→ BUBBLE START/END 1996-2006
2002-2006

→ See Bibliography
→ Case-Shiller

The U.S. housing bubble and bust: impacts on employment

Employment Projections Program data are used to estimate employment impacts due to the recent housing market cycle, and alternative "nonbubble" demand scenarios indicate that at the peak of the bubble, in 2005, approximately 1.2 million to 1.7 million residential-construction-related jobs were attributable to "bubble-related demand"

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Several years ago, conditions in the U.S. economy—such as ease in the credit market—worked to create a prime situation for the first national bubble in U.S. home prices since that which preceded the Great Depression.[1] Generally, housing demand is restrained as prices rise in the market because buyers can no longer qualify for traditional loans. New "affordability" mortgage products considerably relaxed this restraint, thereby allowing the recent boom period to continue much longer than previous expansionary periods. Nontraditional loans were increasingly granted with fewer requirements for buyers to provide documentation to verify that their income could support the mortgage payment.[2] Moreover, these loans were often granted with little or no down payment. Mortgage-backed securities also contributed to the bubble by increasingly financing these high-risk loans throughout the bubble years.

By late 2005, the rapid growth of investment in residential structures had come to an end. Shortly thereafter, other indications of the oncoming bust became visible. First-time home buyers were increasingly priced out of the market, mortgage rates rose by roughly 1 percent, affordability of homes decreased substantially, and speculators pulled out of the market. The market correction has been much more abrupt than the onset of the bubble. Roughly a decade of growth of investment in residential structures was eliminated over just 3 years—from 2005 to 2008. Home prices, as measured by Robert Shiller's real price index, have fallen considerably from their peak in 2006 to levels more consistent with earlier data. Whether or not the bottom of the cycle has been reached is not yet clear, as recent housing data remain relatively mixed.

The recent dynamic housing market cycle has had a considerable impact on the U.S. job market. Input–output (I–O) data published by the BLS Employment Projections Program (EPP) can be used to estimate the number of jobs related to residential construction spending, employment that includes jobs in the construction sector and jobs in all the industries that supply intermediate products and services demanded by residential construction. On the basis of I–O calculations presented later in this article, EPP estimates that demand for residential construction grew from supporting 5.5 million jobs, or 4.2 percent of all U.S. employ-

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ment, in 1996, to 7.4 million jobs, or 5.1 percent of total employment, at the peak of the cycle in 2005. As the housing market crashed, residential-construction-related employment fell substantially; it was at 4.5 million in 2008, accounting for only 3.0 percent of total U.S. jobs.

Not all of the employment growth during the expansionary period is necessarily related to the bubble, as some increases would have been expected with an expanding population and normal economic growth. Given an alternative "nonbubble" demand scenario, I–O analysis allows one to estimate how much of the job growth was due to the bubble as opposed to "normal" economic growth. The estimated alternative demand is necessarily an approximation. The uncertainty of the start date of the recent housing cycle makes determining "nonbubble" demand an even more difficult exercise at this time.

In order to account for the uncertainty of the timing of the bubble's onset, two possible start dates of the housing market bubble are evaluated, 1996 and 2002, allowing for a range of estimated impacts. Two models are considered to estimate nonbubble demand: Because BLS projections do not forecast business cycle activity and instead focus on long-run trends, previously published projections serve as one tool for approximating nonbubble demand, and a naïve constant growth model serves as the second tool. Depending on the start date, the bubble is estimated to have contributed somewhere between 1.2 million and 1.7 million jobs in 2005, accounting for 0.8 percent to 1.2 percent of total U.S. employment. The housing market correction has also had a considerable effect on the U.S. job market. Residential-construction-related jobs are estimated to have been 1.7 million to 2.2 million fewer in 2008 than they would have been had there not been a bubble. According to these estimates and the embedded assumptions, the bust pulled down 2008 U.S. employment by 1.1 percent to 1.5 percent.

In the sections that follow, the housing bubble is analyzed through demand and price data. Construction sector employment data are discussed as inputs into EPP's employment requirements table and as a commonly cited measure of the employment impacts of the housing market. EPP's methods are discussed, and estimates of "residential-construction-related employment" during the recent boom-and-bust cycle are presented. Finally, growth scenarios based on nonbubble demand are considered in order to estimate how the housing boom and bust have affected U.S. employment.

Bubble period

An economic bubble occurs when "trade is in high volumes at prices that are considerably at variance with intrinsic values."[3] The data discussed in this section show unusual growth and falloff in demand for housing and an unprecedented rise and decline in real home prices; behavior indicative of a bubble. Although the rise in demand in the U.S housing market that occurred through 2005 is now widely referred to as a bubble, when this bubble began is not yet apparent. This is still the subject of much debate and may never be clear, but certainly not until the trough is long past. However, in order to discuss the behavior and impacts of the housing bubble and crash, it is first necessary to come to some decision on when the bubble occurred.

Relying upon input–output analysis, the research presented in this article utilizes the measure of investment in residential structures, as calculated with Bureau of Economic Analysis (BEA) final-demand data, as the metric of the relative size of growth and decline over the housing bubble and bust.[4] The final-demand data show that the climax of the bubble was in 2005, so that year will serve as the endpoint in this analysis. It should be noted, however, that other housing market measures did not peak until 2006, including the price index and industry employment data, examined later.

In the demand data, the bubble's starting point is much less apparent than its endpoint. The expansionary period started in 1991, but when this growth became a bubble is debatable. Many different start dates have been discussed, but years from the late 1990s and early 2000s are the most often suggested. Some people, including Thomas Lawler, an independent analyst who worked for Fannie Mae from 1984 to 2006, contend the bubble started in 2002. Lawler claims that, as the tech-stock bubble came to an end in 2000, investors focused on real estate as an alternative investment vehicle. The low interest rates set by the Federal Reserve over the following few years provided further incentive for home buying. He further asserts that relaxed lending standards helped demand continue when prices reached levels that most people could not otherwise have afforded.[5]

Others contend the bubble began much earlier. For example, Dean Baker, codirector of the Center for Economic and Policy Research, argues the bubble started in 1997. Baker holds that the runup in demand and prices for housing was in large part due to the increased trade deficit and financial market deregulation in the 1990s.[6] Robert Shiller has pointed out that prices, as measured by the Case–Shiller 10-city home price index, rose from 1995 to 2006, and he therefore refers to this as the boom period.[7] As explained earlier, for the purpose of this article, two potential start dates will be examined, al-

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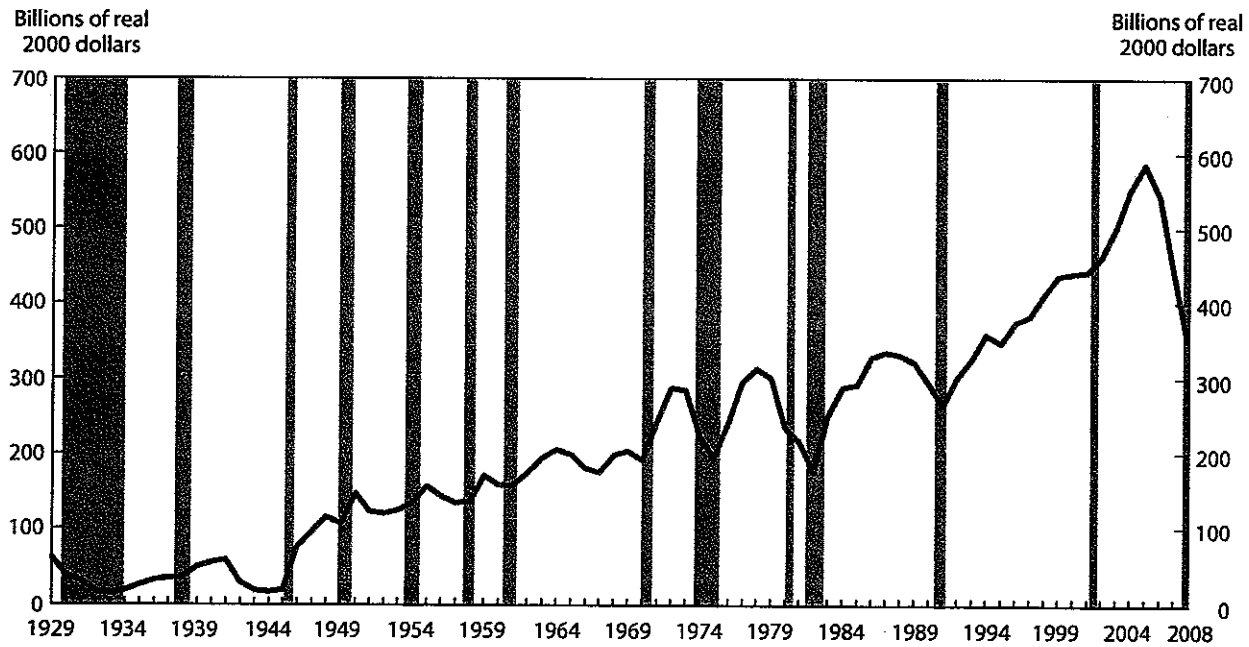
lowing for comparisons between a lengthier bubble and a shorter one: 1996, between the onset of the runup in prices and Baker's asserted bubble start date, and 2002, as proposed by Lawler.

Measures of the bubble and bust

Several measures of the bubble and bust are presented here in order to compare data on the magnitude of growth and decline during the bubble and bust years. Although the price data offer important information regarding certain economic effects, residential-construction-related employment over the recent bubble and bust years has more closely tracked measurements related to the demand for homes than the prices paid for the homes. Regardless, I–O analysis dictates that final-demand data be used to gauge the magnitude of the bubble. Other demand-related estimates of housing market activity are presented here as comparative measures of the housing bubble and the bust. The alternative data sources offer measures of the relative size of the bubble and bust that are similar to those in the final-demand data. The similarity in data lends support to the use of final demand as an acceptable metric to gauge the impact of the housing bubble and bust on U.S. employment.

Demand for residential structures. BEA's measure of investment in residential structures comprises construction of single-family and multifamily homes and other residential structures. To calculate the estimate, BEA estimates the value of new construction and then makes adjustments such as adding the value of brokers' commissions on the sale of new and used structures, the value of improvements to structures, and the value of investment in manufactured homes.[8] Theory holds residential investment as a leading economic indicator, as is depicted in chart 1. The gray bars represent recessions as declared by the National Bureau of Economic Research. Residential investment tends to be procyclical, meaning that it generally peaks prior to the onset of recessions and reaches its trough before the end of recessionary periods. BEA estimates demand for residential structures as far back as 1929. In the early years, demand was affected considerably by the Great Depression, falling by nearly 80 percent from 60.0 billion dollars in 1929 to 12.6 billion in 1933.[9] Demand recovered gradually until 1941 and then experienced another dip during World War II followed by a rapid recovery in the latter half of the 1940s.

Chart 1. Residential investment, 1929–2008



NOTE: The shaded bars denote National Bureau of Economic Research (NBER)-designated recessions.
SOURCE: Bureau of Economic Analysis (data published June 25, 2009).

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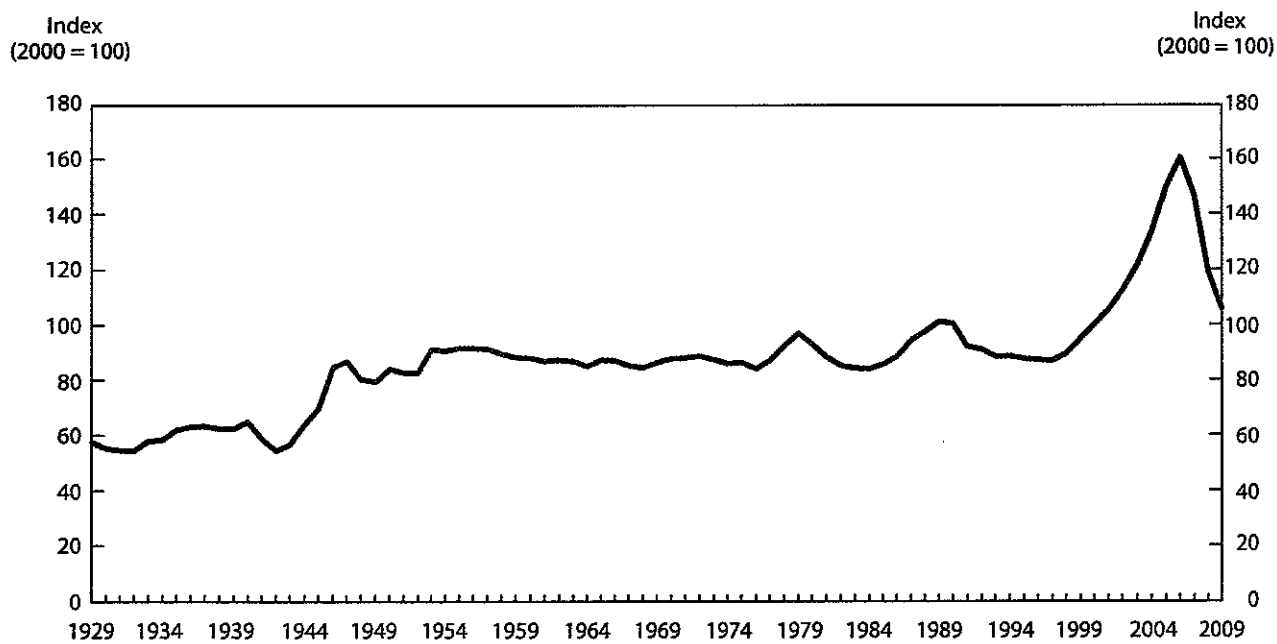
Growth was somewhat more stable in the 1950s and 1960s, with more moderate declines during economic downturns. Its behavior then became more dynamic starting in the 1970s. Demand experienced peaks followed by troughs around the time of the 1970s oil crises and the energy crisis in 1979. Investment in residential construction once again struggled during the "double-dip recessions" in 1980 and 1982 while buyers faced record-high mortgage rates. As the economy recuperated and interest rates declined, demand recovered until the onset of the savings and loan crisis in the late 1980s. Demand then continued to fall through the recession of 1990–91.

Residential construction then underwent an unprecedented expansionary period that consisted of 14 years of positive growth over 1991–2005, with the exception of a slight decline over 1994–95. Growth in demand over the 1991–2005 period was more than double that of any other expansionary period in the U.S. housing market since 1950. For the first time in the post-World War II era, an expansionary period continued throughout a recession. In fact, some argue that appreciation in home prices stimulated consumer spending and thereby helped to keep the 2001 recession relatively short and shallow.[10] Annual growth rates of demand over this expansionary period were moderate given historical behavior; however, by 2005, 14 years of growth had left demand far above what would be expected given the long-run trend.

Demand more than doubled from 1991 to 2005, from 264.0 billion real dollars to 586.0 billion. Some of this expansion was to be expected as a result of normal cyclical activity. From 1996 (one of the years considered as a starting point for the bubble) to 2005, demand increased by 210.9 billion dollars, with average annual growth of 5.1 percent. More than half of the growth, 123.8 billion, occurred between 2002 and 2005, when demand grew much faster—by 8.2 percent annually. After the bubble period came to an end, in just 3 years demand fell back to 351.3 billion (the 2008 figure), near the 1995 level.

Prices of residential structures. As defined earlier, a bubble arises when demand is high and prices "are considerably at variance with intrinsic values." Therefore, it is not surprising to see that, during the recent housing cycle, prices were affected more than demand. Chart 2 depicts Robert Shiller's real home price index, published in *Irrational Exuberance*,[11] updated with data through 2009. From 1929 through the mid-1940s, as the market suffered through the Great Depression and World War II, the

Chart 2. Robert Shiller real house price index, 1929–2009



SOURCE: http://irrationalexuberance.com. To view the data, click on the link in the second bullet point on the main Web page.

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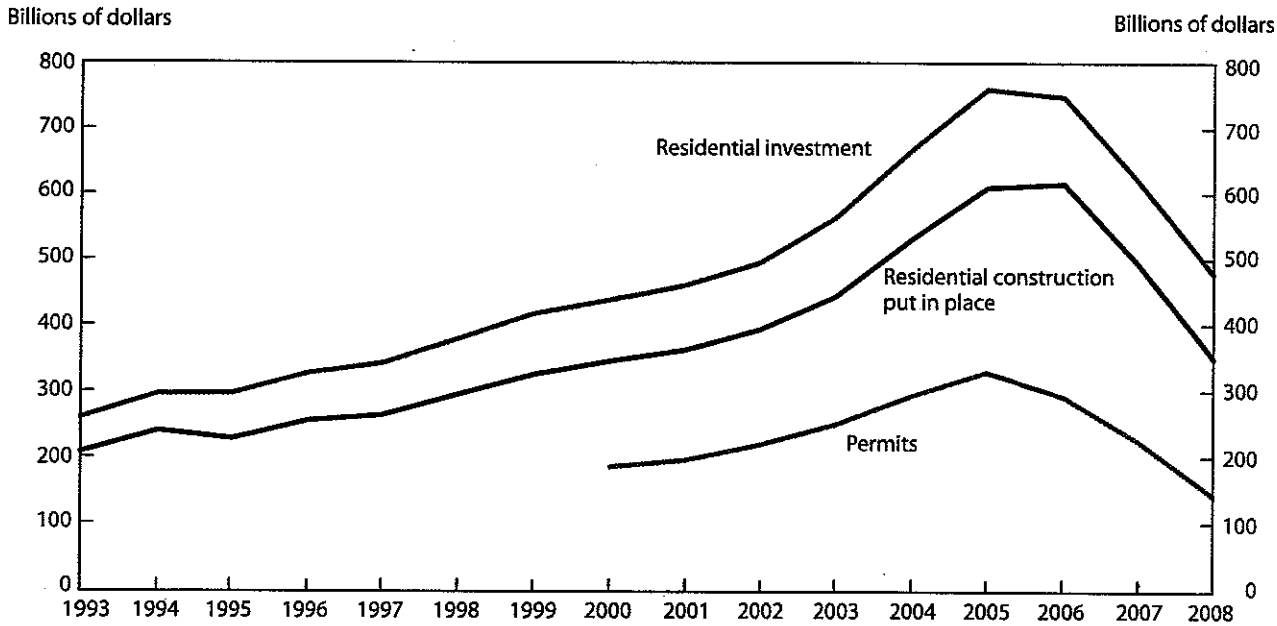
Shiller real home price index stayed close to 60. During the mid-1940s, prices exhibited rapid growth, and the index reached 86.6 in 1947. Prices then remained relatively stable through the late 1990s, with the exception of some cyclical activity in the late 1970s and late 1980s. Outside of the Great Depression and recent bubble period, home prices have closely followed changes to overall prices as measured by the Consumer Price Index. From 1996 to 2006, the Shiller real price index nearly doubled, from 87.0 to 160.6, with 65.7 percent of this growth occurring from 2002 to 2006. Prices quickly plunged thereafter, and the index was at 105.7 in 2009. This surge in growth followed by rapid decline is unprecedented in the history of U.S. real housing prices.

Other measures. There are several demand-related estimates available that could be used as an alternative to the final-demand estimate published by BEA. Data on the value of construction put in place (estimated by the Census Bureau), for example, show a nominal increase from 1996 to 2005, 138.1 percent, similar to that shown by the BEA nominal demand data, 132.1 percent.[12] (See chart 3.) If 2002 is used as the starting point, the two measures show nearly equivalent estimates of percentage growth. The decline from the peak in 2005 to 2008 was only slightly steeper as measured by the value of construction put in place than as measured by nominal final demand (42.5 percent compared with 37.1 percent, respectively). Since the data on the value of construction put in place are a primary input into BEA's estimate of final demand, the similarity between the "construction put in place" estimates of growth and decline and the corresponding final demand estimates is to be expected.

Data on permits authorized for new privately owned housing units, also published by the Census Bureau, are another measure of housing market activity. Since data for permits are available starting from 2000, only the later bubble start date is examined here. From 2002 to 2005, the number of permits increased by 50.2 percent, similar to the increase in nominal final demand during the same period, which was 53.3 percent. In contrast, there was disparity between the two measures from 2005 to 2008: permits fell by 57.0 percent, and final demand declined by 37.1 percent.

The final measure used for comparison, private housing starts, shows the biggest discrepancy compared with final demand but still exhibits a similar pattern over the bubble-and-bust cycle, as shown in chart 4. Growth in

Chart 3. The nominal value of residential investment, of permits, and of residential construction put in place, 1993–2008



SOURCES: Bureau of Economic Analysis and Census Bureau.

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housing starts was 41.1 percent between 1996 and 2005, compared with a 56.2-percent increase in final demand. From 2002 to 2005, the two measures show closer estimates of growth. Housing starts declined by 56.6 percent from 2005 to 2008 while demand declined by 40.1 percent.

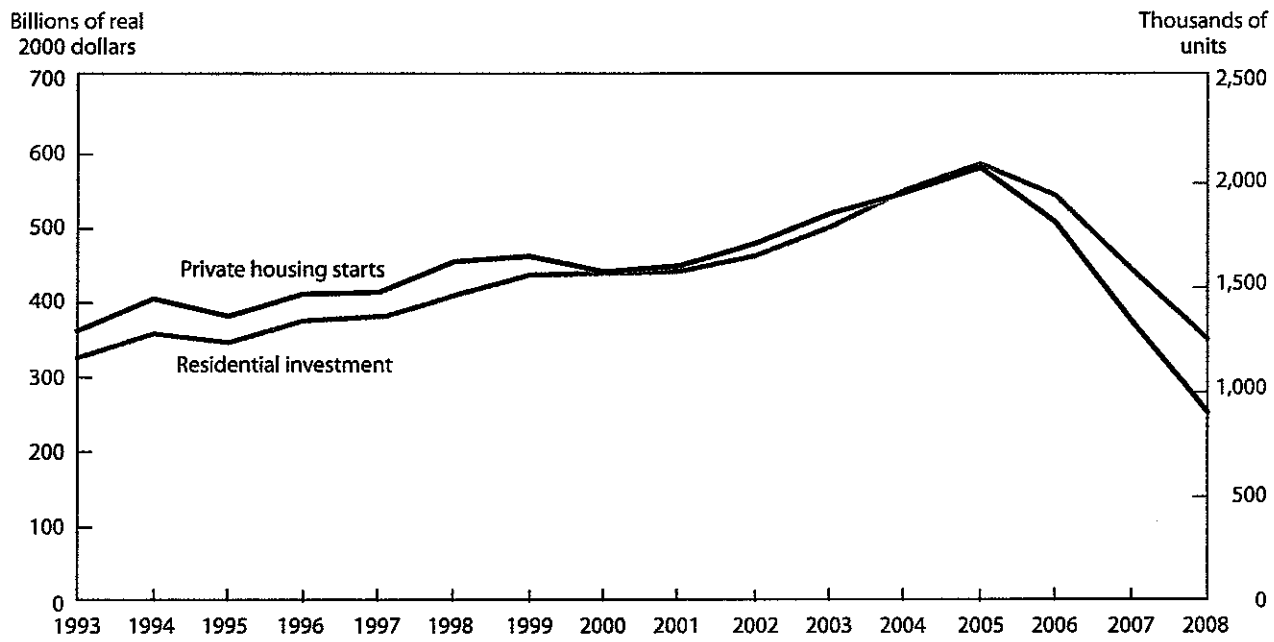
The rate of growth during the housing boom is very similar across the four measures. The decline from 2005 to 2008 was slightly less dramatic in the demand data than in the other estimates. It may be that demand data lag the other data and would track more closely overall if the 2009 measures were available.[13] Because of the nature of I–O models, the research presented later in this article necessarily relies on final-demand data to measure the impact of the housing bubble on U.S. employment. Analysis shows only relatively minor discrepancies in measurement of growth and decline between the final-demand data and the other demand-related measures.

Employment trends in construction

To gauge the impact of the housing bubble on the job market, researchers often look to BLS estimates of employment within the construction sector. BLS publishes two such measures of employment, the Current Employment Statistics (CES) estimate and the Current Population Survey (CPS) estimate.[14] The CES survey is an establishment, or payroll, survey that estimates only wage and salary employment, whereas the CPS is a household-based survey that also captures unpaid family workers and the self-employed. The CES survey counts jobs, while the CPS counts persons. In assembling its projections, the EPP is interested in a total jobs count, analyzing trends in wage and salary employment as well as the employment of unpaid family workers and the self-employed. EPP takes the slightly unconventional step of summing CES data for wage and salary workers with the CPS estimate of self-employed and unpaid family workers to arrive at an estimate of total jobs. In doing so, EPP implicitly assumes within its industry employment data that each self-employed or unpaid family worker counted by the CPS has only one job.[15]

EPP estimates of total employment within the construction sector are presented in chart 5.[16] The total employment measure is available only for the aggregate construction sector, which comprises residential building construction, nonresidential building construction, heavy and civil engi-

Chart 4. Annual residential investment (left axis) and annual private housing starts (right axis), 1993–2008



SOURCE: Bureau of Economic Analysis.

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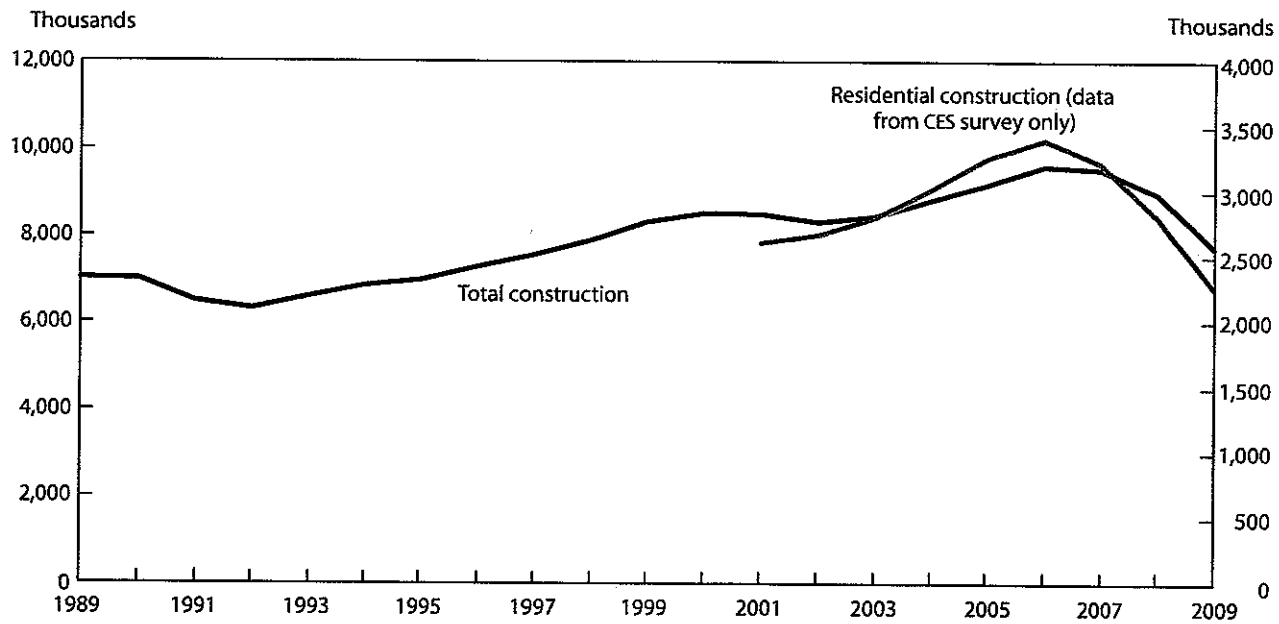
Chart 5. Total employment in the construction sector (left axis) and employment in residential construction (right axis), 1989–2009



SOURCES: Total construction employment is measured as the the sum of wage and salary employment from the Current Employment Statistics survey and the number of self-employed workers and unpaid family workers from the Current Population Survey. The line showing employment in residential construction exhibits data from the Current Employment Statistics survey only.

neering construction, and specialty trade contractors. During the recent housing cycle, employment in the construction sector peaked in 2006, 1 year after the demand climax. Because employment data for the construction sector are available through 2009, they are included in this discussion even though data on final demand are available only through 2008. Also, since employment peaked 1 year later in the employment data than in the demand data, this allows for a comparison of 3 years of decline in each of the time series.

Employment in the construction sector grew notably, by 2.3 million jobs, or 31.6 percent, between 1996 and 2006. More than half of this growth, 1.3 million jobs, occurred from 2002 to 2006. From 2006 to 2009, employment fell by 1.9 million jobs, a decline of 19.4 percent. These data indicate that the housing bubble and bust had a considerable impact on U.S. construction employment, but it is important to bear in mind that they cover employment in the construction sector as a whole, not just in residential construction.

A measure of residential construction employment alone is of course preferable for isolating the impacts of the housing bubble and bust on residential construction. Unfortunately, with regard to data on unpaid family workers and the self-employed, the CPS does not break out the construction sector into more detailed components. The CES survey disaggregates construction employment into the following: construction of buildings (residential and nonresidential), heavy and civil engineering construction, and specialty trade contractors (residential and nonresidential). However, specialty trade contractors has been broken out only since 2001. Summing residential building construction and residential specialty trade contractors data results in what this article refers to as data on "residential construction."[18] Summing the CES data shows that residential construction employment made up between 37.6 percent and 44.5 percent all employment in the construction sector from 2001 to 2009. During the same period, nonresidential construction accounted for 42.6 percent to 48.4 percent of construction sector employment, and heavy and civil engineering construction supplied 12.8 percent to 14.0 percent.

Residential construction showed faster employment growth during the bubble and steeper decline over the bust period than the construction sector as a whole. From 2002 to 2006, employment in residential construction

increased by 26.6 percent, considerably faster than the 15.4-percent growth in the construction sector as a whole. Of the 1.3 million jobs added in construction, more than half—715,000—were in residential construction. From 2006 to 2009, wage and salary employment within residential construction industries declined by 1.1 million, or 33.4 percent, while the total number of construction jobs fell by 1.9 million, or 19.4 percent.

The effects of the housing bubble and bust were not limited to the construction sector. Record sales of existing and new homes during the housing boom propelled economic growth throughout the economy. Though the impact of the housing boom cannot directly be seen in every industry within CES data, some industries appear to rely heavily on demand for residential construction, including those shown in italics in table 1.[17] Employment in cement and concrete product manufacturing and in construction machinery manufacturing grew by 5.1 percent and 9.0 percent, respectively, from 2001 to 2006 while overall employment in manufacturing fell by 13.9 percent.[18] Employment in the real estate credit industry and the mortgage and nonmortgage loan brokers industry ballooned by 52.0 percent and 119.5 percent, respectively. The housing boom appears to have supported job growth not only in these industries, but also in the industry group of offices of real estate agents and brokers and that of activities related to real estate.

As the housing bubble deflated and the United States entered a recession, industries that heavily depend on demand from residential construction began to suffer considerable losses in employment, losses much greater in percentage terms than those sustained in the overall economy. Employment in real estate credit and in mortgage and nonmortgage loan brokers fell back to 2001 levels or even lower by 2009. Wood product manufacturing and cement and concrete product manufacturing also suffered extensive losses in employment from 2006 to 2009, much greater than the average loss across all manufacturing sectors.

Table 1. Current Employment Statistics estimates of employment in select industries, in thousands, select years, 2001–09

Industry	2001	2006	2009	Numerical change		Percent change	
				2001–06	2006–09	2001–06	2006–09
Total nonfarm	131,826.0	136,086.0	130,920.0	4,260.0	–5,166.0	3.2	–3.8
Total private	110,708.0	114,113.0	108,371.0	3,405.0	–5,742.0	3.1	–5.0
Construction	6,826.0	7,691.0	6,037.0	865.0	–1,654.0	12.7	–21.5
Construction of buildings	1,588.9	1,804.9	1,365.6	216.0	–439.3	13.6	–24.3
Residential buildings	781.4	1,008.8	639.4	227.4	–369.4	29.1	–36.6
Nonresidential buildings	807.5	796.1	726.2	-11.4	–69.9	–1.4	–8.8
Heavy and civil engineering	953.0	985.1	846.9	32.1	–138.2	3.4	–14.0
Specialty trade	4,283.9	4,901.1	3,824.4	617.2	–1,076.7	14.4	–22.0
Residential specialty trade contractors	1,848.1	2,396.8	1,629.6	548.7	–767.2	29.7	–32.0
Nonresidential specialty trade contractors	2,435.8	2,504.4	2,194.9	68.6	–309.5	2.8	–12.4
Manufacturing	16,441.0	14,155.0	11,883.0	–2,286.0	–2,272.0	–13.9	–16.1
Wood products	574.1	558.8	360.7	–15.3	–198.1	–2.7	–35.5
Cement and concrete products	236.2	248.3	187.7	12.1	–60.6	5.1	–24.4
Architectural and structural metals	421.8	411.6	348.3	–10.2	–63.3	–2.4	–15.4
Construction machinery	71.3	77.7	67.4	6.4	–10.3	9.0	–13.3
Wholesale trade	5,772.7	5,904.5	5,625.3	131.8	–279.2	2.3	–4.7
Lumber and construction supply	220.5	264.1	205.1	43.6	–59.0	19.8	–22.3
Retail trade	15,238.6	15,353.3	14,527.8	114.7	–825.5	0.8	–5.4
Furniture stores	281.8	298.9	224.3	17.1	–74.6	6.1	–25.0
Building material and garden supply stores	1,151.8	1,324.1	1,162.6	172.3	–161.5	15.0	–12.2
Financial activities	7,808.0	8,328.0	7,758.0	520.0	–570.0	6.7	–6.8
Real estate credit	231.2	351.4	196.9	120.2	–154.5	52.0	–44.0
Mortgage and nonmortgage loan brokers	66.0	144.9	66.0	78.9	–78.9	119.5	–54.5
Real estate	1,343.4	1,499.0	1,416.7	155.6	–82.3	11.6	–5.5
Offices of real estate agents and brokers	291.1	374.6	305.2	83.5	–69.4	28.7	–18.5
Activities related to real estate	437.6	521.9	537.2	84.3	15.3	19.3	2.9

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Residential-construction-related employment

By combining the total jobs estimate with other output measures, EPP assembles a time series of historical input–output tables.[19] I–O tables provide detailed information on the flows of goods and services that make up the production processes of U.S. industries. The employment requirements table, one table within the National Income and Product Accounts, measures the number of jobs supported through the entire production process.[20] The table estimates the thousands of jobs required by each industry to satisfy a million dollars of final demand for a given good or service.

The employment requirements table illustrates what is driving industry employment with respect to both final demand and to the production of intermediate goods and services, applying an input–output view to industry data. Exhibit 1 depicts the employment requirements table in a simplified three-industry economy: manufacturing, construction, and all other industries. The entries in each row show direct and indirect employment in each industry. Direct employment, shown in the upper left, middle, and bottom right of the table, measures the employment within the producing industry necessary to generate the primary good or service produced by the given industry. Indirect employment, represented by all cells in the matrix other than those along this diagonal, is the employment generated in all of the industries that support the producing industry with their inputs.[21] For example, I_{mc} represents the indirect employment in the construction sector supported by demand for manufacturing goods.

As residential construction boomed, secondary effects spilled over into many industries generating indirect employment (since building new homes required purchases of intermediate goods and services). Employment in the manufacturing sector, for example, benefited because of purchases of intermediate goods such as carpet, toilets, countertops, and construction equipment that went into the construction of new homes or improvements on existing structures. Even seemingly unrelated industries, such as legal services, benefited indirectly from surging demand for residential construction. As the money spent on construction projects increased, construction companies probably required more legal support.

Multiplying a given row of the employment requirements table, say, construction, by the vector of total final demand calculates the number of jobs within the sector. In 2005, for example, the CES survey estimated 7.3 million wage and salary jobs in the construction sector and the CPS reported 1.8 million self-employed workers and unpaid family workers, resulting in an EPP estimate of 9.2 million total jobs in the construction sector. Multiplying the construction row of the employment requirements table by EPP's vector of total final demand shows that 8.2 million of the jobs within the construction sector were attributable to direct employment. That is, these jobs satisfied demand for goods classified in the construction sector. The remaining 1.0 million indirect jobs added to final demand for other goods and services by providing construction activity as an input. For example, when consumers paid their hospital bills, some of that money went to pay employees in the construction industry who did work for the hospitals. EPP estimates that 59,000 jobs in the construction sector supplied work that served as an intermediate input into the hospitals industry.

Rather than looking at a particular row within the em-

Exhibit 1. Analysis of a simplified employment requirements table

Employment requirements table

	Manufacturing	Construction	Other
Manufacturing	D_m	I_{cm}	I_{om}
Construction	I_{mc}	D_c	I_{oc}
Other	I_{mo}	I_{co}	D_o

×

Vector of final demand
FD_m
FD_c
FD_o

Total employment = direct employment + indirect employment

Direct employment =

Manufacturing	$D_m \times FD_m$
Construction	$D_c \times FD_c$
Other	$D_o \times FD_o$

Indirect employment =

Manufacturing	$(I_{cm} \times FD_c) + (I_{om} \times FD_o)$
Construction	$(I_{mc} \times FD_m) + (I_{oc} \times FD_o)$
Other	$(I_{mo} \times FD_m) + (I_{co} \times FD_c)$

NOTE: D = direct employment, I = indirect employment, FD = final demand, m = manufacturing, c = construction, and o = other

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The 2008–18 employment projections

Although this article is focused on the recent impacts of the housing bubble and bust, EPP's 2008–18 projections are briefly discussed as they relate to the housing market. EPP expects that construction will be the only sector among goods-producing sectors to show employment growth over the projected period.[1] Construction was more heavily affected by the 2007–09 recession than other goods-producing sectors and is therefore expected to show higher growth in the recovery period.

EPP anticipates demand for residential construction to recover to 581.6 billion dollars in 2018, very near the peak level of 586.0 billion in 2005. The projected level of demand is expected to support 6.2 million residential-construction-related jobs in 2018, near the 2003 level but not as high as the level in 2004 or 2005. EPP expects that residential-construction-related employment will climb back to 3.8 percent of total employment in 2018, higher than the 3.0 percent level of 2008 but lower than the 5.1 percent level of 2005 and slightly lower than the 1993 level. Sixty percent of the residential-construction-related jobs lost between 2005 and 2008, or 1.7 million, are anticipated to be recovered over the projection period.

Note

[1] For more information on industry employment projections, see Rose Woods, "Industry output and employment projections to 2018," *Monthly Labor Review*, November 2009, pp. 52–81.

ployment requirements table to break out sector employment by what types of demand the industry in question is satisfying, one can analyze the table in its entirety to estimate how demand results in employment in all industries throughout the U.S. job market. Multiplying the employment requirements matrix in its entirety by the column vector of final demand for investment in residential construction yields an estimate of what this article refers to as "residential-construction-related employment." EPP's analysis of direct and indirect employment includes data only for the construction sector as a whole. Determining employment impacts related specifically to demand for residential construction requires the assumption that the relationship of jobs to demand is the same for residential as for aggregate construction.

Because investment in residential construction requires purchases of many intermediate goods and services from a variety of industries, the effects of the housing bubble spread throughout the economy. Construction output attributable to residential construction spending grew from 695.3 billion dollars in 1996, to 827.0 billion in 2002, to slightly over 1.0 trillion dollars in 2005. The purchases of intermediate goods and services for residential structures accounted for nearly half of this output. During the bust period, output related to residential construction demand fell, and it was at 600.2 billion in 2008.[22]

EPP estimates that output related to residential construction spending led to employment of 5.5 million in 1996. As the housing market expanded, related employment grew to 6.0 million jobs in 2002. By the peak of the housing market, in 2005, it had increased to 7.4 million. Employment expanded by 1.8 million jobs, or by 33.4 percent, between 1996 and 2005, with 1.4 million of this growth occurring between 2002 and 2005. As the bubble burst, residential-construction-related employment fell to 4.5 million in 2008, 385,000 fewer jobs than in 1993, the earliest year of available data.

Residential construction spending supported an estimated 4.0 percent to 4.4 percent of total employment within the United States from 1993 to 2000. By 2005, employment related to residential construction reached 5.1 percent of total U.S. employment; it then fell, reaching 3.0 percent in 2008. (See chart 6.) Since it makes up only a small portion of total employment, residential-construction-related employment usually has not had a considerable impact on overall employment change in the U.S. economy. It is interesting to note that, according to EPP's estimates, in 2008 the decline in residential-construction-related employment—1.2 million—was greater than the overall net loss in employment in the U.S. economy—804,000.

Employment growth attributable to the bubble

Not all of the residential-construction-related employment growth during the bubble period was generated from the housing bubble, given that some increases would have been expected for reasons including population growth and continued expansion in the economy. I–O tables allow researchers to conduct an in-depth analysis of the economy-wide effects that a change in final demand has on industry output as well as employment.[23] By estimating what demand would have been without a bubble, one can measure how many U.S. jobs there would have been under the alternative demand scenario. The difference between the actual number of jobs and the number approximated under the scenario of nonbubble demand

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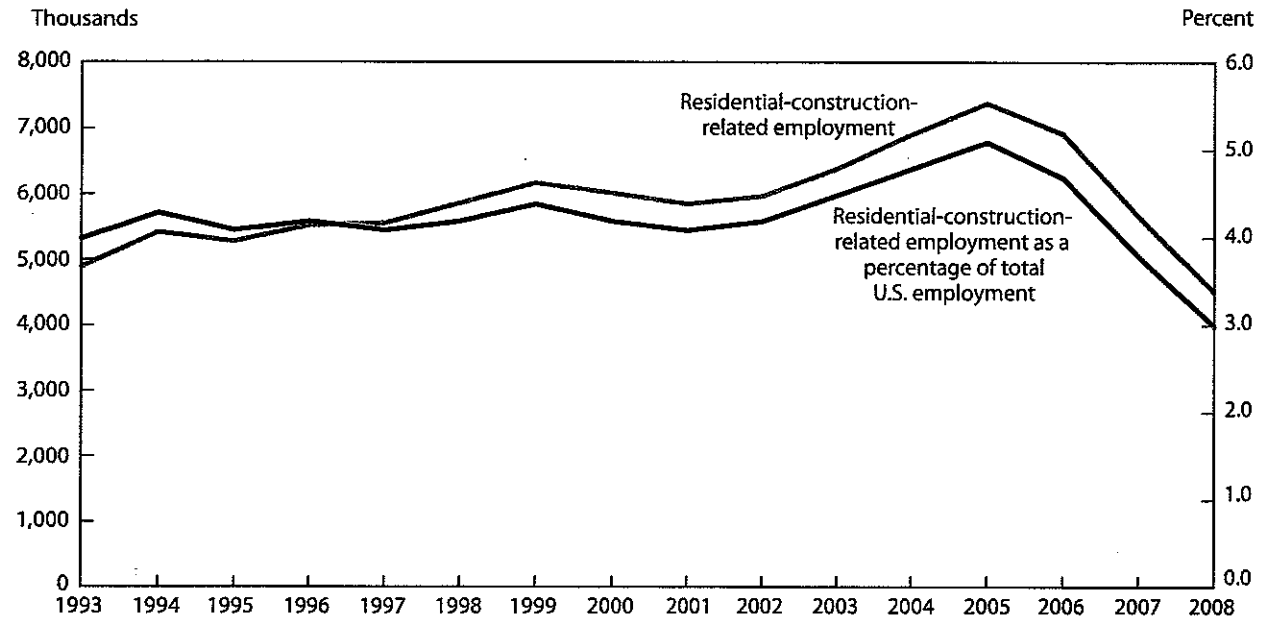
Chart 6. Residential-construction-related employment in thousands (left axis) and as a percentage of total U.S. employment (right axis), 1993–2008



SOURCES: Current Employment Statistics survey and Current Population Survey.

serves as an estimate of the number of jobs due to the housing bubble.

This type of analysis is necessarily uncertain and relies upon a number of assumptions. The alternative demand scenarios are only approximations, as no one knows what would have happened without a housing bubble. The bubble had reverberating impacts throughout the economy that are impossible to isolate from other economic activity. Relying upon I–O tables for impact analysis also requires assumptions. For example, I–O accounts are defined such that each industry has a unique production function. It is assumed that there are no economies of scale in production. In addition, changes in final demand are assumed to be achieved instantaneously and without price changes.

Given that the 10-year projections of employment and macroeconomic activity that EPP publishes every 2 years are not a forecast, previous EPP projections provide one estimate of investment in residential construction without a bubble. Predicting shocks over 10 years is usually impossible. Moreover, in spite of economic shocks, the economy tends to revert to long-run trends. Therefore, BLS projections are not a forecast of business-cycle activity.[24]

Accounting for both 1996 and 2002 as possible start dates for the bubble, the 1996–2006 and 2002–12 projections serve in this article as one method of estimating nonbubble demand for residential structures. BLS publishes a point projection for a 10-year period, so it does not publish data for intervening years. Because of large-scale revisions, data published in previous projections are not comparable to more recently published data, but the projected growth rate usually is comparable. Therefore, the projected average annual growth rate is applied to actual demand data from the proposed start date of the bubble. A naïve model of constant growth is also considered, wherein the average annual growth rate from 1950 to 1996 or from 1950 to 2002 continues to hold throughout the bubble period.

Nonbubble demand scenarios. The 1996–2006 projections were prepared using the Standard & Poor's DRI (Data Resources, Inc.) U.S. quarterly model.[25] At the time of that publication, BLS expected demographics to be the main factor changing the growth in demand for residential construction over the projected decade. An expected decline in the number of people in the age groups typically thought of as those of first-time home buyers was

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anticipated to hold growth to 0.8 percent annually over the projection period, in comparison with the 2.1 percent exhibited on average annually between 1950 and 1996. If the bubble did start in 1996 and the projections accurately captured demand without the bubble, 86.0 percent of growth in demand for residential structures between 1996 and 2005, or 181.4 billion dollars, was attributable to the housing market bubble. In another scenario, if growth had continued at the 1950–96 average annual pace, the bubble contributed an estimated 134.9 billion dollars of investment, 64.0 percent of growth, over the 1996–2006 period. (See chart 7.)

The 2002–12 projections were prepared by use of the macroeconomic model developed by Macroeconomic Advisers, LLC.[26] EPP once again stated that demographics were expected to slow investment in residential structures. However, rapid growth during the late 1990s and early 2000s likely contributed to a projected annual growth rate of 2.1 percent from 2002 to 2012, higher than the rate projected for 1996–2006. The average annual growth rate from 1950 to 2002 was 2.2 percent, nearly equivalent to the 2002–12 projection. Because results based on the naïve constant growth model for 1950–2002 are nearly identical to those based on the 2002–12 projections, the constant growth model for 1950–2002 is not examined separately. If the bubble started in 2002, demand for residential construction in 2005 was 93.3 billion dollars higher than nonbubble demand as measured by the 2002–12 projections. According to this model, three quarters of the growth exhibited from 2002 to 2005 was attributable to the bubble.

From 2005 to 2008, demand for residential structures fell considerably as the market corrected for rapid growth during the boom years. In 2008, demand was only slightly higher than its 1995 level. All of the proposed models anticipated that demand for residential construction would be higher than it was in 2008. If the bubble began in 1996, on the basis of the 1996–2006 projections, demand would be expected to be 18.1 percent higher in 2008 than it actually was. On the basis of average annual growth from 1950 to 1996, growth would be expected to be 36.6 percent higher than it actually was. If the bubble started in 2002, demand would be projected to be 49.5 percent higher than it actually was.

Related nonbubble employment. The alternative demand estimates were combined with data from the employment requirements table to estimate the impacts of the bubble and bust throughout the U.S. job market. (See chart 8.) On the basis of the 2002–12 projections, the number of residential-construction-related jobs was approximated to be 1.2 million over the theoretical nonbubble level at the peak of the housing market in 2005. According to this estimate, 82.7 percent of the job growth between 2002 and 2005 was a result of the housing bubble. Also, the bubble is estimated to have increased U.S. employment by 0.8 percent in 2005.

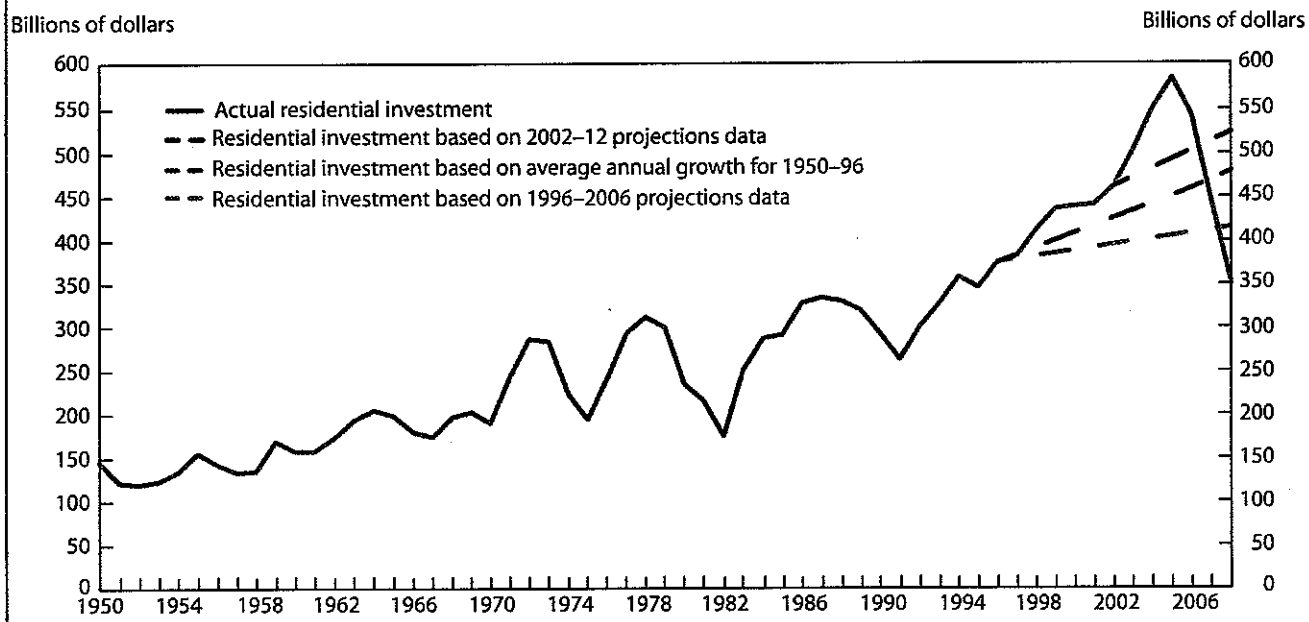
If, however, the bubble started in 1996, the constant growth model implies that employment was 1.7 million over nonbubble residential-construction-related employment and contributed 1.2 percent to the total number of U.S. jobs in 2005. According to the 1996–2006 projections, employment was to stay relatively flat between 1996 and 2008, with a slight dip in the between years. In this nonbubble scenario, residential-construction-related employment was expected to fall by 433,000 between 1996 and 2005.

The decline in nonbubble employment present in the 1996–2006 projections could be due to a number of factors. The assumptions underlying I–O analysis may be having some impact here. For example, the production function may not have been the same without a bubble. Perhaps output was higher in relation to employment in the construction industry during the bubble than it would have been without a bubble. Alternatively, the projections could have underestimated nonbubble demand. Regardless, because nonbubble residential-construction-related employment was expected to decline from 1996 to 2006, the results of this model are disregarded because they are considered to be too low.

By 2008, housing-related employment fell to 4.5 million and was accounting for only 3.0 percent of total U.S. jobs. If the bubble began in 1996, the naïve growth model expects that, if the market were not correcting for excess growth in the bubble years, residential-construction-related employment would have been 1.7 million higher in 2008. If the bubble did not begin until 2002, it is approximated that residential construction-related employment would have been 2.2 million higher in 2008. The bust in the housing market, according to these measures and the embedded assumptions, pulled down U.S. employment by 1.1 percent to 1.5 percent below where it would have been had there not been a bubble.

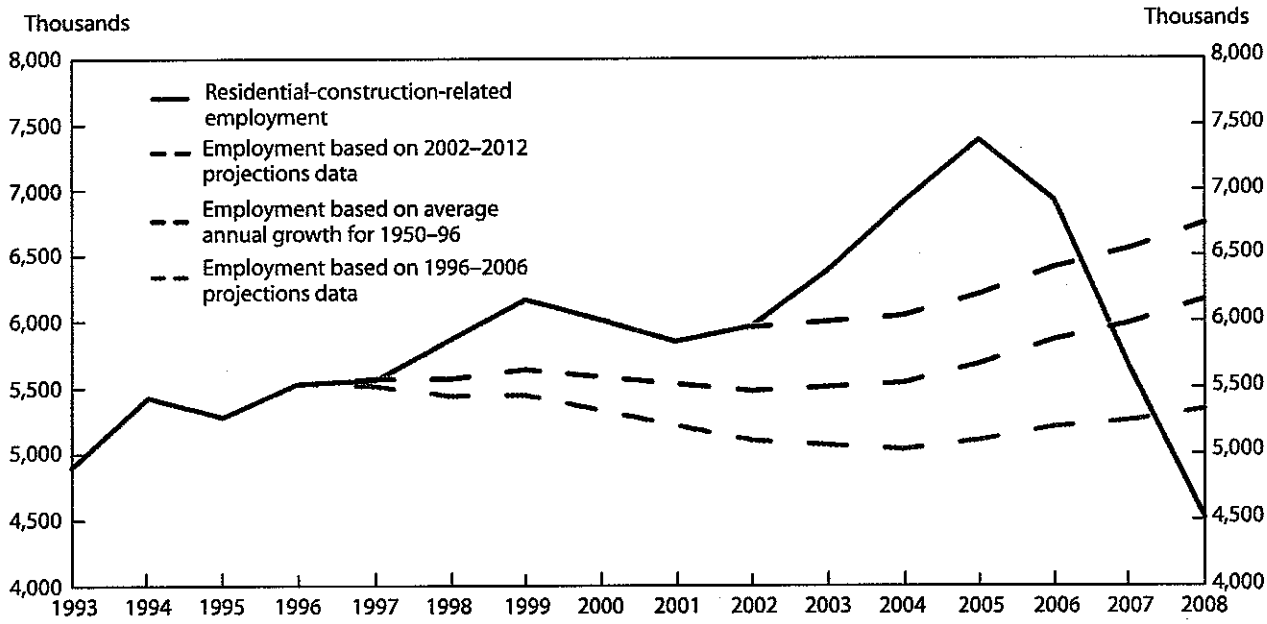
IN RECENT YEARS, THE HOUSING BOOM AND BUST have had a substantial impact on the U.S. job market. Because the date of the onset of the bubble is not clear, this article considers two possible starting points, 1996 and 2002. Whereas industry employment data offer analysis of employment within the entire construction sector, I–O

Chart 7. Nominal residential investment from 1950 to 2008 and hypothetical "nonbubble" demand estimated for 1996–2008 and for 2002–08



SOURCES: Bureau of Economic Analysis and Bureau of Labor Statistics.

Chart 8. Residential-construction-related employment from 1993 to 2008 and hypothetical "nonbubble" employment estimated for 1996–2008 and 2002–08



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data published by EPP can be used to estimate the level of employment related to a specific category of demand and related purchases of intermediate goods and services. In this article, residential-construction-related employment was analyzed. Stimulated by the bubble in the housing market, demand for residential construction grew by 56.2 percent from 1996 to 2005, with much of this growth occurring during the last 3 years. Given EPP's assumptions, its data imply that the growth in demand for residential construction accounted for an increase of 1.8 million jobs from 1996 to 2005, of which 1.4 million appeared from 2002 to 2005. Because of the burst of the bubble, residential-construction-related employment fell by 2.9 million from 2005 to 2008.

Some of the growth in employment related to residential construction was to be expected because of normal economic expansion, whereas some was propelled solely by the housing bubble. Two types of models—one a naïve constant growth model and the other based on previous BLS projections—were evaluated to estimate what the level of investment in residential structures would have been without the bubble stimulating growth. The 1996–2006 projections and the average annual growth model for 1950–1996 were compared to estimate the employment impacts of the bubble with the assumption that it started in 1996. The projections implied that, had there not been a bubble, residential-construction-related employment would have declined slightly over the bubble period; therefore, this estimate was considered too low. The constant growth model was thus considered the preferable measure for the earlier start date of the bubble. Because the constant growth model for 1950–2002 and the 2002-to-2012 projections were nearly equivalent with regard to employment related to residential construction, only the projections were examined for the later start date.

The constant growth model projected only 153,000 of the 1.8 million rise in residential-construction-related employment from 1996 to 2005. The model indicates that, by 2005 (the peak of the bubble), the housing bubble supported 1.7 million jobs, or 1.2 percent of total U.S. employment. The BLS 2002–12 projections indicate that, if the bubble started in 2002, residential-construction-related employment would have grown by 244,000 from 2002 to 2005 without a bubble, as compared with the job growth of 1.4 million jobs that actually occurred. According to this model, residential-construction-related employment was 1.2 million jobs over the nonbubble level and accounted for 0.8 percent of U.S. employment in 2005.

The decline over 2005 to 2008 was much more abrupt than the growth that had recently occurred, and it nearly matched the growth exhibited over 1993 to 2005. EPP data show that residential-construction-related employment fell from 7.4 million jobs in 2005 to 4.5 million in 2008, which was 385,000 fewer than existed in 1993. Depending on the bubble start date, employment is estimated to have been between 1.7 million and 2.2 million below nonbubble employment in 2008. According to these estimates and the embedded assumptions, the bust in the housing market pulled down 2008 U.S. employment to 1.1 percent to 1.5 percent lower than where it would have been had there not been a bubble. □

Notes

[1] For more discussion on comparisons of the current bubble-and-bust cycle in home prices to that of the Great Depression, see David C. Wheelock, "The Federal Response to Home Mortgage Distress: Lessons from the Great Depression," the Federal Reserve Bank of St. Louis *Review*, May/June 2008, pp. 133–48, on the Internet at **http://research.stlouisfed.org/publications/review/08/05/Wheelock.pdf** (visited July 14, 2010).

[2] See Shayna M. Olesiuk and Kathy R. Kalser, "The Sand States: Anatomy of a Perfect Housing-Market Storm," on the Internet at **www.fdic.gov/bank/analytical/quarterly/2009_vol3_1/AnatomyPerfectHousing.html** (visited Dec. 1, 2010).

[3] Ronald R. King, Vernon L. Smith, Arlington W. Williams, and Mark V. van Boening, "The Robustness of Bubbles and Crashes in Experimental Stock Markets," in Richard H. Day and Ping Chen, eds., *Nonlinear Dynamics and Evolutionary Economics* (New York, Oxford University Press).

[4] "Residential investment" and "final demand for residential structures" are used interchangeably in this article.

[5] See James R. Hagerty, "Who's to Blame for the Housing Bubble?" *The Wall Street Journal*, WSJ Blogs, Nov. 16, 2009, on the Internet at **http://blogs.wsj.com/developments/2009/11/16/whos-to-blame-for-the-housing-bubble/** (visited Dec. 1, 2010).

[6] See Dean Baker, "East Asia's economic revenge," *guardian.co.uk*, on the Internet at **www.guardian.co.uk/commentisfree/cifamerica/2009/mar/09/usa-useconomy** (visited Apr. 10, 2010).

[7] See Robert J. Shiller, "Don't Bet the Farm on the Housing Recovery," *New York Times*, Apr. 10, 2010, on the Internet at **www.nytimes.com/2010/04/11/business/economy/11view.html?emc=eta1** (visited Dec. 1, 2010).

[8] For a more thorough discussion of BEA's data on private structures, see Paul R. Lally, "How BEA Accounts for Investment in Private Structures," *Survey of Current Business* (U.S. Department of Commerce, Bureau of Economic Analysis, February 2009), pp. 9–15, on

the Internet at **www.bea.gov/scb/pdf/2009/02%20February/0209_briefing_structures.pdf**.

[9] All dollar figures in this article, unless otherwise noted, are real values in year-2000 dollars. All BEA data in this article are consistent with figures published as of July of 2009 and with EPP's 2008–18 projections presented in this article.

[10] See Frank E. Nothaft, "The Contribution of Home Value Appreciation to US Economic Growth," *Urban Policy and Research*, March 2004, pp. 23–34, on the Internet at **www.freddiemac.com/news/pdf/contribution_homevalue.pdf**; and Kevin B. Moore and Michael G. Palumbo, *The Finances of American Households in the Past Three Recessions: Evidence from the Survey of Consumer Finances* (Washington, DC, Federal Reserve Board, Dec. 10, 2009), on the Internet at **www.federalreserve.gov/pubs/feds/2010/201006/201006pap.pdf** (visited Dec. 1, 2010).

[11] Several other price indices are often cited when referencing the housing market, including the Case–Shiller 10 and 20, the Case–Shiller national, and the Federal Housing Finance Agency house price index, but these indexes have historical data going back no further than 1987. Note that, for the years 1987–2009, the Shiller real index is based on the Case–Shiller national index adjusted by the Consumer Price Index measurement of inflation. Earlier years are based on other price measures. For further information on the Shiller real index, see Robert J. Shiller, *Irrational Exuberance*, second edition (Princeton University Press, 2005); see also **http://irrationalexuberance.com/** (visited Mar. 22, 2010).

[12] Data on construction put in place and data on permits are not adjusted for changes in prices and are therefore compared with the nominal final-demand data published by BEA.

[13] BEA implemented a comprehensive revision to its National Income and Product Accounts in July of 2009. The estimates for 2009 are not comparable with earlier annual data as published by EPP because they were based upon BEA data as published before the comprehensive revision.

[14] There are many differences between CPS and CES data, only a few of which are mentioned here. For a comparison between the two surveys, see **www.bls.gov/bls/empsitquickguide.htm** (visited July 19, 2010).

[15] That is, EPP assumes that the count of self-employed and unpaid family workers is the equivalent of a jobs count. CPS data are also used by EPP to estimate wage and salary employment in industries for which the CES survey does not provide estimates, including the agricultural and private household industries.

[16] The CPS program estimated data for 1983–2002 on the basis of the old Standard Industrial Classification (SIC) codes. Data for 2000–09 are based on the North American Industry Classification System (NAICS). (For 2000–02, data were calculated both within the framework of NAICS and within that of the SIC system.) The 1983–99 data were adjusted to account for the coding change.

[17] The industries in table 1 were selected on the basis of those included in Matthew Miller, "A visual essay: post-recessionary employment growth related to the housing market," *Monthly Labor Review*, October 2006, pp. 23–34.

[18] Wood product manufacturing and architectural and structural metals manufacturing did see slight declines in employment over 2001–06. However, these declines were minor in comparison with the loss of jobs in the overall manufacturing sector. Also, both showed much larger declines over 2006–09 than over 2001–06, suggesting that the housing bubble may have held onto jobs that otherwise would have been lost during this period.

[19] BEA's benchmark I–O accounts provide the most comprehensive picture available of transactions within the U.S. economy, but are published only once every 5 years. The 2002 benchmark I–O data, released in 2007, were the latest data available for EPP's 2018 projections. On the basis of the 2002 benchmark I–O data, annual data from the National Income and Product Accounts, annual Census data, and data from a host of other sources, EPP estimates a historical time series of I–O data, currently 1993 to 2008. For detailed information regarding the 2002 benchmark I–O accounts, see Ricky L. Stewart, Jessica Brede Stone, and Mary L. Streitwieser, "U.S. Benchmark Input-Output Accounts, 2002," *Survey of Current Business* (U.S. Department of Commerce, Bureau of Economic Analysis, October 2007), pp. 19–48. For a more complete discussion of the methods used by EPP, see the *BLS Handbook of Methods*, chapter 13, on the Internet at **www.bls.gov/opub/hom/homch13_a.htm** (visited Apr. 5, 2010).

[20] The employment requirements table is "import adjusted"; that is, it is modified to account only for the sales of domestically produced goods and services to final users because imported goods generally do not generate domestic employment.

[21] All employees, direct and indirect, earn income that will generally be spent on consumer goods and services, which, in turn, will generate a third type of employment called induced employment (also referred to as "income multiplier effects on employment"). The Bureau of Labor Statistics does not measure induced employment.

[22] Estimating total output related to a specific category of final demand requires the assumption that the employment requirements table estimated for the economy as a whole also holds at the more detailed level.

[23] See Mary L. Streitwieser, "A Primer on BEA's Industry Accounts" (U.S. Department of Commerce, Bureau of Economic Analysis, June 2009), on the Internet at **www.bea.gov/scb/pdf/2009/06%20June/0609_indyaccts_primer_a.pdf** (visited Dec. 6, 2010).

[24] The projections do, however, include in-house projections of the growth of the population, an important contributor to growth within the housing market. For more discussion on how BLS's assumptions affected the 1996 to 2006 projections, see Ian Wyatt, "Evaluating the 1996–2006 employment projections," *Monthly Labor Review*, October 2010, pp. 33–69.

[25] For more information on the 1996–2006 projections, see Thomas Boustead, "The U.S. economy to 2006," *Monthly Labor Review*, November 1997, pp. 6–22.

[26] For more information on the 2002–12 projections, see Betty W. Su, "The U.S. economy to 2012: signs of growth," *Monthly Labor Review*, February 2004, pp. 23–36.