

Rental equivalence estimates of national and regional housing expenditures

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The Personal Consumption Expenditures (PCE) series published by the Bureau of Economic Analysis (BEA) includes estimates of rent expenditures and owner-occupied housing expenditures for the benchmark year 2001. The main data sources are the Residential Financial Survey (RFS), carried out in conjunction with the decennial censuses dating back to 1960, and the biennial American Housing Survey. The RFS was discontinued after 2001. In addition to being a large component of the National Income and Product Accounts (NIPA), housing expenditures are estimated in several different branches of the Regional Income and Product divisions of BEA, including for state-level PCE, Gross Domestic Product (GDP) by state, and the Regional Price Parities (RPP) series. The latter uses a combination of microdata from the Bureau of Labor Statistics (BLS) data and the Census' American Community Survey (ACS), both through special interagency agreements, and not available to the public. This paper applies the rental equivalence method that could potentially be used as the basis for both national and regional housing expenditure series. The estimates are based on publicly available data from the ACS, called Public Use Micro Sampling data or PUMS, and to a lesser degree from Zillow website data, but BEA could draw from the full ACS which totals over 3 million housing observations a year.

Background

The current method for imputing owner-occupied expenditures relies primarily on extrapolations of the owner-occupied rent (OOR) expenditures from their benchmark value in 2001.¹ The extrapolations involved the CPI rent index and a current value of residential housing index from the estimates of capital stock in current prices.² Rents rose relatively smoothly after 2000 but home values increased very rapidly so

¹ The Residential Financial Survey sampled owner occupied residents and landlords with special reference to their mortgages and source of finance as well as lenders. The sample size of the RFS in 2001 was about 69,000 units. The NIPA estimates are derived on the RV ratios from the 2001 RSF. For landlords, the rents were derived from receipts from tenants and either the purchase price if between 1996 and 2000 or an estimate of value by the owner of its price in 2001. For multi-unit buildings the receipts were reported as a total as was the value, so the RV refers to the building, and a per unit ratio is calculated.

² The survey responses for owner-occupied residences (OOR) allowed calculation of RV ratios for less than half the units. The West, Midwest, South and Northeast were the regions reported, but BEA used rent to value ratios for all of the United States. The ratios were arrayed by value classes ranging from under \$20,000 to over \$500,000 in 2001

that the rent to value ratios declined. This is illustrated in Table 1 that shows the NIPA estimates from 2000 to 2015. As home values fell post 2006-08, rent to value ratios rose again.

Table 1. Annual Expenditures and Implicit Rent to Value ratios 2000-2015 NIPA

		2000	2003	2006	2009	2012	2015
NIPA							
Annual Totals (\$ billions)	Renters	228	249	287	360	418	488
	Owner-Occupied	769	913	1109	1210	1266	1411
	Total Renters + Owners	997	1162	1396	1570	1683	1899
	Utilities	188	217	266	289	291	313
Monthly \$	Renters	539	570	640	758	827	933
	Owner-Occupied	930	1056	1237	1321	1398	1551
	Implicit OO Rent:Value	9.9%	9.2%	7.9%	8.8%	9.9%	9.8%

Sources: NIPA (National Income and Product Accounts) Table 2.4.5 Personal Consumption Expenditures, BEA website, author's calculations of Monthly \$ and Implicit OO Rent:Value.

In the next section we examine the rent to value (RV) ratios during the period, and propose using the rental-equivalence method for the owner-occupied rent imputations. The last section discusses the state-level results. One of the advantages of the rental equivalence method is that all rents and owner-occupied rent expenditures would be consistent across different BEA national and regional series, and could be applied to smaller geographic units such as metropolitan areas if we were to use the ACS microdata.

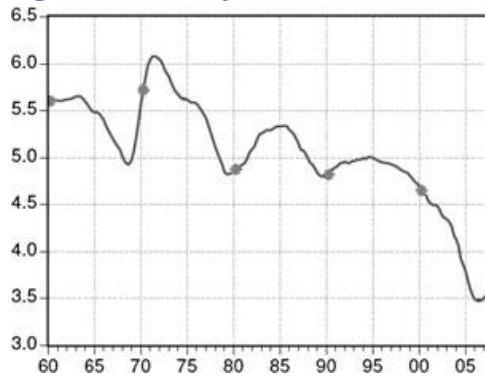
Rent to Value (RV) ratios

Davis, Lehnert and Martin (2008) made estimates of the RV ratio for OOR in the US over the period 1960 to 2005. Their Figure 1 (p.283) is reproduced below, where DCH refers to the Decennial Census of Housing. The RV ratios range from 5.8% in 1970 (single family homes only) to 4.8% in 1990, beginning at 5.6% in 1960. Even in this 30 year period there is a slight drift downward which continues to 2000, after which their estimates go to 3.5% in 2005, continuing a downward trend that is even more pronounced.

prices. Rental receipts were also arrayed into "percent of value class" categories, and the RV ratios are the midpoints of the latter weighted by the count of tenant-occupied units in each value class. For example, in the \$125,000-\$149,999 class, the RV was found to be 7.4%. Lastly, the number of owner-occupied units in each value class was obtained from the American Housing Survey² (AHS): the number of units times the mid-point of the value class was multiplied by the RV ratios. Unfortunately, the AHS had somewhat different value classes than the RSF, necessitating further adjustments. The final estimate of owner-occupied expenditures required separate treatment of mobile homes and farm residences.

Their pattern over the period is similar to the NIPA estimates, albeit at a much lower level. The BEA RV ratios in 2001 ranged from 14.5% for OO units valued at less than \$20,000 to 6.3% for units above \$500,000, and averaged 7.3% across all value classes in 2001 (Aten, Figueroa and Martin 2012, Table 5, p.12). Because the Public Use Microdata Sample (PUMS)⁴ is derived from a much larger sample and provides more housing unit details, we are able to report the RV ratios at a more disaggregate level than either DLM or present BEA practice. We turn to the PUMS RV ratios, and the Zillow RV ratios below.

Figure 1. Ratio of Annual Rents to Prices (%), 1960:1–2007:2



Note: Starred points indicate direct observations from DCH.

Table 2 shows three rows of RV ratios for single-family and multi-family dwellings (condos) for 2015. The first is the ‘pure’ Zillow RV, directly from their site. The second uses Zillow home values but PUMS rents and the third row shows the PUMS values and rents. Zillow only began estimating rents in 2010 and they are ‘scraped’ directly from the internet, where most observations are from commercial sources in predominantly urban areas. This may explain the much higher rents than those sampled in the ACS. For this reason, we henceforth use only Rents from the PUMS, applying them to the Zillow and the PUMS home values.

Table 2. Rent to Value ratios: 2000 – 2015 All Homes

	RV All Homes	2000	2003	2006	2009	2012	2015
1	Zillow Home Values, Zillow Rents	-	-	-	-	9.2%	9.0%
2	Zillow Home Values, PUMS Rents	5.1%	4.4%	3.7%	5.1%	6.1%	5.4%
3	PUMS Home Values, PUMS Rents	5.6%	4.7%	4.0%	4.9%	5.6%	5.4%

Sources: Zillow: inverse of Price to Rent data and estimates of median home values from Zillow.com/Research/Data; PUMS rents and home values from the U.S. Census Bureau. Zillow has rent data from 2012 onwards.

⁴ Another Census source of rent to values ratios is the Decennial Census of Housing, where the ratios beginning in 1940 were, at each 10-year intervals, 11.0, 6.9, 7.2, 7.6, 6.2, 6.8, and 6.0 percent in 2000. The ratios were of gross rent and gross value both unadjusted for prices.

Figures 2 and 3 show the RV ratios for 1,2,3,4 and 5 bedroom homes using only Zillow values and PUMS home values respectively (and PUMS rents for both). Clearly they do not remain stable over the period, nor are they constant across house size, although the 2-bedroom RVs are generally higher than the others, with 5-bedroom RVs the lowest.

Figure 2. ZILLOW Rent to Value ratios 2000-2015

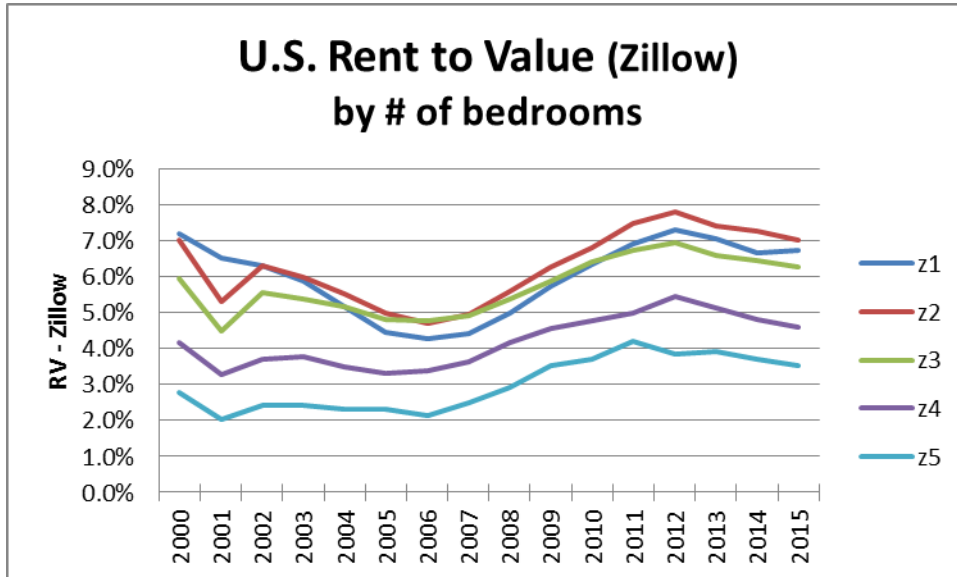
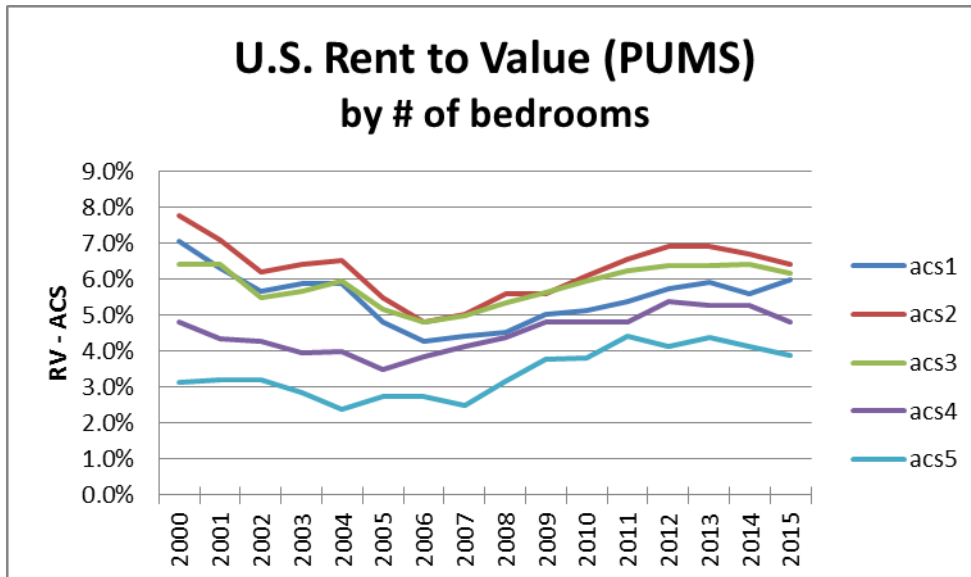


Figure 3. PUMS Rent to Value ratios 2000-2015



In Table 3, the values are shown for the series of 2 bedroom homes. The Rent : Value ratio equal the Monthly Rents times 12 divided by the Median Values.

Table 3. Rent to Value ratios for 2 Bedroom Homes between 2000-2015: Zillow and PUMS

2 Bedrooms	2000	2003	2006	2009	2012	2015
Rent:Value						
Zillow	7.0%	6.0%	4.7%	6.3%	7.8%	7.0%
PUMS	7.8%	6.4%	4.8%	5.6%	6.9%	6.4%
Median Value \$						
Zillow	94,019	120,111	165,290	133,618	115,254	136,812
PUMS	85,000	112,500	162,500	150,000	130,000	150,000
Monthly Rents \$						
PUMS	550	600	650	700	750	800

Sources: Zillow estimates of median home values ; ACS PUMS value of home reported by home owner and observed contract rents (utilities excluded) ; rent:value ratios are the rents times 12 divided by the median value.

Robert Shiller (2015, p.20) in his revised edition of *Irrational Exuberance* develops a series on real house prices showing that 1997 to 2006 was the period of most rapid increase in house values ever experienced in the United States since the beginning of his series in 1890. Table 3 confirms this rapid growth in 2-bedroom home values in both datasets (76% for Zillow between 2000 and 2006, and 91% in the PUMS). Growth in current value rents were not particularly rapid (18% between 2000 and 2006) so that the RV ratio substantially decreased from 2000 to 2006, from over 7% to under 5% in both Zillow and PUMS. By 2015 the rent to value ratios had rebounded approaching their levels in 2000 due to the substantial adjustment in house values following the financial crisis of 2008.

Rental Equivalence

Given that the Residential Financial Survey used by BEA is no longer available, this paper considers the rental equivalence approach using currently available ACS data as an alternative for estimating housing expenditures. Conceptually, the user cost approach might suggest the use of house values. Although appealing [Katz (2009) and Poole, Ptacek, and Verbrugge (2005)], the user cost approach has proved problematic when implemented, particularly in periods of rapidly rising or falling house prices. The use of rental equivalence where units of OOR are assumed to provide services at a price for which comparable housing would rent is much simpler to implement. This is the practice in the European Union, where average rents are collected for a stratified classification of housing and applied to the physical quantity of owner-occupied residences in each stratum. In the United States the American Community Survey (ACS) since 2000 has provided a very rich data set on housing.

In our previous work, Aten, Figueroa and Martin (2012) estimated the relationship between rents and owner costs in the Consumer Price Index (CPI) and applied it to the rents in the ACS⁵. In this paper, we use a more direct approach and rely solely on the housing data from the ACS. We estimate the weighted mean tenant rents for a stratified classification of housing in the PUMS file (type of structure, number of bedrooms, total number of rooms and age of the unit), and multiply by the number of owner-occupied units in the same strata. The results for the U.S. are shown in Table 4.

Table 4. Annual Expenditures and Implicit Rent to Value ratios 2000-2015 PUMS

		2000	2003	2006	2009	2012	2015
PUMS							
Annual Totals (\$ billions)	Renters	238	277	317	374	424	482
	Owner-Occupied	454	537	654	744	778	841
	Total Renters + Owners	692	813	971	1118	1202	1323
	Utilities	188	222	284	304	301	317
Units (millions)	Renters	35	36	37	40	42	44
	Owner-Occupied	69	72	75	76	75	76
	Median Value \$	112,500	137,500	187,500	180,000	170,000	190,000
Monthly \$	Renters	562	634	707	788	840	921
	Owner-Occupied	549	621	729	813	860	925
	Implicit OO Rent:Value	5.9%	5.4%	4.7%	5.4%	6.1%	5.8%

Sources: PUMS public files, author's calculations.

The implicit values obtained from the PUMS data, range from 5.9% in 2000 down to 4.7% in 2006 and back up to 5.8% in 2015. A difference worth noting between tenant rent estimates in the NIPAs and the PUMS data is that Tenant rents in NIPA are based on the Census of Housing after costs of utilities, appliances and furniture are removed (BEA, 2012, Ch. 5-40). BEA estimates the production of power, fuels, water and sewer for the United States as a whole and then allocates a portion as final product to residential housing services. In this paper, a Country-Product-Dummy⁶ (CPD) equation estimates the utility component for those

⁵ The rents and owner-equivalent rents in the BLS housing survey were averaged over 2005-2009 by type of structure across 38 BLS index areas.

⁶ The CPD equation (Summers, 1972) regresses the log of the proportion of utilities (monthly electricity and gas, annual water and sewer and other fuel costs divided by 12) out of the rent (for observations where utilities are excluded from the rent), on characteristics of the housing units: type of structure, number of bedrooms and total

observations where utilities are included in rent, and subtracts the estimate so that all rents are net of utilities. Also, Mobile homes are estimated separately in the NIPAs, but included in the proposed rental equivalence results shown here. Lastly, in the NIPA methodology the census year tenant rents are updated in current prices by use of the CPI index for rental housing, whereas PUMS has annual current prices.

State Level Results

What are the patterns of rents, rent to value ratios and imputed owner-occupied expenditures at the state level? Although we have presented the national results first, the rental equivalence estimates were built up from the state level. In principle this could be done at the metropolitan area level and perhaps at an even finer geographic level of detail with access to the microdata underlying the PUMS. One disadvantage of going below the national level is that the finer the stratification, the greater the variance in the size of the sampling units, and national expenditure totals for imputed owner-occupied homes will vary depending on the stratification. On the other hand, the estimates will be more representative of the data and all totals will be consistent from the smallest to the largest (national) unit⁷.

There are two estimating equations. The first estimates the percent expenditures on utilities and subtracts it from those housing units where utilities are included. The second predicts the mean rents from the sample of renters where utilities are excluded and multiplies by the number of owner-occupied homes. Both equations have dummies for states as well as four other classification variables: type of structure / number of bedrooms combination, total number of rooms, and age of structure.⁸ These are the variables that are common to both renters and owners. Some combinations have no observations, such as when the total number of rooms is less than number of bedrooms, and in others, the distribution varies greatly between renters and owners and across states. The overall distribution of units between Renters and Owner-Occupied homes by type of structure is shown in Table 5.

number of room, year built. The resulting coefficients are applied to the observations where utilities are included in the rents to predict the proportion of the rent that should be subtracted.

⁷ Currently, the PCE components at the regional level are controlled to national totals.

⁸The class variables are as follows: Mobile homes and Other types of homes, Small Apartments (up to 9 units) ranging from zero to more than three bedrooms, Large Apartments (from 0 to 3+ bedrooms), Attached and Detached Homes (both ranging from 1-4+ bedrooms); total number of rooms (1-2, 3-4, 5-6 and more than 7), and age of structure grouped into four classes (built before 1939, after 1990 for the years prior to 2010, and after 2000 for the years after 2010, with 20 and 30 year interval classes in between).

Table 5. Distribution of housing units by type of structure

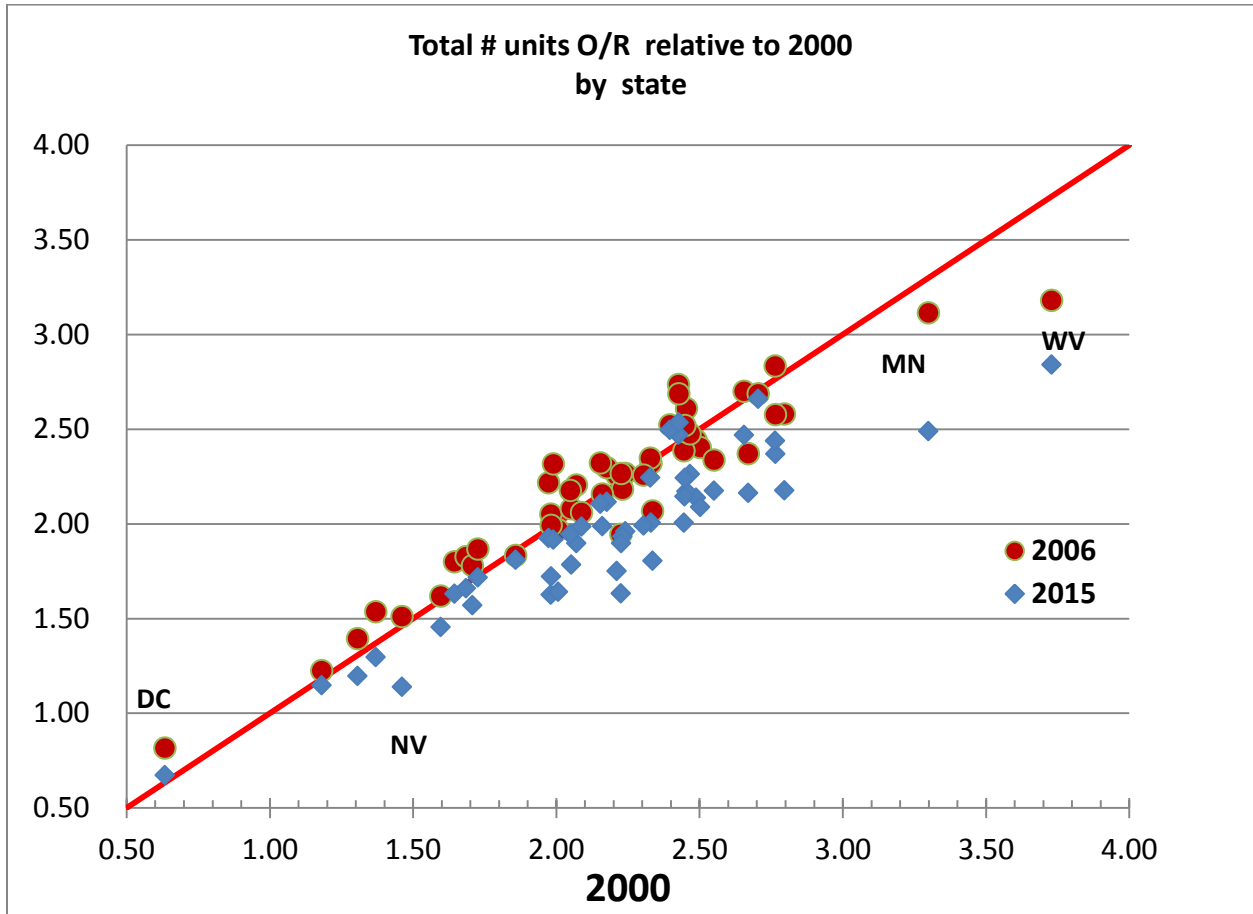
			Apartments			Single-Family		
			Mobile	Small	Large	Attached	Detached	Sum
2000	Units (000)	Rent	1459	12909	11131	2051	7713	35263
		Own	5759	2309	1583	3846	55428	68924
	Percent	Rent	4%	37%	32%	6%	22%	100%
		Own	8%	3%	2%	6%	80%	100%
	O/R		3.95	0.18	0.14	1.87	7.19	1.95
2006	Units (000)	Rent	1705	12879	12203	2104	8457	37348
		Own	5364	2365	1818	4357	60789	74693
	Percent	Rent	5%	34%	32%	6%	23%	100%
		Own	7%	3%	2%	6%	81%	100%
	O/R		3.15	0.18	0.15	2.07	7.19	2.00
2015	Units (000)	Rent	1807	13471	14152	2727	11446	43603
		Own	4866	2248	1949	4394	62368	75825
	Percent	Rent	4%	31%	32%	6%	26%	100%
		Own	6%	3%	3%	6%	82%	100%
	O/R		2.69	0.17	0.14	1.61	5.45	1.74

Source: PUMS public use file, 2015

The bulk of home owners are in detached homes (around 80%) while most of the renters are in apartments (over 60%) and remains steady through the period, but the ratio of Owners to Renters (O/R) drops dramatically from 2006 to 2015, especially in single-family homes (attached and detached) and overall goes from a ratio of 2.00 to 1.74.

Across states, the same pattern emerges. There is a drop in the ratio of owner to renter units between 2006 and 2015 for all states and DC. In Figure 4 the red circles are the ratios in 2006 and the blue diamonds those in 2015 for all homes. Many of the red circles are above the line of unity with 2000, but drop below the line in 2006, indicating that they drop below the 2000 level. Minnesota and West Virginia have the highest owner to renter ratios, while DC is the only observation with more renters than owners. Table A1 from which the graph is drawn is in the Appendix. Table A1 also shows the implicit price change of the monthly rents in current dollars from 2000 to 2015 across both owners and renters. The U.S. is equal to 1.67, a 67% increase in unit rents for the period, from \$553 to \$923. DC has the highest growth at 2.16 while Michigan at 1.45 and Ohio at 1.49 are below the national average.

Figure 4. # Units Owners/Renters by State, 2000, 2006 and 2015

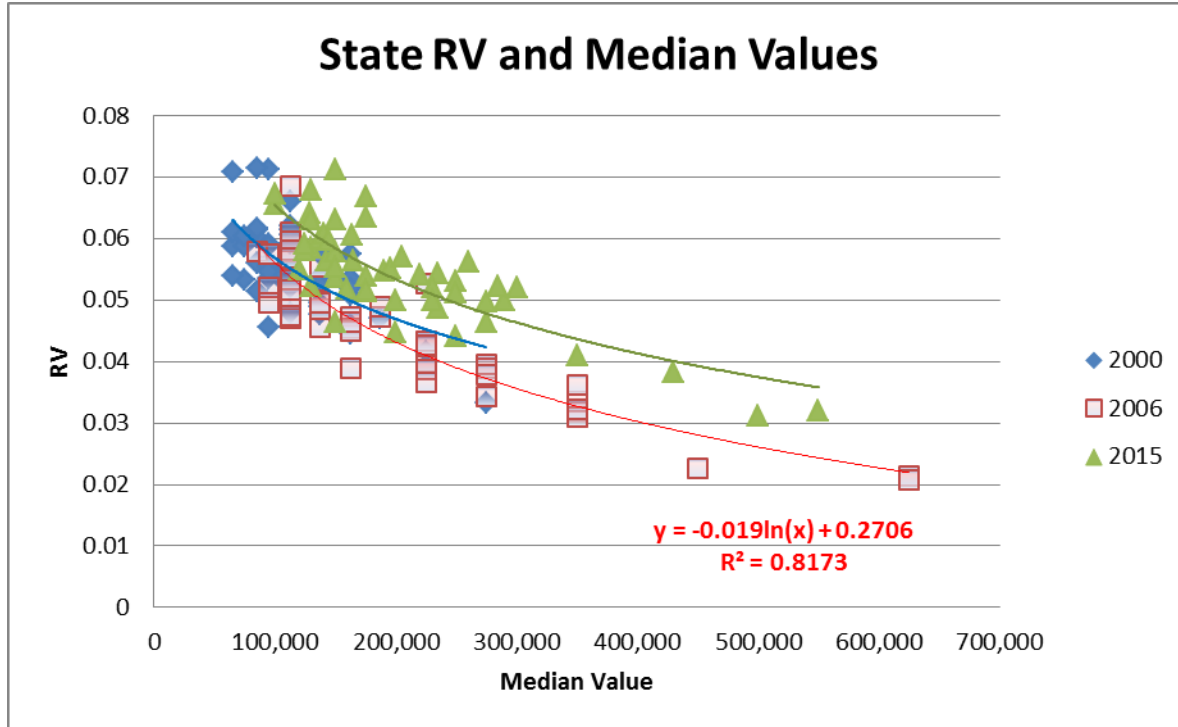


In discussing the US experience from 2000 to 2015 it is clear in the aggregate that the value of housing has fluctuated much more than rents, leading to fluctuations in the rent to value ratios. Figure 5 illustrates the same relationship where the changes in housing values are plotted against changes in rent to value ratios over the 2000 to 2015 period for the 50 states and the District of Columbia. The relationship is strongly negative.

The underlying data are shown in Table A2. The variance of the median home values is high, especially in 2006 (CV = 59%). The same is true for the RVs but to a lesser degree (CV = 23%). Figure 5 shows the much greater scatter in 2006, and extremely high median values (California and Hawaii at \$625,000). Together with the District of Columbia the high median values translate into relatively low RV ratios, just above 2%. The highest RV ratio is consistently in Texas, but not the lowest median home values, so rents are relatively high compared with other states. North Dakota has a large increase in values between 2000 and 2006 (from \$65,000 to \$112,500), but also an increase in rents between 2006 and 2015,

reflecting the rapid growth of the fracking industry, and its rent to value ratio drops from 7.1% in 2000 to 5.2% from 2006 forward.

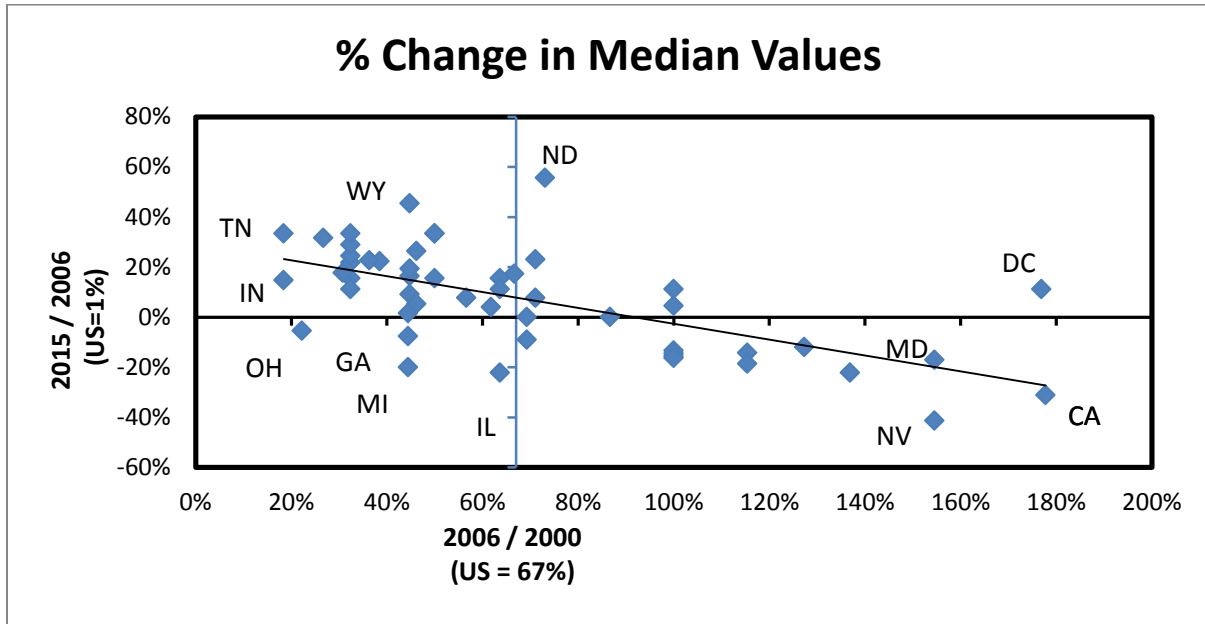
Figure 5. State Rent to Value ratios and Median Values 2000, 2006, 2015 (see Table A2)



In Figure 6, the growth in median value has been broken down into the change from 2000 to 2006 on the horizontal axis and the 2006 to 2015 on the vertical axis. On average, median values grew by 67% between 2000 and 2006 (where the vertical axis crosses the horizontal axis), and by 1.3% between 2006 and 2015. However it is clear from Figure 6 that the experience was very different across the states, with a boom and bust cycle in California (CA), Maryland (MD) and Nevada (NV) and to some extent the District of Columbia (DC). Gains in estimated home values for Nevada were 155% between 2000 and 2006 and then dropped by more than 40% in 2015. Twelve other states experienced declines in median values from 2006 to 2015. The last column in Table A2 shows the overall change in values between 2015 and 2000, with the US median equal to 1.69 or 69% in current dollars. States that lagged below the US average include Michigan (16%), Ohio (16%), Illinois (27%), Georgia (33%), and Indiana (36%).

Table 6 shows the regional values of dwellings as measured by the weighted median values of owner-occupied units in 2000 and 2015, and their ratio over the period. It emphasizes that the Midwestern states experienced below average growth for the 15 year period.

Figure 6. Growth in Median Home Values, 2000 - 2015(see Table A2)



On average, the twelve Midwestern states had a 43% growth, well below the national average of 87%. Only North and South Dakota are above the national average, due to the fracking boom.⁹ With the exception of the Dakotas, this is not a housing market that provides households with a sense of rising net worth, not does it make it easier to consider selling a home and moving to other regions for better employment opportunities. The averages for other states are unremarkable except that the South is a very heterogeneous group including very high and low change states like Delaware (156%) and Mississippi (59%). In terms of the housing crisis, it is worth noting that in 2006 the total value was \$17,448 billion, 105 percent above 2000 and 10 percent above 2015.

Table 6. Total Value of Owner-Occupied Dwellings by Region

	OO Value * units (\$ billions)		
	2000	2015	2015/2000
Midwest	1,883	2,687	1.43
Northeast	1,814	3,336	1.84
South	2,372	4,811	2.03
West	2,422	5,057	2.09
All	8,491	15,890	1.87

⁹ The Midwest states are Illinois, Indiana, Iowa, Kansas, Missouri, Nebraska, North Dakota, Ohio, Michigan, Minnesota, South Dakota and Wisconsin.

Summary

The first part of the paper shows that there is a great deal of variation in the rent to value ratios between 2000 and 2015 using median home values from the Public Use Microdata Samples (PUMS) of the Census of Housing and estimates from an independent commercial site, Zillow. The rent data are from the PUMS and not from Zillow rent estimates, which are thought to be less comprehensive. The second part proposes using the rental equivalence approach and shows national housing expenditure totals for selected years between 2000 and 2015. We estimate utilities and rents for each combination of the following characteristics: geographic unit, type of structure, number of bedrooms, total number of rooms and age of the structure and apply the results to the owner-occupied units. The geographic units are states, so regional and national housing expenditures are fully consistent. In principal, one could also estimate metropolitan area expenditures with access to the Census microdata. The final part of the paper examines the state level results more closely, shedding light on the regional differences as well as the boom and bust cycle for some of the states.

Current housing expenditures in the NIPAs are based on a discontinued survey, the Residential Finance Survey (RFS), and have relied on a benchmark set of imputed OOR expenditures derived from a rent to value ratios. The ACS is a relatively new survey that contains comprehensive housing data at a detailed geographic level and was used in this paper to estimate imputed OOR expenditures using a rental equivalence approach. Future research will attempt to identify the specific factors contributing to the different results obtained by the two approaches.

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Appendix

Table A1. Implicit Monthly Tenant plus Owner-Occupied Rents per Unit and Price Change 2015/2000

		(1) Units (000)	(2) Units O/R	(3) Monthly \$	(1)	(2)	(3)	(1)	(2)	(3)	Price Change (4) US=1	
		2000			2006			2015			2015/00	
United States		104,187.6	1.95	\$ 553	112,040	2.00	\$ 722	119,428	1.74	\$ 923	1.67	1.00
Alabama	AL	1,702.0	2.80	\$ 336	1,778	2.58	\$ 444	1,861	2.18	\$ 579	1.72	1.03
Alaska	AK	210.9	1.86	\$ 647	218	1.83	\$ 941	242	1.81	\$ 1,185	1.83	1.10
Arizona	AZ	1,902.4	1.98	\$ 567	2,244	2.05	\$ 734	2,528	1.62	\$ 852	1.50	0.90
Arkansas	AR	1,026.1	2.24	\$ 326	1,082	2.27	\$ 414	1,142	1.96	\$ 548	1.68	1.01
California	CA	11,245.2	1.31	\$ 774	12,139	1.39	\$ 1,071	12,844	1.20	\$ 1,343	1.74	1.04
Colorado	CO	1,694.0	2.05	\$ 708	1,871	2.08	\$ 783	2,094	1.78	\$ 1,110	1.57	0.94
Connecticut	CT	1,282.0	1.97	\$ 676	1,328	2.22	\$ 865	1,381	1.92	\$ 1,069	1.58	0.95
Delaware	DE	295.7	2.43	\$ 613	325	2.74	\$ 772	360	2.47	\$ 935	1.53	0.91
District of Columbia	DC	248	0.63	\$ 629	255	0.81	\$ 876	287	0.67	\$ 1,358	2.16	1.29
Florida	FL	6,350	2.21	\$ 569	7,183	2.26	\$ 806	7,725	1.75	\$ 976	1.72	1.03
Georgia	GA	2,921	2.01	\$ 492	3,421	1.97	\$ 626	3,712	1.64	\$ 777	1.58	0.95
Hawaii	HI	378	1.37	\$ 751	419	1.54	\$ 1,088	457	1.30	\$ 1,477	1.97	1.18
Idaho	ID	461	2.76	\$ 462	542	2.58	\$ 596	600	2.37	\$ 727	1.58	0.94
Illinois	IL	4,531	2.07	\$ 553	4,782	2.20	\$ 711	4,873	1.90	\$ 914	1.65	0.99
Indiana	IN	2,304	2.49	\$ 441	2,469	2.44	\$ 557	2,555	2.14	\$ 671	1.52	0.91
Iowa	IA	1,122	2.66	\$ 392	1,203	2.70	\$ 493	1,253	2.47	\$ 628	1.60	0.96
Kansas	KS	1,029	2.33	\$ 429	1,083	2.32	\$ 530	1,123	2.00	\$ 672	1.57	0.94
Kentucky	KY	1,554	2.50	\$ 366	1,642	2.40	\$ 462	1,725	2.09	\$ 596	1.63	0.98
Louisiana	LA	1,625	1.99	\$ 377	1,517	2.32	\$ 476	1,736	1.92	\$ 674	1.79	1.07
Maine	ME	516	2.70	\$ 435	543	2.69	\$ 594	547	2.66	\$ 768	1.77	1.06
Maryland	MD	1,968	2.05	\$ 612	2,104	2.18	\$ 905	2,216	1.95	\$ 1,191	1.95	1.17
Massachusetts	MA	2,409	1.64	\$ 715	2,460	1.80	\$ 933	2,577	1.63	\$ 1,160	1.62	0.97
Michigan	MI	3,804	2.76	\$ 512	3,920	2.83	\$ 616	3,897	2.44	\$ 725	1.42	0.85
Minnesota	MN	1,907	3.30	\$ 575	2,053	3.11	\$ 710	2,167	2.49	\$ 882	1.53	0.92
Mississippi	MS	1,028	2.45	\$ 338	1,046	2.61	\$ 413	1,100	2.17	\$ 549	1.63	0.97
Missouri	MO	2,197	2.44	\$ 422	2,305	2.39	\$ 514	2,397	2.01	\$ 658	1.56	0.93
Montana	MT	354	2.45	\$ 365	363	2.49	\$ 519	412	2.14	\$ 727	1.99	1.20
Nebraska	NE	647	2.09	\$ 429	699	2.06	\$ 542	741	1.99	\$ 689	1.61	0.96
Nevada	NV	753	1.46	\$ 649	962	1.51	\$ 870	1,091	1.14	\$ 943	1.45	0.87
New Hampshire	NH	471	2.40	\$ 595	504	2.52	\$ 867	521	2.50	\$ 1,028	1.73	1.04
New Jersey	NJ	3,021	1.98	\$ 755	3,158	1.99	\$ 1,005	3,227	1.72	\$ 1,245	1.65	0.99
New Mexico	NM	640	2.18	\$ 433	716	2.30	\$ 555	772	2.12	\$ 689	1.59	0.95

New York	NY	7,003	1.18	\$	679	7,110	1.22	\$	903	7,328	1.15	\$	1,206	1.78	1.06
North Carolina	NC	3,076	2.34	\$	447	3,474	2.07	\$	565	3,903	1.80	\$	715	1.60	0.96
North Dakota	ND	243	2.23	\$	384	269	1.95	\$	469	320	1.63	\$	758	1.98	1.18
Ohio	OH	4,409	2.23	\$	445	4,573	2.18	\$	554	4,627	1.93	\$	665	1.49	0.89
Oklahoma	OK	1,327	2.16	\$	367	1,388	2.16	\$	451	1,467	1.99	\$	613	1.67	1.00
Oregon	OR	1,363	1.68	\$	562	1,446	1.83	\$	677	1,554	1.66	\$	909	1.62	0.97
Pennsylvania	PA	4,696	2.47	\$	465	4,855	2.47	\$	617	4,993	2.26	\$	811	1.74	1.04
Rhode Island	RI	407	1.60	\$	537	411	1.62	\$	810	413	1.45	\$	924	1.72	1.03
South Carolina	SC	1,476	2.55	\$	442	1,655	2.34	\$	543	1,879	2.18	\$	729	1.65	0.99
South Dakota	SD	277	2.33	\$	372	307	2.35	\$	446	337	2.24	\$	579	1.55	0.93
Tennessee	TN	2,195	2.30	\$	428	2,377	2.26	\$	521	2,547	1.99	\$	682	1.59	0.95
Texas	TX	7,285	1.71	\$	507	8,216	1.78	\$	626	9,529	1.57	\$	872	1.72	1.03
Utah	UT	711	2.45	\$	641	815	2.52	\$	709	940	2.24	\$	925	1.44	0.86
Vermont	VT	234	2.43	\$	539	250	2.69	\$	735	256	2.53	\$	945	1.75	1.05
Virginia	VA	2,659	2.23	\$	582	2,918	2.27	\$	798	3,149	1.90	\$	1,066	1.83	1.10
Washington	WA	2,279	1.73	\$	621	2,474	1.87	\$	770	2,735	1.72	\$	1,053	1.70	1.02
West Virginia	WV	689	3.73	\$	296	725	3.18	\$	389	726	2.84	\$	556	1.88	1.13
Wisconsin	WI	2,074	2.15	\$	490	2,242	2.32	\$	610	2,332	2.10	\$	755	1.54	0.92
Wyoming	WY	190	2.67	\$	451	203	2.37	\$	552	231	2.16	\$	813	1.80	1.08
Maximum		11,245	3.73	\$	774	12,139	3.18	\$	1,088	12,844	2.84	\$	1,477	2.16	1.29
Minimum		190	0.63	\$	296	203	0.81	\$	389	231	0.67	\$	548	1.42	0.85
Range		11,055	3.09	\$	478	11,937	2.37	\$	700	12,613	2.17	\$	928	0.74	0.44

Source: PUMS files, author's calculations of monthly rents net of utilities plus imputed owner-occupied rents.

Table A2. Median Values and Rent to Value ratios

		2000		2006		2015		Ratio Median Values		
		Median Value \$	RV	Median Value \$	RV	Median Value \$	RV	2006: 2000	2015: 2006	2015: 2000
<i>United States</i>		<i>112,500</i>	<i>5.9%</i>	<i>187,500</i>	<i>4.7%</i>	<i>190,000</i>	<i>5.8%</i>	<i>1.67</i>	<i>1.01</i>	<i>1.69</i>
Alabama	AL	75,000	5.3%	112,500	4.7%	130,000	5.2%	1.50	1.16	1.73
Alaska	AK	137,500	5.7%	225,000	5.3%	260,000	5.6%	1.64	1.16	1.89
Arizona	AZ	112,500	6.1%	225,000	4.0%	190,000	5.5%	2.00	0.84	1.69
Arkansas	AR	65,000	5.9%	95,000	5.2%	120,000	5.5%	1.46	1.26	1.85
California	CA	225,000	4.2%	625,000	2.1%	430,000	3.8%	2.78	0.69	1.91
Colorado	CO	162,500	5.3%	225,000	4.3%	275,000	5.0%	1.38	1.22	1.69
Connecticut	CT	162,500	5.1%	275,000	3.9%	250,000	5.3%	1.69	0.91	1.54
Delaware	DE	112,500	6.6%	225,000	4.2%	235,000	4.9%	2.00	1.04	2.09
District of Columbia	DC	162,500	4.5%	450,000	2.3%	500,000	3.1%	2.77	1.11	3.08
Florida	FL	95,000	7.1%	225,000	4.3%	175,000	6.7%	2.37	0.78	1.84
Georgia	GA	112,500	5.2%	162,500	4.7%	150,000	6.3%	1.44	0.92	1.33
Hawaii	HI	275,000	3.3%	625,000	2.1%	550,000	3.2%	2.27	0.88	2.00
Idaho	ID	103,750	5.4%	162,500	4.5%	175,000	5.1%	1.57	1.08	1.69
Illinois	IL	137,500	4.8%	225,000	3.9%	175,000	6.3%	1.64	0.78	1.27
Indiana	IN	95,000	5.6%	112,500	6.1%	129,000	6.4%	1.18	1.15	1.36
Iowa	IA	85,000	5.6%	112,500	5.3%	130,000	5.9%	1.32	1.16	1.53
Kansas	KS	85,000	6.1%	112,500	5.8%	137,000	6.0%	1.32	1.22	1.61
Kentucky	KY	85,000	5.1%	112,500	5.0%	125,000	5.8%	1.32	1.11	1.47
Louisiana	LA	75,000	6.0%	112,500	5.0%	150,000	5.4%	1.50	1.33	2.00
Maine	ME	95,000	5.5%	162,500	4.5%	175,000	5.4%	1.71	1.08	1.84
Maryland	MD	137,500	5.4%	350,000	3.2%	290,000	5.0%	2.55	0.83	2.11
Massachusetts	MA	187,500	4.7%	350,000	3.3%	350,000	4.1%	1.87	1.00	1.87
Michigan	MI	112,500	5.5%	162,500	4.6%	130,000	6.8%	1.44	0.80	1.16
Minnesota	MN	112,500	6.2%	225,000	3.9%	195,000	5.5%	2.00	0.87	1.73
Mississippi	MS	65,000	6.1%	85,000	5.8%	100,000	6.6%	1.31	1.18	1.54
Missouri	MO	85,000	6.0%	137,500	4.6%	143,000	5.6%	1.62	1.04	1.68
Montana	MT	95,000	4.6%	162,500	3.9%	200,000	4.5%	1.71	1.23	2.11
Nebraska	NE	85,000	6.1%	112,500	5.9%	140,000	6.1%	1.32	1.24	1.65
Nevada	NV	137,500	5.8%	350,000	3.1%	205,000	5.7%	2.55	0.59	1.49
New Hampshire	NH	137,500	5.2%	275,000	4.0%	235,000	5.4%	2.00	0.85	1.71
New Jersey	NJ	162,500	5.8%	350,000	3.6%	300,000	5.2%	2.15	0.86	1.85
New Mexico	NM	95,000	5.4%	137,500	4.9%	160,000	5.2%	1.45	1.16	1.68
New York	NY	162,500	5.2%	350,000	3.2%	285,000	5.2%	2.15	0.81	1.75
North Carolina	NC	95,000	5.6%	137,500	5.0%	150,000	5.8%	1.45	1.09	1.58
North Dakota	ND	65,000	7.1%	112,500	5.2%	175,000	5.2%	1.73	1.56	2.69
Ohio	OH	112,500	4.8%	137,500	5.0%	130,000	6.3%	1.22	0.95	1.16
Oklahoma	OK	75,000	5.9%	95,000	5.8%	125,000	5.9%	1.27	1.32	1.67

		2000		2006		2015		Ratio Median Values		
		Median Value \$	RV	Median Value \$	RV	Median Value \$	RV	2006: 2000	2015: 2006	2015: 2000
Oregon	OR	137,500	5.0%	225,000	3.7%	250,000	4.4%	1.64	1.11	1.82
Pennsylvania	PA	95,000	5.9%	137,500	5.5%	164,000	6.1%	1.45	1.19	1.73
Rhode Island	RI	137,500	4.9%	275,000	3.8%	230,000	5.2%	2.00	0.84	1.67
South Carolina	SC	85,000	6.2%	112,500	5.8%	145,000	6.0%	1.32	1.29	1.71
South Dakota	SD	75,000	6.0%	112,500	4.7%	150,000	4.6%	1.50	1.33	2.00
Tennessee	TN	95,000	5.5%	112,500	5.7%	150,000	5.5%	1.18	1.33	1.58
Texas	TX	85,000	7.2%	112,500	6.9%	150,000	7.1%	1.32	1.33	1.76
Utah	UT	137,500	5.8%	187,500	4.7%	230,000	5.0%	1.36	1.23	1.67
Vermont	VT	112,500	5.9%	187,500	4.9%	220,000	5.4%	1.67	1.17	1.96
Virginia	VA	112,500	6.1%	225,000	4.3%	250,000	5.1%	2.00	1.11	2.22
Washington	WA	162,500	4.6%	275,000	3.4%	275,000	4.6%	1.69	1.00	1.69
West Virginia	WV	65,000	5.4%	95,000	4.9%	100,000	6.7%	1.46	1.05	1.54
Wisconsin	WI	112,500	5.3%	162,500	4.6%	165,000	5.6%	1.44	1.02	1.47
Wyoming	WY	95,000	5.9%	137,500	5.0%	200,000	5.0%	1.45	1.45	2.11
Maximum		275,000	7.2%	625,000	6.9%	550,000	7.1%	2.78	1.56	3.08
Minimum		65,000	3.3%	85,000	2.1%	100,000	3.1%	1.18	0.59	1.16
Range		210,000	3.8%	540,000	4.8%	450,000	4.0%	1.59	0.97	1.92
CV		36%	13%	59%	23%	46%	15%			

Source: PUMS public use files. Rent to Value ratios from the estimated owner-occupied rents for each state, and Median Values are weighted by the housing unit weights.