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- Table 10 starts with the forward-looking estimate of the 2007 rental stock and produces an estimate of the 2009 rental stock that is 863,000 more than the estimate from the backward-looking analysis. Table 11 starts with the backward-looking estimate of the 2009 rental stock and produces an estimate of the 2007 rental stock that is 862,000 less than the forward-looking estimate.<sup>19</sup>
- Table 10 estimates that 17,492,000 units were in the same affordability category in both 2007 and 2009; Table 11 estimates this number as 17,020,000. These estimates are based on the same AHS sample units and differ only because the weights applied to the sample units differ.

These inconsistencies point out the need for caution in using Tables 10 and 11. This paper looks at these tables for information on the direction and magnitude of changes in affordability and for estimates of the relative magnitude of the underlying causes.

In Table 10, the estimation process runs from left to right. The calculations begin with the 2007 rental stock in 2007 (column A). The forward-looking analysis tracks movement of these units either out of the rental stock (column C) or to other affordability categories (columns D and E). Column F counts the number of units that were rental in 2007, remained rental in 2009, and were in the same affordability category in both years. Column F equals column A minus the sum of columns C, D, and E. At this point, for each affordability category, the table has taken the count of units in that category in 2007 and stripped out all the units that are not in that category in 2009. Now the table adds in units that are in the category in 2009 but did not start out in that category in 2007. Columns G and H add units that came from other affordability categories, and column I adds units that were non-rental in 2007. Column J is the estimate for 2009 of the number of units in each affordability category produced by this process. For comparison, column K contains the estimates for 2009 from the backward-looking analysis.

In Table 11, the estimation process runs from right to left. The calculations begin with the 2009 rental stock (column K). The backward-looking analysis removes units that were not rental in 2007 (column I) and units that came from other affordability categories (columns G and H). Column F counts the number of units that were rental in 2009, were also rental in 2007, and were in the same affordability category in both years. Column F is column K minus the sum of columns G, H, and I. At this point, for each affordability category, the table has taken the count of units in that category in 2009 and stripped out all the units that were not in that category in 2007. Now the table adds in units that are in the category in 2007 but did not continue in that category in 2009. Columns D and E add units that had moved out of the affordability class since 2007, and column C adds units that had moved out of the rental stock since 2007. Column B is

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<sup>19</sup> The difference is the same, except for rounding, in both cases because of the symmetry in the estimation procedure. The difference between columns A and K is 679,000 in both tables. The movement among affordability categories netted across all categories must be zero. Therefore, the only source of net gain or loss is the difference between columns I and C, which is 1,542,000 in both tables.  $1,542,000 - 679,000 = 863,000$ .



the estimate for 2007 of the number of units in each affordability category produced by this process. For comparison, column A contains the forward-looking estimate for the 2007 rental stock.

Columns A and K are the same in both tables. This paper uses the difference between column K and column A as the CINCH estimate of change in the size of each category over the period. Table 10 estimates the change in the size of each category by subtracting column A from column J, while Table 11 estimates the change by subtracting column B from column K.

To facilitate the discussion, Table 12 collects the information from Tables 10 and 11 to explain how the rental housing stock changed from 2007 to 2009. Columns C and I are identical in both Tables 10 and 11. The difference between column I and column C is an estimate for each affordability category of the net gain between 2007 and 2009 from outside the rental stock and is reported as column E in Table 12.

Columns D, E, G, and H in Tables 10 and 11 measure movement of rental units between affordability categories. Column D measures movements from more affordable categories in 2007 to less affordable categories in 2009, while column G measures movements into less affordable categories in 2009 from more affordable categories in 2007. The sum of the movements in column D must be the same as the sum of the movements in column G in both tables.<sup>20</sup> Column E measures movements from less affordable in 2007 to more affordable categories in 2009, while column H measures movements into more affordable categories in 2009 from less affordable categories in 2007. Again, the sum of the movements in column E must be the same as the sum of the movements in column H in both tables.

For this reason, the sum of the totals of columns G and H minus the sum of the totals of columns D and E must equal zero in both tables. However, column G + column H – column D – column E will not equal zero for individual affordability categories. This sum is the net of all movements into and out of other affordability categories. In Table 12, column F reports this sum from Table 10, while column G reports the negative of this sum for Table 11.

The paper now examines changes in rental affordability between 2007 and 2009. To facilitate the discussion, Table 12 collects the information from Tables 10 and 11. Table 12 also contains the estimates using AHS weights from Table 1. Using Table 12, the paper discusses each affordability category separately.

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<sup>20</sup> Column D in Table 10 sums *horizontally* the numbers in the cells between columns C and I of Table 3 in the area above the diagonal in that section of Table 3. Column G in Table 10 sums *vertically* the numbers in the same area of Table 3. The same is true for columns D and G of Table 11 with respect to the area above the diagonal in columns C through I of Table 6.

**Table 12: Changes in the Rental Stock by Affordability Category, Combined Analysis (all counts in thousands)**

	A	B	C	D	E	F	G
<b>Rent groups</b>	AHS estimates of 2007-2009 change (Table 1)	CINCH estimate of 2007-2009 change (column K - column A)	Table 10 estimate of 2007-2009 change (column J - column A)	Table 11 estimate of 2007-2009 change (column K - column B)	Net Gain from non-rental sources (column I - column C)	Table 10 estimate of net gain from movement across categories	Table 11 estimate of net gain from movement across categories
Non-market	-1,540	-1,537	-1,443	-1,195	-71	-1,372	-1,124
Extremely Low Rent	-495	-566	-524	-632	-170	-354	-462
Very Low Rent	-1	288	527	526	130	397	396
Low Rent	541	761	917	888	211	706	677
Moderate Rent	782	1,096	1,268	1,238	594	674	644
High Rent	430	539	597	569	461	136	108
Very High Rent	150	222	260	243	273	-13	-30
Extremely High Rent	-170	-126	-60	-96	114	-174	-210
<b>Total</b>	<b>-305</b>	<b>678</b>	<b>1,542</b>	<b>1,541</b>	<b>1,542</b>	<b>0</b>	<b>-1</b>
	<b>As percent of 2007 rental stock</b>						
<b>Rent groups</b>	AHS estimates of 2007-2009 change (Table 1)	CINCH estimate of 2007-2009 change (column K - column A)	Table 10 estimate of 2007-2009 change (column J - column A)	Table 11 estimate of 2007-2009 change (column K - column B)	CINCH estimate of 2007 rental stock		
Non-market	-18.2%	-18.2%	-17.1%	-14.1%	8,461		
Extremely Low Rent	-21.9%	-25.0%	-23.2%	-27.9%	2,262		
Very Low Rent	0.0%	3.1%	5.7%	5.7%	9,309		
Low Rent	8.6%	12.1%	14.6%	14.1%	6,290		
Moderate Rent	10.2%	14.3%	16.6%	16.2%	7,650		
High Rent	17.7%	22.2%	24.5%	23.4%	2,432		
Very High Rent	10.7%	15.9%	18.6%	17.4%	1,396		
Extremely High Rent	-8.9%	-6.6%	-3.1%	-5.0%	1,913		
<b>Total</b>	<b>-0.8%</b>	<b>1.7%</b>	<b>3.9%</b>	<b>3.9%</b>	<b>39,712</b>		

- **Overall rental housing stock**

- The rental housing stock—the combination of renter-occupied units and vacant rental units—grew between 2007 and 2009. The CINCH estimate is 678,000 in growth (1.7 percent), somewhat larger than the 499,000 estimate based on the AHS published reports. We chose these estimates over the estimate in column A, which was produced by applying AHS weights to the rental stock for which we have information in both survey years.
- We attempt to explain the growth between 2007 and 2009 by combining both the forward-looking and backward-looking analyses. The price of combining data using different weights is a larger overall estimate, 1,542,000 more rental stock in 2009 than in 2007. At the rental stock level, movements among affordability categories cancel out and, therefore, the entire change is explained by the difference between the

CINCH estimates of rental units added between 2007 and 2009 and rental units lost between 2007 and 2009.

- **Non-market units**
  - The number of non-market units decreased between 2007 and 2009. Estimates of the number of non-market units lost range from 1,195,000 to 1,540,000, a decline of between 14.1 and 18.2 percent of the 2007 non-market rental stock.
  - Both the forward-looking and backward-looking analyses indicate that almost all of the loss resulted from movement of non-market units into market units.
  
- **Extremely low rent units**
  - The analyses indicate a decrease in the number of extremely low rent units, ranging from 495,000 to 632,000 units, a decline of between 21.9 and 27.9 percent of the 2007 extremely low rent stock.
  - The two CINCH analyses indicate that losses exceeded additions for this group and that more units moved out of this category than into it between 2007 and 2009. The net movement out accounted for approximately 95 percent of the loss.
  
- **Very low rent units**
  - The number of very low rent units most likely increased between 2007 and 2009. The estimate, based on AHS weights, indicates no change, while the three CINCH-based estimates indicate an increase ranging from 288,000 to 527,000, an increase between 0.0 and 5.7 percent of the 2007 very low rent stock.
  - The very low rent category benefited from both net additions and net in-movement from other categories. Net in-movement from other rent categories accounted for approximately 70 percent of the increase.
  
- **Low rent units**
  - All four estimates report increases in low rent units, ranging from 541,000 to 917,000, an increase of between 8.6 and 14.6 percent of the 2007 low rent stock.
  - The low rent category benefited from both net additions and net in-movement from other categories. Net in-movement from other rent categories accounted for approximately 75 percent of the increase.
  
- **Moderate rent units**
  - All four estimates report increases in moderate rent units, ranging from 782,000 to 1,268,000, an increase of between 10.2 and 16.6 percent of the 2007 moderate rent stock.
  - The moderate rent category benefited from both net additions and net in-movement from other categories. Net additions and net in-movement from other rent categories accounted for approximately equal amounts of the growth.
  
- **High rent units**
  - All four estimates report increases in high rent units, ranging from 430,000 to 597,000, an increase of between 17.7 and 24.5 percent of the 2007 high rent stock.

- The high rent category benefited from both net additions and net in-movement from other categories. Net additions accounted for approximately 80 percent of the growth.
- **Very high rent units**
  - All four estimates report increases in very high rent units, ranging from 150,000 to 260,000, an increase of between 10.7 and 18.6 percent of the 2007 very high rent stock.
  - The gain came entirely from net additions, as the analysis indicates a small net movement into other affordability categories.
- **Extremely high rent units**
  - All four estimates report decreases in extremely high rent units, ranging from 60,000 to 170,000, a decline of between 3.1 and 8.9 percent of the 2007 extremely high rent stock.
  - The extremely high rent category experienced a substantial gain from the excess of additions over losses, but this gain was more than offset by movement into other categories.

## **Conclusion**

This paper began with two questions that can now be answered:

- Did the number of rental units affordable to lower income households grow or decline between 2007 and 2009?

The two most affordable categories—non-market units and extremely low rent units—both experienced sizable declines between 2007 and 2009. Very low rent units appeared to have grown some, and there is solid evidence of growth among low rent units. The three lowest categories declined by between 1.3 and 2.0 million units, depending upon the source of the estimate. When low rent units are included in the group, the decline ranges between 0.4 to 1.5 million.

- What factors caused the number of affordable rental units to grow or decline during this period?

Focusing only on non-market, extremely low rent, and very low rent units, net movement into and out of other affordability categories accounted for over 90 percent of the decline.

The dynamics of rental housing in the 2007-2009 period resulted from the combination of three factors:

- A major decline in additions to the rental housing stock, particularly in new construction.
- A substantial increase in the *net* flow of units from the owner stock to the renter stock.
- Large flows among affordability classes in which the most affordable and least affordable categories experienced the largest net outflows.