

American Housing Survey

**Rental Market Dynamics:
2011–2013**

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Table of Contents

Executive Summary	1
1. Overview	3
2. Growth of the Rental Stock	4
3. Affordability	8
4. Rental Dynamics Analysis: 2011–2013	9
5. Decline in Affordable Rental Housing, 2001–2013	16
Appendix A: Data Sets and Variables Used	A-1
Appendix B: Weighting and Reconciling the Forward-Looking and Backward-Looking Analyses	B-1

List of Tables

Table ES-1: Changes in Rental Affordability, 2011-2013 (in thousands).....	1
Table 1: Growth in the Rental Housing Stock, 2011-2013.....	5
Table 2: Changes in the Rental Stock over Two-Year Periods, 2001–2013 (all numbers in thousands).....	7
Table 3: Forward-Looking Rental Dynamics Analysis, Counts: 2011–2013 (All Numbers in Thousands).....	11
Table 4: Forward-Looking Rental Dynamics Analysis, Row Percentages: 2011–2013	11
Table 5: Backward-Looking Rental Dynamics Analysis, Counts: 2011–2013 (All Numbers in Thousands)	13
Table 6: Backward-Looking Rental Dynamics Analysis, Row Percentages: 2011–2013	13
Table 7: Evolution of the Rental Housing Market by Affordability Category, 2011 to 2013 (Counts in Thousands)	15
Table 8: Total and Affordable Rental Housing, 2001-2013.....	17
Table 9: Changes in the Affordable Rental Stock over Two-Year Periods, 2001-2013 (all counts in thousands)	19
Table B-1: Forward-Looking Rental Dynamics Analysis (Table 3), using counts of sample unit	B-2
Table B-2: Backward-Looking Rental Dynamics Analysis (Table 5), using counts of sample unit	B-2
Table B-3: Alternative Weighting Example	B-3
Table B-4: Derivation of Estimates of Units With Moderate Rents in Both 2011 and 2013 (Weighted Counts in Thousands)	B-4
Table B-5: Tracking Changes in the Moderate Rent Category: 2011–2013 (Weighted Counts in Thousands).....	B-5

Executive Summary

This report uses the American Housing Survey (AHS) to paint a precise picture of what happened to rental housing between 2011 and 2013, with particular attention paid to affordable rental housing. The report focuses on the entire rental stock—occupied rental units, vacant rental units, vacant units offered for sale or rent, and units rented but not yet occupied—not just renter-occupied units.

The rental housing stock increased from 43,504,000 units in 2011 to 44,564,000 units in 2013, an increase of 1,060,000 units. Changes from owner to rental status accounted for a net gain of 451,000 units. Shifts among year-round and seasonal use and the excess of additions over losses had minimal net effects on the rental stock, a loss of 27,000 units and a gain of 59,000 units, respectively. Weighting adjustments accounted for an increase of 577,000 units. The one-million net increase belies the magnitude of fundamental changes within the rental housing stock over this 2-year period. Inflows and outflows to the rental stock involved a total of 11,556,000 units.

“Affordability” is a characteristic of a rental unit that is independent of the household that occupies the unit; it depends solely on the relationship between the gross rent of the unit, the number of bedrooms in the unit, and median family income in the local area. While the report examines changes in the number of rental units in each of eight affordability categories, it focuses on the three most affordable categories: non-market units (subsidized units and those with no cash rents), extremely low rent units (those affordable to households earning 30 percent of local median family income), and very low rent units (those affordability to households earning 50 percent of local median family income).

Table ES-1: Changes in Rental Affordability, 2011-2013 (in thousands)

Affordability Categories	Total in 2011	Total in 2013	Change
Non-Market	7,670	7,539	-131
Extremely Low Rent	1,986	2,268	282
Very Low Rent	9,425	9,412	-13
Low Rent	7,613	7,579	-34
Moderate Rent	9,504	9,531	27
High Rent	3,490	3,916	426
Very High Rent	1,727	1,970	243
Extremely High Rent	2,090	2,350	260
Total	43,504	44,564	1,060

Between 2011 and 2013, the rental stock increased by 1,060,000 units. Most of this growth was recorded among the 3 least affordable categories: high rent (426,000 units), very high rent (243,000 units), and extremely high rent (260,000 units). The 3 most affordable categories—non-market, extremely low rent, and very low rent—increased by 137,000 units but only because the extremely low rent category grew by 282,000 units. The non-market segment declined by 131,000 units. The counts of very low rent, low rent, and moderate rent units were virtually unchanged between 2011 and 2013. Gentrification dominated filtration between 2011 and 2013. Over all 8 affordability categories, gentrification exceeded filtration by 2.3 million units.

The years between 2001 and 2013 encompassed first a vigorous economic expansion (November 2001 to December 2007), then a severe recession (December 2007 to June 2009), and finally a weak recovery (June 2009 to the present). Embedded within this period was a worldwide financial crisis that began early in 2006 with troubles involving subprime and nontraditional mortgage products and quickly spread to other financial markets. These events had profound effects on the housing market.

During the 2001–2007 boom period, the rental stock grew slower than the overall housing stock; however, between 2007 and 2013, a period that included the recession and a modest recovery, the rental stock added more units than the housing stock as a whole. Flows into and out of the owner sector were the driving force in shaping how the rental market performed in the two 6-year timeframes. The net gain from the owner sector was almost five times larger from 2007 to 2013 than from 2001 to 2007. The renter stock also gained 691,000 units from 2007 to 2013 from seasonal use after having lost 698,000 to seasonal use from 2001 to 2007. Additions exceed losses to the rental stock in all six periods studied but the net gain from 2001 to 2007 was approximate twice the gain from 2007 to 2013. Additions from sources other than new construction are important for the rental sector, accounting for between one-third and one-half of all new additions.

There were 2.4 million fewer affordable rental units in 2013 than in 2001. Most of this decline occurred during the financial crisis from 2005 to 2009; part of the observed decline between 2005 and 2007 might be attributed to a change in the way the U.S. Department of Housing and Urban Development calculates local median family income, which is used to identify affordable units. Since 2009 there has been a modest increase in the number of affordable rental units, but the proportion of rental units that are affordable has declined steadily from 58.0 percent in 2003 to 43.1 percent in 2013. Gentrification has been the strongest factor in the decline of affordable rental housing.

During the economic expansion (2001–2007), the affordable rental stock declined by 1.5 million units; during the recession and subsequent slow recovery (2007–2013), the affordable rental stock declined by an additional 0.8 million units. The major difference between the two 6-year timeframes was the net inflows from the owner sector and from seasonal use. Combined, the net inflow from these two sectors was a negative 865,000 during 2001–2007 versus a positive 538,000 during 2007–2013. There was no clear break in the trends observed over the longer period that explains the 137,000 unit increase in affordable rental housing between 2011 and 2013.

Rental Market Dynamics: 2011–2013

1. Overview

The U.S. Department of Housing and Urban Development (HUD) and the U.S. Census Bureau (Census) collaborate to gather comprehensive data on the U.S. housing stock through the American Housing Survey (AHS). Data are collected on the same housing units every 2 years so that analysts can track what happens to housing units over time. Taking advantage of this unique data set, HUD has funded a series of studies, called rental market dynamics analyses, to depict how affordable rental housing evolves between AHS surveys.¹ This report depicts changes in the rental housing market between 2011 and 2013, with particular emphasis on affordable rental housing.

Rental market dynamics focuses on the supply of rental housing and how that supply changes over time. Rental dynamics analysis has many of the features of components of inventory change (CINCH) analysis, which seeks to explain how units change characteristics (e.g., high rent or low rent) or change status (e.g., in the stock or out of the stock). Like CINCH, rental dynamics traces where units come from and where they go, but with an emphasis on low rent units. This paper is part of a larger research project that includes several research studies using the AHS.

This report differs from previous rental market dynamics analyses in two respects: more attention is given to the evolution of the entire rental stock, and the recent changes in both affordable rental housing and all rental housing are put into the context of changes over the six 2-year periods between 2001 and 2013.

This document is organized as follows:

- Section 2 explains how the number of rental units changed between 2011 and 2013 and compares these changes to changes in previous periods.
- Section 3 explores what is meant by affordable housing and breaks the entire rental inventory into eight categories based on how affordable the units are.
- Section 4 details what happened to the 2011 rental stock with respect to affordability by 2013 and also shows where the 2013 rental stock came from with respect to affordability. These are two separate analyses because changes between surveys in how sample units are weighted make it difficult to reconcile the counts. By showing explicitly how changes in sample weights affect the results, Section 4 reconciles the counts of units by affordability in 2011 and 2013.
- Section 5 tracks the decrease in affordable rental housing between 2001 and 2013 and explains how the decline came about.

¹ A companion series of studies called CINCH analyses explains how the overall housing stock evolves between AHS surveys. A complete listing of the CINCH and Rental Dynamics analyses can be found at <https://www.huduser.gov/portal/datasets/cinch.html>.

- Appendix A describes the data sets used in the analysis.
- Appendix B provides a thorough discussion of how changes in sample weights affect the analysis.

The Census Bureau interviews a sample of approximately 60,000 housing units every 2 years for the AHS. The Census Bureau then uses external information to develop weights that transform the sample results into an accurate portrait of the American housing stock for that survey year. To maintain accuracy, Census modifies the weights with each new survey. Although these modifications are minor, they introduce some inconsistencies into counting groups of units from one survey year to the next. The reader needs to be aware that these inconsistencies complicate the findings of the report in various ways. The text notes where they impact the results, and footnotes offer more insight into their effects. Appendix B is devoted to this issue.

The reader should also remember that this report defines rental housing broadly; the definition includes renter-occupied housing, units vacant for rent, units vacant for either rent or sale, and units rented but not yet occupied.

2. Growth of the Rental Stock

2.1. Growth from 2011 to 2013

The rental housing stock increased by slightly over 1 million units between 2011 and 2013. Using the AHS sample, Table 1 details how this increase came about.

Almost 12 million housing units underwent fundamental changes between 2011 and 2013 to bring about this 1 million-unit increase in the rental housing stock. Shifts in tenure involved more than 7 million units: 3.2 million units that were in the rental stock in 2011 became part of the owner stock in 2013, while 3.7 million units that were in the owner stock in 2011 became part of the rental stock in 2013. The net gain from tenure shifts was 451,000 units.

Approximately 3.5 million units shifted their orientation between year-round provision of housing to part-year provision as either seasonal-use only units or units used for migratory shelter or other part-time housing. These movements had the net effect of reducing the rental stock by 27,000 units.

Almost 600,000 units were added to the rental stock through new construction or other means, such as the splitting of existing units into multiple units or the conversion of non-residential structures to rental units. In the same period, 535,000 units in the 2011 rental stock were lost to the housing stock either permanently or temporarily. The net effect was a gain of 59,000 rental units.

Table 1: Growth in the Rental Housing Stock, 2011-2013

1	Rental units in 2011	43,504,000	
2	2011 rental units to owner stock in 2013		-3,238,000
3	2011 owner stock to rental in 2013		3,688,000
4	Net owner to renter	451,000	
5	2011 rental units to seasonal & other related use in 2013		-1,765,000
6	2011 seasonal or other related use units to rental in 2013		1,737,000
7	Net seasonal to rental	-27,000	
8	2011 rental units lost to the stock by 2013		-535,000
9	Rental units added by new construction		323,000
10	Rental units added by other means		270,000
11	Net additions minus losses	59,000	
12	Change in weight of sample units rental in both years	577,000	
13	Rental units in 2013	44,564,000	
14	Absolute value of inflows and outflows (excludes weight changes)		11,556,000

The AHS sample contained 18,714 units that were rental in both 2011 and 2013. The Census Bureau adjusted the weights applied to these units from 2011 to 2013, resulting in an increase of 577,000 units.² This small adjustment had a large impact when looked at from the perspective of the net increase, 54 percent of the 1,060,000; however, when considered as part of all the changes affecting the rental housing stock, the effect appears much most modest, 5 percent of the absolute value of the inflows and outflows.

The rental housing stock increased from 43,504,000 units in 2011 to 44,564,000 units in 2013, an increase of 1,060,000 units. Changes between owner and rental status accounted for a net gain of 451,000 units. Shifts among year-round and seasonal use and the excess of additions over losses had minimal net effects on the rental stock, a loss of 27,000 units and a gain of 59,000 units, respectively. Weighting adjustments accounted for an increase of 577,000 units. The modest net increase belies the magnitude of fundamental changes within the rental housing stock over this two-year period. Inflows and outflows to the rental stock involved a total of 11,556,000 units.

2.2. Growth from 2001 to 2013

The years between 2001 and 2013 encompassed first a vigorous economic expansion (November 2001 to December 2007), then a severe recession (December 2007 to June 2009), and finally a weak recovery (June 2009 to the present).³ Embedded within this period was a worldwide financial crisis which began early in 2006 with troubles involving subprime and nontraditional mortgage products and quickly spread to other financial markets. On July 21, 2007, two of Bear Stern's hedge funds filed for bankruptcy and then, on September 15, 2008, the fourth largest investment bank in the United States, Lehman Brothers, filed for bankruptcy.

² Among the units that were rental in both years, the average weight was 2,028.8 units in 2011 and 2,059.6 units in 2013. This increase of 30.8 units per sample unit (a 1.5-percent increase) resulted in the 577,000 change.

³ See National Bureau of Economic Research official dating of economic cycles at <http://www.nber.org/cycles/cyclesmain.html>.

These events had profound effects on the housing market. The rapid increase in the prices of existing housing from 2000 through 2006 and the aggressive marketing of mortgage refinancing with lax underwriting set the stage for a meltdown in housing finance. The prices garnered by existing housing fell sharply from 2007 through 2011, causing many recently issued mortgage loans to have principal values substantially larger than their collateral, which led to massive defaults and extensive foreclosures.⁴

This section uses previous rental dynamics analyses to calculate inflows and outflows similar to those contained in Table 1 for the five previous 2-year periods between 2001 and 2011. Table 2 combines this information to track the overall rental housing stock from 2001 to 2013.

While the number of rental units increased in each of the six 2-year periods recorded in Table 2, the smallest growth occurred during the economic boom between 2001 and 2007. In these years, the housing stock grew by 7.4 million units, while its rental component increased by only 1.6 million units. By comparison, the rental stock gained more units between 2007 and 2013 (4.9 million) than did the overall housing stock (4.6 million). Rental units formed 33.5 percent of the overall housing stock in 2013, up from 31.0 percent in 2007.⁵

The turbulence caused by the financial crisis and ensuing recession expanded both the demand for and supply of rental housing. The single biggest change was the shift of existing housing units from the owner to the rental sector. From 2001 to 2007, the combined net inflow from the owner sector (see row 4) was only 682,000; over the next 6 years the net inflow was 3,162,000 units. The shift in orientation from the owner to the renter stock was particularly heavy in the 2007–2009 and 2009–2011 periods, the height of the shake-out from the financial crisis.

Over the entire 12-year period, the movement of units from seasonal use to the rental sector was a wash, and the rental sector lost units to seasonal use in four of six periods. However, in the 2007–2013 timeframe, the rental sector gained 691,000 units from seasonal use. Most of this shift occurred in the 2009–2011 period. From 2001 to 2007, the rental sector had lost 698,000 units to seasonal use.

Additions to the rental sector exceed losses in all six periods. Losses were heaviest between 2005 and 2009 and then tailed off after 2009. Perhaps the turmoil caused by the financial crisis led landlords to abandon low-valued properties or to take them temporarily out of service during these years. New construction was fairly constant in the first five periods but declined sharply in the 2011–2013 period. New construction exceeded losses only in the 2009–2011 period. Between one-third and one-half of all additions were “additions other than new construction.” Previous CINCH studies have shown that “additions other than new construction” are concentrated in the rental sector.

⁴ The data on the price of existing housing come from the repeat sale index produced by the Federal Housing Finance Board and reported on HUD’s U.S. Housing Market Conditions Web site at https://www.huduser.gov/portal/ushmc/hd_repeat_sales.html.

⁵ The homeownership rate, which excludes vacant and seasonal units, fell from 68.3 percent in 2007 to 65.3 percent in 2013, based on AHS data.

Table 2: Changes in the Rental Stock over Two-Year Periods, 2001–2013 (all numbers in thousands)⁶

		2001– 2003	2003– 2005	2005– 2007	2007– 2009	2009– 2011	2011– 2013	2001– 2013 ⁷
1	Base year rental units	37,392	38,171	38,444	39,712	40,311	43,504	37,392
2	Base-year rental to owner	-2,910	-3,360	-3,201	-2,772	-2,859	-3,238	-18,340
3	Base-year owner to renter	3,093	3,366	3,694	3,999	4,343	3,688	22,183
4	Net owner to renter	183	6	493	1,227	1,484	451	3,844
5	Base -year rental to seasonal	-1,441	-1,515	-1,509	-1,456	-1,389	-1,765	-9,075
6	Base-year seasonal to rental	1,223	1,364	1,180	1,546	2,017	1,737	9,067
7	Net seasonal to rental	-218	-151	-329	90	628	-27	-7
8	Base-year rental lost to stock	-729	-717	-910	-842	-563	-535	-4,297
9	Rental new construction	677	715	652	604	620	323	3,592
10	Rental additions by other means	413	623	523	462	313	270	2,605
11	Net additions - losses	361	621	265	224	370	59	1,899
12	Change in weight of sample units rental in both years	522	-48	884	-865	793	577	1,864
13	Final year rental units	38,241	38,599	39,756	40,391	43,587	44,564	44,564
14	Absolute value of inflows and outflows, excludes weight changes	10,487	11,661	11,669	11,681	12,104	11,557	69,158

⁶ Because weights used in these six analyses changed between periods, the count of units for the base year is not equal to the count of units for the final year in the previous column. For example, in the first column, the count of rental units in 2003 is 38,241,000, but in the second column, the count of rental units in 2003 is 38,171,000. In this sense the separate 2-year analyses are fully consistent.

⁷ The last column sums the factors across all six periods. For this column the factors do not add up to the change between 2001 and 2013; the difference is accounted for by the sum of the differences in counts for the same year explained in the previous footnote.

The bottom row shows that the absolute value of flows into and out of the rental sector was fairly constant despite changing economic conditions. The rental market is characterized by a substantial level of turnover; existing units move between the rental sector and both the owner sector and seasonal use, new rental units are added, and existing rental units leave the housing stock either temporarily or permanently. Over a 2-year period, these flows sum, in absolute value, to between 25 and 30 percent of the rental stock. While the economic climate appears to have little influence on the magnitude of the turnover, the economy does affect the size of individual components, which, in turn, determine how the rental stock changes.

During the 2001–2007 boom period, the rental stock grew slower than the overall housing stock; however, between 2007 and 2013, a period that included the recession and a modest recovery, the rental stock added more units than the housing stock as a whole. Flows into and out of the owner sector were the driving force in shaped how the rental market performed in the two 6-year timeframes. The net gain from the owner sector was almost five times larger from 2007 to 2013 than from 2001 to 2007. The renter stock also gained 691,000 units from 2007 to 2013 from seasonal use after having lost 698,000 to seasonal use from 2001 to 2007. Additions exceed losses to the rental stock in all six periods studied, but the net gain from 2001 to 2007 was approximately twice the gain from 2007 to 2013. Additions from sources other than new construction are important for the rental sector, accounting for between one-third and one-half of all new additions.

3. Affordability

A key step in rental market dynamics analysis is separating the rental stock into classes or strata based on how affordable units are. This paper uses eight categories, adapted from HUD's Housing Affordability Data System (HADS)⁸:

- Non-market – Either no cash rent or a subsidized rent.
- Extremely low rent – Affordable to renters with incomes equal to 30 percent of local area median income.
- Very low rent – Affordable to renters with incomes equal to 50 percent of local area median income.
- Low rent – Affordable to renters with incomes equal to 60 percent of local area median income.
- Moderate rent – Affordable to renters with incomes equal to 80 percent of local area median income.
- High rent – Affordable to renters with incomes equal to 100 percent of local area median income.

⁸ See the HADS documentation at https://www.huduser.gov/portal/datasets/hads/HADS_doc.pdf, particularly pages 7–11.

- Very high rent – Affordable to renters with incomes equal to 120 percent of local area median income.
- Extremely high rent – All other rental units with cash rents.

For each category, “affordable” is defined as a gross rent-to-income ratio of 30 percent or less for incomes that define the boundary for that category.⁹ The categories are defined relative to area median income with an adjustment for the number of bedrooms in the unit. The boundaries of the categories will change as area median income changes. For example, if area median income increases between 2011 and 2013, then the boundaries of each category will also increase between 2011 and 2013.¹⁰

Whether or not a unit remains in the same affordability category between surveys depends on the interaction of several factors: the growth rate of household income, changes in utility costs, changes in property taxes resulting from changes in property values or changes in tax rates, and changes in the demand for rental units. Growth in median household income, by itself, will tend to shift units to more affordable categories, whereas increases in utility costs or property taxes by themselves will tend to shift units into less affordable categories. In high-demand markets, units will likely become less affordable, whereas in low-demand markets, units will become more affordable.

The location of a rental unit within the local rent distribution and the shape of that distribution also affect the extent to which rents can rise or fall. If a large percentage of the rental stock has higher rents, then landlords can raise rents in response to rising costs or greater demand with less concern about pricing themselves out of the market.

“Affordability” is a characteristic of a rental unit that is independent of the household that occupies the unit; it depends solely on the relationship between the gross rent of the unit, the number of bedrooms in the unit, and median family income in the local area. This paper adds the non-market category to the seven affordability categories for market rate units defined in HADS and uses the affordability determinations made by HUD in HADS for sample rental units in the AHS survey for a given year.

4. Rental Dynamics Analysis: 2011–2013

Section 4 contains three parts. The first part examines what happened to the 2011 rental stock by 2013. Because it takes the 2011 rental stock as its starting point, it is called forward-looking analysis. The second part examines where the 2013 rental units came from with respect to their

⁹ Gross rent is rent plus utilities. If local median income were \$48,000 a year, then—on a monthly basis—50 percent of median income would be \$2,000 and 30 percent would be \$1,200. The boundary of the extremely low income and very low income categories would be \$360 (0.30*\$1,200) and \$600 (0.30*\$2,000). A unit costing \$300 per month with tenant-paid utilities of \$90 per month would have a gross rent of \$390. This unit would be too expensive for the extremely low rent category but would qualify for the very low rent category.

¹⁰ This means that rental costs and affordability do not always move in the same direction. Continuing the example in the preceding footnote, if the costs of renting a unit are \$390 in 2011 and \$400 in 2013, while the boundary of the extremely low income category changes from \$360 to \$410 between 2011 and 2013, then the unit that was classified as extremely low income in 2011 will be classified as very low income in 2013 despite higher rental costs.

status in 2011. Because it takes the 2013 rental stock as its starting point, it is called backward-looking analysis. The report separates these analyses because the sample units upon which they are based have different weights in 2011 and 2013. By taking the impact of the change in weights into account, the third part reconciles the two analyses. Sections 4.1 and 4.2 contain the key tables used in the five previous rental dynamics report; however, the report reserves discussion of the changes to the rental stock to after the combined analysis in Section 4.3. This discussion draws upon all five tables in the three parts.

4.1. What happened to the 2011 rental stock

Table 3 tracks how 43,504,000 rental units in the 2011 housing stock relate to the 2013 housing stock. Of the 2011 rental units, 11,411,000 were extremely low rent or very low rent units. In addition 7,670,000 units were either assisted or offered for no cash rent. These three categories accounted for 43.9 percent of the 2011 housing stock.

Columns B through L explain where the 2011 rental units fit into the 2013 housing stock.

- If the units are still rental in 2013, they will be counted in columns B through I, depending on how affordable they are in 2013.
- If the units have become owner occupied, they will be counted in column J.
- Seasonal units, units that are not the primary residence of their occupants, units used for migratory workers, and units that are vacant but not for rent or sale are counted in column K.
- Column L counts 2011 units that are not in the 2013 housing stock; these can be either temporary or permanent losses to the stock.

The sum of columns B through L equals column A, except for rounding.

Table 4 presents the same information as Table 3, but columns B through L are now percentages of column A. Columns B through L sum to 100 percent in each row.

Over 60 percent of the 2011 non-market units are non-market in 2013 as well. In this case, one might have expected even greater consistency between surveys, because non-market units consist of assisted housing and units that are not rented for cash. Public housing units and units in projects that receive assistance in 2011 should remain assisted in 2013 unless they have left the stock. (Only 1.1 percent of the non-market units were not in the stock in 2013.) Units that received assistance through the housing voucher program and “no cash rent” units can change their status between surveys. Response errors can also account for a change in status.

The three largest market rent categories in terms of number of units—moderate rent units, very low rent units, and low rent units—also showed a high level of stability, with 40 to 50 percent of the 2011 units in these categories staying in the same category in 2013. Units that had extremely low rents in 2011 displayed the highest propensity to change status between surveys; only 19.0 percent of these units were extremely low rent in 2013. The small extremely low rent category may be sensitive to changes in boundaries caused by changes in local median income.

Table 3: Forward-Looking Rental Dynamics Analysis, Counts: 2011–2013 (All Numbers in Thousands)

Affordability Categories	A Total in 2011	B Non-Market in 2013	C Extremely Low Rent in 2013	D Very Low Rent in 2013	E Low Rent in 2013	F Moderate Rent in 2013	G High Rent in 2013	H Very High Rent in 2013	I Extremely High Rent in 2013	J Owner Occupied in 2013	K Seasonal or Related Vacant in 2013	L Lost to Stock in 2013
Non-Market	7,670	4,678	252	579	370	374	137	59	57	861	221	82
Extremely Low Rent	1,986	206	376	334	141	229	162	38	69	214	161	55
Very Low Rent	9,425	548	460	4,691	1,562	635	149	92	112	603	404	169
Low Rent	7,613	362	244	1,318	3,063	1,608	169	49	61	382	295	61
Moderate Rent	9,504	385	307	632	1,246	4,448	988	326	188	600	293	89
High Rent	3,490	77	95	219	164	605	1,443	389	102	224	145	26
Very High Rent	1,727	46	47	92	54	190	191	504	305	166	114	19
Extremely High Rent	2,090	37	74	108	77	127	54	196	1,065	188	131	34
Total	43,504	6,339	1,856	7,973	6,677	8,215	3,294	1,654	1,959	3,238	1,765	535

Table 4: Forward-Looking Rental Dynamics Analysis, Row Percentages: 2011–2013

Affordability Categories	A Total in 2011 (Thousands)	B Non-Market in 2013	C Extremely Low Rent in 2013	D Very Low Rent in 2013	E Low Rent in 2013	F Moderate Rent in 2013	G High Rent in 2013	H Very High Rent in 2013	I Extremely High Rent in 2013	J Owner Occupied in 2013	K Seasonal or Related Vacant in 2013	L Lost to Stock in 2013
Non-Market	7,670	61.0%	3.3%	7.5%	4.8%	4.9%	1.8%	0.8%	0.7%	11.2%	2.9%	1.1%
Extremely Low Rent	1,986	10.4%	19.0%	16.8%	7.1%	11.5%	8.2%	1.9%	3.5%	10.8%	8.1%	2.8%
Very Low Rent	9,425	5.8%	4.9%	49.8%	16.6%	6.7%	1.6%	1.0%	1.2%	6.4%	4.3%	1.8%
Low Rent	7,613	4.8%	3.2%	17.3%	40.2%	21.1%	2.2%	0.7%	0.8%	5.0%	3.9%	0.8%
Moderate Rent	9,504	4.0%	3.2%	6.7%	13.1%	46.8%	10.4%	3.4%	2.0%	6.3%	3.1%	0.9%
High Rent	3,490	2.2%	2.7%	6.3%	4.7%	17.3%	41.3%	11.1%	2.9%	6.4%	4.2%	0.8%
Very High Rent	1,727	2.7%	2.7%	5.3%	3.1%	11.0%	11.0%	29.2%	17.7%	9.6%	6.6%	1.1%
Extremely High Rent	2,090	1.8%	3.5%	5.2%	3.7%	6.1%	2.6%	9.4%	51.0%	9.0%	6.3%	1.6%
Total	43,504	14.6%	4.3%	18.3%	15.3%	18.9%	7.6%	3.8%	4.5%	7.4%	4.1%	1.2%

4.2. Where did the 2013 rental stock come from?

Table 5 shows the source, by status in 2011, of the 44,564,000 rental units in the 2013 housing stock. In 2013, 11,680,000 units were extremely low rent or very low rent units. In addition, 7,539,000 units were either assisted or offered for no cash rent. Comparing Tables 3 and 5, we see that the rental stock grew by almost 1.1 million units and that the three most affordable categories grew by 138,000 units. As a group, the three most affordable categories represented a slightly lower share of the rental stock in 2013 than in 2011 (43.1 percent versus 43.9 percent).

Table 6 presents the same information as Table 5, but columns B through M are now percentages of column A.

Columns B through M explain where the 2013 rental units came from:

- If the units were rental in 2011, they will be counted in columns B through I, depending on how affordable they were in 2011.
- If the units were owner occupied, they will be counted in column J.
- Seasonal units, units that were not the primary residence of their occupants, units used for migratory workers, and units that were vacant but not for rent or sale are counted in column K.
- Column L counts newly constructed rental units.
- Column M counts rental units that were not in the stock in 2011 but were added to the 2013 stock by means other than new construction.

The sum of columns B through M equals column A, except for rounding. In Table 7, Columns B through M sum to 100 percent in each row.

The numbers in Tables 3 through 6 suggest that some rental units move far from their initial category. For example, 5.2 percent of the units that were extremely high rent in 2011 became very low rent in 2013. Although sizeable movements both up and down are possible, the tables probably overestimate the range of movement. The HADS variables used in this paper rely on AHS variables that are subject to allocation, a process by which the Census Bureau assigns values to variables if respondents fail to answer questions. Previous analysis has shown that using data without allocations produces less movement out of an affordability category and fewer changes of more than one category.¹¹

¹¹ See page 10 of *Rental Market Dynamics: Is Affordable Housing for the Poor an Endangered Species?* at <http://www.huduser.org/datasets/ahs/ahsReports.html#2>.

Table 5: Backward-Looking Rental Dynamics Analysis, Counts: 2011–2013 (All Numbers in Thousands)

Affordability Categories	A Total in 2013	B Non-Market in 2011	C Extremely Low Rent in 2011	D Very Low Rent in 2011	E Low Rent in 2011	F Moderate Rent in 2011	G High Rent in 2011	H Very High Rent in 2011	I Extremely High Rent in 2011	J Owner Occupied in 2011	K Seasonal or Related Vacant in 2011	L New Construction	M Added in Other Ways
Non-Market	7,539	4,702	210	634	407	408	82	51	45	700	219	30	51
Extremely Low Rent	2,268	233	399	481	223	298	88	46	75	234	140	15	35
Very Low Rent	9,412	563	338	4,948	1,366	663	225	111	110	598	385	32	72
Low Rent	7,579	355	139	1,584	3,108	1,283	168	52	79	450	307	17	36
Moderate Rent	9,531	356	219	617	1,632	4,512	636	180	121	786	364	75	32
High Rent	3,916	140	160	147	172	1,010	1,422	194	54	412	134	51	19
Very High Rent	1,970	52	33	91	50	308	411	499	199	211	76	30	10
Extremely High Rent	2,350	46	69	102	61	162	104	298	1,014	296	113	73	14
Total	44,564	6,446	1,566	8,605	7,020	8,644	3,136	1,431	1,696	3,688	1,737	323	270

Table 6: Backward-Looking Rental Dynamics Analysis, Row Percentages: 2011–2013

Affordability Categories	A Total in 2013	B Non-Market in 2011	C Extremely Low Rent in 2011	D Very Low Rent in 2011	E Low Rent in 2011	F Moderate Rent in 2011	G High Rent in 2011	H Very High Rent in 2011	I Extremely High Rent in 2011	J Owner Occupied in 2011	K Seasonal or Related Vacant in 2011	L New Construction	M Added in Other Ways
Non-Market	7,539	62.4%	2.8%	8.4%	5.4%	5.4%	1.1%	0.7%	0.6%	9.3%	2.9%	0.4%	0.7%
Extremely Low Rent	2,268	10.3%	17.6%	21.2%	9.9%	13.1%	3.9%	2.0%	3.3%	10.3%	6.2%	0.7%	1.6%
Very Low Rent	9,412	6.0%	3.6%	52.6%	14.5%	7.0%	2.4%	1.2%	1.2%	6.4%	4.1%	0.3%	0.8%
Low Rent	7,579	4.7%	1.8%	20.9%	41.0%	16.9%	2.2%	0.7%	1.0%	5.9%	4.0%	0.2%	0.5%
Moderate Rent	9,531	3.7%	2.3%	6.5%	17.1%	47.3%	6.7%	1.9%	1.3%	8.3%	3.8%	0.8%	0.3%
High Rent	3,916	3.6%	4.1%	3.8%	4.4%	25.8%	36.3%	5.0%	1.4%	10.5%	3.4%	1.3%	0.5%
Very High Rent	1,970	2.6%	1.7%	4.6%	2.6%	15.6%	20.9%	25.3%	10.1%	10.7%	3.9%	1.5%	0.5%
Extremely High Rent	2,350	1.9%	2.9%	4.3%	2.6%	6.9%	4.4%	12.7%	43.1%	12.6%	4.8%	3.1%	0.6%
Total	44,564	14.5%	3.5%	19.3%	15.8%	19.4%	7.0%	3.2%	3.8%	8.3%	3.9%	0.7%	0.6%

4.3. Reconciling the forward-looking and backward-looking analyses for 2011–2013

Table 7 combines the information from Tables 3 and 5 to explain how the rental stock evolved from 2011 to 2013. Appendix B explains how Table 7 was constructed.

Overall the rental stock increased by 2.4 percent; but four of the eight affordability categories contained almost the same number of rental units in 2013 as they had in 2011. The non-market category declined 1.7 percent; the very low rent category declined 0.1 percent; the low rent category declined 0.4 percent, and the moderate rent category increased 0.3 percent.

Column B measures net additions—new construction plus other additions from Table 5 minus losses from Table 3—which overall added 59,000 units to the rental stock. Losses to the stock exceeded additions in the three lowest market rent categories (extremely low rent, very low rent, and low rent housing units). Lower valued units were more likely to leave the stock, and additions were likely to be higher valued units.

Overall the rental stock gained more units from the owner stock than were lost to this sector (column C). On net, 451,000 units were added that had previously been part of the owner stock became part of the rental stock. The non-market and very low rent categories were net losers to the owner sector over this period; the biggest gains were recorded by the moderate rent, high rent, and extremely high rent sectors. Rental units that were previous owner-occupied are generally larger than the typical rental unit and therefore able to command higher rents.

Overall the renter sector lost 43,000 units on net to the seasonal sector. Only the low rent and moderate rent categories gained units from the seasonal sector.

Columns E and F record, respectively, the interaction between a particular category and less affordable categories and between a particular category and more affordable categories. Column E records the net flow from and into less affordable categories. This inflow is zero for the extremely high rent category because there are no categories that are less affordable. A positive number in column E means that more units filtered down from less affordable categories than gentrified up into those categories. Only the non-market and extremely low rent categories recorded a net inflow from the less affordable categories, and only the extremely low rent category benefited substantially from filtration.

Column F records the net flow from and into more affordable categories. This inflow is zero for the non-market category because there are no categories that are more affordable. A positive number in column F means that more units gentrified up from more affordable categories than filtered down into those categories. Except for the very low rent category, all the categories gained more units from more affordable categories than they lost to these categories.

Column G is a statistical adjustment. The same sample units are used to estimate the segment of the rental stock that are in a particular affordability category in both 2011 and 2013 but the weights used to produce the 2013 estimate are different than the weights used to produce the 2011 estimate. Column G measures the impact of changing the weights between surveys. The largest adjustment was in the large very low rent category (257,000 units), but this adjustment was less than 3 percent of the number of units in the very low rent category.

Table 7: Evolution of the Rental Housing Market by Affordability Category, 2011 to 2013 (Counts in Thousands)

	Affordability Categories	A	B	C	D	E	F	G	H	I
		2011 Rental Units	Net Additions	Net Inflow from owner sector	Net inflow from seasonal sector	Net Inflow From Less Affordable Category	Net Inflow From More Affordable Category	Impact of Different Weights	2013 Rental Stock	Change between 2011 and 2013
1	Non-market	7,670	0	-161	-2	8	0	24	7,539	-131
2	Extremely Low Rent	1,986	-4	21	-22	238	27	22	2,268	282
3	Very Low Rent	9,425	-64	-5	-19	-75	-107	257	9,412	-13
4	Low Rent	7,613	-8	68	12	-305	154	46	7,579	-34
5	Moderate Rent	9,504	18	186	70	-566	254	64	9,531	27
6	High Rent	3,490	44	188	-11	-243	469	-21	3,916	426
7	Very High Rent	1,727	21	45	-38	-106	325	-5	1,970	243
8	Extremely High Rent	2,090	53	109	-18	0	169	-51	2,350	260
9	Total	43,504	59	451	-27	-1050	1290	336	44,564	1,060
10	Non-Market, Extremely Low Rent, and Very Low Rent	19,081	-69	-146	-42	11	0	383	19,219	138

Between 2011 and 2013, the number of units in the three most affordable categories—non-market, extremely low rent, and very low rent—increased only slightly, from 19.1 million to 19.2 million. When these three categories are combined, there can be only gains from and losses to less affordable categories. These flows—filtration—contributed a net gain of only 11,000 units. Losses to the stock exceeded new construction and other additions by 68,000 for these three categories, and the three categories saw 145,000 more units go to the owner sector and 43,000 more units go to the seasonal sector than flowed in from those sectors. The statistical adjustment was 2.0 percent of the units in the three categories.

Between 2011 and 2013, the rental stock increased by 1,060,000 units. Most of this growth was recorded among the three least affordable categories: high rent (426,000 units), very high rent (243,000 units), and extremely high rent units (260,000 units). The three most affordable categories—non-market, extremely low rent, and very low rent—increased by 138,000 units but only because the extremely low rent category grew by 282,000 units. The non-market segment declined by 131,000 units. The counts of very low rent, low rent, and moderate rent units were virtually unchanged between 2011 and 2013.

Gentrification dominated filtration between 2011 and 2013. Over all eight affordability categories, gentrification exceeded filtration by 2.3 million units. On net, another 451,000 units were added as units that had previously been part of the owner stock became part of the rental stock. The non-market and very low rent categories were net losers to the owner sector over this period; the biggest gains were recorded by the moderate rent, high rent, and extremely high rent sectors. Net additions—new construction plus other additions minus losses—added 59,000 units to the rental stock. Losses to the stock exceeded additions in the three lowest market rent categories (extremely low rent, very low rent, and low rent housing units).

5. Decline in Affordable Rental Housing, 2001–2013

Table 8 tracks the housing stock, the overall rental housing stock, and its most affordable segments over the 2001–2013 period. While the rental stock grew by 19.1 percent, 7.2 million units, over the entire 12-year period, the number of affordable rental units actually declined. The number of rental units that were non-market, extremely low rent, or very low rent fell from 21.6 million in 2001 to 19.2 million in 2013, a decline of 2.4 million units. The number of affordable *market* units—those with either extremely low rents or very low rents—fell from 13.3 million in 2001 to 11.7 million units in 2013, a decline of 1.6 million units. Most of the decline occurred in the two periods between 2005 and 2009; since 2009 there has been a modest recovery in affordable rental housing.

On a percentage basis, rental housing became markedly less affordable over this period—this is true whether affordability takes non-market units into account or not. Non-market, extremely low rent, or very low rent units accounted for 57.8 percent of the rental stock in 2001 but only 43.1 percent in 2013. They accounted for 18.3 percent of the housing stock in 2001 but only 14.5 percent in 2013. Despite the rise in the number of affordable rental units since 2009, the share of rental housing that is affordable continued to decline because of the strong growth in the overall rental stock.

Table 8: Total and Affordable Rental Housing, 2001-2013

Housing units (counts in thousands)	2001	2003	2005	2007	2009	2011	2013
Non-market, extremely low rent, and very low rent units	21,597	22,128	21,631	20,032	18,042	19,049	19,218
Extremely low rent and very low rent units	13,264	13,909	13,025	11,571	11,197	11,404	11,680
All rental units	37,392	38,171	38,444	39,712	40,311	43,504	44,564
Housing stock	118,196	120,777	124,377	128,203	130,112	132,419	132,832
As percent of housing stock	2001	2003	2005	2007	2009	2011	2013
Non-market, extremely low rent, and very low rent units	18.3%	18.3%	17.4%	15.6%	13.9%	14.4%	14.5%
Extremely low rent and very low rent units	11.2%	11.5%	10.5%	9.0%	8.6%	8.6%	8.8%
All rental units	31.6%	31.6%	30.9%	31.0%	31.0%	32.9%	33.5%
As percent of rental stock	2001	2003	2005	2007	2009	2011	2013
Non-market, extremely low rent, and very low rent units	57.8%	58.0%	56.5%	50.4%	44.8%	43.7%	43.1%
Extremely low rent and very low rent units	35.5%	36.4%	34.0%	29.1%	27.8%	26.2%	26.2%

Table 9 uses the framework developed in Tables 2 and 7 to explain how the changes reported in Table 8 for the affordable rental stock came about. Gentrification has been the strongest factor. During the 12 years between 2001 and 2013, 2.6 million rental units flowed out of the non-market, extremely low rent, and very low rent categories into the less affordable categories. Most of this gentrification occurred in the 4 years between 2005 and 2009.

Except for a gain in the 2009–2011 period, the net inflow from the seasonal sector was negative throughout the 12 years for a cumulative loss of 493,000 units. Losses to the affordable stock exceeded the sum of new construction and additions by other means in five of the six 2-year periods.

During the economic expansion (2001–2007), the affordable rental stock declined by 1.5 million units; during the recession and subsequent slow recovery (2007–2013), the affordable rental stock declined by an additional 0.8 million units. The major difference between the two 6-year timeframes was the net inflows from the owner sector and from season use. Combined, the net inflow was a negative 865,000 during 2001–2007 versus a positive 538,000 during 2007–2013.

One caveat to this picture of how affordable rental housing declined during this 12-year timeframe is the possible influence of a modification in 2007 to the methodology HUD uses to calculate local median income. In 2007 HUD switched from updating decennial census data to using more current data from the American Community Survey (ACS). In publishing the 2007 median family income estimates, HUD observed that analysis by the Census Bureau found that income data collected using procedures similar to the ACS were typically lower than income data collected in the past by the decennial census.

There were 2.4 million fewer affordable rental units in 2013 than in 2001. Most of this decline occurred during the financial crisis from 2005 to 2009; part of the observed decline between 2005 and 2007 might be attributed to a change in the way HUD calculates local median family income, which is used to identify affordable units. Since 2009 there has been a modest increase in the number of affordable rental units, but the proportion of rental units that are affordable has declined steadily from 58.0 percent in 2003 to 43.1 percent in 2013. Gentrification has been the strongest factor in the decline of affordable rental housing.

During the economic expansion (2001–2007), the affordable rental stock declined by 1.5 million units; during the recession and subsequent slow recovery (2007–2013), the affordable rental stock declined by an additional 0.8 million units. The major difference between the two 6-year timeframes was the net inflows from the owner sector and from season use. Combined, the net inflow from these two sectors was a negative 865,000 during 2001–2007 versus a positive 538,000 during 2007–2013.

There was no clear break in the trends observed over the longer period that explains the 137,000-unit increase in affordable rental housing between 2011 and 2013. It appears to be mainly the result of the reweighting of the rental stock between the 2011 and 2013 AHS surveys.

Table 9: Changes in the Affordable Rental Stock over Two-Year Periods, 2001-2013 (all counts in thousands)^{12 13}

		2001– 2003	2003– 2005	2005– 2007	2007– 2009	2009– 2011	2011– 2013	2001– 2013
1	Base year non-market, extremely low rent, and very low rent units	21,597	22,128	21,631	20,032	18,042	19,081	21,597
2	Base-year rental to owner	-1,654	-1,967	-1,802	-1,489	-1,355	-1,678	-9,945
3	Base-year owner to renter	1,791	1,708	1,702	1,600	1,778	1,532	10,111
4	Net owner to renter	137	-259	-100	111	423	-146	166
5	Base -year rental to seasonal	-875	-933	-939	-806	-612	-786	-4,951
6	Base-year seasonal to rental	708	796	600	725	885	744	4,458
7	Net seasonal to rental	-167	-137	-339	-81	273	-42	-493
8	Base-year rental lost to stock	-465	-488	-592	-542	-353	-306	-2,746
9	Rental new construction	255	262	192	155	181	78	1,123
10	Rental additions by other means	304	389	300	246	157	159	1,555
11	Net additions - losses	94	163	-100	-141	-15	-69	-68
12	Net inflow from less affordable category	321	-257	-1,375	-1,370	50	11	-2,620
13	Net inflow from more affordable category	0	0	0	0	0	0	0
14	Change in weight of sample units affordable in both years	259	-30	362	-324	278	383	928
15	Final year non-market, extremely low rent, and very low rent units	22,241	21,609	20,081	18,227	19,049	19,218	19,218

¹² The calculations for each 2-year period use weights especially constructed for that period. Because weights change between periods, the count of units for base year is not equal to the count of units for the final year in the previous column. For example, in the first column, the count of affordable rental units in 2003 is 22,241,000; however, in the second column, the count of affordable rental units in 2003 is 22,128,000.

¹³ The last column sums the factors across all six periods. For this column the factors do not add up to the total change. The difference is accounted for by the sum of the differences in counts for the same year explained in the preceding footnote.

Appendix A: Data Sets and Variables Used

The American Housing Survey (AHS) provided the data used in this analysis and is well suited for this purpose, as it is a large, nationally representative sample of the housing stock. The AHS gathers information on the same housing units at 2-year intervals. Following the same unit over time allows the analysis to track changes in how units serve the housing market.

This paper also used two related data sets that greatly facilitated the analysis:

- Housing Affordability Data System (HADS).¹⁴
- 2011–2013 components of inventory change (CINCH) variables and weights.¹⁵

HADS is a data set that measures the affordability of AHS sample units and the housing cost burdens of households relative to area median incomes, poverty level incomes, and HUD Fair Market Rents. HADS contains two important variables not available in the regular AHS data set. The first is OWNRENT, which classifies units as either owned or rented.¹⁶ It differs from the AHS variable TENURE in two respects. First, OWNRENT has two states: owned or rented. TENURE has three states: owned, rented for cash, or rented for no cash rent. More importantly, OWNRENT applies to all occupied or vacant units, whereas TENURE does not apply to vacant units.^{17 18}

HADS also contains variables that classify all units by the cost of the unit relative to adjusted median income in the locality where the unit is located. From this set of variables, this paper uses COSTMEDRELAMICAT in 2011 and 2013, which puts the unit into one of seven categories based on the ratio of total monthly housing costs to monthly adjusted median income for the locality. Except for the non-market classification, these seven categories match the eight categories used in this paper.

The CINCH variables and weights data set was a product of the companion research report. For all AHS units, the data set contains (1) a set of forward-looking CINCH weights (FLCINCHWT) that allow one to track from 2011 to 2013 those units that were part of the 2011 housing stock and (2) a set of backward-looking CINCH weights (BLCINCHWT) that allow one to track from 2013 to 2011 those units that were part of the 2011 housing stock. This paper uses these weights for the rental dynamics analysis.

¹⁴ HADS is a data system developed by the Office of Policy Development and Research, U.S. Department of Housing and Urban Development. The HADS files and documentation are online at <http://www.huduser.org/datasets/hads/hads.html>.

¹⁵ The data set and documentation are available at <http://www.huduser.org/datasets/cinch.html>.

¹⁶ With the exception of abbreviations such as AHS, CINCH, and HADS, words in Appendix A that are printed with all capital letters are the names of variables in different data sets.

¹⁷ OWNRENT counts vacant units with VACANCY values of 1, 2, or 4 as rental, and those with VACANCY values of 3 or 5 as owned. No-cash-rent units are classified as rental.

¹⁸ TENURE also does not apply to units whose occupants usually reside somewhere else or to units that were not interviewed because they were temporarily or permanently out of the housing stock. OWNRENT does not apply to these units either.

The CINCH variables and weights data set also contains other variables that are important for the rental dynamics analysis and that are not found in the regular AHS data set. FLSTATUS indicates whether a 2011 housing unit was also in the 2013 housing stock or whether it had been lost to the stock for one of six reasons, while BLSTATUS indicates whether a 2013 housing unit was also in the 2013 housing stock or whether it had been added to the stock by one of six means. The CINCH data set includes four additional variables that were constructed from OWNRENT and COSTMEDRELAMICAT in HADS. Two variables (FLRENT and FLAFFORD) classify rental units in 2011 and 2013, respectively, into one of the eight categories used in this paper. Two variables (BLRENT and BLAFFORD) classify rental units in 2013 and 2011, respectively, into one of the eight categories used in this paper.

Appendix B: Weighting and Reconciling the Forward-Looking and Backward-Looking Analyses

Section 1 explained that the weights of American Housing Survey (AHS) sample units can change between surveys and that these changes can introduce inconsistencies into the analysis of rental dynamics. The first part of Section 4 bypassed these inconsistencies by breaking the investigation into two parts: a study of what happened to the 2011 rental stock by 2013 (forward-looking analysis; see Table 3) and a study of where the 2013 rental stock came from with respect to 2011 (backward-looking analysis; see Table 5). The second part of Section 4 reconciled the forward-looking and backward-looking analyses by taking into account how weight changes affect the observed outcomes; see Table 7.

Appendix B demonstrates how weighting enters into the analysis by reproducing Tables 3 and 5 using *unweighted* data and then explaining how weights are applied to the sample units to produce the estimates in the report. Table B-1 is an unweighted version of Table 3; Table B-2 is the unweighted version of Table 5.

In Tables B-1 and B-2, columns B through I count the sample units that were rental in both years. For example, 1,699 sample units were moderate rent in both years—see row 5 and column F in both Tables. Of the 3,746 sample units that were moderate rent in 2011 (Table B-1, row 5, column A), 377 had become high rent in 2013 (Table B-1, row 5, column G). Of the 1,506 sample units that were high rent in 2013 (Table B-2, row 6, column A), 377 had been moderate rent in 2011 (Table B-2, row 6, column F).

This example points out two important facts:

- The *same* sample units are used in both the forward-looking and backward-looking analyses to study units that are rental in both years.
- Rows 1 through 8 and columns A through I in Table B-2 are a transposition of rows 1 through 8 and columns A through I in Table B-1.

For the forward-looking analysis, what weights to use appears to be a simple question. 2011 weights are used to translate the 3,746 sample units (Table B-1, row 5, column A) into an estimate of moderate rent units in 2011 (9,504,000). Columns B through L of row 5 in Table B-1 depict what happened to those sample units by 2013. Table 3 uses 2011 weights to produce actual unit counts for these disposition options.

Similarly what weights to use for the backward-looking analysis appears to be a simple question. 2013 weights are used to translate the 1,506 sample units that were high rent in 2013 (Table B-2, row 6, column A) in an estimate of high rent units (3,916,000). Columns B through L of row 6 in Table B-2 depict where these sample units came from with respect to 2011. Table 5 uses 2013 weights to produce actual unit counts for these origin options.

Table B-3 shows how the 1,699 sample units that were moderate rent in both years and the 377 units that were moderate rent in 2011 and high rent in 2013 are weighted in the forward-looking and backward-looking analyses.

Table B-1: Forward-Looking Rental Dynamics Analysis (Table 3), using counts of sample unit

	Affordability Categories	A Total in 2011	B Non-Market in 2013	C Extremely Low Rent in 2013	D Very Low Rent in 2013	E Low Rent in 2013	F Moderate Rent in 2013	G High Rent in 2013	H Very High Rent in 2013	I Extremely High Rent in 2013	J Owner Occupied in 2013	K Seasonal or Related Vacant in 2013	L Lost to Stock in 2013
1	Non-Market	6,530	4,986	203	324	198	188	74	25	29	319	114	70
2	Extremely Low Rent	949	222	154	143	57	95	44	19	33	79	74	29
3	Very Low Rent	3,843	335	184	1,856	599	253	59	39	52	222	169	75
4	Low Rent	2,995	192	90	520	1,174	617	67	20	28	142	114	31
5	Moderate Rent	3,746	203	116	262	482	1,699	377	122	79	232	128	46
6	High Rent	1,362	49	39	88	65	239	538	140	40	91	60	13
7	Very High Rent	673	24	20	27	23	74	72	192	120	63	47	11
8	Extremely High Rent	903	31	33	48	37	56	22	64	454	74	63	21
	Total	21,001	6,042	839	3,268	2,635	3,221	1,253	621	835	1,222	769	296

Table B-2: Backward-Looking Rental Dynamics Analysis (Table 5), using counts of sample unit

	Affordability Categories	A Total in 2013	B Non-Market in 2011	C Extremely Low Rent in 2011	D Very Low Rent in 2011	E Low Rent in 2011	F Moderate Rent in 2011	G High Rent in 2011	H Very High Rent in 2011	I Extremely High Rent in 2011	J Owner Occupied in 2011	K Seasonal or Related Vacant in 2011	L New Construction	M Added in Other Ways
1	Non-Market	6,453	4,986	222	335	192	203	49	24	31	254	109	18	30
2	Extremely Low Rent	1,019	203	154	184	90	116	39	20	33	90	63	9	18
3	Very Low Rent	3,702	324	143	1,856	520	262	88	27	48	232	154	11	37
4	Low Rent	2,958	198	57	599	1,174	482	65	23	37	167	125	10	21
5	Moderate Rent	3,716	188	95	253	617	1,699	239	74	56	299	144	32	20
6	High Rent	1,506	74	44	59	67	377	538	72	22	157	60	23	13
7	Very High Rent	751	25	19	39	20	122	140	192	64	76	33	14	7
8	Extremely High Rent	1,047	29	33	52	28	79	40	120	454	115	52	35	10
	Total	21,152	6,027	767	3,377	2,708	3,340	1,198	552	745	1,390	740	152	156

Table B-3: Alternative Weighting Example

	Sample Count	Forward-Looking Weighted Count	Backward-Looking Weighted Count
Moderate rent in both years	1,699	4,448,000	4,512,000
Moderate rent in 2011 and high rent in 2013	377	988,000	1,010,000

The forward-looking analysis counted the 1,699 sample units that were moderate rent in both years as 4,448,000 rental units; the backward-looking analysis counted them as 4,512,000 units. The forward-looking analysis counted the 377 sample units that were moderate rent in 2011 and high rent in 2013 as 988,000; the backward-looking analysis counted them as 1,010,000. While the differences are small, 1.4 percent and 2.2 percent respectively, they are not insignificant.

Breaking the analysis into forward-looking and backward-looking components gets around these inconsistencies by evaluating the sample units in the terms of the year being studied, without reference to their weight in the other year. The reconciliation analysis reported in Tables 2, 7, and 9 adopts the following rules:

- Units leaving a category are given the weights they had before they left, 2011 in the example.
- Units coming into a category are given the weights they have when they arrive, 2013 in the example.
- An explicit adjustment is made for units that do not change status but whose weights change.

Table B-4 explains the derivation of Table 7, using the Moderate Rent Affordability category as an example of how these rules were applied.

Table B-4 has two panels. The left panel uses the numbers in Tables 3 and B-1 to describe what happened to the rental units in 2011 with moderate rents; the right panel uses the numbers in Table 5 and B-2 to explain where 2013 rental units with moderate rents came from.

There are three important facts about Table B-1:

- Both the sample counts and the weighted numbers are consistent within each panel; that is, $A=B+C+D+E+F+G$ and $H=I+J+K+L+M+N+O$.
- The weights used in each panel are appropriate to the task of that panel. Each of the weighted numbers is a statistically sound estimate of its segment of the housing market. For example, in row C, 191,000 is a statistically valid estimate of the number of 2011 rental units with moderate rents that had become part of the owner stock by 2013.
- The estimates in each panel are conceptually appropriate for the task of that panel. B, C, D, E, F, and G tell what happened to A by 2013, while I, J, K, L, M, N, and O are the pieces that form H in 2013.

Table B-4: Derivation of Estimates of Units With Moderate Rents in Both 2011 and 2013 (Weighted Counts in Thousands)

What Happened to 2011 Rental Units				Where 2013 Rental Units Came From			
	Forward-Looking Analysis	Sample	Weighted		Backward-Looking Analysis	Sample	Weighted
A	Moderate rent units in 2011	3,746	9,504	H	Moderate rent units in 2013	3,716	9,531
B	Lost to the stock	46	89	I	New construction	32	75
				J	Other additions to stock	20	32
C	Became owner stock	232	600	K	Came from owner stock	299	786
D	Became seasonal stock	128	293	L	Came from seasonal stock	144	364
E	Outflow to less affordable category	578	1,503	M	Inflow from less affordable category	369	938
F	Outflow to more affordable category	1,063	2,571	N	Inflow to more affordable category	1,153	2,824
G	Moderate rents in both 2011 and 2013	1,699	4,448	O	Moderate rents in both 2011 and 2013	1,699	4,512

Table B-4 raises the obvious question: rows G and O purport to be the same segment—rental units that have moderate rents in both 2011 and 2013. Not only are the sample counts identical for rows G and O, but the sample units are identical. Every AHS unit that is in G is also in O and vice versa. The counts differ because different weights are applied to the same units, and different weights are used because the left and right panels tell different stories. In the context of the left panel, row G estimates how many 2011 moderate rent units will remain moderate rent in 2013. The row G estimate is based on the 2011 housing stock. In the context of the right panel, row O estimates how many 2013 moderate rent units were moderate rent in 2011. The row O estimate is based on the 2013 housing stock.

Understanding the difference between rows G and O allows us to construct a consistent description of how the rental stock evolved between 2011 and 2013. Table B-5 combines the left and right panels of Table B-4 to trace how the moderate rent category changed between 2011 and 2013. Table B-5 contains a new row, O-G, that measures the effect from using new weights when the perspective changes from 2011 to 2013.

Table B-5: Tracking Changes in the Moderate Rent Category: 2011–2013 (Weighted Counts in Thousands)

	Forward-Looking Analysis	Sample	Weighted
A	Moderate rent units in 2011	3,746	9,504
B	Lost to the stock	46	89
C	Became owner stock	232	600
D	Became seasonal stock	128	293
E	Outflow to less affordable category	578	1,503
F	Outflow to more affordable category	1,063	2,571
G	Moderate rents in both 2011 and 2013	1,699	4,448
O-G	Increase in 2013 count of units in the moderate rent category due to change in weights	0	64
	Backward-Looking Analysis	Sample	Weighted
O	Moderate rents in both 2011 and 2013	1,699	4,512
I	New construction	32	75
J	Other additions to stock	20	32
K	Came from owner stock	299	786
L	Came from seasonal stock	144	364
M	Inflow from less affordable category	369	938
N	Inflow to more affordable category	1,153	2,824
H	Moderate rent units in 2013	3,716	9,531

Row O-G should *not* be thought of as an error term. As explained, it measures the impact of changing the perspective from 2011 to 2013.

The changes in weights enter into this portrayal in another way. Over all eight affordability categories, the unweighted sum of row E plus row F should equal the unweighted sum of row M

plus row N. Every unit that moves out of one of the eight categories must move into one of the eight categories. This equality holds for the counts of sample units but not for the weighted counts. The 2011 weights are applied to rows E and F; the 2013 weights are applied to rows M and N. Table 7 implicitly assumes that the outflows occurs in a 2011 context and the inflows occurs in a 2013 context.