Draft Bay Area UrbanSim Location Choice Model Specifications

Michael Reilly
Principal Researcher
Association of Bay Area Governments

Introduction

UrbanSim is a land use modeling system developed to understand the likely impacts of land and transportation policy on future metropolitan development patterns. It uses a microsimulation approach grounded in urban microeconomics meaning that the individual choices of three types of "agents" are predicted repeatedly and summarized to produce predictions of the overall future pattern. The construction of new buildings (i.e. supply) is modeled as the behavior of real estate developers initiating new projects in places that are profitable. Profitability is in part driven by households choosing new homes and businesses choosing new commercial buildings. This technical memorandum describes the initial specification of statistical models capturing these household and business location choices within the San Francisco Bay Area.[1]

This memorandum briefly introduces the UrbanSim package, provides additional detail on the configurations of the location choice models, and then describes the initial calibration of the household and business location choice models.

Bay Area UrbanSim Land Use Model Application

UrbanSim is a modeling system developed to support the need for analyzing the potential effects of land use policies and infrastructure investments on the development and character of cities and regions. UrbanSim has been applied in a variety of metropolitan areas in the United States and abroad, including Detroit, Eugene-Springfield, Honolulu, Houston, Paris, Phoenix, Salt Lake City, Seattle, and Zürich.

UrbanSim has been developed to support land use, transportation and environmental planning, with particular attention to the regional transportation planning process. The kinds of tasks for which UrbanSim has been designed include the following:

- Predicting land use information1 for input to the travel model, for periods of 10 to 40 years into the future, as needed for regional transportation planning.
- Predicting the effects on land use patterns from alternative investments in roads and transit infrastructure, or in alternative transit levels of service, or roadway or transit pricing, over long-term forecasting horizons. Scenarios can be compared using different transportation network assumptions, to evaluate the relative effects on development from a single project or a more wide-reaching change in the transportation system, such as extensive congestion pricing.

[1] Additional information about UrbanSim including its other sub-models can be found at urbansim.org

- Predicting the effects of changes in land use regulations on land use, including the effects of policies to relax or increase regulatory constraints on development of different types, such as an increase in the allowed Floor Area Ratios (FAR) on specific sites, or allowing mixed-use development in an area previously zoned only for one use.
- Predicting land use development patterns in high-capacity transit corridors.
- Predicting the effects of environmental policies that impose constraints on development, such as protection of wetlands, floodplains, riparian buffers, steep slopes, or seismically unstable areas.
- Predicting the effects of changes in the macroeconomic structure or growth rates on land use. Periods of more rapid or slower growth, or even decline in some sectors, can lead to changes in the spatial structure of the city, and the model system is designed to analyze these kinds of shifts.
- Predicting the possible effects of changes in demographic structure and composition of the city on land use, and on the spatial patterns of clustering of residents of different social characteristics, such as age, household size and income.
- Examining the potential impacts on land use and transportation of major development projects, whether actual or hypothetical. This could be used to explore the impacts of a corporate relocation, or to compare alternative sites for a major development project.

The application of UrbanSim for the Bay Area was developed by the Urban Analytics Lab at UC Berkeley under contract to MTC.[2] The area included in the Bay Area model application includes all incorporated and unincorporated areas of the nine-county Bay Area.[3] This geographic area defined the scope of the data collection efforts necessary to define the modeling assumptions. The year 2010 was selected as the base year for the parcel-based model system.

Model Structure

Within UrbanSim there are several sub-models simulating the real-world choices and actions of households and businesses within the region. Households have particular characteristics such as income and number of children that may influence preferences for housing of different types at different locations. Businesses also have preferences that vary by industry and business size for building types and locations. Developers construct new buildings or redevelop existing ones in response to demand and planning constraints, such as zoning. Buildings are located on land parcels that have particular characteristics such as value, land use, topography, and other environmental qualities. Governments set policies that regulate the use of land, through the imposition of land use plans, urban growth boundaries, environmental regulations, or through pricing policies such as development impact fees. Governments also build infrastructure, including transportation infrastructure, which interacts with the spatial distribution of households and businesses to generate patterns of accessibility at different locations that in turn influence the attractiveness of these sites for different consumers.

The Bay Area UrbanSim model system simulates these choices through the sub-models described below and shown in Figures 1, 2, and 3. Figures 1, 2 and 3 also show how the Travel Model and Bay Area

[2] More information on UrbanSim is available at http://urbansim.org
[3] Technical information on Bay Area UrbanSim can be found at http://analytics.mtc.ca.gov/foswiki/Main/LandUseModel

UrbanSim interact. Several of the system models include algorithms that aim to match the total number of units (e.g. jobs, households) prepared by ABAG. These control totals are checked at the end of each model year run. In each of Bay Area UrbanSim's annual predictions, the model system steps through the following components:

1. The *Business Transition Model* (referred to as the *Employment Transition Model* in Figure 1) predicts new businesses being created within or moved to the region, and the loss of businesses in the region – either through closure or relocation out of the region. The role of this model is to keep the number of jobs in the simulation synchronized with aggregate expectations of employment in the region forecasted by ABAG.
2. The *Household Transition Model* predicts new households migrating into the region, the loss of households emigrating from the region, or new household formation within the region. The Household Transition Model accounts for changes in the distribution of households by type over time, using an algorithm analogous to that used in the Business Transition Model. In this manner, the Household Transition Model keeps Bay Area UrbanSim household counts synchronized with the aggregate household projection forecasted by ABAG.
3. The *Real Estate Development Model* simulates the location, type, and density of real estate development, conversion, and redevelopment events at the level of specific land parcels. This sub-model simulates the behavior of real estate developers responding to excess demand within land use policy constraints. The algorithm examines a subset of parcels each forecast year and builds pro formas comparing development costs and income. New structures are built in profitable locations.
4. The *Scheduled Development Events Model* provides an alternative means for the introduction of new buildings into the region. This component is simply a list of predetermined structures to be built in particular future years. These represent large, committed, public-private partnership projects.

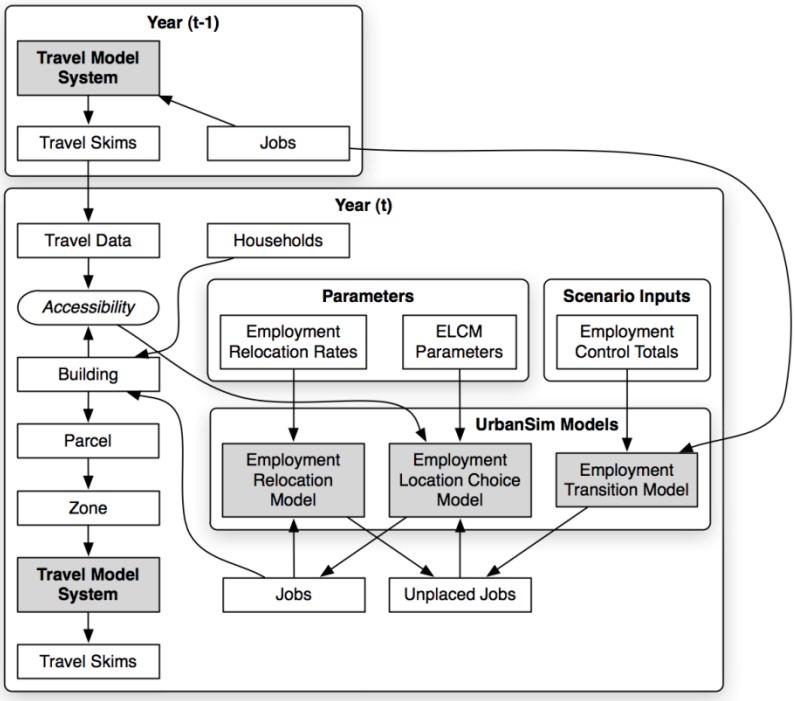

FIGURE 1: URBANSIM MODEL FLOW: EMPLOYMENT FOCUS

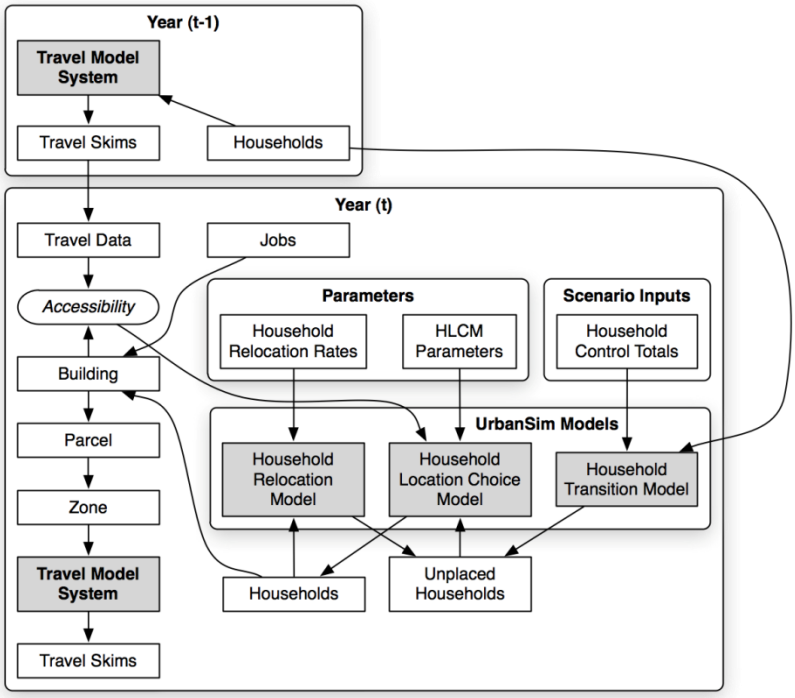

FIGURE 2: URBANSIM MODEL FLOW: HOUSEHOLD FOCUS

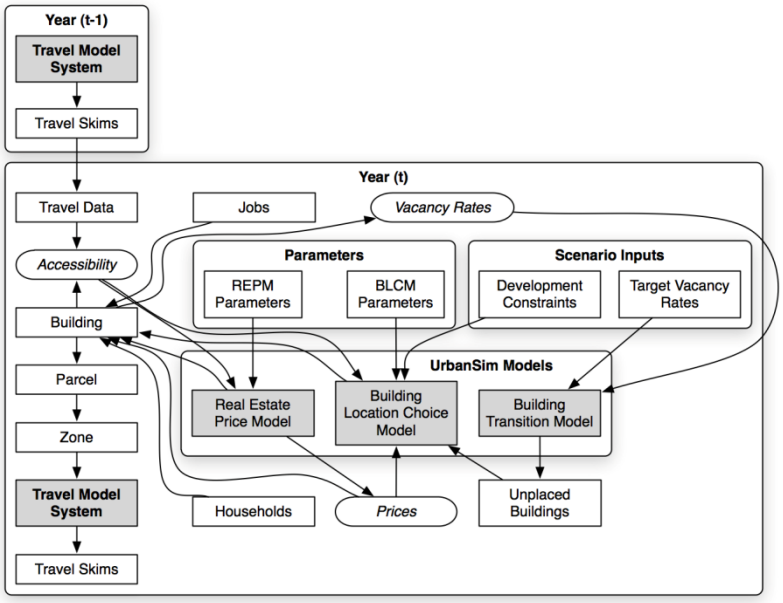

FIGURE 3: URBANSIM MODEL FLOW: REAL ESTATE FOCUS

5. The *Business Relocation Model* (referred to as the *Employment Relocation Model* in Figure 1) predicts the relocation of business establishments (i.e. specific branches of a firm) within the region each simulation year. The Business Relocation Model predicts the probability that jobs of each type will move from their current location to a different location within the region or stay in place during a particular year.

6. The *Household Relocation Model* predicts the relocation of households within the region each simulation year. For households, mobility probabilities are based on the synthetic population from the MTC Travel Model. Drawn from Census data, these rates reflects the tendency for younger and lower income households to move more often.

7. The *Government Growth Model* uses a set of rules to project the employment in non-market sectors such as government and schools based on historical employment in those sectors and projected local, sub-regional, and regional population growth.

8. The *Business Location Choice Model* (referred to as the *Employment Location Choice Model* in Figure 1) predicts the location choices of new or relocating establishments. In this model, we predict the probability that an establishment that is either new (from the Business Transition Model), or has moved within the region (from the Business Relocation Model), will be located in a particular employment submarket. Each job has an attribute of the amount of space it needs, and this provides a simple accounting framework for space utilization within submarkets. The number of locations available for an establishment to locate within a submarket will depend mainly on the total vacant square footage of nonresidential floorspace in buildings within the submarket, and on the density of the use of space (square feet per employee). This sub-model simulates the behavior of businesses moving to suitable locations within the region.

9. The *Household Location Choice Model* predicts the location choices of new or relocating households. In this model, as in the business location choice model, we predict the probability that a household that is either moving into the region (from the Household Transition Model), or has decided to move within the region (from the Household Relocation Model), will choose a particular location defined by a residential subarket. This sub-model simulates the household behavior in selecting a neighborhood based on their sociodemographic preferences.

10. The *Real Estate Price Model* predicts the price per unit of each building. For residential units, the sale price is estimated for owner units, and the rent is estimated for rental units. UrbanSim uses real estate prices as the indicator of the match between demand and supply of land at different locations and with different land use types, and of the relative market valuations for attributes of housing, nonresidential space, and location. This role is important to the rationing of land and buildings to consumers based on preferences and ability to pay, as a reflection of the operation of actual real estate markets. Since prices enter the location choice utility functions for jobs and households, an adjustment in prices will alter location preferences. All else being equal, this will in turn cause higher price alternatives to become more likely to be chosen by occupants who have lower price elasticity of demand. Similarly, any adjustment in land prices alters the preferences of developers to build new construction by type of space, and the density

Business Location Choice Model

Objective

The Business Location Choice Model predicts the location choices of new or relocating establishments.

In this model, we predict the probability that an establishment that is either new (from the Business Transition Model), or has moved within the region (from the Business Relocation Model), will be located in a particular employment submarket. Submarkets are used as the basic geographic unit of analysis in the current model implementation. Each business has an attribute of space it needs based on the employment within the establishment, and this provides a simple accounting framework for space utilization within submarkets. The number of locations available for an establishment to locate within a submarket will depend mainly on the total square footage of nonresidential floorspace in buildings within the submarket, and on the density of the use of space (square feet per employee).

The model is specified as a multinomial logit model, with separate equations estimated for each employment sector. For both the business location and household location models, we take the stock of available space as fixed in the short run of the intra-year period of the simulation, and assume that locators are price takers. That is, a single locating establishment or household does not have enough market power to influence the transaction price, and must accept the current market price as given. However, the price is iteratively adjusted to account for market equilibrating tendencies as the aggregated demand across all agents increases in some submarkets and decreases in others. This topic is described in a later section on market price equilibration.

The variables included in the business location choice model are drawn from the literature in urban economics. We expect that accessibility to population, particularly high-income population, increases bids for retail and service businesses. We also expect that two forms of agglomeration economies influence location choices: localization economies and inter-industry linkages.

Localization economies represent positive externalities associated with locations that have other firms in the same industry nearby. The basis for the attraction may be some combination of a shared skilled labor pool, comparison shopping in the case of retail, co-location at a site with highly desirable characteristics, or other factors that cause the costs of production to decline as greater concentration of businesses in the industry occurs. The classic example of localization economies is Silicon Valley. Inter-industry linkages refer to agglomeration economies associated with location at a site that has greater access to businesses in strategically related, but different, industries. Examples include manufacturers locating near concentrations of suppliers in different industries, or distribution companies locating where they can readily service retail outlets.

One complication in measuring localization economies and inter-industry linkages is determining the relevant distance for agglomeration economies to influence location choices. At one level, agglomeration economies are likely to affect business location choices between

states, or between metropolitan areas within a state. Within a single metropolitan area, we are concerned more with agglomeration economies at a scale relevant to the formation of employment centers. The influence of proximity to related employment may be measured using two scales: a regional scale effect using zone-to-zone accessibilities from the travel model, or highly localized accessibilities using queries of the area immediately around the given parcel. Most of the spatial queries used in the model are of the latter type, because the regional accessibility variables tend to be very highly correlated, and because agglomerations are expected to be very localized.

Table 1: Employment Sectors

Sector ID	Sector Description
1	Professional services
2	Finance, insurance, and real estate
3	Business services
4	Agriculture
5	Natural resources
6	Arts and recreation
7	Government
8	Other education
9	Logistics
10	Eating and drinking
11	Regional retail
12	Social services
13	Leasing
14	Heavy manufacturing
15	Health
16	Local retail
17	Transportation
18	Higher education
19	Utilities
20	Construction
21	Biotechnology
22	Light manufacturing
23	Information
24	Hotel
25	Tech manufacturing
26	Personal services
27	K-12 Education
28	Unclassified

Age of buildings is included in the model to estimate the influence of age depreciation of commercial buildings, with the expectation that businesses prefer newer buildings and discount their bids for older ones. This reflects the deterioration of older buildings, changing architecture, and preferences, as is the case in residential housing. There is the possibility that significant renovation will make the actual year built less relevant, and we would expect that this would dampen the coefficient for age depreciation. We do not at this point attempt to model maintenance and renovation investments and the quality of buildings.

Density, the inverse of lot size, is included in the location choice model. We expect businesses, like households, to reveal different preferences for land based on their production functions and

the role of amenities such as green space and parking area. As manufacturing production continues to shift to more horizontal, land-intensive technology, we expect the discounting for density to be relatively high. Retail, with its concentration in shopping strips and malls, still requires substantial surface land for parking, and is likely to discount bids less for density. We expect service firms to discount for density the least, since in the traditional urban economics models of bid-rent, service firms generally outbid other firms for sites with higher accessibility, land cost, and density.

We might expect that certain sectors, particularly retail, show some preference for locations near a major highway, and are willing to bid higher for those locations. Distance to a highway is measured in meters, using grid spatial queries. We also test for the residual influence of the classic monocentric model, measured by travel time to the CBD, after controlling for population access and agglomeration economies. We expect that, for most regions, the CBD accessibility influence will be insignificant or the reverse of that in the traditional monocentric model, after accounting for these other effects.

Estimation of the parameters of the model is based on a geocoded establishment file (matched to the parcel file to link employment by type to land use by type). A sample of geocoded establishments in each sector is used to estimate the coefficients of the location choice model. As with the Household Location Choice Model, the application of the model produces demand by each employment type for building locations.

The independent variables used in the business location choice model can be grouped into the categories of real estate characteristics, regional accessibility, and urban-design scale effects as shown below:

- Real Estate Characteristics Prices Development type (land use mix, density)
- Regional accessibility Access to population
- Travel time to CBD, airport
- Urban design-scale Proximity to highway, arterials
- Local agglomeration economies within and between sectors: center formation

Algorithm

Jobs to be located by this model are those that were added by the EmploymentTransitionModel or predicted to move by the EmploymentRelocationModel. The model selects all those jobs with no location, and identifies all available, vacant nonresidential space within the simulation year. Since the choice sets are generally too large, normally random sampling of alternatives is used to construct plausible sized choice sets. It then uses a Multinomial Logit Model structure to generate location choice probabilities across the choice set for each locating job. The location probabilities are used with Monte Carlo Sampling to make a determination for each job regarding which of the available locations they will choose. Once a job has chosen a location, that location is committed to the job (like a lease or purchase contract) and the space becomes unavailable for any other locating jobs, until such time as the occupying job is predicted to move.

In the current application, the Business Location Choice Model is run iteratively with a price adjustment component, to reflect a short-term price equilibration process.

Household Location Choice Model

Objective

The Household Location Choice Model (HLCM) predicts the location choices of new or relocating renter and owner households.

In this model, as in the employment location model, we predict the probability that a household that is either new (from the transition component), or has decided to move within the region (from the household relocation model) and has determined whether to rent or own a unit (from the household tenure choice model), will choose a particular location defined by a residential submarket. As before, the form of the model is specified as multinomial logit, with random sampling of alternatives from the universe of submarkets with vacant housing.

For both the household location and business location models, we take the stock of available space as fixed in the short run of the intra-year period of the simulation, and assume that locators are price takers. That is, a single locating household does not have enough market power to influence the transaction price (or rent), and must accept the current

The model architecture allows location choice models to be estimated for households stratified by income level, the presence or absence of children, and other life cycle characteristics. Alternatively, these effects can be included in a single model estimation through interactions of the household characteristics with the characteristics of the alternative locations. The current implementation is based on the latter but is general enough to accommodate stratified estimation, for example by household income.

For the Bay Area application of the model, households are stratified by 4 income categories cross-classified with household size of 1, 2, 3 or more. Income and household size provide a strong basis for differentiating among consumers with substantially different preferences and trade-offs in location choices.

We further differentiate households by their tenure choice, given the importance of this distinction for understanding the impacts of housing prices and rents on location choices. Predictions of tenure for each household are made by the Household Tenure Choice Model, discussed in Section 2.5.

The variables used in the model are drawn from the literature in urban economics, urban geography, and urban sociology. An initial feature of the model specification is the incorporation of the classical urban economic trade-off between transportation and land cost. This has been generalized to account not only for travel time to the classical monocentric center, the CBD, but also to more generalized access to employment opportunities and to shopping. These accessibilities to work and shopping are measured by weighting the opportunities at each destination zone with a composite utility of travel across all modes to the destination, based on the logsum from the mode choice travel model.

These measures of accessibility should negate the traditional pull of the CBD, and, for some population segments, potentially reverse it. In addition to these accessibility variables, we include in the model a net building density, to measure the input-substitution effect of land and capital. To the extent that land near high accessibility locations is bid up in price, we should expect that builders will substitute capital for land and build at higher densities. Consumers for whom land is a more important amenity will choose larger lot housing with less accessibility, and the converse should hold for households that value accessibility more than land, such as higher income childless households.

The age of housing is considered for two reasons. First, we should expect that housing depreciates with age, since the expected life of a building is finite, and a consistent stream of maintenance investments are required to slow the deterioration of the structure once it is built. Second, due to changing architectural styles, amenities, and tastes, we should expect that the wealthiest households prefer newer housing, all else being equal. The exception to this pattern is likely to be older, architecturally interesting, high quality housing in historically wealthy neighborhoods. The preference for these alternatives are accommodated through a combination of nonlinear or dummy variable treatment for this type of housing and neighborhood.

A related hypothesis from urban economics is that, since housing is considered a normal good, it has a positive income elasticity of demand. This implies that as incomes rise, households will spend a portion of the gains in income to purchase housing that is more expensive, and that provides more amenities (structural and neighborhood) than their prior dwelling. A similar hypothesis is articulated in urban sociology in which upward social mobility is associated with spatial proximity to higher status households. Both of these hypotheses predict that households of any given income level prefer, all else being equal, to locate in neighborhoods that have higher average incomes. (UrbanSim does not attempt to operationalize the concepts of social status or social assimilation, but does consider income in the location choice.)

The age hypothesis and the two income-related hypotheses are consistent with the housing filtering model, which explains the dynamic of new housing construction for wealthy households that sets in motion a chain of vacancies. The vacancy chain causes households to move into higher status neighborhoods than the ones they leave, and housing units to be successively occupied by lower and lower status occupants. At the end of the vacancy chain, in the least desirable housing stock and the least desirable neighborhoods, there can be insufficient demand to sustain the housing stock and vacancies go unsatisfied, leading ultimately to housing abandonment. We include in the model an age depreciation variable, along with a neighborhood income composition set of variables, to collectively test the housing filtering and related hypotheses.

One of the features that households prefer is a compatible land use mix within the neighborhood. It is likely that the model parameters are estimated using a random sample of alternative locations, which has been shown to provide consistent estimates of the coefficients. In application for forecasting, each locating household is modeled individually, and a sample of alternative cell locations is generated in proportion to the available (vacant) housing. Monte

Carlo simulation is used to select the specific alternative to be assigned to the household, and vacant and occupied housing units are updated in the cell.

The independent variables can be organized into the three categories of housing characteristics, regional accessibility, and urban-design scale effects as shown below.

- Housing Characteristics Prices (interacted with income)
- Development types (density, land use mix) Housing age
- Regional accessibility Job accessibility by auto-ownership group
- Travel time to CBD and airport
- Urban design-scale (local accessibility) Neighborhood land use mix and density
- Neighborhood Employment

Algorithm

Households to be located by this model are those that were added by the HouseholdTransitionModel or predicted to move by the HouseholdRelocationModel. The model selects all those households of a specified tenure status (renter or owner) that need to find a housing unit, and identifies all available, vacant housing units within the simulation year that are of the appropriate tenure. Since the choice sets are generally too large, normally random sampling of alternatives is used to construct plausible sized choice sets. It then uses a Multinomial Logit Model structure to generate location choice probabilities across the choice set for each household. The location probabilities are used with Monte Carlo Sampling to make a determination for each household regarding which of the available locations they will choose. Once a household has chosen a location, that location is committed to the household (like a rental contract or closing on a purchase of a house) and the residential unit becomes unavailable for any other households, until such time as the occupying household is predicted to move.

Location Choice Model Estimation for the Bay Area

This chapter documents the specification, estimation, calibration and validation of the UrbanSim model components for the Bay Area region. The first sections present model estimation results. This is organized according to the different UrbanSim models that require statistical estimation of parameters. For each model, model structure and data are briefly reviewed, followed by a description of the model specification and estimation results for the model equations. All estimated coefficients were generated within UrbanSim.

After estimation results are presented, the calibration and validation process is discussed. Model estimation was followed by 1-year simulation runs to compare output with validation targets. Models were calibrated in order to better account for target changes. Next, 30-year simulations were run to gauge the model's policy sensitivities. Model calibration, validation, and sensitivity analyses were highly inter-connected procedures, due to UrbanSim model components having a high degree of mutual influence. Adjusting one model might necessitate the re-calibration of a separate model; the whole process was iterative and inter-dependent.

Household Location Choice Estimation

The Household Location Choice Model (HLCM) predicts the probability that a household that is either new (from the Household Transition model) or has decided to move within the region (from the Household Relocation model) will choose a particular submarket location. The model is specified as a multinomial logit (MNL) with sampling of alternatives from the universe of submarkets to estimate model coefficients. Submarkets are defined as school-district/residential-building-type/tenure/transit-proximity combinations. After submarkets are predicted for households (using Monte Carlo simulation), the choice of a specific building within the submarket is predicted.

The model is stratified into submodels by household income, size, and tenure (4 income categories, 3 household size categories, and 2 tenure categories, for a total of 24 submodels). Explanatory variables used in the model include accessibility, attributes of housing, price, and interaction terms between household and location attributes.

The location choice set consists of submarket alternatives. Submarkets are defined by school district, residential building type, tenure, and transit proximity combinations. The submarket dataset is automatically generated from the parcel-level building data, so the number of submarkets in the region can evolve over time if areas take on new building types.

Model coefficients were estimated using data from the synthetic households table for the Bay Area. For the majority of submodels (except when the sample size was too small), only households that had moved within the previous five years (as identified in the PUMS record) were used for estimation. The restriction to households which had moved within the past 5 years was made to reflect the choices of households in similar circumstances to those being modeled (household that are relocating or moving into the region).

Household location choice is represented for the Bay Area by a sequence of choice models. The models are, in order: tenure choice, submarket choice, and building choice. This is the order in which the models are simulated. The first choice model represents a binary household choice of ’rent’ vs. ’own’. Next, the choice of submarket is modeled, conditional on the previously modeled tenure dimension. Tables 2 to 25 below list the coefficients for the submodels, each of which was specified independently. Variable sets were somewhat similar across submodels, although there was variation owing to the principal that households in different sumbmodels might predicate their location choice on different factors. The final model in the sequence of models that represents household location choice is a simple location choice model that allocates households to specific buildings within the chosen submarket. In the tenure choice model, children, age of head, and income are hypothesized to be positively associated with home-ownership. In the submarket household locaation choice models, the location choice of owner-households is hypothesized to be positively associated with single-family submarkets (and the opposite association is likely to be seen for renters), a negative association with price is hypothesized across all submodels, and, other things equal,a positive association with accessibility, square footage, residential units, and income is hypothesized across all submodels. For some variables, variation in coefficient sign is expected, as the correlations between household location choice and specific variables will vary by submodel (recall that

submodels reflect household income, size, and tenure categories) and in some cases variables may be proxying for the effect of an unobserved variable.

Table 2: Submodel 1 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	1.71744	0.22576	7.60734
ln_avg_sale_price	-0.44035	0.0379	-11.61844
ln_median_income	0.0964	0.16003	0.60239
ln_median_lot_sqft	-0.37356	0.03701	-10.0943
ln_median_sqft	-0.00764	0.02353	-0.32474
ln_residential_units	0.20493	0.02426	8.4478
median_age_of_head	0.06093	0.01141	5.33858
median_household_size	-0.27251	0.07333	-3.71648
proportion_single_person_households	3.4289	0.81048	4.23072
submarket_avg_auto_peak_total_access	0.08771	0.03979	2.2043
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 3: Submodel 2 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	1.68862	0.23392	7.2187
ln_avg_sale_price	-0.5016	0.05029	-9.97478
ln_median_income	0.44197	0.18302	2.41483
ln_median_lot_sqft	-0.48275	0.04147	-11.64127
ln_median_sqft	-0.06711	0.0261	-2.57165
ln_residential_units	0.14853	0.02739	5.42277
median_age_of_head	0.06294	0.01242	5.06929
median_household_size	-0.16941	0.08527	-1.98688
proportion_single_person_households	4.40545	0.84834	5.19305
submarket_avg_auto_peak_total_access	0.08478	0.04661	1.81897
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 4: Submodel 3 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	1.99034	0.23116	8.61017
ln_avg_sale_price	-0.51135	0.05339	-9.57828
ln_median_income	0.63309	0.18787	3.36992
ln_median_lot_sqft	-0.4603	0.04082	-11.27577
ln_median_sqft	-0.06567	0.02631	-2.49559
ln_residential_units	0.24036	0.02789	8.61697
median_age_of_head	0.0409	0.01309	3.12507
median_household_size	-0.13755	0.08434	-1.6309
proportion_single_person_households	5.98178	0.8583	6.96933
submarket_avg_auto_peak_total_access	0.09192	0.04745	1.93716
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 5: Submodel 4 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	1.62362	0.2377	6.83053
ln_avg_sale_price	-0.48333	0.05255	-9.1975
ln_median_income	2.04434	0.1812	11.28226
ln_median_lot_sqft	-0.59079	0.04814	-12.27127
ln_median_sqft	-0.05453	0.03018	-1.80694
ln_residential_units	0.30426	0.02897	10.50306
median_age_of_head	0.05825	0.01384	4.20729
median_household_size	-0.24404	0.09666	-2.5247
median_year_built	-0.00025	0.00014	-1.72993
proportion_single_person_households	7.35139	0.97024	7.57687
submarket_avg_auto_peak_total_access	0.21812	0.05348	4.07883
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 6: Submodel 5 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	1.86126	0.25468	7.30826
ln_avg_sale_price	-0.47489	0.06539	-7.26248
ln_median_income	-0.72493	0.23084	-3.14042
ln_median_lot_sqft	-0.19342	0.05868	-3.2962
ln_median_sqft	-0.04198	0.03694	-1.13633
ln_residential_units	0.12254	0.03511	3.48979
median_age_of_head	0.0401	0.01668	2.40462
median_household_size	-0.09451	0.08026	-1.17757
submarket_avg_auto_peak_total_access	0.22091	0.06087	3.62926
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 7: Submodel 6 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	2.09224	0.22039	9.49345
ln_avg_sale_price	-0.48741	0.04685	-10.40411
ln_median_income	-0.53607	0.19116	-2.80436
ln_median_lot_sqft	-0.30067	0.04711	-6.38259
ln_median_sqft	-0.09723	0.03128	-3.10854
ln_residential_units	0.16957	0.02924	5.79919
median_age_of_head	0.05345	0.01256	4.25622
median_household_size	-0.3863	0.06575	-5.87511
submarket_avg_auto_peak_total_access	-0.05223	0.04615	-1.13185
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 8: Submodel 7 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	1.23399	0.15369	8.02926
ln_avg_sale_price	-0.45596	0.03362	-13.56052
ln_median_income	0.20302	0.13683	1.48379
ln_median_lot_sqft	-0.17562	0.04134	-4.2482
ln_median_sqft	0.04893	0.02357	2.07568
ln_residential_units	0.09271	0.02074	4.47004
median_age_of_head	0.03802	0.01011	3.75961
median_household_size	-0.10861	0.04748	-2.28748
submarket_avg_auto_peak_total_access	0.17403	0.03505	4.96558
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 9: Submodel 8 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	0.78212	0.09813	7.97
ln_avg_sale_price	-0.35139	0.01876	-18.73154
ln_median_income	1.39785	0.08435	16.5716
ln_median_lot_sqft	-0.36089	0.02489	-14.50156
ln_median_sqft	0.00284	0.01608	0.17636
ln_residential_units	0.14115	0.01401	10.07131
median_age_of_head	0.0373	0.00649	5.74846
median_household_size	-0.33446	0.03245	-10.30654
submarket_avg_auto_peak_total_access	0.12949	0.02534	5.10943
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 10: Submodel 9 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	2.66004	0.3297	8.06815
ln_avg_sale_price	-0.44733	0.05864	-7.62892
ln_median_income	-1.00791	0.26649	-3.78215
ln_median_lot_sqft	-0.24334	0.08558	-2.84335
ln_median_sqft	0.00779	0.0569	0.13691
ln_residential_units	0.30812	0.04313	7.14379
median_age_of_head	0.03648	0.02013	1.8123
median_household_size	0.0418	0.09167	0.45595
median_year_built	-0.00016	0.00018	-0.94036
submarket_avg_auto_peak_total_access	0.53634	0.07851	6.83138
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 11: Submodel 10 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	2.73826	0.23323	11.74043
ln_avg_sale_price	-0.40612	0.04307	-9.429
ln_median_income	-1.70904	0.2112	-8.0922
ln_median_lot_sqft	-0.07599	0.06197	-1.22633
ln_median_sqft	0.04663	0.03751	1.24306
ln_residential_units	0.2481	0.03193	7.77036
median_age_of_head	0.01671	0.01432	1.16658
median_household_size	0.15037	0.0676	2.22421
submarket_avg_auto_peak_total_access	0.34078	0.05749	5.92754
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 12: Submodel 11 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	2.25454	0.14713	15.32326
ln_avg_sale_price	-0.47648	0.03145	-15.15205
ln_median_income	-0.58163	0.13139	-4.42685
ln_median_lot_sqft	-0.25534	0.03337	-7.6509
ln_median_sqft	0.02442	0.02229	1.09515
ln_residential_units	0.19393	0.01827	10.61304
median_age_of_head	0.01951	0.00854	2.2832
median_household_size	0.22218	0.03894	5.70575
median_year_built	-0.00013	0.00006	-2.06532
submarket_avg_auto_peak_total_access	0.20201	0.03189	6.3352
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 13: Submodel 12 -Household Location Choice Model -Owner Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	1.30417	0.08342	15.63404
ln_avg_sale_price	-0.32335	0.01353	-23.89114
ln_median_income	1.02673	0.0643	15.96794
ln_median_lot_sqft	-0.15312	0.02108	-7.26368
ln_median_sqft	0.09201	0.01395	6.59517
ln_residential_units	0.15379	0.01023	15.02851
median_age_of_head	0.01277	0.005	2.55574
median_household_size	0.17073	0.02204	7.74788
submarket_avg_auto_peak_total_access	0.40583	0.01984	20.45391
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 14: Submodel 1 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-49.33662	15.73242	-3.13598
ln_avg_rent	-2.30607	0.27749	-8.31042
ln_median_income	-1.98369	0.38439	-5.16067
ln_median_lot_sqft	0.22307	0.03048	7.31807
ln_median_sqft	6.58357	2.10006	3.13495
ln_residential_units	1.70497	0.07041	24.21317
median_year_built	0.00069	0.00008	8.41329
submarket_avg_auto_peak_total_access	0.2796	0.1359	2.05742
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 15: Submodel 2 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-27.46331	10.73358	-2.55863
ln_avg_rent	-2.10348	0.34831	-6.0391
ln_median_income	0.24048	0.4209	0.57135
ln_median_lot_sqft	0.21486	0.03354	6.4055
ln_median_sqft	3.5181	1.45465	2.41852
ln_residential_units	1.58428	0.09185	17.24826
median_year_built	0.00061	0.00009	6.66914
submarket_avg_auto_peak_total_access	-0.19531	0.17586	-1.11059
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 16: Submodel 3 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-82.94025	29.46636	-2.81474
ln_avg_rent	-3.1692	0.54009	-5.8679
ln_median_income	2.46983	0.5995	4.1198
ln_median_lot_sqft	0.20346	0.05528	3.68034
ln_median_sqft	10.69258	3.95712	2.70211
ln_residential_units	1.58801	0.12393	12.81378
median_year_built	0.00065	0.00013	5.17189
submarket_avg_auto_peak_total_access	-0.17919	0.25707	-0.69705
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 17: Submodel 4 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-7.03252	0.468	-15.02671
ln_avg_rent	-2.15289	0.20801	-10.35004
ln_median_income	2.86519	0.42658	6.71668
ln_median_lot_sqft	0.87813	0.04447	19.74783
ln_residential_units	1.41582	0.11348	12.47614
median_year_built	0.00337	0.00013	25.45209
submarket_avg_auto_peak_total_access	-0.4502	0.26289	-1.71251
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 18: Submodel 5 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-11.19277	4.22949	-2.64636
ln_avg_rent	-2.71806	0.49295	-5.51387
ln_median_income	-3.29094	0.49853	-6.60131
ln_median_lot_sqft	0.22588	0.04294	5.26014
ln_median_sqft	1.52275	0.54835	2.77697
ln_residential_units	1.77082	0.11796	15.01192
median_year_built	0.00065	0.00011	5.86101
submarket_avg_auto_peak_total_access	0.43083	0.18891	2.28061
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 19: Submodel 6 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-108.13213	21.29703	-5.07733
ln_avg_rent	-5.10417	0.49965	-10.21542
ln_median_income	-0.34228	0.47215	-0.72495
ln_median_sqft	14.31135	2.83934	5.04038
ln_residential_units	2.11889	0.10111	20.9554
median_year_built	0.00063	0.00011	5.79608
submarket_avg_auto_peak_total_access	0.87068	0.19692	4.42151
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 20: Submodel 7 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-15.48125	10.25219	-1.51004
ln_avg_rent	-1.85928	0.36339	-5.1165
ln_median_income	-0.3692	0.46099	-0.80087
ln_median_lot_sqft	0.28396	0.03549	8.00081
ln_median_sqft	1.88601	1.392	1.35489
ln_residential_units	1.465	0.09098	16.10168
median_year_built	0.00098	0.00011	9.03581
submarket_avg_auto_peak_total_access	-0.01178	0.19512	-0.06038
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 21: Submodel 8 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-88.98542	31.05302	-2.8656
ln_avg_rent	-3.58663	0.39686	-9.03744
ln_median_income	2.66799	0.50958	5.23565
ln_median_lot_sqft	0.20344	0.04117	4.94167
ln_median_sqft	11.51784	4.16835	2.76316
ln_residential_units	1.79409	0.09248	19.39986
median_year_built	0.00068	0.0001	6.57533
submarket_avg_auto_peak_total_access	0.01383	0.24346	0.05681
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 22: Submodel 9 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-47.1172	10.97871	-4.29169
ln_avg_rent	-2.89596	0.36522	-7.92926
ln_median_income	-3.88444	0.44015	-8.82521
ln_median_lot_sqft	0.21657	0.0366	5.91657
ln_median_sqft	6.45218	1.47869	4.36344
ln_residential_units	1.97979	0.10571	18.72763
median_year_built	0.00063	0.0001	6.11185
submarket_avg_auto_peak_total_access	0.82693	0.19524	4.23544
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 23: Submodel 10 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-17.23904	9.77127	-1.76426
ln_avg_rent	-2.08884	0.3681	-5.67473
ln_median_income	-2.04757	0.42055	-4.86881
ln_median_lot_sqft	0.24324	0.03343	7.27635
ln_median_sqft	2.3227	1.32647	1.75104
ln_residential_units	1.72643	0.0982	17.58027
median_year_built	0.00075	0.0001	7.73172
submarket_avg_auto_peak_total_access	0.28946	0.18519	1.56303
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 24: Submodel 11 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-14.37618	4.10068	-3.50581
ln_avg_rent	-2.2236	0.38554	-5.76751
ln_median_income	0.24072	0.3953	0.60894
ln_median_lot_sqft	0.2232	0.02915	7.65734
ln_median_sqft	1.79825	0.5635	3.19121
ln_residential_units	1.68759	0.08479	19.90401
median_year_built	0.00068	0.00009	7.67789
submarket_avg_auto_peak_total_access	-0.11604	0.1872	-0.61988
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Table 25: Submodel 12 -Household Location Choice Model -Renter Coefficients

Coefficient Name	Estimate	Standard Error	T-Statistic
is_single_family_submarket	-25.3638	5.05925	-5.01335
ln_avg_rent	-2.13844	0.47891	-4.46519
ln_median_income	2.05841	0.47756	4.31028
ln_median_lot_sqft	0.20801	0.0495	4.20183
ln_median_sqft	3.20882	0.69684	4.60479
ln_residential_units	1.82891	0.10902	16.77642
median_year_built	0.00083	0.00012	7.13177
submarket_avg_auto_peak_total_access	-0.45989	0.21467	-2.14226
county_is_alameda_calib	-0.9	1	1
county_is_contracosta_calib	-1.8	1	1
county_is_marin_calib	-2.65	1	1
county_is_napa_calib	-2.4	1	1
county_is_sanmateo_calib	-0.5	1	1
county_is_santaclara_calib	-0.7	1	1
county_is_solano_calib	-1.7	1	1
county_is_sonoma_calib	-2.9	1	1

Business Location Choice Estimation

In the Business Location Choice Model (BLCM), we predict the probability that an establishment that is either new (from the Business Transition model), or has moved within the region (Business Relocation model), will be located at a particular employment submarket location. Employment submarkets are defined as jurisdiction, building type, and transit-proximity combinations.

The BLCM is specified as a multinomial logit (MNL) model, with separate equations estimated for each employment sector. An MNL is applied to estimate the probability that each establishment will move to each of the alternative employment submarkets under consideration. Monte Carlo simulation is used to generate a decision to locate in a particular employment submarket. Once this choice is made, the establishment is assigned to the employment submarket. In the next step, establishments are assigned to specific parcel-level buildings within the employment submarket using a simple location choice model that accounts for available job spaces within buildings. Business Location Choice Model coefficients are presented in Table 26.

The number of job spots available in an employment submarket that establishments can locate in will depend mainly on the total square footage of non-residential floorspace in the employment submarket, and on the square feet per employee in the building type that the employment submarket represents (for each building type, a certain number of square feet are defined as the minimum to support each job).

BLCM estimation has been performed for all sectors except government. In the base-year, existing establishments were assigned to buildings. The BLCM is comprised of a number of submodels, one for each modeled employment sector. In simulation, the BLCM is run after the Business Transition and Business Relocation models. Establishment choice of employment submarket is simulated by submodel, and once all establishments have selected an employment submarket with capacity, they are allocated to specific buildings with capacity within the employment submarket. Each submodel was specified independently. The variable sets were somewhat similar across submodels although there is quite a bit of variation owing to the principal that establishments in different sectors predicate their location choices on different factors. It is hypothesized that establishment choice of location is positively associated with accessibility, negatively associated with price, and positively associated with non-residential square footage. For certain employment sector submodels, a positive association with transit-presence and jobs of the same sector is hypothesized. The relationship between establishments and buildings of a certain type (such as office structures), and between establishments and population, is hypothesized to vary by employment sector.

Table 26: Business Location Choice Model Coefficients

Submodel	Coefficient Name	Estimate	Standard Error	T-Statistic
1	esubmarket_alameda_county	-0.5	1	2
1	esubmarket_avg_transit_peak_total_access	0.06888	0.0075	9.18387
1	esubmarket_close_to_transit	0.37604	0.02723	13.80737
1	esubmarket_contracosta_county	2	1	2
1	esubmarket_marin_county	4.25	1	2
1	esubmarket_napa_county	4	1	2
1	esubmarket_sanfrancisco_county	-1.5	1	2
1	esubmarket_sanmateo_county	0.5	1	2
1	esubmarket_solano_county	9	1	2
1	esubmarket_sonoma_county	2	1	2
1	is_office_esubmarket	1.80169	0.03094	58.23391
1	ln_avg_nonres_rent	-0.18019	0.02214	-8.1398
1	ln_jobs_in_jurisdiction	0.12346	0.01799	6.86468
1	ln_non_residential_sqft_esubmarket	0.71928	0.01281	56.1528
1	share_jobs_sector_1	1.38197	0.34387	4.01891
2	esubmarket_alameda_county	-0.5	1	2
2	esubmarket_avg_transit_peak_total_access	0.02033	0.00505	4.026
2	esubmarket_close_to_transit	0.28286	0.01935	14.61472
2	esubmarket_contracosta_county	2	1	2
2	esubmarket_marin_county	4.25	1	2
2	esubmarket_napa_county	4	1	2
2	esubmarket_sanfrancisco_county	0	1	2
2	esubmarket_sanmateo_county	0.5	1	2
2	esubmarket_solano_county	9	1	2
2	esubmarket_sonoma_county	2	1	2
2	is_office_esubmarket	1.48979	0.02046	72.79925
2	ln_avg_nonres_rent	-0.07567	0.01366	-5.53944
2	ln_jobs_in_jurisdiction	0.13448	0.01191	11.28626
2	ln_non_residential_sqft_esubmarket	0.64677	0.00884	73.19049
2	share_jobs_sector_2	2.55412	0.17917	14.2556
3	esubmarket_alameda_county	-0.5	1	2
3	esubmarket_avg_transit_peak_total_access	0.05642	0.00506	11.14619
3	esubmarket_close_to_transit	0.24574	0.01866	13.17
3	esubmarket_contracosta_county	2	1	2
3	esubmarket_marin_county	4.25	1	2
3	esubmarket_napa_county	4	1	2
3	esubmarket_sanfrancisco_county	-1.5	1	2
3	esubmarket_sanmateo_county	0.5	1	2
3	esubmarket_solano_county	9	1	2
3	esubmarket_sonoma_county	2	1	2
3	is_office_esubmarket	1.01057	0.01985	50.91223
3	ln_avg_nonres_rent	-0.19507	0.01296	-15.05483
3	ln_jobs_in_jurisdiction	0.15184	0.01178	12.88719
3	ln_non_residential_sqft_esubmarket	0.68213	0.00845	80.73724
3	share_jobs_sector_3	2.69226	0.19889	13.53641
4	esubmarket_alameda_county	-0.5	1	2
4	esubmarket_avg_transit_peak_total_access	-0.0829	0.01849	-4.48312
4	esubmarket_close_to_transit	0.0527	0.0746	0.70642
4	esubmarket_contracosta_county	2	1	2
4	esubmarket_marin_county	4.25	1	2
4	esubmarket_napa_county	4	1	2
4	esubmarket_sanfrancisco_county	-1.5	1	2
4	esubmarket_sanmateo_county	0.5	1	2
4	esubmarket_solano_county	9	1	2
4	esubmarket_sonoma_county	2	1	2
4	is_office_esubmarket	0.35256	0.07998	4.40786

4	ln_avg_nonres_rent	-0.9	0.04826	1.70529
4	ln_jobs_in_jurisdiction	-0.05427	0.04545	-1.19398
4	ln_non_residential_sqft_esubmarket	0.70192	0.03311	21.19945
4	share_jobs_sector_4	0.30102	1.8728	0.16073
5	esubmarket_alameda_county	-0.5	1	2
5	esubmarket_avg_transit_peak_total_access	-0.20324	0.06381	-3.18521
5	esubmarket_close_to_transit	0.73177	0.32327	2.26361
5	esubmarket_contracosta_county	2	1	2
5	esubmarket_marin_county	4.25	1	2
5	esubmarket_napa_county	4	1	2
5	esubmarket_sanfrancisco_county	-1.5	1	2
5	esubmarket_sanmateo_county	0.5	1	2
5	esubmarket_solano_county	9	1	2
5	esubmarket_sonoma_county	2	1	2
5	is_office_esubmarket	1.52251	0.35	4.35003
5	ln_avg_nonres_rent	-1.61574	0.18137	-8.90856
5	ln_jobs_in_jurisdiction	0.47996	0.16189	2.96471
5	ln_non_residential_sqft_esubmarket	0.68149	0.1302	5.23399
5	share_jobs_sector_5	6.97405	2.53257	2.75375
6	esubmarket_alameda_county	-0.5	1	2
6	esubmarket_avg_transit_peak_total_access	0.07209	0.0119	6.06076
6	esubmarket_close_to_transit	0.46052	0.0481	9.57457
6	esubmarket_contracosta_county	2	1	2
6	esubmarket_marin_county	4.25	1	2
6	esubmarket_napa_county	4	1	2
6	esubmarket_sanfrancisco_county	-1.5	1	2
6	esubmarket_sanmateo_county	0.5	1	2
6	esubmarket_solano_county	9	1	2
6	esubmarket_sonoma_county	2	1	2
6	is_office_esubmarket	0.01927	0.05539	0.34787
6	ln_avg_nonres_rent	-0.09591	0.02745	-3.49367
6	ln_jobs_in_jurisdiction	0.06527	0.02878	2.2678
6	ln_non_residential_sqft_esubmarket	0.62613	0.02111	29.65766
6	share_jobs_sector_6	2.09311	0.63675	3.2872
7	esubmarket_alameda_county	-0.5	1	2
7	esubmarket_avg_transit_peak_total_access	0.10523	0.02669	3.94319
7	esubmarket_close_to_transit	0.37421	0.09902	3.77903
7	esubmarket_contracosta_county	2	1	2
7	esubmarket_marin_county	4.25	1	2
7	esubmarket_napa_county	4	1	2
7	esubmarket_sanfrancisco_county	-1.5	1	2
7	esubmarket_sanmateo_county	0.5	1	2
7	esubmarket_solano_county	9	1	2
7	esubmarket_sonoma_county	2	1	2
7	is_office_esubmarket	1.91125	0.11315	16.89071
7	ln_avg_nonres_rent	-1.7925	0.05872	-30.52776
7	ln_jobs_in_jurisdiction	0.28983	0.06083	4.76451
7	ln_non_residential_sqft_esubmarket	0.51724	0.04694	11.01985
7	share_jobs_sector_7	5.78703	0.64838	8.92529
8	esubmarket_alameda_county	-0.5	1	2
8	esubmarket_avg_transit_peak_total_access	0.1258	0.02088	6.02554
8	esubmarket_close_to_transit	0.1935	0.0788	2.45545
8	esubmarket_contracosta_county	2	1	2
8	esubmarket_marin_county	4.25	1	2
8	esubmarket_napa_county	4	1	2
8	esubmarket_sanfrancisco_county	-1.5	1	2
8	esubmarket_sanmateo_county	0.5	1	2
8	esubmarket_solano_county	9	1	2
8	esubmarket_sonoma_county	2	1	2

8	is_office_esubmarket	1.18873	0.08112	14.6547
8	ln_avg_nonres_rent	-0.66606	0.04804	-13.86421
8	ln_jobs_in_jurisdiction	0.09967	0.04983	2.00045
8	ln_non_residential_sqft_esubmarket	0.61618	0.03553	17.34465
8	share_jobs_sector_8	1.05183	5.52571	0.19035
9	esubmarket_alameda_county	-0.5	1	2
9	esubmarket_avg_transit_peak_total_access	0.06197	0.00783	7.91373
9	esubmarket_close_to_transit	0.41182	0.03014	13.66159
9	esubmarket_contracosta_county	2	1	2
9	esubmarket_marin_county	4.25	1	2
9	esubmarket_napa_county	4	1	2
9	esubmarket_sanfrancisco_county	-1.5	1	2
9	esubmarket_sanmateo_county	0.5	1	2
9	esubmarket_solano_county	9	1	2
9	esubmarket_sonoma_county	2	1	2
9	is_office_esubmarket	-0.69203	0.04007	-17.26847
9	ln_avg_nonres_rent	-0.9	0.01713	4.20567
9	ln_jobs_in_jurisdiction	0.09057	0.01892	4.78602
9	ln_non_residential_sqft_esubmarket	0.65221	0.01347	48.42725
9	share_jobs_sector_9	1.97623	0.38107	5.18599
10	esubmarket_alameda_county	-0.5	1	2
10	esubmarket_avg_transit_peak_total_access	0.07304	0.0086	8.49246
10	esubmarket_close_to_transit	0.48235	0.03221	14.97552
10	esubmarket_contracosta_county	2	1	2
10	esubmarket_marin_county	4.25	1	2
10	esubmarket_napa_county	4	1	2
10	esubmarket_sanfrancisco_county	-1.5	1	2
10	esubmarket_sanmateo_county	0.5	1	2
10	esubmarket_solano_county	9	1	2
10	esubmarket_sonoma_county	2	1	2
10	is_office_esubmarket	-1.29264	0.04638	-27.86878
10	ln_avg_nonres_rent	-0.9	0.01892	37.17438
10	ln_jobs_in_jurisdiction	-0.02215	0.02239	-0.98926
10	ln_non_residential_sqft_esubmarket	0.74465	0.01473	50.56183
10	share_jobs_sector_10	1.92532	0.43434	4.43274
11	esubmarket_alameda_county	-0.5	1	2
11	esubmarket_avg_transit_peak_total_access	0.00678	0.0064	1.05917
11	esubmarket_close_to_transit	0.11513	0.02473	4.65474
11	esubmarket_contracosta_county	2	1	2
11	esubmarket_marin_county	4.25	1	2
11	esubmarket_napa_county	4	1	2
11	esubmarket_sanfrancisco_county	-1.5	1	2
11	esubmarket_sanmateo_county	0.5	1	2
11	esubmarket_solano_county	9	1	2
11	esubmarket_sonoma_county	2	1	2
11	is_office_esubmarket	0.22015	0.03065	7.18211
11	ln_avg_nonres_rent	-1.00923	0.0198	-50.98092
11	ln_jobs_in_jurisdiction	0.1665	0.01609	10.34551
11	ln_non_residential_sqft_esubmarket	0.77109	0.01191	64.74244
11	share_jobs_sector_11	-2.37074	0.27102	-8.74751
12	esubmarket_alameda_county	-0.5	1	2
12	esubmarket_avg_transit_peak_total_access	-0.0107	0.03008	-0.35564
12	esubmarket_close_to_transit	0.34274	0.11371	3.01413
12	esubmarket_contracosta_county	2	1	2
12	esubmarket_marin_county	4.25	1	2
12	esubmarket_napa_county	4	1	2
12	esubmarket_sanfrancisco_county	-1.5	1	2
12	esubmarket_sanmateo_county	0.5	1	2
12	esubmarket_solano_county	9	1	2

12	esubmarket_sonoma_county	2	1	2
12	is_office_esubmarket	0.44598	0.13482	3.30799
12	ln_avg_nonres_rent	-1.03179	0.07881	-13.09218
12	ln_jobs_in_jurisdiction	0.22622	0.07759	2.91554
12	ln_non_residential_sqft_esubmarket	0.71273	0.05657	12.59965
12	share_jobs_sector_12	2.2656	13.15677	0.1722
13	esubmarket_alameda_county	-0.5	1	2
13	esubmarket_avg_transit_peak_total_access	-0.15146	0.01497	-10.11522
13	esubmarket_close_to_transit	-0.08492	0.04563	-1.86095
13	esubmarket_contracosta_county	2	1	2
13	esubmarket_ln_residential_units_within_walking_distance	1.00969	0.04007	25.19856
13	esubmarket_marin_county	4.25	1	2
13	esubmarket_napa_county	4	1	2
13	esubmarket_sanfrancisco_county	-1.5	1	2
13	esubmarket_sanmateo_county	0.5	1	2
13	esubmarket_solano_county	9	1	2
13	esubmarket_sonoma_county	2	1	2
13	is_office_esubmarket	1.77063	0.0478	37.04317
13	ln_avg_nonres_rent	-1.46442	0.03078	-47.57436
13	ln_jobs_in_jurisdiction	0.20599	0.02934	7.02134
13	ln_non_residential_sqft_esubmarket	0.53124	0.02213	24.0027
13	share_jobs_sector_13	3.48378	0.69004	5.04863
14	esubmarket_alameda_county	-0.5	1	2
14	esubmarket_avg_auto_peak_total_access	0.10014	0.03877	2.58265
14	esubmarket_close_to_transit	0.04907	0.04952	0.99086
14	esubmarket_contracosta_county	2	1	2
14	esubmarket_marin_county	4.25	1	2
14	esubmarket_napa_county	4	1	2
14	esubmarket_sanfrancisco_county	-1.5	1	2
14	esubmarket_sanmateo_county	0.5	1	2
14	esubmarket_solano_county	9	1	2
14	esubmarket_sonoma_county	2	1	2
14	is_office_esubmarket	-0.38323	0.0769	-4.9838
14	ln_avg_nonres_rent	-1.35652	0.04464	-30.38671
14	ln_jobs_in_jurisdiction	0.05522	0.03202	1.72464
14	ln_non_residential_sqft_esubmarket	0.8338	0.02415	34.52124
14	share_jobs_sector_14	0.97855	0.55562	1.76119
15	esubmarket_alameda_county	-0.5	1	2
15	esubmarket_avg_transit_peak_total_access	-0.12417	0.00678	-18.32435
15	esubmarket_close_to_transit	0.02941	0.02305	1.27579
15	esubmarket_contracosta_county	2	1	2
15	esubmarket_ln_residential_units_within_walking_distance	0.73493	0.01585	46.3702
15	esubmarket_marin_county	4.25	1	2
15	esubmarket_napa_county	4	1	2
15	esubmarket_sanfrancisco_county	-1.5	1	2
15	esubmarket_sanmateo_county	0.5	1	2
15	esubmarket_solano_county	9	1	2
15	esubmarket_sonoma_county	2	1	2
15	is_office_esubmarket	-1.1818	0.02982	-39.63638
15	ln_avg_nonres_rent	-0.13605	0.01422	-9.56999
15	ln_jobs_in_jurisdiction	-0.04234	0.01493	-2.83641
15	ln_non_residential_sqft_esubmarket	0.77738	0.01026	75.79861
15	share_jobs_sector_15	1.71442	0.30518	5.61769
16	esubmarket_alameda_county	-0.5	1	2
16	esubmarket_avg_transit_peak_total_access	-0.07139	0.00787	-9.06892
16	esubmarket_close_to_transit	0.06752	0.02407	2.80557
16	esubmarket_contracosta_county	2	1	2
16	esubmarket_ln_residential_units_within_walking_distance	0.58481	0.02073	28.20799
16	esubmarket_marin_county	4.25	1	2

16	esubmarket_napa_county	4	1	2
16	esubmarket_sanfrancisco_county	-1.5	1	2
16	esubmarket_sanmateo_county	0.5	1	2
16	esubmarket_solano_county	9	1	2
16	esubmarket_sonoma_county	2	1	2
16	is_office_esubmarket	1.94611	0.02659	73.19583
16	ln_avg_nonres_rent	-0.45364	0.01764	-25.7235
16	ln_jobs_in_jurisdiction	0.15905	0.01606	9.90073
16	ln_non_residential_sqft_esubmarket	0.61377	0.01186	51.76307
16	share_jobs_sector_16	3.22152	0.21333	15.10137
17	esubmarket_alameda_county	-0.5	1	2
17	esubmarket_avg_auto_peak_total_access	0.36456	0.05002	7.28789
17	esubmarket_close_to_transit	-0.10622	0.0609	-1.74408
17	esubmarket_contracosta_county	2	1	2
17	esubmarket_ln_residential_units_within_walking_distance	0.30333	0.03127	9.69923
17	esubmarket_marin_county	4.25	1	2
17	esubmarket_napa_county	4	1	2
17	esubmarket_sanfrancisco_county	-1.5	1	2
17	esubmarket_sanmateo_county	0.5	1	2
17	esubmarket_solano_county	9	1	2
17	esubmarket_sonoma_county	2	1	2
17	is_office_esubmarket	0.63358	0.06109	10.37122
17	ln_avg_nonres_rent	-0.75187	0.04162	-18.06489
17	ln_jobs_in_jurisdiction	0.02892	0.03559	0.81261
17	ln_non_residential_sqft_esubmarket	0.66982	0.02605	25.71649
17	share_jobs_sector_17	5.07757	0.55343	9.17474
18	esubmarket_alameda_county	-0.5	1	2
18	esubmarket_avg_transit_peak_total_access	-0.21574	0.10766	-2.00382
18	esubmarket_close_to_transit	-0.53799	0.33432	-1.60922
18	esubmarket_contracosta_county	2	1	2
18	esubmarket_ln_residential_units_within_walking_distance	1.34981	0.27339	4.93734
18	esubmarket_marin_county	4.25	1	2
18	esubmarket_napa_county	4	1	2
18	esubmarket_sanfrancisco_county	-1.5	1	2
18	esubmarket_sanmateo_county	0.5	1	2
18	esubmarket_solano_county	9	1	2
18	esubmarket_sonoma_county	2	1	2
18	is_office_esubmarket	1.59352	0.27912	5.70903
18	ln_avg_nonres_rent	-2.27596	0.21961	-10.36371
18	ln_jobs_in_jurisdiction	0.61951	0.18557	3.33841
18	ln_non_residential_sqft_esubmarket	0.56889	0.15253	3.72967
18	share_jobs_sector_18	11.38959	1.82986	6.22429
19	esubmarket_alameda_county	-0.5	1	2
19	esubmarket_avg_auto_peak_total_access	-0.18859	0.10039	-1.87857
19	esubmarket_close_to_transit	0.14666	0.12413	1.18153
19	esubmarket_contracosta_county	2	1	2
19	esubmarket_ln_residential_units_within_walking_distance	0.31742	0.06911	4.59295
19	esubmarket_marin_county	4.25	1	2
19	esubmarket_napa_county	4	1	2
19	esubmarket_sanfrancisco_county	-1.5	1	2
19	esubmarket_sanmateo_county	0.5	1	2
19	esubmarket_solano_county	9	1	2
19	esubmarket_sonoma_county	2	1	2
19	is_office_esubmarket	1.03137	0.12546	8.22088
19	ln_avg_nonres_rent	-1.68234	0.09375	-17.94453
19	ln_jobs_in_jurisdiction	0.23593	0.07482	3.15326
19	ln_non_residential_sqft_esubmarket	0.72809	0.05324	13.67654
19	share_jobs_sector_19	2.39901	6.84219	0.35062
20	esubmarket_alameda_county	-0.5	1	2

20	esubmarket_avg_auto_peak_total_access	-0.02755	0.02656	-1.03722
20	esubmarket_close_to_transit	-0.1013	0.0335	-3.02362
20	esubmarket_contracosta_county	2	1	2
20	esubmarket_ln_residential_units_within_walking_distance	0.25967	0.01839	14.12365
20	esubmarket_marin_county	4.25	1	2
20	esubmarket_napa_county	4	1	2
20	esubmarket_sanfrancisco_county	-1.5	1	2
20	esubmarket_sanmateo_county	0.5	1	2
20	esubmarket_solano_county	9	1	2
20	esubmarket_sonoma_county	2	1	2
20	is_office_esubmarket	0.33675	0.03797	8.86866
20	ln_avg_nonres_rent	-1.1891	0.02414	-49.26128
20	ln_jobs_in_jurisdiction	0.11749	0.01934	6.07603
20	ln_non_residential_sqft_esubmarket	0.65141	0.01474	44.19037
20	share_jobs_sector_20	3.10188	0.38667	8.02193
21	esubmarket_alameda_county	-0.5	1	2
21	esubmarket_avg_transit_peak_total_access	-0.12336	0.06334	-1.94748
21	esubmarket_close_to_transit	-0.56687	0.21655	-2.61778
21	esubmarket_contracosta_county	2	1	2
21	esubmarket_ln_residential_units_within_walking_distance	0.00029	0.12876	0.00225
21	esubmarket_marin_county	4.25	1	2
21	esubmarket_napa_county	4	1	2
21	esubmarket_sanfrancisco_county	-1.5	1	2
21	esubmarket_sanmateo_county	0.5	1	2
21	esubmarket_solano_county	9	1	2
21	esubmarket_sonoma_county	2	1	2
21	is_office_esubmarket	0.54696	0.23634	2.31435
21	ln_avg_nonres_rent	-0.2334	0.17513	-1.33271
21	ln_jobs_in_jurisdiction	0.27907	0.13272	2.10266
21	ln_non_residential_sqft_esubmarket	0.75892	0.09232	8.22058
21	share_jobs_sector_21	5.43973	2.03179	2.67731
22	esubmarket_alameda_county	-0.5	1	2
22	esubmarket_avg_auto_peak_total_access	-0.21566	0.03494	-6.1719
22	esubmarket_close_to_transit	0.0122	0.05077	0.24024
22	esubmarket_contracosta_county	2	1	2
22	esubmarket_ln_residential_units_within_walking_distance	0.25667	0.02564	10.00958
22	esubmarket_marin_county	4.25	1	2
22	esubmarket_napa_county	4	1	2
22	esubmarket_sanfrancisco_county	-1.5	1	2
22	esubmarket_sanmateo_county	0.5	1	2
22	esubmarket_solano_county	9	1	2
22	esubmarket_sonoma_county	2	1	2
22	is_office_esubmarket	-0.28082	0.05847	-4.80287
22	ln_avg_nonres_rent	-0.88059	0.03543	-24.852
22	ln_jobs_in_jurisdiction	0.11826	0.02858	4.13736
22	ln_non_residential_sqft_esubmarket	0.78375	0.02151	36.43852
22	share_jobs_sector_22	1.86882	0.53049	3.52283
23	esubmarket_alameda_county	-0.5	1	2
23	esubmarket_avg_transit_peak_total_access	0.00983	0.00912	1.07743
23	esubmarket_close_to_transit	0.02686	0.0302	0.88962
23	esubmarket_contracosta_county	2	1	2
23	esubmarket_ln_residential_units_within_walking_distance	0.21491	0.02018	10.64815
23	esubmarket_marin_county	4.25	1	2
23	esubmarket_napa_county	4	1	2
23	esubmarket_sanfrancisco_county	-1.5	1	2
23	esubmarket_sanmateo_county	0.5	1	2
23	esubmarket_solano_county	9	1	2
23	esubmarket_sonoma_county	2	1	2
23	is_office_esubmarket	0.93931	0.03025	31.0533

23	ln_avg_nonres_rent	-0.29168	0.02249	-12.96652
23	ln_jobs_in_jurisdiction	0.11947	0.01753	6.81516
23	ln_non_residential_sqft_esubmarket	0.76301	0.01274	59.90509
23	share_jobs_sector_23	2.55666	0.16136	15.8446
24	esubmarket_alameda_county	-0.5	1	2
24	esubmarket_avg_transit_peak_total_access	-0.09569	0.02974	-3.2175
24	esubmarket_close_to_transit	-0.0018	0.10123	-0.01774
24	esubmarket_contracosta_county	2	1	2
24	esubmarket_ln_residential_units_within_walking_distance	1.17499	0.04727	24.85765
24	esubmarket_marin_county	4.25	1	2
24	esubmarket_napa_county	4	1	2
24	esubmarket_sanfrancisco_county	-1.5	1	2
24	esubmarket_sanmateo_county	0.5	1	2
24	esubmarket_solano_county	9	1	2
24	esubmarket_sonoma_county	2	1	2
24	is_office_esubmarket	-0.00506	0.12444	-0.04067
24	ln_avg_nonres_rent	-2.15137	0.05542	-38.81776
24	ln_jobs_in_jurisdiction	0.38074	0.06329	6.01538
24	ln_non_residential_sqft_esubmarket	0.41021	0.04513	9.08978
24	share_jobs_sector_24	7.81124	1.34781	5.79549
25	esubmarket_alameda_county	-0.5	1	2
25	esubmarket_avg_transit_peak_total_access	-0.04402	0.02045	-2.15293
25	esubmarket_close_to_transit	-0.15599	0.06801	-2.29372
25	esubmarket_contracosta_county	2	1	2
25	esubmarket_ln_residential_units_within_walking_distance	-0.06687	0.04275	-1.56393
25	esubmarket_marin_county	4.25	1	2
25	esubmarket_napa_county	4	1	2
25	esubmarket_sanfrancisco_county	-1.5	1	2
25	esubmarket_sanmateo_county	0.5	1	2
25	esubmarket_solano_county	9	1	2
25	esubmarket_sonoma_county	2	1	2
25	is_office_esubmarket	0.46005	0.07878	5.83939
25	ln_avg_nonres_rent	-0.753	0.06191	-12.16313
25	ln_jobs_in_jurisdiction	0.18191	0.04141	4.39248
25	ln_non_residential_sqft_esubmarket	0.86535	0.03143	27.52868
25	share_jobs_sector_25	5.00899	0.31616	15.84301
26	esubmarket_alameda_county	-0.5	1	2
26	esubmarket_avg_transit_peak_total_access	-0.11462	0.00585	-19.60752
26	esubmarket_close_to_transit	-0.05415	0.01858	-2.91344
26	esubmarket_contracosta_county	2	1	2
26	esubmarket_ln_residential_units_within_walking_distance	0.78187	0.01389	56.30621
26	esubmarket_marin_county	4.25	1	2
26	esubmarket_napa_county	4	1	2
26	esubmarket_sanfrancisco_county	-1.5	1	2
26	esubmarket_sanmateo_county	0.5	1	2
26	esubmarket_solano_county	9	1	2
26	esubmarket_sonoma_county	2	1	2
26	is_office_esubmarket	-0.03034	0.0192	-1.5798
26	ln_avg_nonres_rent	-0.62622	0.01211	-51.71799
26	ln_jobs_in_jurisdiction	0.02014	0.01175	1.71317
26	ln_non_residential_sqft_esubmarket	0.70226	0.00853	82.29686
26	share_jobs_sector_26	1.85266	0.35884	5.16286
27	esubmarket_alameda_county	-0.5	1	2
27	esubmarket_avg_transit_peak_total_access	-0.04276	0.04329	-0.98763
27	esubmarket_close_to_transit	-0.10852	0.1223	-0.88734
27	esubmarket_contracosta_county	2	1	2
27	esubmarket_ln_residential_units_within_walking_distance	0.55815	0.08808	6.33673
27	esubmarket_marin_county	4.25	1	2
27	esubmarket_napa_county	4	1	2

27	esubmarket_sanfrancisco_county	-1.5	1	2
27	esubmarket_sanmateo_county	0.5	1	2
27	esubmarket_solano_county	9	1	2
27	esubmarket_sonoma_county	2	1	2
27	is_office_esubmarket	0.99206	0.13823	7.17691
27	ln_avg_nonres_rent	-0.6898	0.08722	-7.90839
27	ln_jobs_in_jurisdiction	-0.04111	0.06716	-0.61221
27	ln_non_residential_sqft_esubmarket	0.7584	0.02656	28.55598
27	share_jobs_sector_27	384.07703	0.65131	589.69714
28	esubmarket_alameda_county	-0.5	1	2
28	esubmarket_avg_transit_peak_total_access	-0.2373	0.05092	-4.65995
28	esubmarket_close_to_transit	-0.42556	0.15256	-2.78941
28	esubmarket_contracosta_county	2	1	2
28	esubmarket_ln_residential_units_within_walking_distance	1.31053	0.14789	8.86125
28	esubmarket_marin_county	4.25	1	2
28	esubmarket_napa_county	4	1	2
28	esubmarket_sanfrancisco_county	-1.5	1	2
28	esubmarket_sanmateo_county	0.5	1	2
28	esubmarket_solano_county	9	1	2
28	esubmarket_sonoma_county	2	1	2
28	is_office_esubmarket	1.88894	0.15419	12.25043
28	ln_avg_nonres_rent	-2.75949	0.11578	-23.83475
28	ln_jobs_in_jurisdiction	0.44782	0.10402	4.30511
28	ln_non_residential_sqft_esubmarket	0.42823	0.07966	5.3756
28	share_jobs_sector_28	6.95702	2.99011	2.32668