

Value and Rent per ft^2 of Residential Parcels at Model Zone Level *

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Abstract

Value and rent per square foot of floor area of residential parcels were calculated. Missing sale values were imputed from SCAG parcel database, while rents were calculated from sale values by multiplying corresponding rent-value ratios, whose relationships with accessibility measures, building ages, and value per ft^2 can be obtained from Census data.

1 Introduction

The computation of value per square foot of floor area for residential parcels is nothing different from that for non-residential non-vacant parcels, while the calculation of rent per square foot of floor area is unique to residential parcels.

Value per ft^2 of floor area can be estimated from SCAG parcel database, in the same way as estimating other land use types. However, rent per ft^2 of floor area cannot be estimated from SCAG parcel database, as it has no data on rents. Therefore, rent data has to be obtained from other data sources.

In estimating rents for non-residential and non-vacant land uses, *Costar* office database were used. It provides data on both sales price and rents of office buildings. And rent-value ratio of office buildings was estimated as a function of accessibility measures, time, and city. By assuming that this relationship applies to all other non-residential and non-vacant land uses, rent-value ratio for those land uses were estimated. As values can be estimated from SCAG parcel database, rents were simply obtained by multiplying values estimated by the rent-value ratio estimated.

The above methodology can be used in estimating residential rents, but a better database providing rents and values exactly on residential housing units is available. It is the US census

*This report was prepared in conjunction with the University of California MRPI Project LA-Plan.

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Table 1: The correspondence between LA project land use code and SCAG 1993 code

LA project land use code			SCAG 1993 code	
Numerical	Alphabetic	Name	3-digit	Name
1	RS-SF	Single-family residential	111	Single family residential
2	RS-MF	Multi-family residential	112	Multi-family residential
3	RS-MX	Mixed residential	110	Residential
			113	Mobile homes and trailer parks
			114	Mixed residential
			115	Rural residential

data. It provides census tract ¹ average data on rents of rental housing units and on values of owner-occupied housing units. But it provides no information on floor area, so one cannot obtain value and rent per unit floor area from Census data alone, even at a rather aggregated average level.

Therefore, Census data and SCAG parcel data must be combined to estimate rent per ft^2 , given that no better data sources are available.

The problem is how to integrate those two data sets, as SCAG data is structure type based (see table 1). Census data is tenure type based with some information on building structure (see table 2). More specifically, it counts for each census tract the number of houses that have more than five and less than ten units. Beyond that, it provides no more detailed information on how many houses exactly have six units. Therefore, some correspondence of structure type between SCAG parcel data and Census data is assumed (see table 3).²

Some authors argued out of common sense that single family house corresponds to being owner occupied, while multi-family residential house corresponds to being rental. In fact, in Los Angeles County in the 2000 Census, 11% of single family housing units were rented while 28% of multi-family housing units are owned.

2 Data from Census

US 2000 Census data gives aggregate rents for rental housing units and aggregate values for owner-occupied housing units, by census tract and structure type. It also gives the total number of rental housing units and total number of owner-occupied housing units by census tract and structure type.

There are five land use types in SCAG parcel database (see table 1), and counterparts of three of them can be found in Census database (see table 3). In this project, mobile homes were treated the same way as multi-residential housing units, in estimating values from SCAG parcel database and calculate rent-value ratio from Census.

¹Actually rents and values data is available down to as geographically small as block average level. But census data is more accurate at more aggregate level because of manipulation by Census bureaus, like data swapping. So census tract average level was used

²More discussions about treatment of duplexes

Table 2: H32. TENURE BY UNITS IN STRUCTURE

	Census Tract 1011.10	Census Tract 1011.20
Total:	1,626	1,197
Owner occupied:	822	1,024
1, detached	793	1,024
1, attached	22	0
2	7	0
3 or 4	0	0
5 to 9	0	0
10 to 19	0	0
20 to 49	0	0
50 or more	0	0
Mobile home	0	0
Boat, RV, van, etc.	0	0
Renter occupied:	804	173
1, detached	349	129
1, attached	30	6
2	29	32
3 or 4	87	0
5 to 9	50	0
10 to 19	88	0
20 to 49	121	6
50 or more	50	0
Mobile home	0	0
Boat, RV, van, etc.	0	0

Table 3: Correspondence between SCAG data and Census data

Census classification	SCAG classification
1, detached	Single-family residential
1, attached	
2	Multi-family residential
3 or 4	
5 to 9	
10 to 19	
20 to 49	
50 or more	
Mobile home	Mobile home
Boat, RV, van, etc.	Not included

Knowns from Census database: (for a census tract)

H_{os} Number of single family owner occupied housing units

H_{om} Number of multi-family owner occupied housing units

H_{rs} Number of single family rental housing units

H_{rm} Number of multi-family rental housing units

V_{os} Average value of single family owner occupied housing units

V_{om} Average value of multi-family owner occupied housing units

R_{rs} Average monthly rent of single family rental housing units

R_{rm} Average monthly rent of multi-family rental housing units

Unknowns from Census:(for a census tract)

R_{os} Average monthly rent of single family owner occupied housing units

R_{om} Average monthly rent of multi-family owner occupied housing units

V_{rs} Average value of single family rental housing units

V_{rm} Average value of multi-family rental housing units

Note that all variables are in year 2000 except last sale price and last sale year, and all variables are for a specific census tract except for parameters.

Parameters (same for all census tracts):

$\alpha = 0.5$ The ratio of value for a single housing unit if it is rental to the value if it is owner occupied

$\gamma = 0.6$ The ratio of rent for a single housing unit to the rent if it is owner occupied

$\zeta = 0.9$ Adjustment of over-report of owner occupied housing units, set as the ratio of owner reported value and market value

$\theta = 0.8$ Percentage of floor area that is rentable for multi-family housing units

3 Calculating Rent-Value ratio from Census data

Rent-Value ratio for rental housing units is generally larger than that for owner occupied housing units of the same quality. Because there is favorable tax treatment of owner occupied housing units against rental housing units, so people are willing to pay more buying a house than "renting" a house lifetime. Therefore, the ratio of average rent of rental housing units and average value of owner occupied housing unit is a rather crude proxy of average rent-to-value ratio across both tenure types.

A more scientific approach was taken, which serves the objective that an average rent-value ratio over all tenure types in a census tract is desired. Take single family residential

land use type as an example, the ratio is defined as:

Definition 1.

$$\eta_s = \frac{H_{rs} * R_{rs} + H_{os} * R_{os}}{H_{rs} * V_{rs} + H_{os} * V_{os}}$$

However, data on average value of rental housing units and average rent of owner-occupied housing units are not reported in Census database. They are not directly observable in market, but they are very much related to rents of values that are observable in market. Therefore some assumptions about the relationship between observables and unobservables were made:

Rental housing units on average provide less service than that of owner occupied housing units.

Assumption 1. *Average rent of rental housing units is a fixed proportion (60%) of the average rent of owner occupied housing units.*

$$\frac{R_{rs}}{R_{os}} = \gamma = 0.6$$

Assumption 2. *Average value of rental housing units is a fixed proportion (50%) of the average value of owner occupied housing units.*

$$\frac{V_{rs}}{V_{os}} = \alpha = 0.5$$

Rent-value ratio depends on the tenure status of a residential housing unit, but it is less noxious to assume that rent-value ratio are equal across land use types.

Assumption 3. *Rent-value ratio of rental housing units are constant across single and multi land uses.*

$$\frac{V_{rs}}{R_{rs}} = \frac{V_{rm}}{R_{rm}}$$

Assumption 4. *Rent-value ratio of owner occupied housing units are constant across single and multi land uses.*

$$\frac{V_{os}}{R_{os}} = \frac{V_{om}}{R_{om}}$$

The four unknown rents and values variables can then be calculated from the above four equations. And then average rent-value ratio of single residential, multi residential, mobile homes can be calculated using definition 1. For mixed residential and rural residential land use types, Census does not provide data on rents of those types. Average rent-value ratio can be approximated by the weighted average of rent-value ratio of single family residential housing units and rent-value ratio of multi-family residential housing units. And the weight is the number of housing units that belong to either single or multi residential land use type.

4 Imputing housing values from SCAG parcel database

Value imputation follows closely the hedonic pricing literature. SCAG parcel database provides data on transaction prices and transaction date of a portion ³ of houses. SCAG also classified all parcels into five major categories according to structure types (see table 1. And according to geographical coordinates, data on the city a house locates and various accessibility measures can be calculated. Thus, a hedonic regression function can be estimated. And then housing value of every house in year 2000 can be obtained by either discounting the transaction prices from transaction year to base year 2000 or by predicting from regressors when data on both transaction price and transaction year are not available.

The regression framework for multi family residential housing is exactly the same as the one for non-residential non-vacant land uses:

$$\ln(vsq) = \beta_0 + \beta_1 fsub + \beta_2 cbd + \beta_3 fwy + \beta_4 ocean + \beta_5 saleyr + \beta_6 lu08 + \epsilon \quad (1)$$

While the regression equations for single residential housing is slightly different, which is modified McMillen-Redfearn specification:

$$\ln(v) = \beta_0 + \beta_1 \ln(f) + \beta_2 \ln(l) + \beta_3 fsub + \beta_4 cbd + \beta_5 fwy + \beta_6 ocean + \beta_7 saleyr + \beta_8 lu08 + \epsilon \quad (2)$$

where

$$\begin{aligned} \ln(v) &= \ln(\text{last sale price}) \\ \ln(f) &= \ln(\text{floor area}) \\ \ln(l) &= \ln(\text{lot size}) \\ \ln(vsq) &= \ln\left(\frac{\text{last sale price}}{\text{floor area}}\right) \end{aligned}$$

Single residential property has lower floor area ratio than multi residential properties, and usually the area that is not considered as improvement, and is therefore not counted in floor area contributes a significant portion of value to single residential properties. For example, a single house that has larger lawns and backyard is not going to be priced the same as one with smaller lawns and backyard with all other conditions/qualities being the same. The discrepancies in non-improvement area among single residential properties can be huge, but for multi-residential properties, the discrepancies are usually smaller, and in terms of per housing unit's rent burden or housing value, it can be negligible. So the regression framework for multi residential parcels is such that natural logarithm of value per unit of floor area is dependent variable and lot size is not included in either side of the regression equation, while natural logarithm of lot size and natural logarithm of improvement floor area are both independent variables and natural logarithm of last sale price is dependent variable for single residential parcels.

³provide exact number here!!

5 Results

In construction...

5.1 regression coefficients

5.2 value and rent per unit area at aggregated model zone level

For single family residential, add a compound measure of "Area"

Table 4: Estimated value and rent per unit floor area of
single residential housing unit

MZ ID	Model Zone name	# of parcels	Average land area (ft^2)	Average floor area (ft^2)	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
1	Downtown Los Angeles	3828	6693	3415	140.24	12.29
2	Westside	7437	8150	4047	254.05	11.06
3	Glendale	33428	7241	2478	226.52	13.76
4	East Los Angeles	29314	6717	1746	180.18	15.60
5	Maywood	4921	6328	1807	160.47	14.68
6	Florence	19949	5592	1647	145.24	14.55
7	Baldwin Hills	44849	6842	2217	215.89	16.32
8	Beverly Hills	26812	9204	3387	381.19	18.63
9	El Segundo	34565	6128	2213	273.71	16.48
10	Santa Monica	8950	7011	2737	317.09	16.70
11	Marina del Rey	8969	5656	2267	320.12	20.90
12	Westwod	3504	9618	4034	422.03	20.19
13	East Santa Monica Mtns	38803	12440	3018	358.38	18.13
14	Reseda - van Nuys	40477	10531	2281	223.54	17.74
15	East van Nuys	38568	8287	2040	180.55	21.20
16	Burbank	46577	8601	2074	224.56	17.19
17	Pasadena	26211	9596	2212	211.61	12.31
18	East Pasadena	24449	11075	2236	222.48	13.04
19	Rosemead	18833	7973	1848	183.74	16.31
20	Pico Rivera	33861	6917	1676	182.28	16.69
21	South Gate	17721	6978	1771	163.04	16.15
22	West Compton	39535	6308	1548	166.83	17.78
23	Torrance	18466	6623	2040	265.79	20.13
24	Palos Verdes	25737	8263	2187	286.07	15.11

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MZ ID	Model Zone name	# of parcels	Average land area (ft^2)	Average floor area (ft^2)	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
25	Carson	33216	6422	1640	195.19	19.18
26	Long Beach	845	6222	3589	137.54	14.04
27	Signal Hill	40932	6009	1987	225.01	15.99
28	Compton	34073	6586	1604	171.60	18.68
29	Hawaiian Gardens	37695	6268	1648	212.71	19.90
30	Cerritos	8019	5665	1826	219.12	22.88
31	Norwalk	69223	7134	1625	188.60	19.26
32	Industry	37692	10819	1761	172.74	15.14
33	Diamond Bar	24474	11449	1982	177.45	17.33
34	North El Monte	28433	8549	1732	179.44	17.11
35	West Covina	9430	7666	1562	168.46	18.89
36	Glendora	22254	10497	1797	175.18	16.74
37	La Verne - Azusa	29135	11947	1948	167.76	15.40
38	Altadena	38818	13038	1964	215.70	14.05
39	North Hills - Sylmar	44128	10345	1839	179.03	18.76
40	Chatsworth	32516	11509	2379	196.85	19.98
41	Calabasas	41728	13508	2392	221.91	17.37
42	Malibu - Point Dume	6950	26552	2851	423.12	21.46
43	Agoura Hills	6135	16468	2683	214.29	17.10
44	Lake Los Angeles	407	50683	1446	80.18	11.27
45	Lancaster - Palmdale	77168	17900	1989	102.84	13.04
46	Santa Clarita	46039	13602	2113	177.87	17.52
47	Ventura North County	29869	15968	1616	178.60	11.67
48	Thousand Oaks	80359	12967	2068	176.72	15.84
49	Oxnard - Camarillo	64318	7730	1734	179.44	16.53
50	Seal Beach - Los Alamitos	19620	7260	1992	205.88	16.24
51	Cypress	19302	6991	1806	174.09	17.08
52	South Buena Park	7628	8950	2078	174.33	19.71
53	Buena Park - La Habra	50543	9275	1989	164.60	14.50
54	Placentia	15055	8684	2226	162.53	16.23
55	Yorba Linda	19107	10479	2000	154.24	13.67
56	Huntington Beach	45177	7136	1960	166.55	14.25
57	Garden Grove	36065	8413	1698	179.14	20.04
58	Anaheim	20730	8388	1778	168.65	17.52
59	North Tustin	51022	12299	2200	158.48	11.88
60	Costa Mesa	15325	7370	2014	214.18	12.53
61	Santa Ana	41388	8038	1754	181.36	18.60
62	Tustin	9028	7081	1933	200.46	21.08
63	Newport Coast	40020	9642	2119	178.05	10.98

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MZ ID	Model Zone name	# of parcels	Average land area (ft^2)	Average floor area (ft^2)	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
64	Irvine	8926	15220	2694	212.32	23.15
65	East Orange County	67333	9871	2107	192.62	18.50
66	San Juan Capistrano	37092	10973	2073	161.23	11.27
67	Montclair - Chino	47441	9865	1931	118.97	11.47
68	Ontario	9618	8129	1517	109.05	13.13
69	Rancho Cucamonga	17748	6759	1639	121.84	17.17
70	Upland	50316	10666	2191	113.60	11.12
71	Fontana	43353	9437	1639	96.53	13.35
72	Colton	25915	12697	1675	86.66	11.53
73	San Bernardino	12246	8742	1480	84.09	12.35
74	Redlands - Highland	26200	9983	1862	82.21	9.58
75	Crestline	65293	11038	1599	91.10	11.90
76	Victorville	83148	28623	1856	65.52	9.32
77	Lucerne Valley	14148	48824	1588	46.34	5.44
78	San Bernardino Mountains	53804	13960	1650	80.50	6.75
79	Northwest Mojave	1228	56181	1331	33.12	3.83
80	Northeast Mojave	15532	45107	1451	29.99	4.25
81	Corona	52159	13370	2397	127.01	13.17
82	East Riverside	59723	13672	1725	128.73	15.87
83	Indio	21242	9309	2003	98.26	11.68
84	East Mojave	9577	20660	1863	87.72	6.90
85	Lake Elsinore	42770	17325	2212	113.05	11.43
86	Riverside	10860	12243	1693	124.91	13.80
87	Moreno Valley	61119	14145	2052	113.12	14.58
88	Perris	31426	17635	1738	116.97	17.27
89	Banning	31466	14279	1912	105.26	11.68
90	Hemet	40664	25682	1977	104.72	11.20
91	Temecula	37890	13603	2342	129.62	14.86
92	Palm Springs	23835	12187	1931	110.19	12.25
93	La Quinta	28447	14886	2668	110.24	8.13
94	Cathedral City	11766	10207	2193	104.13	10.58
95	Palm Desert	14317	12002	2345	104.04	9.07
96	Imperial Valley	8146	9190	3273	19.32	2.15
97	El Centro	18182	9988	3557	25.08	11.26

Table 5: Estimated value and rent per unit floor area of
multi residential housing unit

MZ ID	Model Zone name	# of parcels	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
1	Downtown Los Angeles	4846	79.82	7.62
2	Westside	5236	90.70	4.46
3	Glendale	4780	99.87	6.82
4	East Los Angeles	2596	101.66	9.69
5	Maywood	2440	102.97	10.31
6	Florence	2255	83.26	9.15
7	Baldwin Hills	8596	97.39	8.38
8	Beverly Hills	7202	124.02	6.87
9	El Segundo	6169	139.79	9.50
10	Santa Monica	2617	142.77	8.44
11	Marina del Rey	3069	165.84	12.12
12	Westwod	895	165.21	8.84
13	East Santa Monica Mtns	3109	108.80	6.35
14	Reseda - van Nuys	1891	92.79	8.42
15	East van Nuys	3055	74.22	10.01
16	Burbank	5687	113.85	9.99
17	Pasadena	2995	99.20	6.52
18	East Pasadena	1498	104.13	6.94
19	Rosemead	2305	104.63	10.34
20	Pico Rivera	1761	89.53	9.37
21	South Gate	2099	89.68	9.89
22	West Compton	2780	89.52	10.74
23	Torrance	1144	117.15	9.99
24	Palos Verdes	2546	123.25	7.39
25	Carson	1018	106.96	11.95
26	Long Beach	2292	86.36	9.29
27	Signal Hill	7818	127.19	10.14
28	Compton	2081	87.04	10.71
29	Hawaiian Gardens	1463	110.84	11.88
30	Cerritos	683	140.01	16.38
31	Norwalk	2764	94.23	11.08
32	Industry	1394	97.60	9.82
33	Diamond Bar	579	112.20	12.46
34	North El Monte	3146	107.03	11.44
35	West Covina	585	88.42	11.51

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MZ ID	Model Zone name	# of parcels	Value per (<i>ft</i> ²) floor area	Annual rent per (<i>ft</i> ²) floor area
36	Glendora	933	99.08	10.94
37	La Verne - Azusa	2289	101.72	10.75
38	Altadena	874	110.59	8.24
39	North Hills - Sylmar	562	82.62	9.86
40	Chatsworth	1061	96.71	11.38
41	Calabasas	666	103.01	9.31
42	Malibu - Point Dume	255	285.77	16.23
43	Agoura Hills	1055	141.76	12.95
44	Lake Los Angeles	13	57.34	8.81
45	Lancaster - Palmdale	1805	52.54	7.72
46	Santa Clarita	1601	102.69	11.52
47	Ventura North County	2807	128.32	9.51
48	Thousand Oaks	16355	133.58	13.70
49	Oxnard - Camarillo	12980	135.88	14.23
50	Seal Beach - Los Alamitos	3636	123.18	10.61
51	Cypress	1784	117.54	13.43
52	South Buena Park	756	76.68	10.15
53	Buena Park - La Habra	6223	137.63	14.02
54	Placentia	2564	124.86	14.48
55	Yorba Linda	1815	115.38	11.78
56	Huntington Beach	8916	169.15	16.57
57	Garden Grove	6295	129.73	16.70
58	Anaheim	2908	113.33	13.54
59	North Tustin	3691	137.72	11.91
60	Costa Mesa	4597	163.03	10.93
61	Santa Ana	5677	137.56	16.09
62	Tustin	1968	90.94	11.12
63	Newport Coast	7567	149.27	10.46
64	Irvine	1424	138.44	16.22
65	East Orange County	3502	108.07	11.74
66	San Juan Capistrano	6351	154.13	12.26
67	Montclair - Chino	5613	122.69	13.74
68	Ontario	2994	121.99	16.70
69	Rancho Cucamonga	6658	91.67	14.79
70	Upland	6858	103.94	11.93
71	Fontana	1406	64.78	10.43
72	Colton	3659	58.76	8.98
73	San Bernardino	951	47.57	7.90
74	Redlands - Highland	2946	52.81	7.11

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MZ ID	Model Zone name	# of parcels	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
75	Crestline	3099	49.09	7.43
76	Victorville	3016	32.22	5.33
77	Lucerne Valley	598	41.32	5.56
78	San Bernardino Mountains	1829	58.58	5.68
79	Northwest Mojave	47	12.33	1.59
80	Northeast Mojave	694	11.20	1.78
81	Corona	1968	142.34	17.23
82	East Riverside	1557	130.14	18.56
83	Indio	349	79.35	10.97
84	East Mojave	259	72.77	6.68
85	Lake Elsinore	685	94.86	11.23
86	Riverside	853	132.74	16.89
87	Moreno Valley	1114	135.72	20.34
88	Perris	1250	113.64	19.02
89	Banning	868	104.22	13.34
90	Hemet	2619	112.04	13.87
91	Temecula	468	92.66	12.54
92	Palm Springs	1566	119.11	14.95
93	La Quinta	5430	117.05	9.69
94	Cathedral City	2386	398.14	44.56
95	Palm Desert	8893	105.46	10.41
96	Imperial Valley	304	71.82	7.87
97	El Centro	1115	114.79	12.57

Table 6: Estimated value and rent per unit floor area of **mixed residential housing unit**

MZ ID	Model Zone name	# of parcels	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
1	Downtown Los Angeles	0		
2	Westside	0		
3	Glendale	0		
4	East Los Angeles	3469	72.91	6.54
5	Maywood	2597	75.42	7.16
6	Florence	2270	62.34	6.45
7	Baldwin Hills	170	98.84	8.05
8	Beverly Hills	41	38.67	2.07

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MZ ID	Model Zone name	# of parcels	Value per (<i>ft</i> ²) floor area	Annual rent per (<i>ft</i> ²) floor area
9	El Segundo	634	69.62	4.43
10	Santa Monica	0		
11	Marina del Rey	0		
12	Westwod	0		
13	East Santa Monica Mtns	0		
14	Reseda - van Nuys	0		
15	East van Nuys	0		
16	Burbank	0		
17	Pasadena	13	66.07	4.07
18	East Pasadena	20	102.41	6.21
19	Rosemead	1183	73.93	6.79
20	Pico Rivera	286	67.26	6.40
21	South Gate	1722	68.21	7.03
22	West Compton	2558	58.08	6.44
23	Torrance	322	91.96	7.37
24	Palos Verdes	268	110.02	6.08
25	Carson	180	107.23	10.91
26	Long Beach	441	55.25	5.90
27	Signal Hill	1916	102.43	7.72
28	Compton	1700	64.79	7.36
29	Hawaiian Gardens	0		
30	Cerritos	0		
31	Norwalk	539	84.15	8.94
32	Industry	349	68.81	6.19
33	Diamond Bar	0		
34	North El Monte	509	72.32	7.11
35	West Covina	94	73.75	8.59
36	Glendora	0		
37	La Verne - Azusa	0		
38	Altadena	16	72.29	4.82
39	North Hills - Sylmar	196	69.31	7.47
40	Chatsworth	0		
41	Calabasas	0		
42	Malibu - Point Dume	1		
43	Agoura Hills	0		
44	Lake Los Angeles	0		
45	Lancaster - Palmdale	0		
46	Santa Clarita	52	65.22	6.63
47	Ventura North County	370	210.55	14.15

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MZ ID	Model Zone name	# of parcels	Value per (<i>ft</i> ²) floor area	Annual rent per (<i>ft</i> ²) floor area
48	Thousand Oaks	0		
49	Oxnard - Camarillo	2		
50	Seal Beach - Los Alamitos	1120	188.91	15.34
51	Cypress	58	179.91	18.59
52	South Buena Park	0		
53	Buena Park - La Habra	507	185.45	17.33
54	Placentia	17	233.01	25.01
55	Yorba Linda	0		
56	Huntington Beach	0		
57	Garden Grove	0		
58	Anaheim	14	92.74	10.22
59	North Tustin	0		
60	Costa Mesa	0		
61	Santa Ana	0		
62	Tustin	0		
63	Newport Coast	50	29.30	1.88
64	Irvine	0		
65	East Orange County	0		
66	San Juan Capistrano	0		
67	Montclair - Chino	4	73.88	7.35
68	Ontario	0		
69	Rancho Cucamonga	134	332.03	49.15
70	Upland	0		
71	Fontana	0		
72	Colton	126	584.81	81.03
73	San Bernardino	235	660.47	101.96
74	Redlands - Highland	0		
75	Crestline	10	548.34	73.70
76	Victorville	29	1120.22	162.92
77	Lucerne Valley	21	3006.02	359.21
78	San Bernardino Mountains	140	1290.15	109.65
79	Northwest Mojave	69	4023.20	474.21
80	Northeast Mojave	18	4150.18	601.30
81	Corona	0		
82	East Riverside	23	465.04	59.28
83	Indio	245	404.07	50.62
84	East Mojave	7	4207.23	342.90
85	Lake Elsinore	0		
86	Riverside	0		

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MZ ID	Model Zone name	# of parcels	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
87	Moreno Valley	0		
88	Perris	140	194.17	28.98
89	Banning	54	445.79	50.41
90	Hemet	459	204.72	22.49
91	Temecula	0		
92	Palm Springs	0		
93	La Quinta	24	247.02	18.57
94	Cathedral City	600	340.22	35.52
95	Palm Desert	0		
96	Imperial Valley	4210	10.82	1.20
97	El Centro	551	26.75	2.97

Table 7: Estimated value and rent per unit floor area of **mobile homes**

MZ ID	Model Zone name	# of parcels	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
1	Downtown Los Angeles	21156	89.47	7.90
2	Westside	5338	98.78	4.89
3	Glendale	5804	112.14	7.21
4	East Los Angeles	7530	96.13	8.73
5	Maywood	1550	108.61	10.21
6	Florence	21260	92.18	9.17
7	Baldwin Hills	7568	103.78	8.13
8	Beverly Hills	2452	119.80	5.88
9	El Segundo	4108	143.15	8.92
10	Santa Monica	1076	175.11	9.16
11	Marina del Rey	2784	239.00	16.58
12	Westwod	32	160.96	
13	East Santa Monica Mtns	1662	107.58	5.52
14	Reseda - van Nuys	153	134.83	10.78
15	East van Nuys	767	105.43	12.95
16	Burbank	1434	120.74	9.37
17	Pasadena	2892	98.79	6.01
18	East Pasadena	169	117.48	7.17
19	Rosemead	25	71.53	6.61
20	Pico Rivera	2037	104.94	9.92

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MZ ID	Model Zone name	# of parcels	Value per (<i>ft</i> ²) floor area	Annual rent per (<i>ft</i> ²) floor area
21	South Gate	2532	95.61	10.12
22	West Compton	6352	105.10	11.43
23	Torrance	1724	201.97	15.84
24	Palos Verdes	4137	117.39	6.43
25	Carson	813	119.91	11.96
26	Long Beach	0		
27	Signal Hill	305	315.62	22.94
28	Compton	808	111.34	12.57
29	Hawaiian Gardens	22	112.07	10.54
30	Cerritos	0		
31	Norwalk	794	114.21	12.01
32	Industry	67	144.01	13.31
33	Diamond Bar	3	425.12	41.93
34	North El Monte	15	95.67	9.21
35	West Covina	6	271.03	31.46
36	Glendora	103	67.69	6.63
37	La Verne - Azusa	566	105.07	9.88
38	Altadena	134	128.17	8.65
39	North Hills - Sylmar	574	132.26	13.95
40	Chatsworth	14	5.11	0.53
41	Calabasas	200	153.98	12.10
42	Malibu - Point Dume	3		
43	Agoura Hills	1	2375.19	190.28
44	Lake Los Angeles	56	42.09	6.00
45	Lancaster - Palmdale	538	106.83	13.87
46	Santa Clarita	64	144.32	14.65
47	Ventura North County	2232	104.77	6.92
48	Thousand Oaks	1159	110.60	10.01
49	Oxnard - Camarillo	1862	117.99	10.99
50	Seal Beach - Los Alamitos	314	149.58	13.07
51	Cypress	1		
52	South Buena Park	12	82.12	9.47
53	Buena Park - La Habra	82	109.27	9.59
54	Placentia	9	77.25	8.11
55	Yorba Linda	4		
56	Huntington Beach	1297	115.89	10.17
57	Garden Grove	196	121.81	13.85
58	Anaheim	525	100.86	10.80
59	North Tustin	534	88.63	6.79

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MZ ID	Model Zone name	# of parcels	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
60	Costa Mesa	48	202.76	13.01
61	Santa Ana	402	108.24	11.43
62	Tustin	0		
63	Newport Coast	2228	128.82	8.36
64	Irvine	3		
65	East Orange County	1035	176.64	16.96
66	San Juan Capistrano	577	125.61	8.95
67	Montclair - Chino	608	65.54	6.46
68	Ontario	249	58.19	7.16
69	Rancho Cucamonga	15	48.97	6.93
70	Upland	32	47.98	4.73
71	Fontana	144	38.42	5.44
72	Colton	722	33.72	4.61
73	San Bernardino	713	31.48	4.78
74	Redlands - Highland	402	10.57	1.26
75	Crestline	100	32.07	4.28
76	Victorville	1617	26.85	3.86
77	Lucerne Valley	153	19.59	2.37
78	San Bernardino Mountains	317	25.39	2.25
79	Northwest Mojave	40	3.31	0.39
80	Northeast Mojave	2536	10.06	1.46
81	Corona	871	72.51	7.70
82	East Riverside	45	83.88	10.61
83	Indio	2772	57.86	7.10
84	East Mojave	871	41.75	3.46
85	Lake Elsinore	1680	79.98	8.25
86	Riverside	14	76.11	8.56
87	Moreno Valley	580	68.88	9.13
88	Perris	2716	62.04	9.34
89	Banning	2300	54.14	6.03
90	Hemet	6735	66.00	7.12
91	Temecula	1257	78.56	9.18
92	Palm Springs	947	63.64	7.17
93	La Quinta	82	134.58	10.56
94	Cathedral City	3362	47.53	4.86
95	Palm Desert	2944	63.19	5.55
96	Imperial Valley	4210	10.82	1.20
97	El Centro	551	26.75	2.97

Table 8: Estimated value and rent per unit floor area of **rural** residential housing units

MZ ID	Model Zone name	# of parcels	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
1	Downtown Los Angeles	0		
2	Westside	0		
3	Glendale	0		
4	East Los Angeles	0		
5	Maywood	0		
6	Florence	0		
7	Baldwin Hills	0		
8	Beverly Hills	0		
9	El Segundo	0		
10	Santa Monica	0		
11	Marina del Rey	0		
12	Westwod	0		
13	East Santa Monica Mtns	0		
14	Reseda - van Nuys	0		
15	East van Nuys	0		
16	Burbank	0		
17	Pasadena	0		
18	East Pasadena	0		
19	Rosemead	0		
20	Pico Rivera	0		
21	South Gate	0		
22	West Compton	0		
23	Torrance	0		
24	Palos Verdes	0		
25	Carson	0		
26	Long Beach	0		
27	Signal Hill	0		
28	Compton	0		
29	Hawaiian Gardens	0		
30	Cerritos	0		
31	Norwalk	0		
32	Industry	1		
33	Diamond Bar	0		
34	North El Monte	0		
35	West Covina	0		

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MZ ID	Model Zone name	# of parcels	Value per (<i>ft</i> ²) floor area	Annual rent per (<i>ft</i> ²) floor area
36	Glendora	1		
37	La Verne - Azusa	48		
38	Altadena	321		
39	North Hills - Sylmar	0		
40	Chatsworth	0		
41	Calabasas	3148		
42	Malibu - Point Dume	1013		
43	Agoura Hills	649		
44	Lake Los Angeles	8974		
45	Lancaster - Palmdale	3627		
46	Santa Clarita	2074		
47	Ventura North County	4		
48	Thousand Oaks	9		
49	Oxnard - Camarillo	2		
50	Seal Beach - Los Alamitos	11		
51	Cypress	0		
52	South Buena Park	4		
53	Buena Park - La Habra	15		
54	Placentia	4		
55	Yorba Linda	7		
56	Huntington Beach	22		
57	Garden Grove	0		
58	Anaheim	7		
59	North Tustin	37		
60	Costa Mesa	0		
61	Santa Ana	12		
62	Tustin	18		
63	Newport Coast	10		
64	Irvine	7		
65	East Orange County	5		
66	San Juan Capistrano	0		
67	Montclair - Chino	1		
68	Ontario	0		
69	Rancho Cucamonga	2		
70	Upland	277	49.17	4.98
71	Fontana	0		
72	Colton	0		
73	San Bernardino	0		
74	Redlands - Highland	16	34.90	4.28

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MZ ID	Model Zone name	# of parcels	Value per (ft^2) floor area	Annual rent per (ft^2) floor area
75	Crestline	338	42.73	5.74
76	Victorville	9964	33.65	4.89
77	Lucerne Valley	5048	25.28	3.02
78	San Bernardino Mountains	1907	32.06	2.73
79	Northwest Mojave	3426	7.91	0.93
80	Northeast Mojave	7746	16.81	2.44
81	Corona	1248	51.53	5.51
82	East Riverside	3		
83	Indio	122	34.79	4.36
84	East Mojave	3431	31.44	2.56
85	Lake Elsinore	1048	61.41	6.31
86	Riverside	5	38.01	4.50
87	Moreno Valley	1920	49.50	6.50
88	Perris	7052	44.30	6.61
89	Banning	2713	40.38	4.57
90	Hemet	9810	49.76	5.47
91	Temecula	597	61.13	7.24
92	Palm Springs	995	31.14	3.61
93	La Quinta	783	40.85	3.07
94	Cathedral City	0		
95	Palm Desert	61	50.53	4.56
96	Imperial Valley	4210	10.82	1.20
97	El Centro	551	26.75	2.97

6 Robustness check

sensitivity analysis of parameter values
 comparison of regression functional forms

7 Discussions

7.1 Errors in Census data

Census provides a summary table about tenure by number of housing units in a structure. They counted the number of housing units that fall into a certain
 For confidentiality reason, Census manipulates data so that no individuals can be identified with the help of public available Census data. The data type that is most likely to be altered is frequency of certain variables that are describes population characteristics. In this project, the number of housing units that are

Reference

Census 2000 Database, H032, H054, H067, H079