# Housing Demand Methodology

The methodology used in this paper recreates the industry employment driven housing demand forecast presented by (Sturtevand and Chapman 2013 for the Center for Regional Analysis) for the Washington Metropolitan region. Data, data preparation code and analysis have been made available online.

This analysis expands the method and applies it for all of California’s multiple metropolitan and micropolitan areas and their housing markets. We have chosen to examine housing demand at the scale of commuting zones to capture the tied labor and housing markets decisions.

## Commuting Zones

Commuting zones / labor market areas were developed to create a geographic boundary that better represents a region’s economy than extant political boundaries.[[1]](#footnote-1)They are “clusters of counties characterized by strong within-cluster and weak between-cluster commuting ties.” (Dorn 2013)[[2]](#footnote-2). Developed by Tibor and Gabor; to address the fact that local labor markets, industries, and economic activity is not delimited by state, county or MSA lines but through labor market relationships that can span across largely arbitrary boundaries. States are too large for many local labor markets, and while counties are more detailed they can be too small to encompass the sum of economic relationships in an area. MSAs are also frequently used for local labor markets analysis, albeit with the disadvantage that MSAs only cover regions that encompass urban regions.

For California, commuting zones allow a comprehensive analysis that includes non-urban counties and areas. The other main advantage to using commuting zones is to avoid complicated weighting of commuting patterns data. Commuting zones simplify this process by assuming that the supply of homes will be in the same area as the demand for workers.

### California Commuting Zones Lis:

There are 14 commuting zones for CA, comprised of 53 counties and 36 Metropolitan and Micropolitan Statistical areas. These are listed below:

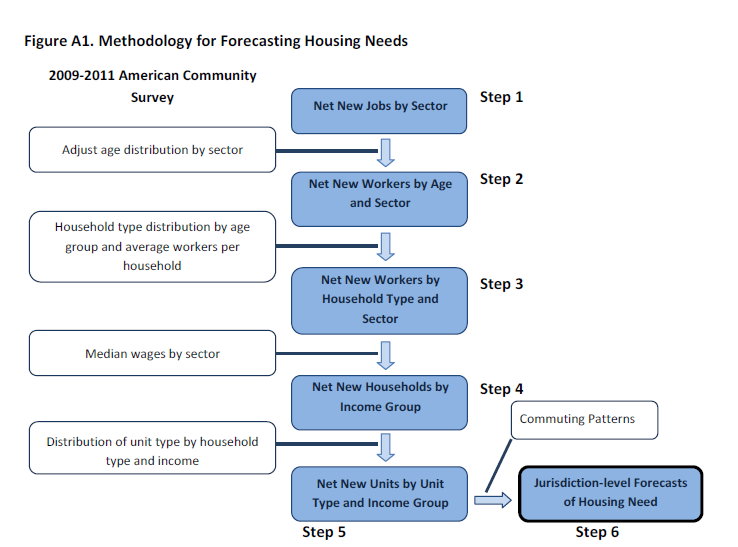
|  |  |
| --- | --- |
| Commuting Zone Name | |
| Redding, CA Metro Red Bluff, CA Micro | |
| Eureka-Arcata-Fortuna, CA Micro | |
| Merced, Modesto Metro PLUS | |
| Bakersfield, CA Metro | |
| Fresno, CA Metro PLUS | |
| Yuba City-Marysville, CA PLUS | |
| Sacramento--Arden-Arcade--Roseville, CA Metro | |
| San Jose-Sunnyvale-Santa Clara, CA Metro | |
| Santa Rosa-Petaluma, CA Metro | |
| San Francisco-San Mateo-Redwood City, CA Metro Division | |
| San Diego-Carlsbad-San Marcos, CA Metro | |
| Yuma, AZ Metro El Centro Metro | |
| Santa Barbara, San Luis Obispo-Paso Robles, CA Metro | |
| Los Angeles-Long Beach-Glendale, CA Metro Division | |
| Commuting Zone Metropolitan Makeup **Commuting Zone Name** | **Metropolitan Area, 2003** | |
| Redding, CA Metro Red Bluff, CA Micro | Redding, CA Metro | |
|  | Red Bluff, CA Micro | |
| Eureka-Arcata-Fortuna, CA Micro | Eureka-Arcata-Fortuna, CA Micro | |
| Merced, Modesto Metro PLUS | Merced, CA Metro | |
|  | Modesto, CA Metro | |
|  | Phoenix Lake-Cedar Ridge, CA Micro | |
| Bakersfield, CA Metro | Bakersfield, CA Metro | |
| Fresno, CA Metro PLUS | Fresno, CA Metro | |
|  | Hanford-Corcoran, CA Metro | |
|  | Madera, CA Metro | |
|  | Visalia-Porterville, CA Metro | |
| Yuba City-Marysville, CA PLUS | Chico, CA Metro | |
|  | Yuba City-Marysville, CA Metro | |
| Sacramento--Arden-Arcade--Roseville, CA Metro | Sacramento--Arden-Arcade--Roseville, CA Metro | |
|  | Truckee-Grass Valley, CA Micro | |
|  | Stockton, CA Metro | |
|  | Gardnerville Ranchos, NV Micro | |
| San Jose-Sunnyvale-Santa Clara, CA Metro | Salinas, CA Metro | |
|  | San Jose-Sunnyvale-Santa Clara, CA Metro | |
|  | Santa Cruz-Watsonville, CA Metro | |
| Santa Rosa-Petaluma, CA Metro | Clearlake, CA Micro | |
|  | Ukiah, CA Micro | |
|  | Santa Rosa-Petaluma, CA Metro | |
| San Francisco-San Mateo-Redwood City, CA Metro Division | Oakland-Fremont-Hayward, CA Metro Division | |
|  | San Francisco-San Mateo-Redwood City, CA Metro Division | |
|  | Napa, CA Metro | |
|  | Vallejo-Fairfield, CA Metro | |
| San Diego-Carlsbad-San Marcos, CA Metro | San Diego-Carlsbad-San Marcos, CA Metro | |
| Yuma, AZ Metro El Centro Metro | Yuma, AZ Metro | |
|  | El Centro, CA Metro | |
| Santa Barbara, San Luis Obispo-Paso Robles, CA Metro | San Luis Obispo-Paso Robles, CA Metro | |
|  | Santa Barbara-Santa Maria-Goleta, CA Metro | |
| Los Angeles-Long Beach-Glendale, CA Metro Division | Los Angeles-Long Beach-Glendale, CA Metro Division | |
|  | Santa Ana-Anaheim-Irvine, CA Metro Division | |
|  | Riverside-San Bernardino-Ontario, CA Metro | |
|  | Oxnard-Thousand Oaks-Ventura, CA Metro | |

#### Commuting Zone County Makeup

|  |  |
| --- | --- |
| **Commuting Zone Name** | **County Name** |
| Shasta County/Tehama County | Shasta County |
| Redding, CA Metro Red Bluff, CA Micro | Tehama County |
| Eureka-Arcata-Fortuna, CA Micro | Humboldt County |
|  | Trinity County |
| Merced, Modesto Metro PLUS | Mariposa County |
|  | Merced County |
|  | Stanislaus County |
|  | Tuolumne County |
| Bakersfield, CA Metro | Kern County |
| Fresno, CA Metro PLUS | Fresno County |
|  | Kings County |
|  | Madera County |
|  | Tulare County |
| Yuba City-Marysville, CA PLUS | Butte County |
|  | Colusa County |
|  | Glenn County |
|  | Sutter County |
|  | Yuba County |
| Sacramento--Arden-Arcade--Roseville, CA Metro | Alpine County |
|  | Amador County |
|  | Calaveras County |
|  | El Dorado County |
|  | Nevada County |
|  | Placer County |
|  | Sacramento County |
|  | San Joaquin County |
|  | Yolo County |
|  | Douglas County |
| San Jose-Sunnyvale-Santa Clara, CA Metro | Monterey County |
|  | San Benito County |
|  | Santa Clara County |
|  | Santa Cruz County |
| Santa Rosa-Petaluma, CA Metro | Lake County |
|  | Mendocino County |
|  | Sonoma County |
| San Francisco-San Mateo-Redwood City, CA Metro Division | Alameda County |
|  | Contra Costa County |
|  | Marin County |
|  | Napa County |
|  | San Francisco County |
|  | San Mateo County |
|  | Solano County |
| San Diego-Carlsbad-San Marcos, CA Metro | San Diego County |
| Yuma, AZ Metro El Centro Metro | Yuma County |
|  | Imperial County |
| Santa Barbara, San Luis Obispo-Paso Robles, CA Metro | San Luis Obispo County |
|  | Santa Barbara County |
| Los Angeles-Long Beach-Glendale, CA Metro Division | La Paz County |
|  | Los Angeles County |
|  | Orange County |
|  | Riverside County |
|  | San Bernardino County |
|  | Ventura County |

## Forecast Methodology

Forecasts were created for the 14 commuting zone areas that comprise the state of California. Two main data inputs are mixed to create the forecast: job growth (in individual jobs) per local industry sector is associated with the types of local demographic types of household; together these factors are used to estimate housing unit demand. Individual jobs added to a region are associated with household level formation and housing need / consumption. Industry forecasts were drawn from Moody’s Analytics local area forecasts, demographic proportions and likelihoods were created using American Community Survey micro-data tabulations.



\*\* Sturtvesant and Chapman p26

### Forecast Determinations and Key Assumptions

Forecasts of housing needs were determined by the current associations of household types, household age group distributions, median wages, and unit types for each commuting zone as determined by the current type of associations for households. The forecasts assume that the various types of today’s household will be similar in the future. This is a key assumption that the average worker’s household in the future will have--for a given region and industry type, have on average the same number of children, wages, roommates, and live in the same type of house, on average. A second factor is that household types are grouped through the industry of the new job holder household only. We assume that people consume housing by partnering with people similar to themselves.

An additional methodology warning, given that major commuting zones are so large, variations in the types of housing across a large diverse area may reduce some of the natural variation in commuting zones. If there is a wide difference in say, the type of household of an average construction industry worker within regions of a combined commuting zone, then the forecast could over or under-estimate the amount of demand. For example, if manufacturing workers who live in Riverside / Inland Empire have fewer children than the same manufacturing worker living in Los Angeles County proper, then the average housing demand for the entire commuting zone could be mis-specified. Future work could re-create the county level forecast and include commuting zones to test whether labor market demand would differ widely.

### Forecast Procedure.

Industry Job Growth was used to determine the types of workers – along with the average age, income, household size, household type factors that are important for understanding the type of housing that they and their families would demand.

Industry employment levels for major level codes are created by Moody’s Economic’s regularly updated county-level econometric forecasts. Non-farm firm level (ie no self-employed firm) forecasts are provided for the following major table groups.

|  |  |  |
| --- | --- | --- |
| Mnemonic | Ind\_Code | Description |
| FERMA | 21 | Natural Resources and Mining |
| FE22A | 22 | Utilities |
| FE23A | 23 | Construction |
| FEMFA | 33 | Manufacturing |
| FE42A | 42 | Wholesale Trade |
| FERTA | 44 | Retail Trade |
| FERWA | 48 | Transportation and Warehousing |
| FE51A | 51 | Information |
| FEFIA | 52 | Financial Activities |
| FEPSA | 54 | Professional and Business Services |
| FELHA | 71 | Leisure and Hospitality |
| FE81A | 81 | Other Services |
| FEGVFA | 91 | Federal Government |
| FEGVSA | 92 | State Government |
| FEGVLA | 93 | Local Government |
| FEEHA | 61 | Education & Health Services |

BLS county level data were used to proportionally divide some provided major groups into the full NAICS code levels. For example, Education & Health Services is split into Educational Services (NAICS code 61) and Health Care and Social Assistance (NAICS code 62); Leisure and Hospitality is split into Arts, Entertainment, and Recreation (NAICS code 71) and Accommodation and Food Services (NAICS code 72); Professional and Business Services are divided into Professional, Scientific, and Technical Services (NAICS code 54); Management of Companies and Enterprises (NAICS code 55) and Administrative and Support and Waste Management and Remediation Services (NAICS code 56). Federal, State, and Local government are rolled into a general government.

### Associating Industry Growth to Household changes

### Age Distribution

The current age distribution for each industry type within each commuting zone (14 zones \* 21 industry groups) is calculated and is used to create an age distribution of current workers future workers. The distribution is created using American Community Survey IPUMS micro-data (XXX cite IPUMS) for 2013 (a one year sample). Three age group bins are created: workers under 30, 30-44, and 45-64. We assume that new workers are slightly younger than the existing workers and adjust the forecast using this assessment.

### Household Types

Workers, and multiple workers create households of different types, they room together, cohabitate, have children, share spaces with parents and children of varying ages. The number of primary workers cohabitating has a direct effect on the number of new housing units required. Distributions of different household types are created: 1 worker no children, 1 worker 1 child, 2 workers 1 child and so on. New workers are again assigned to the household types based on the 2013 distribution of household types.

Using the age distribution calculated in the previous step, a cross tabulation of the number of different age groups within each household distribution is calculated. The average number of working adults within each household is also calculated for each industry, region, age-group household type, and forecasted workers are thus transferred into new household groupings.

This is important because industry types would then be associated with certain types of housing demand through their household choices: e.g. in Los Angeles, Arts and Entertainment workers are primarily young, have lower incomes, and live in households with larger numbers adult households. New employment in Arts and Entertainment would then generally require fewer housing units per person at lower rent price points than new employment in Professional and Technical Services who are less likely to live in multiple person households. Housing demand is in this way elastic through the average wage level and household type demand of the specific industry’s worker.

### Income and Housing Tabulations for New Households

Household incomes are tabulated for every household type for different types and industry groups.

*<$99,999; $100,000 - 124,999; $125,000 – 149,999; and $150,000 to 200,000; $200,000-$300,000; $300,000-$400,000; $400,000-$600,000; and greater than $600,000.*

From this we obtain an income classification of the industry by household type in each region. These are then used to divide the current housing into four classifications: by ownership and single family / multi-family unit residence. Housing use for each household type - income - industry demographic is tabulated for each region and is used as a baseline for future demand. The primary assumption is that new households will consume similar types of housing.

In this manner, we capture the effect of consuming housing as a normal good (people will consume more housing as their incomes increase) through the proxies of wages, industries, and the number of adults living together in a household. If an area is growing high income jobs, then those workers will consume more housing by grouping with fewer people.

One mechanism not captured is the effect that continuing increases in prices could have on this decision. At what price point / elasticity does someone decide to accept another roommate, and how would continuing increases in housing prices suppress the demand for new units for these households at the margin.

1. USDA page on commuting zones <http://www.ers.usda.gov/data-products/commuting-zones-and-labor-market-areas/documentation.aspx> [↑](#footnote-ref-1)
2. David Dorn 2013 <http://www.ddorn.net/data.htm>; For more information (Dorn, 2009 "Essays on Inequality, Spatial Interaction, and the Demand for Skills." Dissertation University of St. Gallen no. 3613, September. Data Appendix, pp. 121-138. [↑](#footnote-ref-2)