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The relationship between the housing and labor market crises and doubling up: an MSA-level analysis, 2005–2011

It is now well established that the U.S. housing market crisis preceded the labor market crisis and that, in the wake of these crises, doubling up and cohabitation increased and homeownership fell. What is less clear, however, is what happened at the subnational level. This article reports on (1) how the length, severity, and relative timing of both the housing and labor market crises varied by metropolitan statistical area (MSA), and (2) the association between the timing of these crises and changes in homeownership and doubling up at the MSA level. The analysis uses data on 353 MSAs, with a focus on 12 MSAs, for the period from 2005 (precrisis) to 2011. MSAs are categorized into those where the housing market declined first, those where the labor market declined first, and those where the events were concurrent. The analysis reveals that (1) in the majority of MSAs, the labor market declined first, contrary to the national pattern and the experience of the vast majority of large MSAs; (2) there is a clear relationship between greater regional housing distress and falling homeownership rates; and (3) somewhat surprisingly, the association between changes in doubling up and these crises is fairly weak at the MSA level.

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In early 2007, the most recent U.S. housing bubble burst. The bust was followed by the onset of the Great Recession and the deepest employment decline that the United States has experienced since the end of World War II.[1] In the wake of these events, media reports and research studies have documented increased "doubling up" of families as well as increased numbers of young adults who returned to their parents' homes or were slower to exit them than they were in years past.[2, 3] A sign of the times, a 2009 *USA Today* article began, "Love isn't all that's keeping family together today. The bruising housing market is too."[4]

Other reports have pointed to rising rates of cohabitation resulting from the economic crisis, in addition to the secular rise that was already underway.[5]

Although these national patterns are now well established, the relative timing of the housing and labor market crises at the MSA level and the association of these crises with household formation have not been fully studied.[6] This article reports on (1) how the length, severity, and relative timing of both the housing and labor market crises varied by MSA, and (2) the association between the timing of these crises and changes in homeownership and doubling up at the MSA level. The analysis uses data on 353 MSAs, with a focus on 12 MSAs, for the period from 2005 (precrisis) to 2011.

In this article, MSA-level housing prices serve as a measure of overall housing conditions. The start of the housing crisis in a given area is identified by looking at when housing prices peaked. Similarly, the start of the labor market crisis in a given area is identified by looking at when employment peaked. Using information on the timing of each crisis, the article then looks at the relative timing of the crises for each of the 353 MSAs examined, by investigating (1) whether the housing market crisis occurred first (which was the pattern observed for the nation as a whole), (2) whether the labor market crisis occurred first (which, it turns out, was the pattern for a slight majority of MSAs), and (3) whether these events were concurrent. The relative timing of the crises appears to be a useful way to categorize MSAs. The MSAs where the housing market declined first have some distinct characteristics: many are among the largest MSAs (as measured by employment size), and the crises in these MSAs were among the most severe, in terms of both magnitude and duration.

The article also investigates the association between the housing and labor market crises and changes in doubling up and homeownership at the MSA level. As would be expected, there is a strong association between greater regional housing distress and falling homeownership rates. Somewhat surprisingly, however, the association between changes in doubling up and these crises appears fairly weak at the MSA level.

Literature review

The collapse of the U.S. housing market in 2007 and the onset of the Great Recession spawned a tremendous amount of inquiry into the nature, causes, and consequences of these crises. The most relevant previous research can be divided into two parts: (1) studies that have looked at the housing market crisis or the labor market crisis at the subnational level, and (2) studies that have looked at the relationship between these crises and household formation at the MSA level. Each literature is discussed in turn.

A number of studies have examined the recent boom and subsequent bust in the national housing market. Estimates of the housing boom's start date vary, with suggested possibilities including 1996, 1998, and 2002.[7] There is a much narrower band around the date when the national housing bubble burst; the bust occurred in either mid-2006 (estimated using the Case–Shiller Home Price Indices) or in first quarter 2007 (estimated using the House Price Index from the Federal Housing Finance Agency [FHFA]).[8] Turning to subnational data, some studies point to considerable dispersion across MSAs in the magnitude of the rise in prices during the boom as well as in the decline of prices during the bust.[9] These studies also find a similar set of patterns: (1) MSAs located in the interior of the United States (e.g., Charlotte, Detroit, Cleveland, and Chicago) experienced smaller increases in housing prices during the boom than did MSAs located on the coasts; and (2) the set of MSAs that experienced larger booms also tended to be those which experienced larger busts. Among the interesting exceptions is Las Vegas. In Las Vegas, the rise in nominal housing prices during the boom (150 percent) was not quite as large as

that for some other West Coast cities (in both Los Angeles and San Diego housing prices increased more than 200 percent), and the decline in housing prices during the bust was considerably larger than the decline for these counterparts (62 percent in Las Vegas versus around 40 percent in both Los Angeles and San Diego).[10]

Some studies have also looked at the subnational variation in the *timing* of housing booms and busts.[11] A study by Todd Sinai is the most relevant here, because it looked at both the timing of the most recent housing boom and the timing of the housing bust, and drew comparisons with the housing cycle of the 1980s.[12] Interestingly, the study found that the timing in MSAs of the most recent housing bust was more closely concentrated than that of the previous bust, with many peaks around 2007 and 2008 but still a good deal of heterogeneity. Unlike the present article, however, the study did not look at more finely grained (quarterly) data or consider variations in the timing of events in the labor market relative to the housing market by MSA.

Extensive evidence also points to substantial heterogeneity in employment conditions at the subnational level during the latter part of the 2000s. MSAs that were especially hard hit by the labor market crisis, as measured by Bureau of Labor Statistics (BLS) local area unemployment rates, include Detroit, Las Vegas, Los Angeles, and Miami. With the notable exception of Detroit from this set, these MSAs also experienced the housing bubble.[13] This is to be expected given the strong relationship between the health of the housing sector and the level of construction employment.[14] Although less attention has been paid to regional variations in the timing of employment crises, Howard Wall conducted one such study.[15] Wall examined the timing of economic expansions and employment downturns for a small number of cities. He found that these cities experienced these events at around the same time the nation did; however, in line with Sinai's conclusion regarding variation in the timing of housing crises at the MSA level, Wall still identified quite a bit of dispersion.

In addition, a few previous studies have sought to explicitly link changes in the housing market and/or the labor market during the recent crisis to changes in household formation at the MSA level.[16] For example, Timothy Dunne used MSA-level data on people ages 18 to 34 to investigate the correlation between household formation (e.g., headship rates[17] and number of households) and labor market conditions and the correlation between household formation and housing prices.[18] Although he found that doubling up is associated to some extent with both a weak housing market and a weak labor market, he did not probe further. Gary Painter also used data on 80 MSAs from the American Community Survey (ACS) for the period 2005–2008 to examine changes in household headship, homeownership, and overcrowding within a dwelling for MSAs grouped by immigrant status.[19] His study found that headship rates and overcrowding rose while homeownership declined for all groups examined, although to differing extents.

Finally, it is worthwhile pointing to a few studies that have used MSA-level data to investigate associations between the housing crisis and other outcomes. Lisa Dettling and Melissa Kearney, for instance, used MSA-level data to examine the relationship between variations in housing prices and fertility during the recent crisis.[20] In addition, a number of studies have looked at spillover and contagion effects of the foreclosure crisis that accompanied the burst of the housing bubble.[21]

To sum up, this article builds upon earlier studies of subnational housing and labor markets and documents geographic differences in the timing and severity of the housing and labor market crises of the late 2000s. It then takes a further step and examines associations between these crises and household formation.

Data and methodology

The analysis uses data on 353 MSAs, with a focus on 12 MSAs, for the period from 2005 to 2010 (and, where data were available, to 2011).[22] The rationale for the selection of these specific MSAs is discussed shortly. Table 1 summarizes the key indicators for household formation and housing and labor market conditions, along with their data sources. Labor market conditions are principally measured using BLS data on nonfarm payroll employment.[23] Overall conditions in the housing market are measured using the FHFA House Price Index for single-family units.[24] In the analysis, the index is set to 100, with 2005 as the base year. These data are available at the quarterly level through 2011. Previous studies examining changes in overall housing conditions across MSAs have similarly used these data or relied on a smaller set of MSAs included in the Case–Shiller indices.[25]

Table 1. Definitions of housing market, labor market, and household formation variables

Variable	Definition	Source
Household formation and homeownership		
Household size	Size of household	ACS
Nonrelatives in family households (percent)	Nonrelatives living in family households as a percentage of total people in family households	ACS
Unmarried households (percent)	Unmarried (opposite-sex) partner households as a percentage of total households	ACS
Homeownership rate (percent)	Owner-occupied households as a percentage of total households	ACS
Housing market conditions		
House Price Index (2005 = 100)	Prices for single-family-unit transactions serviced by Fannie Mae or Freddie Mac	FHFA
Foreclosure rate (percent)	(number of foreclosures / number of loans) x 100; measure is akin to a default rate	CoreLogic
Labor market conditions		
Employment (thousands)	Nonfarm payroll employment, age 16 and over	BLS
Unemployment rate	Rate calculated for civilian noninstitutional population, age 16 and over	BLS

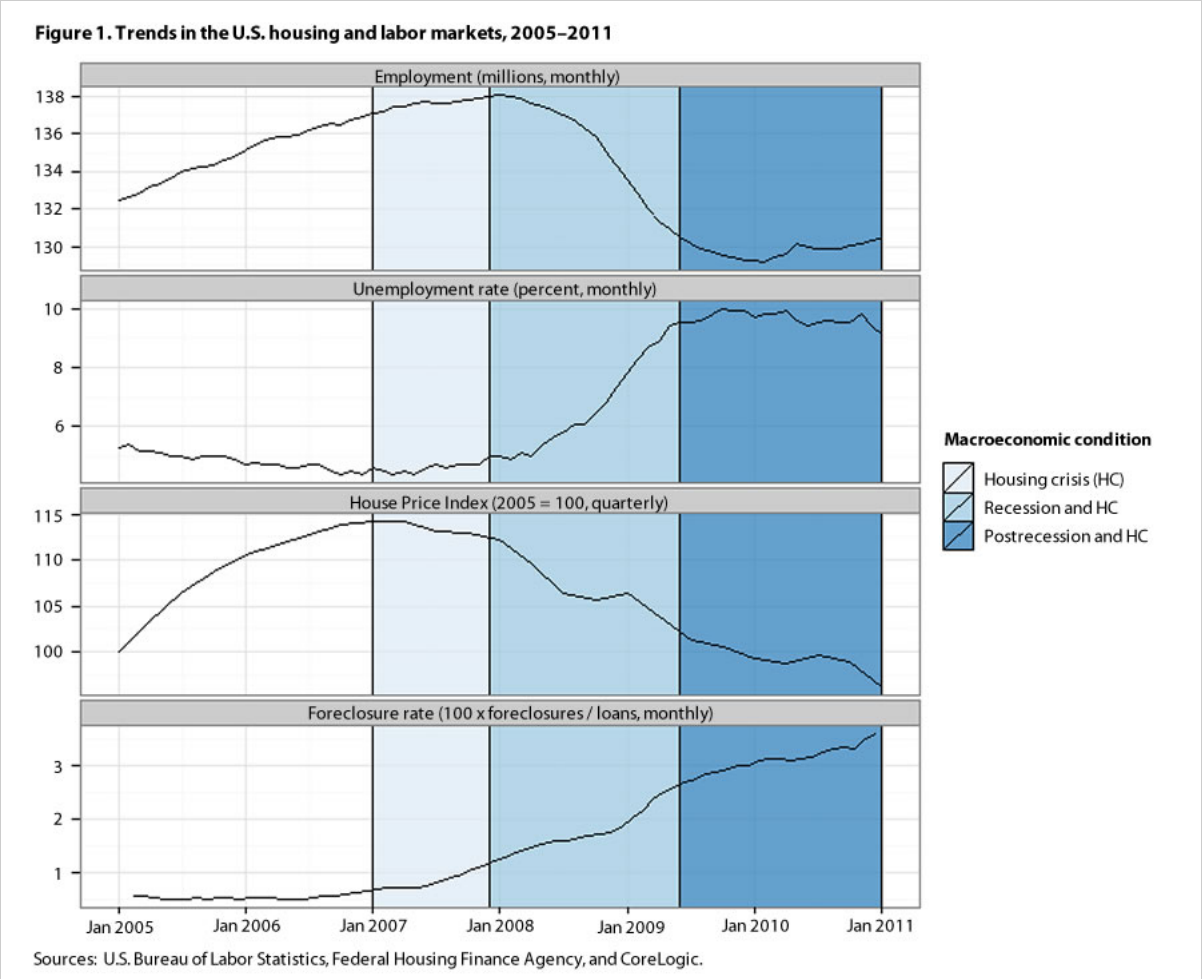
Some attention is also focused on foreclosures, given the acute impact they had on particular housing submarkets (e.g., subprime lending). Foreclosures are measured using proprietary data obtained from CoreLogic, which includes 85 percent of foreclosures and first lien loans.[26] CoreLogic defines a foreclosure as a situation in which an owner's right to a property is terminated, usually because of default. The foreclosure rate is calculated here as foreclosures per number of loans (multiplied by 100). Foreclosure data are available at the monthly level, although in many of the analyses they are aggregated to the quarterly (or annual) level for comparisons with data from other sources. For all nonannual data, seasonal adjustment is undertaken using a locally weighted regression.[27]

Data on rates of doubling up, cohabitation, and housing tenure (home ownership) are drawn from ACS annual data for the period 2005–2010. The prime advantage of the ACS is that, as the largest household survey in the United States, it has information on 3 million addresses. In all analyses, group quarters (i.e., dorms and institutional settings) are omitted as a household type. Using the ACS, two measures of doubling up are examined: (1) average household size and (2) the number of nonrelatives living in family households as a percentage of total number of people residing in family households.[28] For completeness, the article also examines homeownership rates, defined as the percentage of households that are owner occupied. In interpreting these measures, homeownership rates reflect the investment component of housing demand whereas rates of doubling up provide information regarding consumption demand for housing (e.g., need for shelter). Finally, the article also looks at trends in the number of unmarried (opposite-sex) partner households as a percentage of total households. This latter measure differs from

doubling up in that it provides information about the marriage versus cohabitation decision. Although cohabitation rates have been experiencing a secular increase, economic conditions also play an important role, given evidence that couples are more likely to defer marriage until they are able to afford it.[29]

The empirical analysis proceeds in two parts. First, the severity and relative timing of the housing and labor market crises are examined for the 353 MSAs for which complete data are available. This analysis uses quarterly data from second quarter 2005 through fourth quarter 2011.[30] This analysis further focuses on the experience of 12 MSAs with distinct differences in the relative timing of their housing and labor market crises. The second part of the analysis investigates the association between the housing and labor market crises and changes in homeownership and doubling up. In this second portion of the analysis, the quarterly data on the housing and labor market variables are annualized to match the annual data available in the ACS.

Descriptive analysis

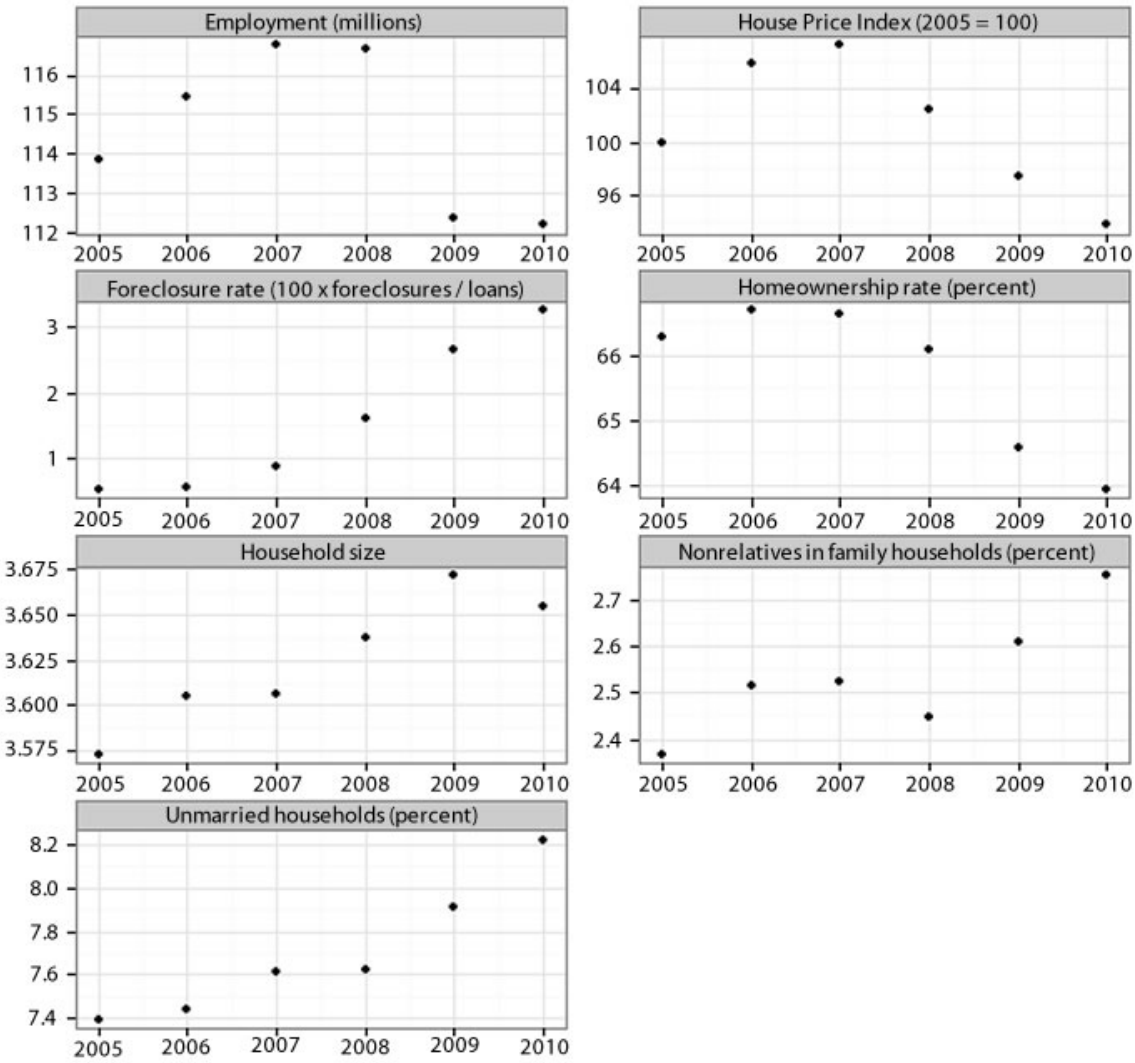


National picture. To provide context for the analysis of MSAs, figure 1 presents information on national U.S. housing and labor market conditions for the period 2005–2011. Housing prices in the nation accelerated during the early to mid-2000s and, according to the FHFA House Price Index, reached a peak in first quarter 2007.[31] From 2007 to 2010, housing prices declined nearly 13 percent on average in the United States, and the foreclosure rate —a measure of acute housing distress—rose from 0.87 percent to 3.26 percent, a whopping 274-percent increase.[32] Trends in U.S. employment and unemployment are mirror images and both show a downturn in the

labor market by the end of 2007 or early 2008. From 2007 to 2010, the unemployment rate rose from 4.6 percent to 9.6 percent, while employment fell by 5.6 percent. The data also show that the Great Recession's start date of December 2007, as determined by the National Bureau of Economic Research, virtually coincides with the start of the labor market downturn. As shown in figure 1, the national situation from 2005 to 2011 can be described as having progressed through four distinct periods: the precrisis period (before 2007), the housing-crisis-only period (first quarter 2007–end of 2007), the housing recession period (end of 2007–summer 2009), and the postrecession period (after summer 2009). As of the end of 2012, the national unemployment rate remained only slightly below 8 percent.

In terms of the timing of the housing and labor market crises, figure 1 shows the well-known story for the United States: the start of the housing crisis, as defined by the fall in housing prices, preceded the downturn in the labor market. This is also the sequence of events for a number of the largest, but not the majority of, MSAs.

Figure 2. Trends in the U.S. labor market, housing market, and measures of doubling up, 353MSAs, 2005–2010



Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, CoreLogic, American Community Survey, and authors' calculations.

MSA-level picture: an overview. Figure 2 illustrates annual trends in employment and housing conditions for all 353 MSAs (unweighted) for the period 2005–2010. These trends closely match those for the nation (MSAs weighted by population size) reported in figure 1. Most notably, figure 2 again shows that the housing crisis started first, followed by the labor market crisis. The top panel of table 2 provides annual statistics for 2 specific years shown in figure 2—2007 and 2010. Statistics are presented for 2007 rather than for 2005 because most MSAs had experienced rising employment and housing prices even before 2007.[33] Table 2 shows that, between 2007 and 2010, housing prices fell on average by nearly 10 percent across the 353 MSAs. This average decline is slightly lower than that for the nation as a whole (see figure 1), because these estimates are unweighted and thereby reflect the fact that housing prices declined less in smaller MSAs.[34]

Table 2. Descriptive statistics for all 353 MSAs and by MSA type, 2007 and 2010

Variable	2007					2010					Percent change (2007–2010)	
	Mean	Standard deviation	Minimum	Median	Maximum	Mean	Standard deviation	Minimum	Median	Maximum	Mean	Median
All 353 MSAs												
Employment (thousands)	325.2	573.6	29.1	123.5	5,304.2	312.5	549.8	28.6	116.7	5,153.7	–4.07	–5.52
House Price Index (2005 = 100)	108.2	8.0	90.6	107.3	137.3	98.4	16.9	41.5	103.1	148.5	–9.97	–3.92
Foreclosure rate (percent)	.80	.50	.11	.67	3.07	2.51	2.23	.49	1.93	17.71	68.11	190.34
Homeownership rate (percent)	68.00	5.73	40.96	68.92	82.68	66.41	6.06	39.53	67.15	81.46	–2.40	–2.58
Household size	3.50	.23	2.63	3.48	4.32	3.56	.21	3.06	3.55	4.40	1.54	1.98
Nonrelatives in family households (percent)	2.49	.71	.89	2.37	4.75	2.69	.72	1.07	2.60	5.87	7.37	9.38
Unmarried households (percent)	7.75	1.87	2.16	7.80	14.88	8.22	1.89	1.66	8.17	13.88	5.72	4.79
Housing crisis first MSAs (55 MSAs)												
Employment (thousands)	576.8	850.7	29.1	210.9	5,304.2	559.2	828.2	28.6	201.6	5,153.7	–3.15	–4.42
House Price Index (2005 = 100)	103.4	8.0	90.7	103.9	137.3	78.0	17.7	41.5	81.5	124.7	–32.60	–21.53
Foreclosure rate (percent)	.87	.48	.12	.80	2.09	3.60	2.57	.82	2.80	13.20	75.96	251.48
Homeownership rate (percent)	65.28	8.03	40.96	65.83	82.68	63.20	7.79	39.53	63.42	81.46	–3.29	–3.66
Household size	3.63	.26	3.08	3.63	4.19	3.69	.22	3.25	3.66	4.24	1.43	.67
Nonrelatives in family households (percent)	2.82	.66	1.80	2.80	4.48	3.25	.78	1.79	3.10	5.87	13.31	11.05

See footnotes at end of table.

Table 2. Descriptive statistics for all 353 MSAs and by MSA type, 2007 and 2010

Variable	2007					2010					Percent change (2007–2010)	
	Mean	Standard deviation	Minimum	Median	Maximum	Mean	Standard deviation	Minimum	Median	Maximum	Mean	Median
Unmarried households (percent)	8.12	1.45	5.06	7.98	11.08	8.49	1.59	5.25	8.40	11.84	4.30	5.30
Labor market crisis first MSAs (67 MSAs)												
Employment (thousands)	142.3	247.9	39.1	74.5	1,968.8	137.9	248.8	37.3	71.1	1,987.9	–3.19	–4.57
House Price Index (2005 = 100)	107.9	3.8	102.5	107.2	122.2	107.8	5.5	93.8	107.8	123.3	–.10	.57
Foreclosure rate (percent)	.74	.40	.25	.62	2.37	1.62	.64	.67	1.51	3.96	54.29	144.68
Homeownership rate (percent)	68.09	4.57	54.55	68.51	75.22	66.47	5.63	48.21	67.41	76.74	–2.43	–1.61
Household size	3.44	.19	3.08	3.43	4.03	3.51	.19	3.06	3.52	4.20	2.16	2.69
Nonrelatives in family households (percent)	2.35	.69	1.22	2.28	4.40	2.47	.57	1.23	2.38	4.16	4.87	4.50
Unmarried households (percent)	6.97	2.06	2.45	6.93	12.30	7.87	1.81	3.49	8.03	12.45	11.37	15.89

Notes:

Note: These data are unweighted. "Housing crisis first" MSAs are those where the housing market turned downward four or more quarters before the labor market did; "labor market crisis first" MSAs are those where the labor market turned downward four or more quarters before the housing market did. Omitted MSAs are those where the housing and labor market crises occurred "concurrently" (defined as less than four quarters difference in timing) and those where peaks could not be clearly identified.

Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, CoreLogic, American Community Survey, and authors' calculations.

Figure 2 and the top panel of table 2 also provide information on annual trends in homeownership rates, measures of doubling up, and the percentage of unmarried households for the 353 MSAs. Consistent with the research on national trends cited earlier, the figure and the table show that doubling up increased, whether measured by higher average household size or by nonrelatives as a percentage of all individuals living in family households. The fraction of unmarried households also rose over the period 2007–2010, in part because of the rising secular trend, but also because of weak economic conditions.[35] Finally, table 2 shows that homeownership rates fell in conjunction with both the decline in housing prices and the rise in foreclosures. Although suggestive, these aggregate data mask substantial subnational variation in the severity, duration, and timing of the crises; these data also obscure the considerable heterogeneity in changes in doubling up and homeownership at the subnational level.

MSA-level analysis: timing of the housing and labor market crises. The analysis identifies the start of each crisis by examining quarterly data from 2005 to 2011. A crisis in the housing market is identified when housing prices, a measure of overall housing conditions, peak in a given quarter and then turn downward.[36] Similarly, a crisis in the

labor market is identified when employment peaks in a given quarter and then falls. In the case that either the housing price or the employment series has multiple peaks, the peak used is the one that precedes the longest downturn.[37]

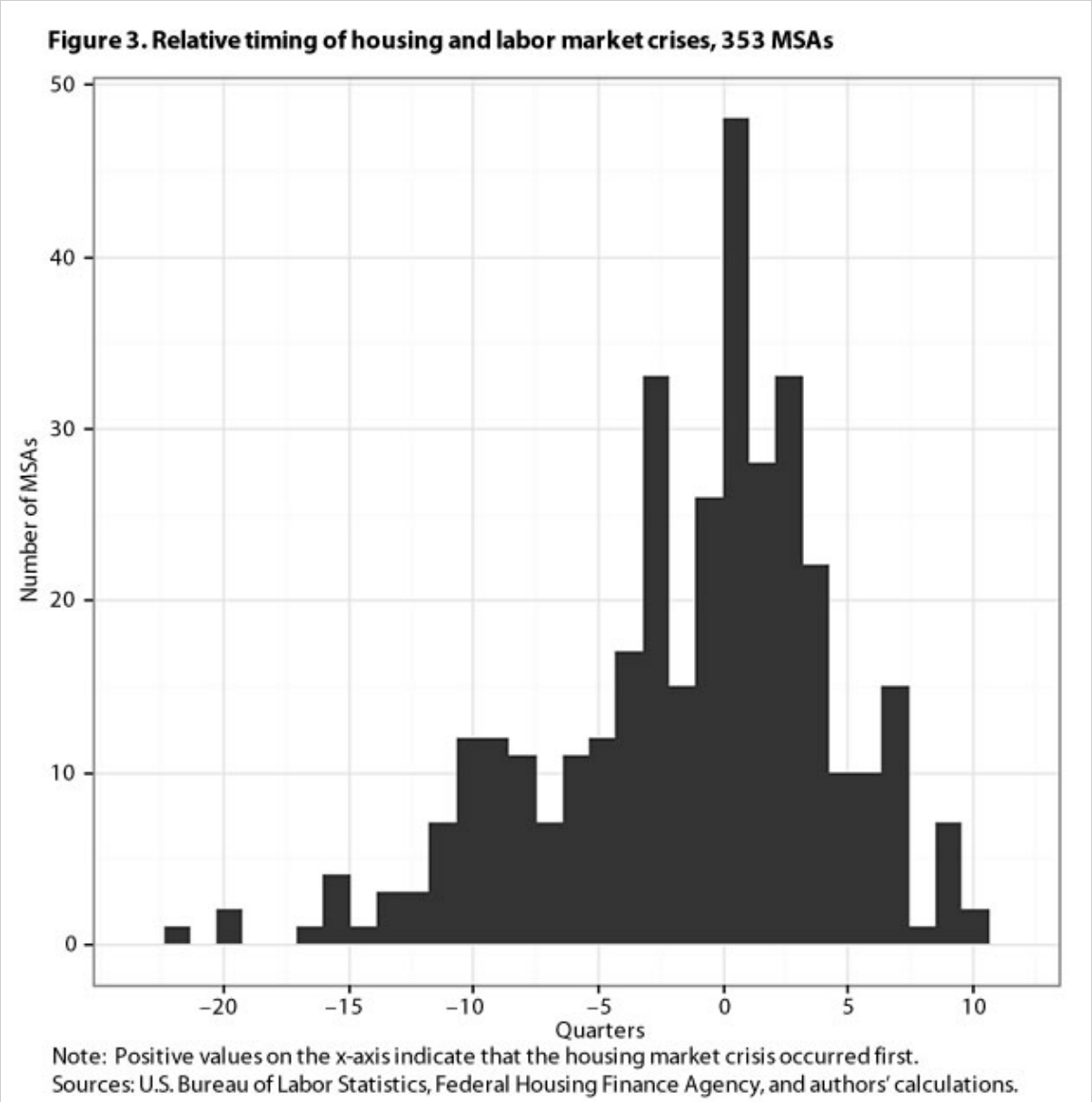


Figure 3 provides a histogram of the relative timing of the crises for the 353 MSAs, where differences in timing are measured in number of quarters. A positive value indicates that the housing market crisis occurred first, whereas a negative value indicates that the labor market crisis occurred first. The distribution is slightly skewed to the left, indicating that in a slight majority of MSAs, it was the labor market, not the housing market, that turned downward first. This pattern is contrary to the one for the nation as a whole. (See figure 1.) The reason for the difference is that the national picture is driven by timing patterns in the largest MSAs.

To illustrate this point, table 3 provides information on the relative timing of the housing and labor market crises for the 25 largest MSAs (based on employment size). In 20 of the 25 MSAs, the housing market declined first, and in 10 of these 20 MSAs, the housing market declined four or more quarters earlier. In 5 of the 25 MSAs, the labor

market declined first, and only Dallas experienced a decline of four or more quarters. Table 3 also shows that the timing of the start of the housing crisis for the largest MSAs is fairly close to the timing for the nation as a whole. (See also figures 1 and 2.) The MSAs identified in yellow in the table receive greater attention shortly.

Table 3. Quarterly difference in timing of housing and labor market crises during the 2005–2011 period, largest 25 MSAs

MSA	Rank by employment size	Onset of housing market crisis	Onset of labor market crisis	Housing market crisis before labor market crisis (in number of quarters)(1)
New York–White Plains–Wayne, NY–NJ Metro Division; New York–Northern New Jersey–Long Island, NY–NJ–PA Metro Area	1	1st quarter, 2007	1st quarter, 2008	4
Los Angeles–Long Beach–Santa Ana, CA Metro Area	2	4th quarter, 2006	3rd quarter, 2007	3
Chicago–Joliet–Naperville, IL–IN–WI Metro Area	3	1st quarter, 2007	4th quarter, 2007	3
Houston–Sugar Land–Baytown, TX Metro Area	4	2nd quarter, 2009	4th quarter, 2008	–2
Atlanta–Sandy Springs–Marietta, GA Metro Area	5	3rd quarter, 2007	4th quarter, 2007	1
Washington–Arlington–Alexandria, DC–VA–MD–WV Metro Area	6	4th quarter, 2006	3rd quarter, 2008	7
Dallas–Fort Worth–Arlington, TX Metro Area	7	1st quarter, 2009	1st quarter, 2008	–4
Phoenix–Mesa–Glendale, AZ Metro Area	8	4th quarter, 2006	1st quarter, 2008	5
Philadelphia–Camden–Wilmington, PA–NJ–DE–MD Metro Area	9	3rd quarter, 2007	2nd quarter, 2008	3
Minneapolis–St. Paul–Bloomington, MN–WI Metro Area	10	4th quarter, 2006	2nd quarter, 2008	6
Riverside–San Bernardino–Ontario, CA Metro Area	11	4th quarter, 2006	1st quarter, 2007	1
Los Angeles–Long Beach–Santa Ana, CA Metro Area	12	3rd quarter, 2006	4th quarter, 2006	1
San Diego–Carlsbad–San Marcos, CA Metro Area	13	1st quarter, 2006	2nd quarter, 2008	9
Boston–Cambridge–Quincy, MA–NH Metro Area	14	4th quarter, 2005	2nd quarter, 2008	10
Nassau–Suffolk, NY Metro Division; New York–Northern New Jersey–Long Island, NY–NJ–PA Metro Area	15	4th quarter, 2006	1st quarter, 2008	5
St. Louis, MO–IL Metro Area	16	3rd quarter, 2007	1st quarter, 2007	–2
Baltimore–Towson, MD Metro Area	17	2nd quarter, 2007	1st quarter, 2008	3
Seattle–Tacoma–Bellevue, WA Metro Area	18	3rd quarter, 2007	2nd quarter, 2008	3
Denver–Aurora–Broomfield, CO Metro Area	19	4th quarter, 2006	2nd quarter, 2008	6
Detroit–Warren–Livonia, MI Metro Area	20	3rd quarter, 2005	2nd quarter, 2005	–1

See footnotes at end of table.

Table 3. Quarterly difference in timing of housing and labor market crises during the 2005–2011 period, largest 25 MSAs

MSA	Rank by employment size	Onset of housing market crisis	Onset of labor market crisis	Housing market crisis before labor market crisis (in number of quarters)(1)
Tampa–St. Petersburg–Clearwater, FL Metro Area	21	4th quarter, 2006	2nd quarter, 2007	2
San Francisco–Oakland–Fremont, CA Metro Area	22	2nd quarter, 2006	1st quarter, 2008	7
Pittsburgh, PA Metro Area	23	2nd quarter, 2009	3rd quarter, 2008	–3
Edison–New Brunswick, NJ Metro Division; New York–Northern New Jersey–Long Island, NY–NJ–PA Metro Area	24	4th quarter, 2006	1st quarter, 2008	5
Miami–Fort Lauderdale–Pompano Beach, FL Metro Area	25	2nd quarter, 2007	4th quarter, 2007	2

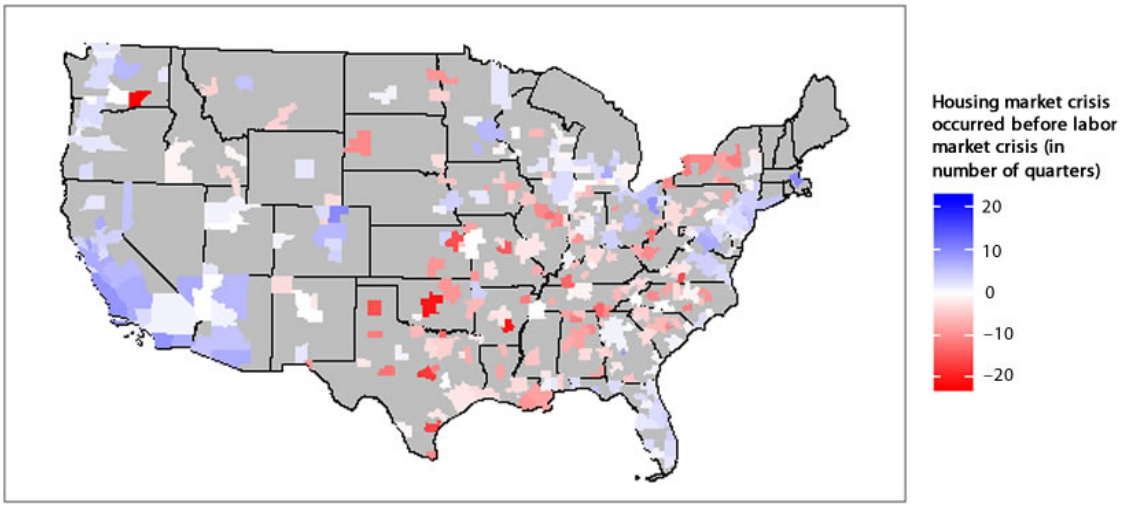
Notes:

See footnotes at end of table.

(1) Positive values indicate that the housing market declined first; negative values indicate that the labor market declined first.
Note: MSAs identified in yellow are analyzed further in figures 5 and 6.
Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, and authors' calculations.

Next, the analysis uses a “four-quarter rule” to identify the MSAs that had *clearly* different experiences regarding the timing of the crises. MSAs are categorized as “housing crisis first” if the housing market turned downward four or more quarters before the labor market did. MSAs are categorized as “labor market crisis first” if the labor market turned downward four or more quarters before the housing market did. As found earlier, the number of MSAs in which the labor market crisis occurred first was slightly larger than the number of MSAs in which the housing market crisis occurred first: 67 versus 55, respectively.[38]

Figure 4. Geographic distribution of relative timing of housing and labor market crises, 353 MSAs

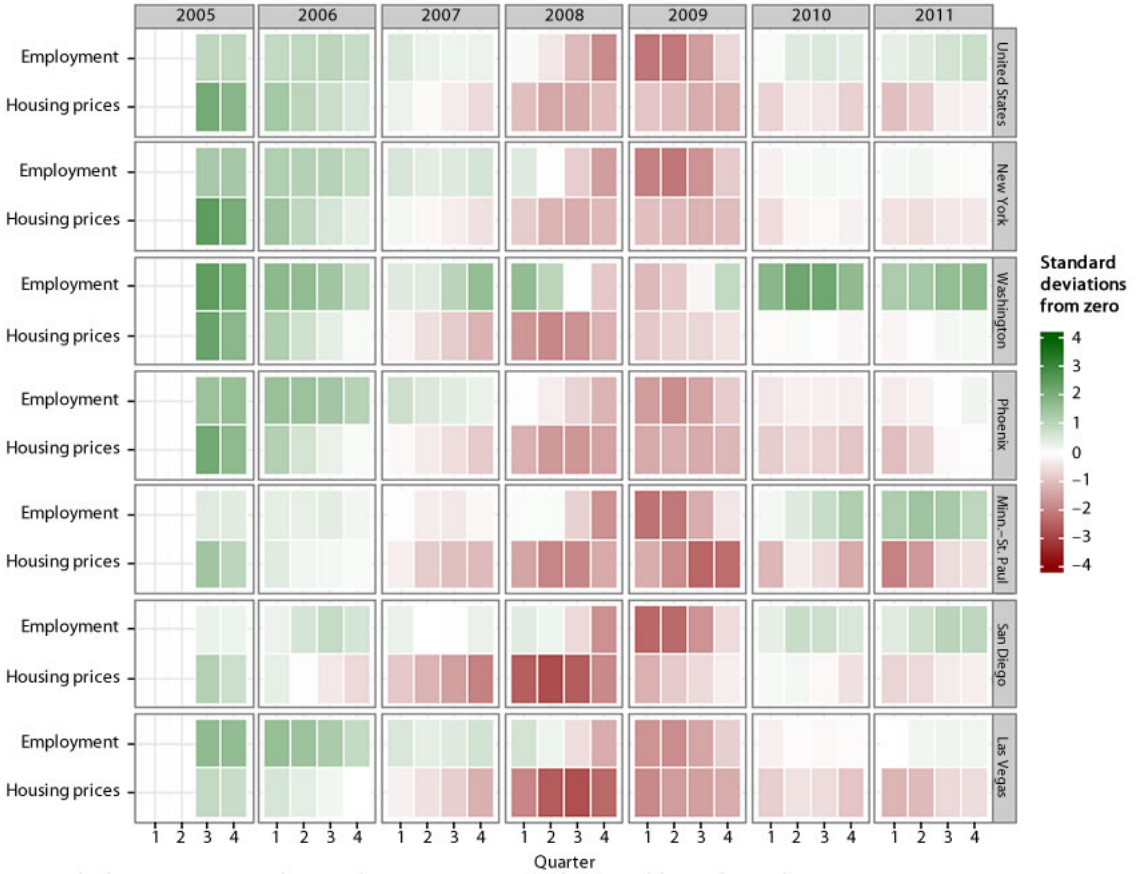


Note: Blue indicates that the housing market crisis occurred first; red indicates that the labor market crisis occurred first.
Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, and authors' calculations.

Figure 4 superimposes the 353 MSAs on a map of the United States and illustrates geographic differences in the relative timing of the crises. Blue indicates that the housing crisis occurred first, and red indicates that the labor market crisis occurred first. A visual comparison of the darkest red and darkest blue MSAs provides the clearest indication of the distinct geographic differences in the crises’ relative timing. What is most apparent is that a larger number of MSAs on the coasts experienced the housing crisis first (more blue), whereas more MSAs in the central part of the United States, including Texas, experienced the labor market crisis first (more red). The observed bifurcation by geographic region matches the findings of earlier studies that looked at the magnitude of regional housing bubbles and subsequent bursts.[39]

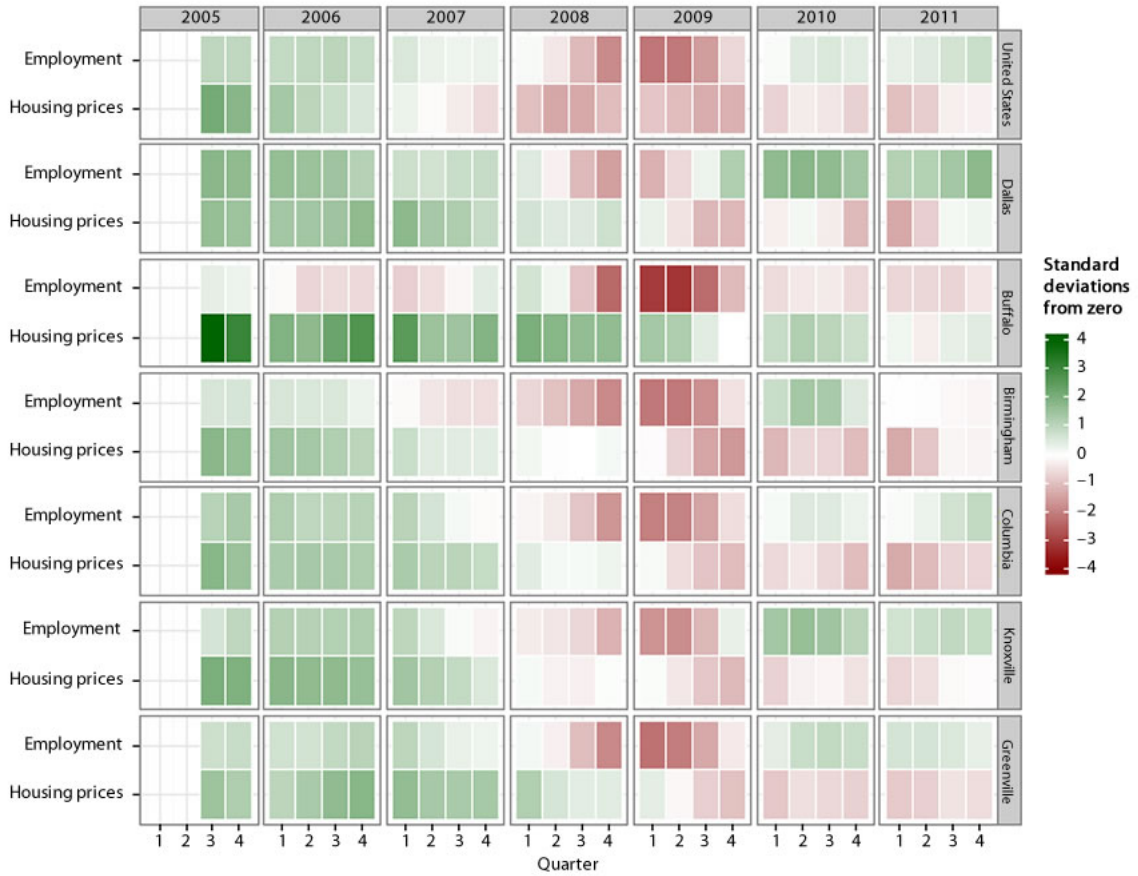
The analysis next looks at the experience of 12 selected MSAs. From the set of “housing crisis first” MSAs, the largest five MSAs (by employment) were selected: these are the MSAs that encompass New York City; Washington, DC; Phoenix; Minneapolis–St. Paul; and San Diego. Although not one of the largest MSAs of this type, Las Vegas was included given the considerable media attention it has received. From the set of “labor market crisis first” MSAs, the largest six were chosen: Dallas, Buffalo, Birmingham, Columbia, Knoxville, and Greenville. The only apparent difference between these two lists is that MSAs where the housing crisis occurred first are considerably larger, with the single exception of Dallas.[40]

Figure 5. Timing of housing and labor market crises for selected MSAs, housing crisis first, standardized percent change, 2005–2011



Note: Red indicates a worsening and green indicates an improvement in housing or labor market conditions.
Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, and authors' calculations.

Figure 6. Timing of housing and labor market crises for selected MSAs, labor market crisis first, standardized percent change, 2005–2011



Note: Red indicates a worsening and green indicates an improvement in housing or labor market conditions.
Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, and authors' calculations.

Figures 5 and 6 use quarterly data for the period 2005–2011 to highlight the timing, length, and severity of the housing and labor market crises for the 12 selected MSAs. The severity of the housing market crisis is measured by the percent change in housing prices, and the severity of the labor market crisis is measured by the percent change in employment. Because these series are measured in different units (housing price is an index and employment in MSA-level data is measured in thousands of people), the percent change reported for each series in figures 5 and 6 is standardized as follows:

$$\%\Delta X_{it} / \sigma_{xi} ,$$

where $\%\Delta X_{it}$ is the annualized percent change in employment (or housing prices) for the *i*th MSA in quarter *t*, and σ_{xi} is the standard deviation of $\%\Delta X$ within the *i*th MSA for the period 2005–2011.

As one example of the standardization procedure, consider the cell for employment in New York in third quarter 2005 in figure 5. The value reported in this cell is 1.35 standard deviations from 0 and was constructed as 2.08 percent (annualized value of percent change in quarterly employment in third quarter 2005 for New York) divided by 1.54 percent (standard deviation calculated across all quarters for New York for the period 2005–2011). For further ease of interpretation of figures 5 and 6, darker colors indicate a larger number of standard deviations in the measure from zero, with red indicating a worsening and green indicating an improvement in housing or labor

market conditions. Both figures also include the United States (all 353 MSAs aggregated) in the top panel for comparison purposes.

Figure 5 focuses on the experience of the six selected “housing crisis first” MSAs. The timing of the crises can be seen by observing that the housing price series turns from green to red earlier (at least four quarters earlier, as specified) than does the employment series. Nonetheless, even among these six MSAs, there is still considerable variation. Las Vegas and San Diego experienced similar timing and relative magnitudes of change in housing prices and employment. Both saw housing prices peak well before employment peaked, and their housing price declines were relatively stronger compared with the eventual employment declines. Further, employment in Las Vegas had not picked up by 2011,[41] and, as seen in figure 5, none of these six housing markets looked strong in 2011. By contrast, the situation in Washington, DC was considerably better, especially for the labor market, most likely because of the substantial number of public sector jobs which tend to be more recession proof.

Figure 6 points to the six selected “labor market crisis first” MSAs. The housing and labor market crises in these MSAs were generally far less severe in length and magnitude. In fact, the Dallas MSA was virtually unscathed, especially compared with the other large MSAs identified in figure 5. Buffalo is a notable exception and experienced a particularly deep labor market downturn from mid-2008 through late 2009; however, its housing market was little affected.[42]

The lower two panels of table 2 (which was introduced earlier) provide annual data for 2007 and 2010 on housing prices, employment, and other measures for the full set of “housing crisis first” and “labor market crisis first” MSAs. On average, employment fell by a similar percentage (about 5 percent) in both types of MSAs between 2007 and 2010, while housing prices declined by 32 percent in “housing crisis first” MSAs but experienced almost no change in “labor market crisis first” MSAs. Table 2 also provides supplementary information on foreclosure rates. As would be expected given the differential trends in housing prices, foreclosure rates rose considerably more in “housing crisis first” MSAs.

Trends in household formation. The final part of the analysis examines the association between the housing and labor market crises and household formation and homeownership by MSA. Table 4 presents pairwise correlations of all the variables (measured as year-to-year percent change) for all 353 MSAs and for the two types of MSAs. The correlation between changes in housing prices and changes in foreclosure rates is negative as expected (falling housing prices go hand in hand with rising foreclosure rates) and considerably stronger in “housing crisis first” MSAs (–0.71) than in “labor market crisis first” MSAs (–0.24). Another fairly strong association identified in “housing crisis first” MSAs is between changes in housing prices and changes in homeownership rates. The correlation is 0.46, compared with 0.21 for all MSAs and 0.20 for MSAs where the labor market fell first. Surprisingly, however, associations between changes in employment and changes in doubling up and associations between changes in housing prices and changes in doubling up are comparatively very weak and quite often not in expected directions across all 353 MSAs and by MSA type.

Table 4. Correlations between percent changes in housing and labor market conditions and percent changes in household formation variables

See footnotes at
end of table.

Table 4. Correlations between percent changes in housing and labor market conditions and percent changes in household formation variables

All 353 MSAs							
	Employment (thousands)	House Price Index (2005 = 100)	Foreclosure rate (percent)	Homeownership rate (percent)	Household size	Nonrelatives in family households (percent)	Unmarried households (percent)
Employment (thousands)	1.00	…	…	…	…	…	…
House Price Index (2005 = 100)	.39	1.00	…	…	…	…	…
Foreclosure rate (percent)	–.10	–.71	1.00	…	…	…	…
Homeownership rate (percent)	.00	.21	–.08	1.00	…	…	…
Household size	.06	–.07	.22	.12	1.00	…	…
Nonrelatives in family households (percent)	.12	.08	–.05	–.06	–.06	1.00	…
Unmarried households (percent)	.11	.09	–.09	–.14	–.11	.48	1.00
Housing crisis first MSAs (55 MSAs)							
	Employment (thousands)	**House Price Index (2005 = 100)**	**Foreclosure rate (percent)**	**Homeownership rate (percent)**	**Household size**	**Nonrelatives in family households (percent)**	**Unmarried households (percent)**
Employment (thousands)	1.00	…	…	…	…	…	…
House Price Index (2005 = 100)	.31	1.00	…	…	…	…	…
Foreclosure rate (percent)	–.23	–.71	1.00	…	…	…	…
Homeownership rate (percent)	.09	.46	–.13	1.00	…	…	…
Household size	.06	–.05	.40	.25	1.00	…	…
Nonrelatives in family households (percent)	.15	.22	–.19	.17	.04	1.00	…
Unmarried households (percent)	.01	–.03	.22	–.02	–.03	.31	1.00
Labor market crisis first MSAs (67 MSAs)							
	Employment (thousands)	**House Price Index (2005 = 100)**	**Foreclosure rate (percent)**	**Homeownership rate (percent)**	**Household size**	**Nonrelatives in family households (percent)**	**Unmarried households (percent)**
Employment (thousands)	1.00	…	…	…	…	…	…

Table 4. Correlations between percent changes in housing and labor market conditions and percent changes in household formation variables

House Price Index (2005 = 100)	.50	1.00	…	…	…	…	…
Foreclosure rate (percent)	–.16	–.24	1.00	…	…	…	…
Homeownership rate (percent)	.05	.20	.05	1.00	…	…	…
Household size	.02	–.09	–.10	.02	1.00	…	…
Nonrelatives in family households (percent)	.02	–.02	–.19	.17	.04	1.00	…
Unmarried households (percent)	–.02	–.05	–.05	–.28	.02	.33	1.00

Notes:

Note: The correlations are calculated on the basis of year-to-year percent changes in the variables.

Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, CoreLogic, American Community Survey, and authors' calculations.

One explanation for why correlations between the crises and household formation are so weak at the MSA level may be that the preceding analysis does not take into account the fact that, as seen earlier, the housing and labor market crises occurred at different points in time in each MSA. For instance, even among "housing crisis first" MSAs, some MSAs continued to experience rising housing prices through 2007, while others had already begun to experience price declines. So, a final important step in the analysis is to match the substantive period (recall that figure 1 could be subdivided into four substantive periods) and the date. Table 5 takes a case-study approach for two representative MSAs: Las Vegas (housing crisis first) and Dallas (labor market crisis first). Because household formation is also studied, annual data for the period 2005–2010 are used. These data are divided into three substantive periods of interest: (1) from 2005 to the first market's peak, (2) from the first market's peak to the second market's peak, and (3) from the second market's peak to 2010. (Recall that a peak defines the start of a crisis.) In the case of Las Vegas, these substantive periods translate into the following three time frames: (1) from 2005 to 2006 (where 2006 refers to the housing market peak), (2) from 2006 (housing market peak) to 2008 (labor market peak), and (3) from 2008 (labor market peak) to 2010. A similar type of decomposition is done for Dallas. Because these substantive periods cover different numbers of years, all figures are reported as an average annual percent change to enable comparisons.

Table 5. Decomposition of changes in doubling up and homeownership by timing of housing and labor market crises, Las Vegas and Dallas MSAs, 2005–2010

Las Vegas, NV, housing crisis first MSA				
Variable	Average annual percent change (by period)			Total percent change (2005–2010)
	Period 1: 2005 to housing market peak (2005–2006)	Period 2: from peak to peak (2006–2008)	Period 3: labor market peak to 2010 (2008–2010)	
Employment (thousands)	4.09	1.66	–2.72	0.36
House Price Index (2005 = 100)	7.82	–14.69	–18.98	–12.43
Foreclosure rate (percent)	90.88	181.68	65.30	110.55
Homeownership rate (percent)	1.81	–1.96	–2.79	–1.55
Household size	–2.07	1.72	1.07	.69
Nonrelatives in family households (percent)	–5.29	–3.42	6.11	–.10
Unmarried households (percent)	5.49	1.72	5.32	3.90
Dallas, TX, labor market crisis first MSA				
Variable	Average annual percent change (by period)			Total percent change (2005–2010)
	Period 1: 2005 to labor market peak (2005–2008)	Period 2: from peak to peak (2008–2009)	Period 3: housing market peak to 2010 (2009–2010)	
Employment (thousands)	1.03	–1.31	1.89	0.73
House Price Index (2005 = 100)	2.43	.33	–.98	1.32
Foreclosure rate (percent)	12.20	30.62	23.62	17.93

See footnotes at end of table.

Table 5. Decomposition of changes in doubling up and homeownership by timing of housing and labor market crises, Las Vegas and Dallas MSAs, 2005–2010

Las Vegas, NV, housing crisis first MSA				
Homeownership rate (percent)	.47	–1.73	–.81	–.23
Household size	.77	.43	–3.53	–.17
Nonrelatives in family households (percent)	.90	16.42	–5.37	2.51
Unmarried households (percent)	–5.39	17.84	3.40	.63

Notes:

See footnotes at end of table.

Note: Housing and labor market peaks are identified in figures 5 and 6 by quarter and then reassigned to the relevant calendar year. A peak is used to define the start of a crisis.

Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, CoreLogic, American Community Survey, and authors' calculations.

First consider the Las Vegas MSA. In period 1, employment and housing prices were rising at annual rates of 4 percent and nearly 8 percent, respectively. At the same time, homeownership was rising at an annual rate of nearly 2 percent, and both average household size and the percentage of nonrelatives living in family households were falling. Increases in the homeownership rate may reflect rising investment demand for housing, whereas declines in doubling up may reflect an increase in the consumption demand for housing. In period 2 (housing market crisis only), employment growth slowed compared with the previous period, while housing prices fell by 15 percent annually and the foreclosure rate rose dramatically.[43] In this period, the homeownership rate fell by 2 percent annually and average household size rose by 1.7 percent annually. While the percentage of nonrelatives living in family households continued to fall (rather than rise, as might be expected), the percent decline in period 2 was, nonetheless, smaller than the decline in period 1. The percentage of unmarried households continued to rise, although, surprisingly, at a lower rate. Finally, in period 3, with both crises underway, employment fell by 2.7 percent annually and housing prices declined even more than they did in the previous period, falling by nearly 19 percent annually. And, as would be expected, the percentage of nonrelatives living in family households rose, as did the percentage of unmarried households. Household size also continued to increase, although not by as much as it did in period 2.

In Dallas, a “labor market crisis first” MSA, changes in housing conditions and employment were far more modest, consistent with figure 6 (which generally showed less severe crises for this MSA type). During period 2 (labor market crisis only), employment fell by just 1.3 percent annually, and there was only a modest decline in the homeownership rate (1.7 percent annually). Turning to changes in doubling up, there is no clear pattern; while household size was virtually unchanged, the percentage of nonrelatives living in family households increased considerably.[44] In period 3, when the housing market declined, the fall in housing prices was slight (just 1 percent annually) and employment was growing again. The pickup in employment may explain concurrent declines in period 3, in both household size and the percentage of nonrelatives living in family households. Although this exercise suggests that isolating associations with the use of information on substantive timing is a potentially useful strategy for understanding housing decisions, it is important to keep in mind that these are just that—associations.

THIS ARTICLE USED DATA ON 353 MSAs, WITH A FOCUS ON 12 MSAs, for the period from 2005 to 2011, to examine the relationship between the severity and relative timing of the housing and labor market crises and changes in household formation. Although it is well established that the U.S. housing market, as a whole, turned downward before the labor market did, this is the first study to look at the relative timing of these crises at the subnational level. The analysis showed that, contrary to the national pattern, in a slight majority of MSAs the labor market turned downward first.

MSAs where the housing market declined first have some distinct characteristics: (1) they are some of the largest areas (e.g., New York and Washington, DC) and are more often located on coasts; and (2) they experienced some of the most substantial downturns in the housing and labor markets, whether measured by the length of the crises, by the magnitude of the decline in housing prices or employment, or by the rise in foreclosures. Along with earlier work on the recent housing crisis,[45] this article deepens our knowledge about the considerable heterogeneity in

the experiences of MSAs, a phenomenon which is obscured when looking at the national picture or at just a handful of well-publicized MSAs.

The article also examined the association between changes in the housing and labor markets and changes in doubling up and homeownership. Declining housing prices were found to be strongly associated with declines in homeownership, especially in those MSAs where the housing crisis occurred before the labor market crisis. However, the association between changes in doubling up and the housing and labor market crises was found to be fairly weak at the MSA level. One explanation for this surprising finding is that the timing of the crises differed considerably across MSAs, necessitating more refined analyses. This study is just a first step in this direction. Factors, such as migration and age distribution of household heads, are not accounted for in the analysis, and finding association is not the same as establishing causation (which is not addressed or claimed here). A logical next step in this line of research is to take advantage of the observed heterogeneity in the experiences of MSAs—heterogeneity in terms of the severity, length, and timing of the recent housing and labor market crises, as identified here—and examine impacts on individual decisions regarding doubling up, homeownership, and cohabitation.

Appendix

Table A–1 presents the data used in conjunction with information on housing and labor market peaks to make the computations used in table 5.

Table A–1. Underlying data for computations in table 5, Las Vegas and Dallas MSAs, 2005–2010, annual

See footnotes at end of table.

Data for Las Vegas, NV, housing crisis first MSA						
Variable	2005	2006	2007	2008	2009	2010
Employment (thousands)	838.9	873.2	890.1	902.4	864.4	854.0
House Price Index (2005 = 100)	100.0	107.8	104.1	78.5	58.7	51.5
Foreclosure rate (percent)	.22	.41	1.36	3.28	6.61	8.97
Homeownership rate (percent)	59.47	60.55	58.62	58.20	56.88	54.99
Household size	3.63	3.55	3.58	3.67	3.66	3.75
Nonrelatives in family households (percent)	3.69	3.50	3.79	3.26	3.66	3.68
Unmarried households (percent)	8.94	9.43	10.21	9.76	10.28	10.83
Data for Dallas, TX, labor market crisis first MSA						
Variable	2005	2006	2007	2008	2009	2010
Employment (thousands)	1,916.9	1,946.0	1,968.8	1,976.8	1,951.0	1,987.9
House Price Index (2005 = 100)	100.0	102.6	105.9	107.5	107.8	106.8
Foreclosure rate (percent)	.65	.65	.73	.91	1.19	1.47
Homeownership rate (percent)	61.05	62.08	62.66	61.91	60.84	60.34
Household size	3.78	3.84	3.85	3.87	3.89	3.75
Nonrelatives in family households (percent)	2.19	2.36	2.34	2.25	2.62	2.48
Unmarried households (percent)	7.32	6.57	6.28	6.20	7.31	7.55

Notes:

Sources: U.S. Bureau of Labor Statistics, Federal Housing Finance Agency, CoreLogic, American Community Survey, and authors' calculations.

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NOTES

[1] Christopher J. Goodman and Steven M. Mance, “Employment loss and the 2007–09 recession: an overview,” *Monthly Labor Review*, April 2011, pp. 3–12.

[2] See Laryssa Mykyta and Suzanne Macartney, “The effects of recession on household composition: ‘doubling up’ and economic well-being,” SEHSD working paper 2011-4 (Washington, DC, U.S. Census Bureau, 2011), https://www.census.gov/hhes/www/poverty/publications/papers.html; Emily E. Wiemers, “The effect of unemployment on household composition and doubling up,” working paper (Boston, MA, University of Massachusetts–Boston, 2012); Pew Organization, “The return of the multi-generational family household,” *Pew Research Social and Demographic Trends*, 2010, http://pewsocialtrends.org/files/2010/10/752-multi-generational-families.pdf; and Dianna B. Elliott, Rebekah Young, and Jane L. Dye, “Variation in the formation of complex family households during the recession,” SEHSD working paper 2011-32 (Washington, DC, U.S. Census Bureau, 2011), https://www.census.gov/hhes/families/data/NCFR2011_Variation_in_Formation_of_Multifamily_Households_in_Recession_FINAL.pdf.

[3] Even before the recent housing and labor market crises, demographers had noted the increasing rate of return (and delayed departure) of young adults from their parents’ homes. These trends were exacerbated by the depth and length of the recent housing and labor market crises; see Richard A. Settersten and Barbara Ray, “What’s going on with young people today? The long and twisting path to adulthood” *Future of Children* 20, Spring 2010, pp. 19–41.

[4] Stephanie Armour, “More families move in together during housing crisis,” *USA Today*, February 3, 2009.

[5] Rose Kreider, “Increase in opposite-sex cohabiting couples from 2009 to 2010 in the Annual Social and Economic Supplement (ASEC) to the Current Population Survey (CPS),” working paper (Washington, DC, U.S. Census Bureau, September 2010), https://www.census.gov/population/www/socdemo/Inc-Opp-sex-2009-to-2010.pdf.

[6] Previous examinations of timing at the subnational level largely focused on the housing market only. See Fernando Ferreira and Joseph Gyourko, “Anatomy of the beginning of the housing boom: U.S. neighborhoods and metropolitan areas, 1993–2009,” working paper 17374 (Cambridge, MA, National Bureau of Economic Research, 2011); and Todd M. Sinai, “House price moments in boom–bust cycles,” working paper 18059 (Cambridge, MA, National Bureau of Economic Research, May 2012). For a brief examination of the association between the crises and doubling up at the MSA level, see Timothy Dunne, “Household formation and the great recession,” *Economic Commentary* (Federal Reserve Bank of Cleveland, 2012).

[7] See Kathryn J. Byun, “The U.S. housing bubble and bust: impacts on employment,” *Monthly Labor Review*, December 2010, pp. 3–17; and Jeffrey P. Cohen, Cletus C. Coughlin, and David A. Lopez, “The boom and bust of U.S. housing prices from various geographic perspectives,” Federal Reserve Bank of St. Louis *Review* 94, September/October 2012, pp. 341–367.

[8] Cohen et al., “The boom and bust of U.S. housing prices.”

[9] See Ibid.; and Sinai, “House price moments in boom–bust cycles.”

[10] See Cohen et al., “The boom and bust of U.S. housing prices.”

[11] See Karl E. Case and Robert J. Shiller, "Is there a bubble in the housing market?" *Brookings Papers on Economic Activity* 2, 2003, pp. 299–342, http://www.econ.yale.edu/~shiller/pubs/p1089.pdf; Ferreira and Gyourko, "Anatomy of the beginning of the housing boom;" and Sinai, "House price moments in boom–bust cycles."

[12] Sinai, "House price moments in boom–bust cycles."

[13] Robert Lerman and Thomas Kingsley, "Metro areas suffering the worst housing shocks also lose the most jobs," *Metro Trends* (Washington, DC, Urban Institute, 2010).

[14] Byun, "The U.S. housing bubble bust."

[15] Howard H. Wall, "The employment cycles of neighboring cities," *Regional Science and Urban Economics* 43, no. 1, 2013, pp. 177–185.

[16] In recent years, quite a few studies have identified a relationship between the advent of the Great Recession and doubling up at the national level. Before the recent crisis, a substantial body of social science research focused on the relationship between housing conditions and household formation decisions of individuals (principally young adults and single mothers). Such studies include Axel Borsch-Supan, "Household formation, housing prices, and public policy impacts," *Journal of Public Economics* 30, July 1986, pp. 145–164; David Card and Thomas Lemieux, "Adapting to circumstances: the evolution of work, school, and living arrangements among North American youth," in David Blanchflower and Richard Freeman, eds., *Youth Employment and Joblessness in Advanced Countries* (Chicago, University of Chicago Press, 1999); John F. Ermisch, "Prices, parents, and young people's household formation," *Journal of Urban Economics* 45, January 1999, pp. 47–71; Frank F. Furstenberg, "On a new schedule: transitions to adulthood and family change," *Future of Children* 20, Spring 2010, pp. 67–87; Frances K. Goldscheider and Julie DaVanzo, "Pathways to independent living in early adulthood: marriage, semiautonomy, and premarital residential independence," *Demography* 26, November 1989, pp. 597–614; Donald R. Haurin and Stuart Rosenthal, "The influence of household formation on homeownership rates across time and race," *Real Estate Economics* 35, December 2007, pp. 411–450; Anne E. Winkler, "The impact of housing costs on the living arrangements of single mothers," *Journal of Urban Economics* 32, November 1992, pp. 388–403; Aaron Yelowitz, "Young adults leaving the nest: the role of the cost of living," in Sheldon Danziger and Cecilia Elena Rouse, eds., *The price of independence: the economics of early adulthood* (New York, Russell Sage, 2007), pp. 170–206; and Zhu X. Di and Xiaodong Liu, "The effects of housing push factors and rent expectations on household formation of young adults," *Journal of Real Estate Research* 28, no. 2, 2006, pp. 149–166.

[17] A headship rate is defined as the fraction of adults who are heads of households.

[18] Dunne, "Household formation and the great recession."

[19] Gary Painter, "What happens to household formation in a recession?" special report (Research Institute for Housing America, April 2010), http://www.housingamerica.org/RIHA/RIHA/Publications/72429_9821_Research_RIHA_Household_Report.pdf.

[20] Lisa J. Dettling and Melissa S. Kearney, "House prices and birth rates: the impact of the real estate market on the decision to have a baby," working paper 17485 (Cambridge, MA, National Bureau of Economic Research, October 2011).

[21] For example, see Atif R. Mian, Amir Sufi, and Francesco Trebbi, "Foreclosures, house prices, and the real economy," working paper 16685 (Cambridge, MA, National Bureau of Economic Research, January 2011); William H. Rogers, "Declining foreclosure neighborhood effects over time," *Housing Policy Debate* 20, September 2010, pp. 687–706; William H. Rogers and William Winter, "The impact of foreclosures on neighboring housing sales," *Journal of Real Estate Research* 31, no. 4, 2009, pp. 455–479; and John P. Harding, Eric Rosenblatt, and Vincent W. Yao, "The contagion effect of foreclosed properties," *Journal of Urban Economics* 66, 2009, pp. 164–178.

[22] The FHFA House Price Index series includes a total of 367 MSAs (metropolitan, micropolitan, and metro divisions). For this article, the figure is slightly reduced to 353 because of data availability for selected years in two other databases: CoreLogic and the annual ACS.

[23] The advantage of looking at employment rather than unemployment is that unemployed status depends on job-search activity. Only figure 1 provides information on both employment and the unemployment rate.

[24] FHFA constant-quality housing prices are constructed using a repeat-sales method (similar to the Case-Shiller index), where sales observations are not included unless the housing unit has been sold at least twice in the data series. One characteristic of a repeat-sales index is that previously published values are subject to change over time, as existing housing units are sold a second time. The present analysis uses data collected from FHFA in the summer of 2012. Thus, the rates of change calculated here may not precisely match reported rates in current or future FHFA publications.

[25] See Cohen et al., "The boom and bust of U.S. housing prices;" and Sinai, "House price moments in boom–bust cycles."

[26] For a comparison with other sources of foreclosure data, including RealtyTrac, see "Sources of foreclosure data," *MBA Research DataNotes* (Mortgage Bankers Association, 2008), http://www.mortgagebankers.org/files/Research/July2008SourcesofForeclosureData.pdf. The report by the Mortgage Bankers Association points to an important drawback of the oft-used RealtyTrac measure: the measure is subject to double counting. Although RealtyTrac only counts one filing per month (even if more than one occurs), if filings for the same property occur in different months, RealtyTrac counts all such events.

[27] Robert B. Cleveland, William S. Cleveland, Jean E. McRae, and Irma Terpenning, "STL: a seasonal-trend decomposition procedure based on loess," *Journal of Official Statistics* 6, 1990, pp. 3–73.

[28] The U.S. Census Bureau defines a family household as a household in which there is at least one person present who is related to the householder by birth, marriage, or adoption. (See U.S. Census Bureau website, https://www.census.gov/hhes/families/about/.)

[29] Pamela Smock, Wendy Manning, and Meredith Porter, "'Everything's there except money:' how money shapes decisions to marry among cohabitors," *Journal of Marriage and Family* 67, August 2005, pp. 680–696.

[30] Because the foreclosure data obtained by the authors from CoreLogic begin in second quarter 2005, all analyses use this period as the start date.

[31] For a discussion of the unique set of events that precipitated the housing boom and the subsequent bust, see Karl E. Case and John M. Quigley, "How housing busts end: house prices, user cost and rigidities during down cycles," in Susan J. Smith and Beverly A. Searle, eds., *The Blackwell companion to the economics of housing: the housing wealth of nations* (West Sussex, United Kingdom, Wiley–Blackwell, 2010). The authors describe the boom as being of "historical proportions."

[32] These figures were calculated by aggregating available monthly and quarterly data to the annual level.

[33] As emphasized in this article, the timing of each crisis varied considerably by MSA, so the choice of 2007 is only for convenience of presentation.

[34] Using weighted and unweighted MSAs, Sinai also points to a similar pattern of findings in his comparison of the severity of housing declines. (See Sinai, "House price moments in boom–bust cycles.")

[35] Kreider, "Increase in opposite-sex cohabiting couples."

[36] More precisely, a crisis is identified when the series growth rate from quarter to quarter changes sign, indicating a switch from growth to decline.

[37] An alternative strategy is to identify the primary housing or labor market peak on the basis of the magnitude of the change in prices (or employment) rather than on the basis of duration. Most MSAs experienced multiple housing price peaks after the main downturn in their housing markets. However, because these housing price fluctuations were usually small in magnitude and duration, the first housing price downturn marked the peak of primary interest.

[38] Besides MSAs excluded on the basis of the "four-quarter rule," some additional MSAs were omitted from the set of "housing crisis first" and "labor market crisis first" MSAs to enable the subsequent annual analysis. Omitted MSAs also include those for which the period from peak to trough or from trough to peak could not be clearly identified. Clear identification of the period requires (1) one unit of time before the first peak in housing prices or employment, (2) one unit of time between peaks, and (3) one unit of time after the second peak in housing prices or employment. (A unit of time refers to a quarter or a year, depending on the analysis.) The omitted

group includes a number of smaller MSAs and Boston. Boston, for example, saw housing prices peak in the summer of 2005 and employment peak in 2008. When the data for Boston were aggregated to annual rates of change to include household information, Boston no longer contained a prepeak period and was therefore dropped.

[39] See Cohen et al., "The boom and bust of U.S. housing prices;" and Sinai, "House price moments in boom–bust cycles."

[40] Some notable cities are excluded from these lists. One exclusion already mentioned is Boston; another is Los Angeles. Although Los Angeles experienced the housing decline first, its labor market crisis occurred three quarters later, and so the city is not included based on the "four-quarter rule."

[41] In interpreting the magnitudes in figure 5, it is important to keep in mind the standardization that is used. The housing collapse in Las Vegas would stand out even more if the analysis had used the standard deviation of the percent change for all areas across the nation instead of the standard deviation of the percent change for the MSA itself. Standardizing each value by MSA allows one more quickly to identify strong changes in the employment and housing price growth within each MSA. This approach also permits meaningful comparisons of timing and magnitude across MSAs.

[42] Buffalo is also notable in that it provides an example of the challenges in identifying peaks. Buffalo experienced two clear declines in employment: a small decline starting in 2006 and a larger decline starting in 2008. On the housing side, the decline in housing prices during the fourth quarter of 2009 is almost impossible to see, as growth returned in 2010. Further, in February 2013, FHFA reported a decline in housing prices in the first quarter of 2010 and not in 2009. This difference is due, in part, to an index calculation adjustment inherent in repeat-sales methods.

[43] Although foreclosures increased considerably, the increase was due to a very low initial base.

[44] It should be kept in mind that the sizeable increase is off of a very low base and that other factors are not held constant.

[45] See Cohen et al., "The boom and bust of U.S. housing prices;" and Sinai, "House price moments in boom–bust cycles."

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