Location Choice vis-à-vis Transportation: The Case of Recent Homebuyers

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Abstract

An understanding of residential location choice is fundamental to behavioral models of land use, and, ultimately, travel demand. A survey of over 900 recent homebuyers in the Austin, Texas area offers valuable data on movers and their reasons for moving. This paper examines the role of access (to employment, freeways, shopping, bus services, and other opportunities) in residential home and location choice by examining housing choice priorities and tradeoffs. Predictive models of home value, amenity preferences, home type, and location choice offer important insights, while controlling for many key factors. While access is important, and is particularly relevant for certain demographic sub-groups, other priorities figure more prominently in the home purchase decision.

Keywords: Location choice, residential development, home ownership, accessibility, and land use-transportation trade-offs

Introduction

Households are a key actor in the theater of urban development. Two-thirds of U.S. households own their own homes, and roughly 60 percent of urban land is devoted to residential uses. An understanding of when, why, and where households move is critical to predicting future land use and activity patterns. In order to generate a model of residential location choice, a survey of recent homebuyers was undertaken in the Austin, Texas region, specifically Travis County. It asked such households about their primary reasons for moving, the importance of various housing and location attributes, their travel patterns, and basic demographic information. This paper positions this study within the context of prior work, describes the data collected, and investigates determinants of residential location (in terms of the reasons for moving, priorities during the housing search process, and tradeoffs in choosing a home). It provides the empirical results of a variety of regression models, including logit models of neighborhood choice.

Literature Review and Motivation

Economic tradition presents the household location problem in a utility-maximization framework, where choices depend on tradeoffs between transport costs and housing prices (Giuliano, 1989). After Alonso's (1964) monocentric city model, Mills (1967) and Muth (1969) pioneered improvements to this model. By using simplified models of spatial equilibrium, these authors argue that when people move farther from their center of employment, greater commuting costs are counterbalanced by less expenditure on land (Wheaton, 1977).

Rosen (1974) first presented a theoretical work on hedonic prices that has motivated the specification of models to relate housing market prices to housing characteristics (see, e.g., Huh and Kwak, 1997; Orford, 2000; and Kockelman, 1997). However, it has been argued that hedonic price functions offer limited information regarding consumer behavior (Ellickson, 1981). A need to reflect taste variations among households has motivated the application of logit models in the analysis of housing markets (Cho, 1997). Numerous studies have applied logit models to predict individual households' housing choices (see e.g., Weisbrod et al., 1980; Friedman, 1981; Ben-Akiva and Bowman, 1998; Sermons and Seredich, 2001; and Zondag and Pieters, 2004). Studies most relevant to this work have incorporated transport choices and access variables into the analysis.

Since accessibility is a major theme in residential location theories, transportation has been a focus of many models. Such studies provide a good basis for understanding the connections between transportation and land use; however, empirical data suggests that many models are incomplete (Giuliano, 1989). Two key weaknesses in many older studies include the assumption of a single-worker household and a monocentric city (in which all jobs occupy the central business district) (Giuliano, 1989). Feminization of the workforce, decentralization, and emergence of multiple centers have invalidated these assumptions (Waddell, 1996). Efforts to model dual-worker household location choices include the studies by Waddell (1996), Sermons and Koppelman (2001), Freedman and Kern (1997), and Van Ommeren et al. (1998), among others.

Also, many studies are based on the data of static households (see, e.g., Bhat and Guo, 2004). Surveys of recent movers can provide better data since such respondents can more accurately recall their motivations for moving and their characteristics at the time of the move. Since household location models seek to identify the determinants of the move decision, and the chosen dwelling unit (including location), there is strong interest in identifying priorities during the search process, and in quantifying all tradeoffs.

In response to such interests, the US Census Bureau recently published a couple Current Population Reports that contain only cross-tabulations and raw distributions of the 2000 Current Population Survey (CPS) and the 2003 Annual Social and Economic Supplement to the CPS. (Schachter, 2001 and Schachter, 2004) Over 30 years ago, Murie (1974) explored the reasons for movement and related them to a few housing and demographic variables, but his data is out-dated and only summarizes basic variable statistics. Filion et al. (1999) addressed households' reasons for moving; but they did not relate these reasons to home qualities or demographic characteristics.

Another important aspect of residential location choice involves the housing search process, particularly the importance of factors that determine household priorities. Filion et al. (1999) and the 2004 American Community Survey (ACS) present some raw statistics regarding the importance associated with accessibility and other, neighborhood variables. However, these studies do not explore explanatory variables that affect these relationships (such as income and household size).

Moves are costly with sellers generally paying 6% (of their home's value) in realtor fees and 1 to 2% in other transaction costs, and all parties typically paying several hundred to thousands of dollars for transport of furnishings. Households often trade-off a variety of location, size, quality, and cost factors when selecting a home and location. Weisbrod et al. (1980) examined several tradeoffs between transportation and other factors for recent movers in Minnesota, but did not quantify these or tie them to demographic characteristics. The 2004 ACS explored a few tradeoffs, but provided only raw statistics. (Belden et al., 2004) This paper tightly links residential location and home attributes to key demographic variables. It relies on logit and ordered probit models of location choice, attribute preferences, and other survey responses.

Data Acquisition

A **survey of realtors** in the Austin area was distributed in order to ascertain key characteristics and preferences of Austin movers. Three realtors were interviewed at length, and then a formal survey instrument was developed and distributed to 229 Austin-area realtors via electronic mail (including 3 reminder emails). This effort yielded just 22 complete responses but provided valuable insights and impressions. Its results were used to aid in the development of the more extensive recent-mover survey, which was designed as a mail-out mail-back (self-completion) survey. It was offered in both English and Spanish, following pilot tests and several rounds of formal revision. The resulting instrument contains 37 questions and can be found at www.ce.utexas.edu/prof/kockelman/public_html/RecentMoverSurvey.htm.

USA Data Inc. assembled the sample frame of all homebuyers identified (via deed purchases and transfers) in the Austin three-county region between March 2004 and February 2005 (a one-year period)[1]. A random sample of just over half of these identified households was purchased, providing 4,451 names and addresses. Surveys were mailed to all 4,451 households in April

[1] Respondents represent a combination of both movers from outside the region and within the region.

2005, and reminders were sent four to six weeks later. (The survey was available on-line as well, for those who had not retained the original survey form, but the reminders generated only 100 or so responses, so no further reminders were sent.) By the end of June 2005, the sample had yielded 965 complete surveys, or a 21.7% response rate. Since some households were not appropriate for the sample frame[2], the actual response rate, from the pool of qualified survey recipients, is believed to be somewhat higher (25% or higher). Those who did respond but did not qualify as "recent movers" were not included in the final data set used for analysis. The target population was reduced to only Travis County (due to few Hays and Williamson County residents in the initial sample), resulting in 943 observations[3] of recent homebuyers in Travis County. This data set was not weighted because it rivaled the limited size (1,069 observations) of the associated Public Use Microdata Sample (PUMS) Census data[4]. The following section describes this final data set and results of the analysis.

Data Sets and Basic Results

The results of the realtors' surveys were used to familiarize the researchers with movers' preferences. For example, realtors indicated that movers are believed to have a hierarchy of needs when searching for a home and neighborhood. The survey asked realtors to rank which housing and location characteristics are most important to their clients. The results revealed that realtors view housing cost/value, quality of schools, and distance to work as most important to their clients. Among all the attributes believed to be relevant (and thus offered on the survey form), pedestrian/bike accommodations and transit access were felt to be least important. Yet realtors generally indicated that attributes of both housing and location were *equally important* to their clients. These results are consistent with NCHRP Report 423A's (Parsons Brinkerhoff, 1999) summary of influential factors, which states that housing cost comes first (and is related to home size, quality, type, and age), and accessibility comes second.

Another survey question asked realtors to rate various categories of clients according to their concerns for access. The results suggest that central-city dwellers are most concerned, which may be because downtown dwellers are more exposed to congestion and/or because they have chosen their central locations in order to maximize access. Lower-income clients and renters also were identified as classes of people most concerned about access. Clients that are perceived by realtors as being least concerned are high-income, childless, and residing in suburban locations. Clients without children may be less subject to time constraints and those with high incomes may

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[2] In this analysis "neighborhood" refers to the region's Traffic Serial Zones (TSZs) as defined by the Capital Area Metropolitan Planning Organization (CAMPO). CAMPO provided information on zonal areas, population, number of households, and employment. Zonal housing characteristics came from the 2000 Census of Population census tract data sets, which were apportioned uniformly to the smaller TSZs, on the basis of area.
[3] Census population data reveals populations for Hays, Travis, and Williamson Counties to be 97,589, 812,280, and 249,967, respectively; and a random sample is expected to approximately reflect these population distributions (8%, 70%, and 22%). However, the purchased list only contained 22 addresses for Hays County and 22 addresses for Williamson County (while containing 4244 addresses for Travis county or 99% of valid addresses), suggesting that a random sample of the complete frame of movers in the three counties was not available to USA Data.
[4] Indeed, any PUMS-based weighting approaches tested (on the basis of household size and income, for example) produced undesirable disparities in the marginal distributions and summary statistics of other attributes (such as vehicle ownership).

enjoy more flexibility in work hours. These results seem fairly intuitive and provide a basis for expected results of the household survey, which offers many more observations.

The first step in analysis of the recent-mover data set involves looking at the raw data. Table 1 provides a variety of summary statistics. Respondents were asked to indicate their "primary reason(s) for moving" to their current home. Although most other surveys (e.g., Murie, 1974 and the Current Population Survey) ask respondents to indicate a single primary reason for moving, it is believed that many households move for multiple reasons. The results of the survey confirm this hypothesis: almost half of all respondents (48.2%) indicated more than one "primary" reason for moving. Table 2 provides these sample results. Simple bivariate correlations indicate statistically significant associations between (1) birth/adoption and wanting a newer/bigger/better home and one that is closer to quality schools, as well as (2) retirement and wanting a change of climate, closer access to family and medical facilities, and having an "other" reason for moving. Multivariate models of this and other decisions are discussed in the following section.

Households were also asked to consider various housing and location attributes and its significance while they were searching for a new home. Table 3 offers summary statistics of these results. Consistent with the realtor survey results, price is the most important. The quality and distance to local public schools were less important, which is contradictory to what was expected from the results of the realtor survey. However, only 31% of responding households had children (age 16 or under) at home. In contrast, the average realtor surveyed indicated that 71% of his/her clients have children at home. (The U.S. Census suggests that 36% of all households include members under the age of 18. Thus, the 22 surveyed realtors may represent a rather biased sample of homebuyers.) Ordered probit models offer a multivariate look at such priorities, simultaneously controlling for the presence of children and a variety of other household characteristics.

Model Results

Four different types of models were used to analyze the recent mover data set. An ordinary least squares (OLS) hedonic regression model of home value reveal marginal market valuations of various housing features, as well as effects of several location characteristics. Logit models were used to analyze stated preferences in binary experiments, and ordered probit models were used to track levels of associated importance in search criteria. Multinomial logit models help explain significant factors in choosing a particular home type and location within the region. (For statistical discussions of all these models, including methods for estimating elasticity-of-response values, please see Greene [2003]).

Linear Regression Analysis of Home Price

The OLS hedonic model of home purchase prices allows one to quantify (in dollars) many tradeoffs that households make in home selection, across home and location attributes. Table 4 provides the final model specification, which was developed based on a process of stepwise addition and deletion and a maximum p-value of 0.10. Neighborhood/zonal attributes were obtained by matching geocoded home addresses to several data sources, including CAMPO's zonal file (which provided information on zone's areas, population, number of households, and employment), the 2000 Census of Population (which provided information on median home values, housing units, housing units' median number of rooms, and average commute times for employed people), and work by Kalmanje and Kockelman (2004). It is this last effort that provided an accessibility index, calibrated from logsums emerging from travel demand models of home-based work trips[5].

As expected, many physical features of the home are statistically and practically significant. Everything else constant – including square footage, both the number of bedrooms and bathrooms are found to be statistically significant and show second order effects. As the number of bedrooms increases, its effect on home values is less dramatic in comparison to the effect of the number of bathrooms. For instance, a home with 3 bathrooms is valued to be $52,100 more than a home with 2 bathrooms, ceteris paribus; compare this to the effect of the number of bedrooms where a home with 3 bedrooms is valued to be only $6,900 more than a home with 2 bedrooms. This may be because additional bathrooms may be considered a luxury factor and may also proxy for other costly attributes of the home. Another somewhat surprising result is that older homes (over 68 years old) enjoy higher values. This may be attributed to quality of construction (including hard wood floors, crown molding, or other attributes), maturity of trees, and neighborhood design diversity. It also may result from age proxying for other key variables, such as location. Older homes are more central, and the distance-to-CBD and other variables somehow may not capture all these effects. Access considerations are not easy to quantify.

Many local and regional features[6] are significant. The neighborhood's median home value is estimated to have a positive effect on home value, which is intuitive. High-valued homes tend to be located in nicer neighborhoods, so this variable may proxy for neighborhood appearance (one of the higher priorities for most movers, according to Table 3), views, the quality of public infrastructure, as well as other variables that are difficult to control for. Distance to the CBD and the mean travel time to work for workers in the area both have negative coefficients, as expected, indicating that households are willing to pay more for greater accessibility to the CBD and employment facilities. Yet one of the most practically significant variables is the logsum measure of regional accessibility (which are based on discrete-choice models of travel demand [as calibrated by Kalmanje and Kockelman 2005]). . Of course, these accessibility terms (distance to CBD, mean commute times, and the logsum accessibility index) are correlated with one another, creating issues of multicollinearity in interpretation (and thus a negative coefficienton the home-based-work accessibility term).

Finally, to control for the school quality, the mean SAT scores for the local public high school within the home's assigned school district were used in the analysis and results suggest that homebuyers, on average, are willing to pay more for higher quality public schools, ceteris paribus. More comprehensive measures of access and land use patterns, and additional information on home structure (such as the presence of stone or brick, landscaping, and garage

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[5] The logsum used here is the expected maximum utility derived across all mode, departure time, and destination combinations available to a trip maker. Kockelman et al (2004) calibrated nested logit models for Austin area trips using the 1996 Austin Travel Surveys. They considered four modes and five times of day, along with the region's 1074 TSZ destinations.

[6] Several survey recipients called to report that they had recently refinanced, rather than purchased their home. Others indicated that they were not actually living at the property but had purchased it as an investment.

size) could prove helpful to this model. However, its predictive power is quite reasonable (adjusted $R^2 = 0.823$), except in the case of high valued homes (especially for those valued around $1,000,000 or more) due to the coding of the data. The survey contained categorical responses for home value, and homes valued at $500,000 or more were coded as $500,000 for analysis. Additionally, it seems that the predictive power of the structural aspects (adjusted $R^2 = 0.671$) is slightly higher than the location information (adjusted $R^2 = 0.614$), when examined separately.

Binary Logit Models of Home-Location Tradeoffs

While the hedonic model for home value offers valuable metrics of revealed preferences using market prices, a great many factors are at play. Stated preference scenarios allow one to control for a host of such potentially confounding variables. Six hypothetical scenarios, each offering two home-choice options, were presented in the survey. (And all other features of each respondent's current residence were assumed to apply, in order to permit a clear and relatively realistic choice situation.) The scenarios compared pairs of the following attributes: easy freeway access (being within 1 mile of one of Austin's two major freeways and a 50% commute-time reduction), increased home size (a larger kitchen and living room), toll road access (within 1 mile of a major toll road resulting in a 15-minute commute time), transit access (bus stops within a ¼ mile from the home and workplace, or other frequent destination), larger lot/yard, and easy access to shopping facilities (within 1 mile of a shopping center). Binary logit models were calibrated to ascertain household preferences, as a function of a variety of demographic and other control variables, including information concerning their current residence (since these characterized the choice alternatives). Table 5 shows the final specifications for all six scenarios. Several variables are not shown in the final specifications, because they were not statistically (or practically) significant; but there were considered initially. (These include occupation and type of dwelling unit, for example.)

In examining the results of the models, there appear to be many similarities between those who favor commute-time reductions via freeway and toll road access (over increased home size). They include those who live in homes in larger homes, those who live in suburban areas, and those in lower income neighborhoods, tend to favor commute reductions. Additionally, the revealed location characteristics of the households seem to reflect their preferences. For example, those who live closer to the CBD are more likely to favor commute reductions over increased home size – perhaps this is because they place high value on accessibility, as reflected by their location choice and would still prefer improvements in accessibility over home improvements. This is consistent with a self-selection theory, in which households choose their location based on their trip-making characteristics and travel preferences. Also, when examined separately, binary logit models with only current home and location characteristics provide higher predictive power (for all scenarios except the comparison between increased shopping and freeway access) than demographic characteristics alone, suggesting that their revealed choices are more reflective of preferences than household demographics.

Demographically, gender and race/ethnicity prove to be significant indicators of preference. Men are estimated to be less concerned with access to toll roads or to shopping facilities (over increased home and lot size). Non-Caucasians are more likely to favor freeway and toll road access (over increased home size), but favor bus access over toll road access and shopping access over freeway access. In terms of transit access, demographic distinctions seem more apparent. Older persons and frequent bus riders are more likely to prefer bus access over toll road access and increased lot size. Overall, the two scenarios related to transit access provide the highest predictive power. In both these cases, household income and vehicle ownership are very helpful predictors of response.

Ordered Probit Models of the Importance of Access

Ordered probit models were calibrated in order to ascertain the importance of access attributes (commute time, distance/travel time to shopping, and access to bus services[7]) during the housing search process. Only demographic/personal control variables were used (rather than home/structural attributes), and Table 6 provides parameter estimates for final specifications. For model results of other, non-access attributes, readers may refer to Bina (2005).

As hypothesized earlier, knowing the reason(s) for a household's move can provide insight into the movers' final home choices (e.g., retirees may locate closer to children or medical facilities, and expecting parents may be interested a larger home and good schools). As one would expect, those who moved for an easier commute are more likely to indicate that access (of all types) is a priority. Those who move for a new job (or job transfer) view commute time and shopping access as important but are estimated to be less likely to value transit access.

Demographically, several characteristics were estimated to play important roles in respondents' valuations of access. For example, in every one of the 3 models, men are estimated to be less concerned with access than women. Higher income households tend to place greater value on access (with the exception of access to transit[8]). This seems to contradict the realtor survey results, which indicated that lower-income households are more concerned with accessibility.

Married persons are estimated to place greater value on shopping access (than unmarried persons). Those owning more vehicles are less likely to value shopping and transit access, while those owning no vehicles place greater value on bus access, as expected. In contrast to full-time students, older persons are estimated to be less likely to value commute time and transit access. Even retirees are less likely to value transit access, which is disconcerting to see, since such persons may need to start considering other travel options (as age takes its toll driving abilities).

While these models' results suggest it is difficult to predict the level of importance that recent movers assign to various access features (all three likelihood ratio index values lie below 0.07), they do illuminate some of the general trends at play. And these trends play a role in location choice, as described in the following section.

Multinomial Logit Model of Home Type Choice

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[7] A model for the importance of freeway access also is not discussed here, since this model offered almost no predictive power (adjusted LRI=0.011).

[8] When included in the initial specifications, households of higher income were estimated to place less importance on the access to bus services.

Homebuyers have many home type options before them, including detached or attached homes, age of dwelling, interior square footage, and lot/parcel size. A multinomial logit model was calibrated to investigate the relationship between household characteristics and selected home type. Alternatives were categorized by detached versus attached housing; older (>20 years) versus younger (≤ 20 years); large interior (> 2500 square feet) versus medium interior size (≤2500 and >1500 square feet) and small interior (≤ 1500 square feet); and large lot (>0.5 acres) versus more moderate lot sizes (≤ 0.5 acres). The base alternative for the model is any type of detached home, since there were so few detached homes in the sample data set. Model specifications were calibrated using stepwise elimination of statistically insignificant variables (p-values greater than 0.1) from an initial specification which included 5 alternative-specific constants and various demographic characteristics (household size, income, number of children, ethnicity, vehicle ownership, respondent age, and number of workers in household) interacted with the constants. Table 7 gives the final model specification.

Results suggest that household income is an important predictor, for all alternatives, both in a statistical and practical sense. Interestingly, respondent ethnicity and household vehicle ownership were not statistically significant for any of the alternatives. Sample probabilities calculated for various household compositions reveal intuitive home type choices. For example, a single-person household (with an age of 22 years and an income of $40,000) is most likely ($\hat{p} = 29\%$) to choose a detached, older, smaller home on a moderately-sized lot. In contrast, an $200,000-income, 8-person household (six children, two workers) has less than a 1% chance of choosing that same home type and is most likely ($\hat{p} = 76\%$) to choose a large, detachedhome on a large lot (with a 41% chance that it is a new home. Results of this model are helpful in obtaining a sense of which households choose which home types. But, of course, it is also very helpful to investigate differences in location choices, as these directly affect travel demands.

Multinomial Logit Model of Location Choice

A location choice model was calibrated for recent movers, using Travis County's 544 TSZs. The movers' choice set consisted of ten alternatives: nine randomly drawn from the set of TZSs, plus the chosen option. Zone "size" was quantified via a natural-log-of-number-of-housing-units control variable (in order to help ensure proportionality between choice probabilities and home availability, everything else constant). First, a pooled model was calibrated, recognizing all sampled households at once. Then the households were segmented, based on a number of demographic attributes, resulting in a series of models for purposes of parameter comparisons. Table 8 presents the pooled model results.

The pooled results suggest that central locations (closer to the CBD) are preferred, everything else constant – including the logsum measures of regional accessibility. This indicates that centrality offers something more than travel preferences alone reveal.[9] However, it also counteracts, to some extent, the negative coefficient on the home-based-work-trip logsum term. That term implies a proximity to jobs may not be so desirable for many households, particularly those with few workers and/or making relatively few trips each day. While access is no doubt

[9] Though simple in nature, distance to CBD measures almost always prove helpful to prediction, even in the face of other, more comprehensive variables. See, e.g., hedonic models by Kockelman (1997) and models of land use change by Zhou and Kockelman (2005).

valued by many households, so is a quiet residential neighborhood. The need for balance between these competing objectives is a challenge, for planners, policymakers, developers and others who want to meet households' preferences – while mitigating congestion, emissions, car dependence, and other, associated impacts of longer-distance trip-making.

Median home values, divided by respondent household incomes, were used to describe neighborhood affordability. As expected, more expensive locations are less likely. However, while controlling for home affordability, zones with greater households incomes are more likely, which may be a proxy for other attributes such as attractive neighborhood appearance, as discussed earlier. Also as expected, neighborhoods offering larger homes (a higher median number of rooms per home) are preferred. Finally, the coefficient on the natural logarithm of housing units in a zone is near one, as anticipated on theoretical grounds (as mentioned earlier).

Elasticities indicate that neighborhood home sizes and regional accessibility are highly practically significant. For example, a 1% increase in the median number of rooms in a zone results in a 1.8% increase in the location choice probability

Data segmentation permits a closer look at behavioral tendencies across demographic groups. Due to space limitations, tables of the numeric results are not provided here, but key results are described. Variations in parameter values across segmented models suggest that higher income households (i.e., those with annual incomes over $100,000) are more sensitive to centrality (preferring zones closer to the Austin CBD), median neighborhood household income (preferring higher income areas), and to home size (preferring larger homes) – everything else constant. CBD access and home affordability are estimated to be more important for households with children than those without.

Conclusions and Extensions

The survey of almost 1000 recent movers in the Austin region enhances our understanding of the relationship between home choices and transportation. Top reasons for these moves are a desire to own one's home, wanting a newer/bigger/better home, facing a new job or job transfer, and seeking an easier commute. Once the decision to move has been made, price, neighborhood appearance, and investment potential are top priorities.

Respondents also indicated the level of importance they place on a variety of home attributes. Ordered probit models of accessibility ratings and binomial logit models of stated preferences across pairs of housing alternatives revealed that a variety of demographic characteristics, including recent reasons for moving, factor prominently. For example, women, non-Caucasians, and those who move to be closer to work or to have an easier commute place a higher value on accessibility (of various types).Younger persons, full-time students, and higher income households tend to place greater importance on commute time, while married persons, older persons, and those with fewer vehicles and/or higher incomes rated shopping access relatively high. Bus access was a greater concern for full-time students, younger persons, and households with fewer vehicles.

Home price is a key consideration for buyers, and this was found to rise with proximity to the CBD (by $8,000 per mile) and shorter average commute times ($4,700 per minute saved in travel time), everything else constant. As expected, high-quality public schools and larger homes were more highly valued. Interestingly, when examined separately, neighborhood and location

attributes performed better in predicting price than did structural elements of a home, underscoring the importance of location.
A multinomial logit model of home type choice (e.g., detached versus attached, large lot versus small lot) revealed that increases in household size, number of children, and income increase the likelihood that a household will choose a larger home and lot size. As an example, a married couple with six children and an annual income of $200,000 has an estimated 76% chance of choosing a large, detached single-family home on a large lot; whereas, a single-person household with an income of $40,000 is predicted to almost never choose that home type (less than 1% of the time).

Logit models of location choice were calibrated for recent movers. Results of the pooled model suggest that households prefer proximity to the CBD, as well as high-income neighborhoods with higher population and employment densities, while controlling for neighborhood affordability (i.e., average home price). Segmentation based on a number of demographic attributes permitted parameter comparisons. Results suggest that as income increases, households are more sensitive to centrality (preferring zones closer to the Austin CBD), to median neighborhood household income (preferring higher income areas), and to home size (preferring larger homes) – everything else constant. Interestingly, CBD access and home affordability are estimated to be more important for households with children than those without.

While the home choice decision is very complex, this new data set and its many associated behavioral models offer many insights. The reasons for a move and priorities in home selection, the hedonic models of home value, the paired comparisons of potential home enhancements, the importance scores of various attributes, the logit models of home type and location choice allow researchers, planners, and developers to more accurately characterize the tradeoffs households make in their home/location choices. When coupled with models of life cycle changes, land development and population growth, as well as travel demand, vehicle ownership and other behaviors, such models facilitate a more integrated look at our communities and their futures.

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Table 1. Sample characteristics of recent mover data set

	Variable	Mean	Minimum	Maximum	Std. Dev.
Household characteristics	Household size	2.27	1	4	1.00
	Number of children in household	0.51	0	4	0.88
	Presence of children (at least one child in household)	0.31	0	1	0.46
	Number of licensed drivers	1.83	0	4	0.63
	Married	0.55	0	1	0.50
	Married & have at least one child	0.25	0	1	0.43
	Age (head of household)	39.58	19	87	12.12
	Male (head of household)	0.56	0	1	0.50
	Number of vehicles available in household	1.95	0	8	0.81
	Number of vehicles per licensed driver	1.08	0	4	0.37
	Number of vehicles per household member	0.94	0	4	0.39
	No vehicles in household	7.95E-03	0	1	0.09
	Household income ($/year)	$93,256	$11,080	$200,000	$51,646
	Caucasian	0.84	0	1	0.36
	Non-Caucasian	0.16	0	1	0.36
	Total number of workers in household	1.43	0	2	0.63
	Full-time student	3.51E-02	0	1	0.18
	Retired	4.79E-02	0	1	0.21
Housing characteristics	Single-family home	0.90	0	1	0.30
	Townhouse	2.01E-02	0	1	0.14
	Duplex	1.06E-02	0	1	0.10
	Condominium	5.94E-02	0	1	0.24
	Other home type	6.36E-03	0	1	0.08
	Number of bedrooms	3.12	1	4	0.73
	Number of bathrooms	2.14	1	3	0.57
	Number of living area	1.80	0	4	0.77
	Age of dwelling (2005 base)	25.18	1	147	19.83
	Home value (dollars)	$220,675	$50,000	$500,000	$118,526
	Interior square footage	2,082.68	1,000	5,000	917.51
	Lot size (acres)	0.39	0	1	0.20
Location characteristics	Rural	0.12	0	1	0.33
	Suburban	0.53	0	1	0.50
	Urban	0.33	0	1	0.47
	CBD	1.55E-02	0	1	0.12
	Distance to CBD	7.75	0	20	4.14
	Major roads per sq mile	4.29	0	400	19.87
	Number of bus stops per sq mile	58.64	0	5,725	302.52
	Mean travel time to work for workers in the area	24.40	15	39	4.78
	Median household income (dollars)	$51,037	$0	$169,590	$28,825
	Median home value (dollars)	$176,182	$48,100	$733,100	$107,556
	Housing unit median rooms	5.63	3	8	1.31
	Population density (persons per square mile)	3286	0	22478	2775
	Employment density (jobs per square mile)	1896	0	143175	9065
	Logsum for home-based work trips	5440	4363	10336	878

Table 2. Primary reason(s) for moving

Primary reason for moving (survey results)	Frequency	Percent
Wanted to own home	481	51.17%
Newer/bigger/better home	226	24.04%
Other reason	208	22.13%
New job/job transfer	201	21.38%
Easier commute	177	18.83%
Marriage or divorce	96	10.21%
Higher quality schools	85	9.04%
Less expensive housing	48	5.11%
Birth/adoption in household	43	4.57%
Change of climate	40	4.26%
Attending or graduating from college	30	3.19%
Retiring	27	2.87%
Member of household moving out of home/need smaller home	12	1.28%
Health reasons	10	1.06%

Table 3. Mean rank of importance of housing and location attributes
(Ranks range from 1 to 4, with 1 = not at all important and 4 = very important)

Housing/location attributes	Mean score[10]	% Indicating "Very Important" or "Important"
Price	3.72	99.3%
Attractive neighborhood appearance	3.59	96.6%
Investment potential or resale	3.40	89.4%
Perception of crime rate in the neighborhood	3.36	89.8%
Number of bedrooms	3.29	89.9%
Commute time to work (or school for full-time students)	3.12	79.1%
Noise levels	3.08	80.5%
Lot size / yard size	2.86	69.3%
Access to major freeway(s)	2.70	64.8%
Social composition of the neighborhood	2.69	60.8%
Distance/travel time to shopping	2.53	52.5%
Quality of local public schools	2.52	50.5%
Views	2.49	45.4%
Neighborhood amenities / recreational facilities	2.45	49.5%
Closeness to friends or relatives	2.25	39.7%
Distance to medical services	2.11	31.4%
Distance to local public schools	2.04	34.0%
Access to bus services	1.57	14.3%
Physical disability accommodations	1.47	9.8%

[10] Attributes rated on a scale of 1-4, where 1 is "not at all important" and 4 is "very important".

Table 4. Final specification for linear regression of home value

	OLS regression of home value (final specification)			
	Explanatory Variables	β	Std. β	Elasticities
	Constant	-127,037*		
Housing-specific characteristics	Attached housing	-32,066*	-0.06	
	Number of bedrooms	41,834	0.24	-0.024
	(Number of bedrooms)^2	-6,979	-0.24	1.103
	Number of bathrooms	-46,359	-0.23	-0.606
	(Number of bathrooms)^2	19,691*	0.40	-0.838
	Number of living areas (including studies)	10,846*	0.07	0.816
	Age of dwelling (2005 base)	-1,402*	-0.24	0.165
	(Age^2)	20.71*	0.29	-0.298
	Interior square footage	39.86*	0.31	0.179
	Lot size (acres)	52,762*	0.09	0.701
Location-specific characteristics	Rural	12,584	0.03	0.171
	Distance to CBD	-8,001*	-0.26	0.013
	Number of bus stops per square mile	44.29*	0.08	-0.524
	Mean travel time to work for workers in the area	-4,666*	-0.18	0.022
	Median home value	0.33*	0.30	-0.961
	Logsum for home-based work trips	-26.85*	-0.20	0.483
	Mean SAT score for local high school	149.79*	0.13	1.233
	Number of observations	729		
	Adjusted R^2	0.823		

Note: All coefficients are statistically significant (p-value < 0.10). Those with an asterisk (*) are highly statistically significant (p-values < 0.01).

Table 5. Final specifications for scenario questions

Explanatory Variables		Freeway access and ½ commute time vs. larger kitchen and living room	Larger kitchen and living room vs. toll road access and ½ commute time	Toll road access vs. bus access	Bus access vs. larger lot size	Larger lot size vs. shopping access	Shopping access vs. freeway access and ½ commute time
		β	β	β	β	β	β
	Constant	0.502	0.192*	0.532*	0.444 *	-0.6336	-0.4846
Home features	Number of bedrooms	----	----	----	-0.472	----	----
	Number of bathrooms	----	----	----	0.393	----	----
	Home value ($10,000)	----	----	----	-0.0418	-0.0146	----
	Age of dwelling (years)		0.0125	-0.0166	----	----	----
	Down payment (%)	0.024	-0.0192		0.0227	----	----
	Interior size (100 sq. ft.)	0.0233**	-0.0244	0.0331	----	----	----
	Lot size (acres)	----	----	----	----	1.434	----
Neighborhood features	All or most friends/family live nearby	-1.116	----	----	----		----
	Commute time to grocery store	----	----	----	----	0.046	----
	Rural	----	----	----	0.496		----
	Suburban	0.320		----		0.327	-0.476
	Distance to CBD	-0.0799	0.0773	----	-0.107	0.072	0.0470
	Median income of neighborhood ($10,000)	-0.0640	0.0611**	----	----	----	----
Household/ respondent characteristics	Number of children in household	----	----	----	----	0.272	----
	Married	----	----	----	0.411	----	----
	Age	----	----	-0.0132	0.0259	-0.0378	----
	Male		0.386	----	----	0.247	0.278
	Number of licensed drivers	----	----	-0.506	----	----	----
	Number of vehicles available		0.204**	----	-0.285	0.251	----
	Number of vehicles per licensed driver	----	----	----	----	----	-0.426
	Bus use (times per month)		0.060	-0.055	0.0895	----	----
	No workers in household	----	----	----	----	----	1.561
	HH Income ($10,000)		-0.0366	0.0688	----	----	----
	Non-white	-0.525	0.6545	-0.443	----	----	0.482
Number of observations		721	667	768	699	711	819
Cox & Snell R^2		0.050	0.059	0.113	0.122	0.118	0.057
Nagelkerke R^2		0.066	0.086	0.239	0.171	0.157	0.077
Market shares (home 1 vs. home 2)		47% vs. 53%	72% vs. 28%	48% vs. 52%	32% vs. 68%	48% vs. 52%	38% vs. 62%

Notes: All parameter estimates are statistically significant (p-values< 0.10), except for those with asterisks. A single asterisk (*) is used for constant terms with rather high p-values (of 0.674, 0.202, and 0.362 for scenarios 2, 3, and 4, respectively). Double asterisks (**) are shown for estimates with p-values lying between 0.10 and 0.15.

Table 6. Ordered probit results for importance of commute time, distance/travel time to shopping, and access to bus services

Explanatory Variables		Commute Time to Work	Distance/Travel Time to Shopping	Access to Bus Services
		Final Estimates β	Final Estimates β	Final Estimates β
	Constant	1.632**	1.615**	-0.496
Reasons for Moving	Marriage or divorce	0.333	----	----
	New job/job transfer	0.424**	0.227	----
	Easier commute	0.956**	0.473**	----
	Member(s) of household moving out of the home/needed smaller home	----	----	----
	Wanted to own home	----	----	0.222
	Newer/bigger/better home	----	0.297**	
	Attending or graduating from college	----	----	0.617
	Change of climate	-0.530	----	----
	Health reasons	----	----	1.254**
Employment Status	Two full-time workers or one full-time, one part-time worker	0.318*	----	----
	Two workers	----	-0.486	----
	One full-time worker	----	-0.508	----
	One part-time worker	----	-0.823**	----
	Total number of workers in household	----	----	0.178
	Full-time student	1.045**	----	1.114**
	Retired		----	0.715
Household Characteristics	Presence of children (at least one child)	-0.490**	----	----
	Number of licensed drivers	----	-0.152	0.156*
	Married	----	0.366**	----
	Married & have at least one child	0.523	----	----
	Age (head of household)		0.008	----
	Male (head of household)	-0.301**	-0.331**	-0.157*
	Number of vehicles available in household	----	----	-0.273**
	Number of vehicles per licensed driver	----	-0.212	----
	No vehicles in household	----	----	1.481**
	Household income ($10,000/year)	----	0.0172	----
	Non-Caucasian	0.207	----	0.343
Thresholds	μ (0)	0	0	0
	μ (1)	1.135	1.297	0.858
	μ (2)	2.497	2.675	1.665
	Number of observations	743	806	673
	Loglikelihood at convergence	-771.196	-927.375	-629.252
	Loglikelihood at constants only	-833.246	-973.439	-682.506
	Adjusted LRI	0.062	0.035	0.062

Notes: All parameter estimates are statistically significant (p-values< 0.10), except for those with single asterisks. A single asterisk (*) is used for estimates with p-lvaues between 0.10 and 0.17. Double asterisks (**) are shown for very statistically signficant estimates, with p-values less than 0.05.

Table 7. Home type choice model results (using MNL)

Explanatory Variables	B	Elasticities
Detached (constant)	-24.920**	
Old (constant)	6.456**	
Large interior (constant)	-3.339**	
Medium interior (constant)	-0.974**	
Large lot (constant)	12.353	
Household size (specific to large lot)	0.278	0.470
Household income $10,000 (specific to detached)	-0.396**	-3.388
Household income $10,000 (specific to large interior)	0.363**	3.122
Household income $10,000 (specific to medium interior)	0.183**	1.553
Household income $10,000 (specific to large lot)	0.253**	2.284
Natural logarithm of household income (specific to detached)	2.597**	26.532
Natural logarithm of household income (specific to old)	-0.606**	-6.146
Natural logarithm of household income (specific to large lot)	-1.511	-16.463
Number of children (specific to large interior)	0.756**	0.060
Married with children indicator (specific to old)	0.0137	
Age (specific to large interior)	0.0085	0.232
Number of workers (specific to old)	0.380**	0.493
Number of workers (specific to large interior)	-0.624**	-0.847
Number of observations	786	
Loglikelihood at convergence	-1540.103	
Loglikelihood: constants only	-1720.962	
Adjusted LRI	0.098	

Note: All variables are statistically significant (p-values < 0.10). Those shown with a double asterisk (**) are highly statistically signifcaint (p-values < 0.01).

Table 8 Pooled residential location choice model results (using MNL)

Explanatory Variables	Pooled Model	
	β	Elasticities
Suburban location	0.476	0.192
Urban location	0.351*	0.096
Distance to CBD (miles)	-0.071	-0.431
Median household income ($10,000 dollars)	0.110	0.579
Ratio of median home value in TSZ to surveyed household income	-0.311	-0.581
Median number of rooms in TSZ per dwelling unit	0.403	1.806
Population density (1,000 persons per square mile)	0.114	0.297
Employment density (1,000 jobs per square mile)	0.0186	0.030
Logsum for home-based work trips	-0.00027	1.189
Natural logarithm of the number of housing units in TSZ	0.814	4.333
Number of observations	811	
Loglikelihood at convergence	-1541.511	
Pseudo adjusted R^2	0.173	

Note: All parameter estimates are highly statistically significant (p-value < 0.01), except for the coefficient on Urban location (shown with an asterisk), which has a p-value of 0.038.