2.5%	97.5%
2:(intercept)	7,178.578	-5,391.179	21,015.400
Commute 5 Miles	-22,416.580	-52,461.910	3,165.359
Commute 10 miles	-63,841.590	-94,395.040	-38,955.430
Commute 20 Miles	-193,098.500	-254,039.400	-152,303.400
Destinations Less than 3 Miles	-9,455.098	-39,255.350	19,044.170
Destinations Less than 10 Miles	-88,824.530	-129,951.800	-58,575.200
Destinations 10 Miles or more	-195,112.300	-259,753.600	-151,567.400
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	62,794.850	39,536.490	94,048.580
Homes Only single fam 1/2 acre lots	198,361.500	156,377.800	262,903.400
Homes Single Fam 1+ acre Lots	179,219.300	139,642.700	237,208.400
Parking On-street or free parking	-370,027.600	-481,712.300	-299,488.500
Parking Off-street or Paid Parking	-448,746.700	-586,668.900	-361,768.000
Streets For Cars, Pedestrians, and cyclers	107,506.600	81,119.630	146,004.900
Transit Bus stop within walking distance and Rail 5 miles away	-7,701.238	-34,894.020	20,324.870

Transit Rail and bus 5 miles away	-44,559.020	-74,029.380	-18,340.980
Transit Rail and Bus 10 miles Away	-78,947.700	-117,763.100	-49,708.160

Table 13 – Interacted with Demographics Renter Models

Interacted with Demographics Renter Models

	Dependent variable:					
	choice					
	Parsimonious Model	Interactions with Employment	Interactions with Education	Interactions with Home Region	Interactions with Plan to Move	Interactions with Current Residency Type
	(1)	(2)	(3)	(4)	(5)	(6)
2:(intercept)	0.015	0.019	0.019	0.023	0.017	0.020
	(0.028)	(0.028)	(0.028)	(0.029)	(0.028)	(0.028)
Commute 5 Miles	-0.149**	0.354	-0.185	-0.184	-0.015	-0.148**
	(0.075)	(0.243)	(0.155)	(0.155)	(0.119)	(0.072)
Commute 10 miles	-0.399***	0.054	-0.279*	-0.278*	-0.301**	-0.408***
	(0.075)	(0.237)	(0.153)	(0.153)	(0.117)	(0.074)
Commute 20 Miles	-1.069***	-0.365	-0.899***	-0.899***	-0.846***	-0.917***
	(0.076)	(0.230)	(0.157)	(0.156)	(0.113)	(0.073)
Destinations Less than 3 Miles	-0.121	-0.381	-0.257	-0.257	0.101	-0.209**
	(0.086)	(0.258)	(0.176)	(0.176)	(0.134)	(0.084)
Destinations Less than 10 Miles	-0.385***	-0.290	-0.301*	-0.301*	-0.128	-0.436***
	(0.081)	(0.244)	(0.160)	(0.160)	(0.125)	(0.080)
Destinations 10 Miles or more	-0.804***	-1.069***	-0.815***	-0.815***	-0.369***	-0.875***
	(0.078)	(0.256)	(0.157)	(0.157)	(0.121)	(0.075)
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	0.265***	0.156	0.299**	0.299**	0.313***	0.252***
	(0.064)	(0.196)	(0.136)	(0.136)	(0.102)	(0.063)
Homes Only single fam 1/2 acre lots	0.275***	0.466**	0.518***	0.518***	0.445***	0.134*
	(0.073)	(0.229)	(0.154)	(0.154)	(0.115)	(0.074)
Homes Single Fam 1+ acre Lots	0.351***	0.216	0.780***	0.781***	0.384***	0.240***

	(0.078)	(0.232)	(0.167)	(0.167)	(0.116)	(0.076)
Parking On-street or free parking	-0.655***	-0.730***	-0.663***	-0.663***	-0.902***	-0.596***
	(0.060)	(0.188)	(0.127)	(0.127)	(0.093)	(0.059)
Parking Off-street or Paid Parking	-0.855***	-0.954***	-1.098***	-1.098***	-0.920***	-0.776***
	(0.077)	(0.251)	(0.165)	(0.165)	(0.121)	(0.077)
Streets For Cars, Pedestrians, and cyclers	0.407***	0.295*	0.555***	0.555***	0.480***	0.434***
	(0.054)	(0.162)	(0.114)	(0.114)	(0.084)	(0.053)
Transit Bus stop within walking distance and Rail 5 miles away	-0.142*	-0.016	0.251	0.251	-0.203	-0.093
	(0.081)	(0.230)	(0.170)	(0.170)	(0.125)	(0.081)
Transit Rail and bus 5 miles away	-0.349***	-0.108	-0.118	-0.118	-0.358***	-0.356***
	(0.082)	(0.246)	(0.173)	(0.173)	(0.126)	(0.081)
Transit Rail and Bus 10 miles Away	-0.607***	-0.447*	-0.160	-0.159	-0.705***	-0.682***
	(0.085)	(0.258)	(0.179)	(0.179)	(0.133)	(0.082)
Numeric Change	-1.961***	-2.834***	-1.711***	-1.709***	-1.626***	-1.739***
	(0.178)	(0.552)	(0.376)	(0.376)	(0.277)	(0.179)
Commute 10 miles X Employment Homemaker	0.651***					
	(0.209)					
Commute 20 Miles X Employment Homemaker	0.661***					
	(0.198)					
Commute 5 Miles X Employment Retired	1.034***					
	(0.395)					
Commute 10 miles X Employment Retired	0.624*					
	(0.369)					
Commute 20 Miles X Employment Retired	1.536***					
	(0.359)					
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos X Employment Homemaker	0.402**					
	(0.178)					
Homes Only single fam 1/2 acre lots X Employment Homemaker	0.659***					
	(0.214)					
Homes Single Fam 1+ acre Lots X Employment Homemaker	1.170***					

	(0.229)		
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos X Employment Not Currently Employed	-0.399*		
Parking On-street or free parking X Employment Homemaker	-0.370**		
	(0.170)		
Parking Off-street or Paid Parking X Employment Retired	0.933**		
	(0.373)		
Commute 5 Miles X Education Associates		-0.576*	
		(0.300)	
Commute 20 Miles X Education Associates		-0.634**	
		(0.298)	
Commute 5 Miles X Education Bachelors		-0.532**	
		(0.262)	
Commute 20 Miles X Education Bachelors		-0.561**	
		(0.249)	
Commute 5 Miles X Education Graduate/Post Doc		-0.491*	
		(0.275)	
Commute 10 miles X Education Graduate/Post Doc		-0.696***	
		(0.270)	
Commute 20 Miles X Education Graduate/Post Doc		-0.959***	
		(0.265)	
Homes Single Fam 1+ acre Lots X Education Associates		0.554*	
		(0.307)	
Transit Rail and bus 5 miles away X Education Graduate/Post Doc		-0.506*	
		(0.286)	
Numeric Change X Home Region Dixie			-2.819*
			(1.444)
Homes Single Fam 1+ acre Lots X Home Region WFRC MAG			-0.447**
			(0.179)

Parking Off-street or Paid Parking X Home Region WFRC MAG	0.319*		
	(0.177)		
Transit Bus stop within walking distance and Rail 5 miles away X Home Region WFRC MAG	-0.418**		
	(0.183)		
Transit Rail and Bus 10 miles Away X Home Region WFRC MAG	-0.540***		
	(0.192)		
Transit Bus stop within walking distance and Rail 5 miles away X Home Region Utah Other	-0.931***		
	(0.331)		
Numeric Change X Plan to Move Unsure		-2.819*	
		(1.444)	
Homes Single Fam 1+ acre Lots X Plan to Move No		-0.447**	
		(0.179)	
Parking Off-street or Paid Parking X Plan to Move No		0.319*	
		(0.177)	
Transit Bus stop within walking distance and Rail 5 miles away X Plan to Move No		-0.418**	
		(0.183)	
Transit Rail and Bus 10 miles Away X Plan to Move No		-0.540***	
		(0.192)	
Numeric Change Current Res Type Townhome/Multi Family 3 or less homes			-0.718*
			(0.394)
Destinations 10 Miles or more X Current Resident Type Townhome/Multi Family 3 or less homes			-0.513***
			(0.168)
Destinations Less than 3 Miles X Current Resident Type Building			-0.303*
			(0.160)
Destinations Less than 10 Miles X Current Resident Type Building			-0.370**
			(0.151)

Destinations 10 Miles or more X Current Resident Type Building	-0.605***		
	(0.145)		
Destinations Less than 10 Miles X Current Resident Type Mobile/Dorm/Other(boat/RV/van)	-0.830*		
	(0.455)		
Destinations 10 Miles or more X Current Resident Type Mobile/Dorm/Other(boat/RV/van)	-0.744*		
	(0.417)		
Homes Only single fam 1/2 acre lots X Current Resident Type Building	-0.230*		
	(0.138)		
Parking On-street or free parking X Current Resident Type Townhome/Multi Family 3 or less homes	0.215*		
	(0.131)		
Parking On-street or free parking X Current Resident Type Building	0.365***		
	(0.112)		
Parking On-street or free parking X Current Resident Type Mobile/Dorm/Other(boat/RV/van)	0.692**		
	(0.340)		
Numeric Change X Current Place Type Suburban res and/or comm mix		-0.764***	
		(0.284)	
Commute 5 Miles X Current Place Type Suburban res and/or comm mix		0.195*	
		(0.117)	
Destinations Less than 3 Miles X Current Place Type rural		2.637***	
		(0.940)	
Homes Only single family 1/2 acre lots X Current Place Type Suburban resident and/or commercial mix		0.325***	
		(0.115)	
Homes Single Family 1+ acre Lots X Current Place Type Suburban Resident and/or Commercial mix		0.339***	
		(0.120)	

Homes Only single family 1/2 acre lots X Current Place Type Small Town						0.790***
						(0.245)
Homes Single Fam 1+ acre Lots X Current Place Type Small Town						0.643**
						(0.266)
Parking Off-street or Paid Parking X Current Place Type rural						-2.006*
						(1.054)
Streets For Cars, Pedestrians, and cyclers X Current Place Type rural						2.550**
						(1.086)
Transit Bus stop within walking distance and Rail 5 miles away X Current Place Type rural						2.388**
						(1.178)
Transit Rail and Bus 10 miles Away X Current Place Type rural						2.178*
						(1.222)
AIC	7683	7745	7730	7319	7738	7709
Observations	6,710	6,710	6,710	6,370	6,710	6,710
R^2	0.191	0.185	0.183	0.182	0.182	0.185
Log Likelihood	-3,760.741	-3,791.464	-3,799.916	-3,610.349	-3,804.226	-3,789.259
LR Test	1,777.464*** (df = 81)	1,716.018*** (df = 81)	1,699.113*** (df = 65)	1,606.558*** (df = 49)	1,690.493*** (df = 65)	1,720.427*** (df = 65)
Note:						*p**p***p<0.01

Table 14 – Interacted with Demographics Owner Models

Interacted with Demographics Owner Models

	Dependent variable:					
	choice					
	Parsimonious Models	Interactions with Education	Interactions with Employment	Interactions with Age	Interactions with Home Region	Interactions with Plan to Move
	(1)	(2)	(3)	(4)	(5)	(6)
2:(intercept)	0.015	0.019	0.017	0.021	0.019	0.019
	(0.020)	(0.021)	(0.020)	(0.024)	(0.020)	(0.020)

Commute 5 Miles	0.138	-0.031	-0.070	-0.071	-0.040	-0.512*
	(0.178)	(0.055)	(0.134)	(0.134)	(0.043)	(0.308)
Commute 10 miles	0.074	-0.249***	-0.021	-0.020	-0.202***	-0.815**
	(0.170)	(0.054)	(0.134)	(0.134)	(0.043)	(0.327)
Commute 20 Miles	-0.264*	-0.717***	-0.376***	-0.375***	-0.595***	-1.436***
	(0.158)	(0.053)	(0.128)	(0.128)	(0.041)	(0.326)
Destinations Less than 3 Miles	0.269	-0.057	-0.174	-0.174	-0.022	-0.017
	(0.212)	(0.062)	(0.142)	(0.142)	(0.048)	(0.353)
Destinations Less than 10 Miles	0.371*	-0.274***	-0.572***	-0.571***	-0.259***	-1.275***
	(0.203)	(0.059)	(0.140)	(0.140)	(0.046)	(0.372)
Destinations 10 Miles or more	0.090	-0.574***	-0.600***	-0.600***	-0.588***	-1.295***
	(0.185)	(0.057)	(0.136)	(0.136)	(0.044)	(0.318)
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos	0.262*	0.191***	0.298***	0.298***	0.226***	-0.054
	(0.151)	(0.047)	(0.114)	(0.114)	(0.037)	(0.257)
Homes Only single fam 1/2 acre lots	0.708***	0.587***	0.988***	0.988***	0.675***	-0.229
	(0.172)	(0.054)	(0.135)	(0.135)	(0.042)	(0.303)
Homes Single Fam 1+ acre Lots	0.331*	0.624***	1.130***	1.129***	0.642***	-0.675**
	(0.181)	(0.056)	(0.143)	(0.143)	(0.044)	(0.313)
Parking On-street or free parking	-1.427***	-1.132***	-1.127***	-1.127***	-1.178***	-0.955***
	(0.147)	(0.045)	(0.108)	(0.108)	(0.035)	(0.249)
Parking Off-street or Paid Parking	-1.796***	-1.354***	-1.396***	-1.396***	-1.416***	-1.232***
	(0.183)	(0.057)	(0.135)	(0.135)	(0.045)	(0.341)
Streets For Cars, Pedestrians, and cyclers	0.208*	0.341***	0.373***	0.373***	0.340***	0.728***
	(0.122)	(0.039)	(0.093)	(0.093)	(0.030)	(0.232)
Transit Bus stop within walking distance and Rail 5 miles away	0.241	-0.084	0.119	0.119	-0.036	-0.225
	(0.188)	(0.059)	(0.144)	(0.144)	(0.046)	(0.332)
Transit Rail and bus 5 miles away	-0.028	-0.196***	-0.199	-0.198	-0.144***	-0.889**
	(0.195)	(0.059)	(0.142)	(0.142)	(0.046)	(0.350)
Transit Rail and Bus 10 miles Away	-0.304	-0.292***	-0.050	-0.050	-0.258***	-1.104***
	(0.204)	(0.061)	(0.144)	(0.144)	(0.048)	(0.334)
Price Percent	-0.580	-0.954***	-0.969***	-0.967***	-0.920***	0.476
	(0.418)	(0.130)	(0.322)	(0.322)	(0.101)	(0.757)

Commute 5 Miles X Education Associates	-0.392*
	(0.222)
Commute 10 miles X Education Bachelors	-0.398**
	(0.182)
Commute 20 Miles X Education Bachelors	-0.404**
	(0.170)
Commute 20 Miles X Education Graduate/Post Doc	-0.457***
	(0.175)
Destinations Less than 10 Miles X Education Some College or Voc/tech Training	-0.545**
	(0.228)
Destinations 10 Miles or more X Education Some College or Voc/tech Training	-0.565***
	(0.210)
Destinations Less than 10 Miles X Education Associates	-0.546**
	(0.246)
Destinations 10 Miles or more X Education Associates	-0.594***
	(0.230)
Destinations Less than 10 Miles X Education Bachelors	-0.697***
	(0.214)
Destinations 10 Miles or more X Education Bachelors	-0.790***
	(0.197)
Destinations Less than 10 Miles X Education Graduate/Post Doc	-0.775***
	(0.219)
Destinations 10 Miles or more X Education Graduate/Post Doc	-0.831***
	(0.202)
Homes Single Fam 1+ acre Lots X Education Some College or Voc/tech Training	0.439**
	(0.206)
Parking On-street or free parking X Education Associates	0.452**
	(0.181)

Parking Off-street or Paid Parking X Education Associates	0.526**	
	(0.230)	
Parking Off-street or Paid Parking X Education Bachelors	0.350*	
	(0.194)	
Parking On-street or free parking X Education Graduate/Post Doc	0.322**	
	(0.160)	
Parking Off-street or Paid Parking X Education Graduate/Post Doc	0.559***	
	(0.199)	
Streets For Cars, Pedestrians, and cyclers X Education Associates	0.362**	
	(0.155)	
Transit Bus stop within walking distance and Rail 5 miles away X Education Graduate/Post Doc	-0.352*	
	(0.206)	
Price Percent X Employment Homemaker		-0.650**
		(0.274)
Price Percent X Employment Retired		0.472*
		(0.261)
Commute 20 Miles X Employment Retired		0.582***
		(0.105)
Commute 5 Miles X Employment Not Currently Employed		-0.680**
		(0.271)
Destinations 10 Miles or more X Employment Homemaker		-0.282**
		(0.121)
Homes Single Fam 1+ acre Lots X Employment student		0.670*
		(0.360)
Homes Only single fam 1/2 acre lots X Employment Homemaker		0.450***
		(0.114)
Homes Single Fam 1+ acre Lots X Employment Homemaker		0.419***

	(0.118)	
Homes Single Fam 1+ acre Lots X Employment Retired	-0.546***	
	(0.113)	
Parking On-street or free parking X Employment Homemaker	-0.249***	
	(0.093)	
Parking Off-street or Paid Parking X Employment Homemaker	-0.410***	
	(0.125)	
Transit Bus stop within walking distance and Rail 5 miles away X Employment Retired	0.224*	
	(0.119)	
Transit Rail and bus 5 miles away X Employment Retired	0.212*	
	(0.119)	
Transit Rail and Bus 10 miles Away X Employment Not Currently Employed	0.649**	
	(0.294)	
Commute 20 Miles X Home Region WFRC MAG		-0.266*
		(0.137)
Commute 20 Miles X Home Region Utah Other		-0.323**
		(0.159)
Destinations Less than 10 Miles X Home Region WFRC MAG		0.256*
		(0.150)
Destinations Less than 10 Miles X Home Region Dixie		0.523***
		(0.197)
Destinations Less than 10 Miles X Home Region Utah Other		0.455***
		(0.175)
Homes Only single fam 1/2 acre lots X Home Region WFRC MAG		-0.452***
		(0.144)
Homes Single Fam 1+ acre Lots X Home Region WFRC MAG		-0.702***
		(0.152)

Homes Only single fam 1/2 acre lots X Home Region Dixie	-0.380**		
	(0.187)		
Homes Single Fam 1+ acre Lots X Home Region Dixie	-0.685***		
	(0.192)		
Parking Off-street or Paid Parking X Home Region Dixie	0.337*		
	(0.188)		
Commute 20 Miles X Plan to Move No		-0.266*	
		(0.137)	
Destinations Less than 3 Miles X Plan to Move No		0.138	
		(0.153)	
Destinations Less than 10 Miles X Plan to Move No		0.256*	
		(0.150)	
Destinations 10 Miles or more X Plan to Move No		-0.087	
		(0.146)	
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos X Plan to Move No		-0.128	
		(0.121)	
Homes Only single fam 1/2 acre lots X Plan to Move No		-0.452***	
		(0.144)	
Homes Single Fam 1+ acre Lots X Plan to Move No		-0.702***	
		(0.152)	
Commute 10 miles X Current Resident Type Building			-0.383**
			(0.190)
Destinations Less than 10 Miles X Current Resident Type Building			-0.483**
			(0.211)
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos X Current Resident Type Townhome/Multi Family 3 or less homes			-0.315**
			(0.147)

Homes Only single fam 1/2 acre lots X Current Resident Type Townhome/Multi Family 3 or less homes	-0.478***		
	(0.167)		
Homes Single Fam 1+ acre Lots X Current Resident Type Townhome/Multi Family 3 or less homes	-0.599***		
	(0.161)		
Homes Only single fam 1/2 acre lots X Current Resident Type Building	-0.391**		
	(0.186)		
Homes Single Fam 1+ acre Lots X Current Resident Type Building	-0.711***		
	(0.182)		
Parking On-street or free parking X Current Resident Type Building	0.457***		
	(0.148)		
Parking Off-street or Paid Parking X Current Resident Type Building	0.522***		
	(0.194)		
Transit Rail and Bus 10 miles Away X Current Resident Type Townhome/Multi Family 3 or less homes	0.487***		
	(0.187)		
Price Percent X Current Place Type Suburban res/comm mix		-1.627**	
		(0.795)	
Price Percent X Current Place Type Suburban residential		-1.372*	
		(0.771)	
Price Percent X Current Place Type Small Town		-1.382*	
		(0.795)	
Price Percent X Current Place Type rural		-2.109**	
		(0.858)	
Commute 10 miles X Current Place Type City residential		0.617*	
		(0.337)	
Commute 20 Miles X Current Place Type City residential		0.820**	
		(0.336)	

Commute 20 Miles X Current Place Type Suburban residental/commerical mix	0.865**
	(0.341)
Commute 10 miles X Current Place Type Suburban residential	0.588*
	(0.333)
Commute 20 Miles X Current Place Type Suburban residential	0.797**
	(0.332)
Commute 10 miles X Current Place Type Small Town	0.747**
	(0.344)
Commute 20 Miles X Current Place Type Small Town	0.862**
	(0.342)
Commute 20 Miles X Current Place Type rural	0.970***
	(0.363)
Destinations Less than 10 Miles X Current Place Type City residential	0.910**
	(0.384)
Destinations Less than 10 Miles X Current Place Type Suburban residential/commercial mix	0.967**
	(0.388)
Destinations Less than 10 Miles X Current Place Type Suburban residential	1.065***
	(0.378)
Destinations 10 Miles or more X Current Place Type Suburban residential	0.715**
	(0.325)
Destinations Less than 10 Miles X Current Place Type Small Town	1.053***
	(0.389)
Destinations 10 Miles or more X Current Place Type Small Town	0.915***
	(0.337)
Destinations Less than 10 Miles X Current Place Type rural	1.009**
	(0.409)
Destinations 10 Miles or more X Current Place Type rural	1.103***

	(0.360)
Homes Only single fam 1/2 acre lots X Current Place Type City residential	0.625**
	(0.315)
Homes Single Fam 1+ acre Lots X Current Place Type City residential	0.857***
	(0.324)
Homes Only single fam 1/2 acre lots X Current Place Type Suburban res/comm mix	0.727**
	(0.319)
Homes Single Fam 1+ acre Lots X Current Place Type Suburban resident/commercial mix	1.149***
	(0.329)
Homes Only single fam 1/2 acre lots X Current Place Type Suburban residential	0.869***
	(0.310)
Homes Single Fam 1+ acre Lots X Current Place Type Suburban residential	1.315***
	(0.320)
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos X Current Place Type Small Town	0.459*
	(0.274)
Homes Only single fam 1/2 acre lots X Current Place Type Small Town	1.183***
	(0.321)
Homes Single Fam 1+ acre Lots X Current Place Type Small Town	1.490***
	(0.331)
Homes Mix, Single Fam 1/2 acre lots, townhomes, apartments, condos X Current Place Type rural	0.495*
	(0.295)
Homes Only single fam 1/2 acre lots X Current Place Type rural	1.445***
	(0.347)
Homes Single Fam 1+ acre Lots X Current Place Type rural	2.500***
	(0.368)
Streets For Cars, Pedestrians, and cyclers X Current Place Type Suburban res/comm mix	-0.449*

						(0.244)
Transit Rail and bus 5 miles away X Current Place Type City residential						0.915**
						(0.362)
Transit Rail and Bus 10 miles Away X Current Place Type City residential						0.980***
						(0.347)
Transit Rail and bus 5 miles away X Current Place Type Suburban res/comm mix						0.760**
						(0.367)
Transit Rail and Bus 10 miles Away X Current Place Type Suburban res/comm mix						0.843**
						(0.353)
Transit Rail and bus 5 miles away X Current Place Type Suburban residential						0.811**
						(0.357)
Transit Rail and Bus 10 miles Away X Current Place Type Suburban residential						0.838**
						(0.342)
Transit Rail and bus 5 miles away X Current Place Type Small Town						0.610*
						(0.369)
Transit Rail and Bus 10 miles Away X Current Place Type Small Town						0.991***
						(0.354)
Transit Rail and Bus 10 miles Away X Current Place Type rural						0.648*
						(0.382)
AIC	14928.483	13582.716	14943.273	10962.717	14927.205	
14841.05						
Observations	13,840	12,640	13,840	10,230	13,840	13,840
R^2	0.230	0.234	0.228	0.231	0.229	0.236
Log Likelihood	-7,383.242	-6,710.358	-7,406.637	-5,448.358	-7,398.602	-7,323.527
LR Test	4,417.111*** (df = 81)	4,100.217*** (df = 81)	4,370.321*** (df = 65)	3,282.183*** (df = 33)	4,386.390*** (df = 65)	4,536.540*** (df = 97)
Note:						*p**p***p<0.01