Volume Title: Housing Markets in the U.S. and Japan

Volume Author/Editor: Yukio Noguchi and James Poterba

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-59015-1

Volume URL: http://www.nber.org/books/nogu94-2

Conference Date: January 3-4, 1991

Publication Date: January 1994

Chapter Title: Land Prices and House Prices in the United States

Chapter Author: Karl E. Case

Chapter URL: http://www.nber.org/chapters/c8820

Chapter pages in book: (p. 29 - 48)

2 Land Prices and House Prices in the United States

Karl E. Case

2.1 Introduction

The behavior of single-family home prices in the United States has become a topic of increasing interest during the past two decades. Prior to 1970, house prices moved slowly at about the rate of inflation or slightly below, and regional differences, while they existed, were relatively modest by current standards. During the 1970s, however, house prices nationwide grew significantly faster than the rate of inflation, and homeowners earned tax-sheltered imputed rents and tax-sheltered capital gains on their leveraged assets, producing dramatic rates of return and low user costs throughout the decade. The decade of the 1980s produced much lower returns overall, but brought with it sharp differences in price behavior across regions and significantly increased volatility.

This paper reviews the behavior of house prices in the United States. First, the paper takes a national perspective, piecing together a description of what we know about house prices since 1950 but focusing on the past two decades. Second, it describes differences in price behavior across regions of the country, especially since the first California boom between 1976 and 1980. Third, it reviews what we know and do not know about the causes of house price movements. A final section looks at the impact of increasing regional disparities on mobility and regional growth.

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The author wishes to thank Brooke Frewing for research assistance and James Poterba and Robert Shiller for helpful comments.

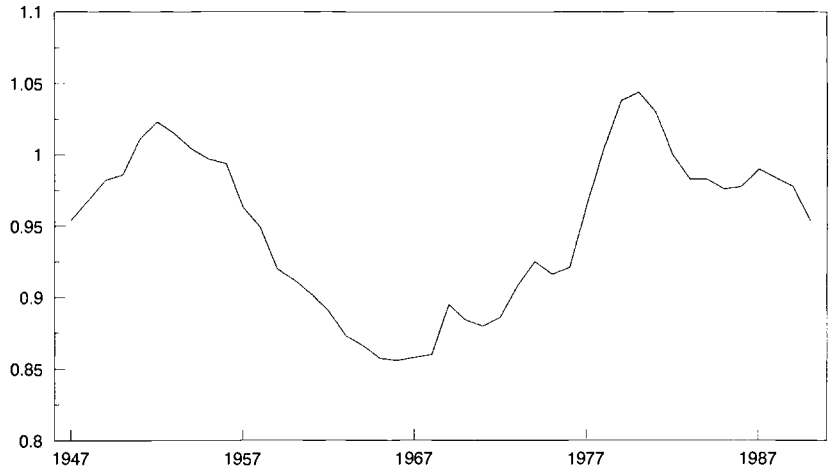

Fig. 2.1 House prices, 1947–90. Residential investment component of GNP deflector relative to GNP deflector

Sources: 1947–87 Data Resources, database (Lexington, Mass.: McGraw-Hill, *U.S. Prices Data Bank;* U.S. Department of Commerce, *1988–90 Survey of Current Business* (Washington, D.C.: Government Printing Office, August 1990–May 1991).

2.2 Housing Prices since 1950: National Trends

The most significant problem in studying the movement of home prices is the lack of consistent data. The two most commonly cited time series used as proxies for home appreciation are the residential investment component of the GNP deflator (see Mankiw and Weil [1989], Hendershott and Hu [1981], and others), and the census's Constant Quality Home Price Index (see Apgar et al. [1990], Hendershott and Hu [1981], and others), which is available only since 1963. While neither is ideal, they are as good as any available national data series on prices prior to 1970.[1] Since 1970, Case and Shiller (1988) have constructed very precise appreciation indices for four cities, but the national data are still weak.

Figure 2.1 shows the pattern of real home prices since 1947 as represented by the residential investment component of the GNP deflator. According to the index, prices dropped from a peak in 1952 to a low in 1966, and then rose until the early 1980s. Table 2.1 looks at the change in the index by decade, relative to two measures of income and construction costs.

Between 1950 and 1960, house prices dropped an average of 0.78 percent per year in real terms, while real per capita income rose 1.90 percent per year

1. The possible exception is a series from the Federal Home Loan Bank Board, which is available since 1960 and is discussed below. Home Loan Bank officials have cautioned against relying on those numbers.

and real median family income rose even faster at 3.2 percent. A similar pattern, with rapid income growth and slightly declining real home prices, recurs in the 1960s. During the 1970s, however, the pattern reverses itself. Income growth in the 1970s, particularly family income, dropped sharply while house prices rose more rapidly.

Rising house prices, of course, make homeowners better off, as their equity grows. On the other hand, when house prices outpace income, housing becomes less affordable to those who do not own. Thus, during the 1950s and 1960s, the return on owning a house was low, but housing became more affordable. During the 1970s, rates of return to owners were dramatic, but housing became less affordable.

This pattern is borne out by the census figures presented in table 2.2. The table gives the ratio of median reported house price to median household income in five metropolitan areas for census years 1950, 1960, 1970, and 1980. In all five cities, the ratio drops significantly from 1950 to 1960 and from 1960 to 1970. The ratio rises during the 1970s.

Both Hendershott and Hu (1981) and Case and Shiller (1990) calculate excess rates of return to home ownership for different periods between 1950 and 1989. While the return measures in the two papers are slightly different, both include estimates of imputed rent, capital gains, property taxes, maintenance, and depreciation and include changes in tax treatment and interest rates. Hendershott and Hu find returns of about −6.5 percent for most owners and −14.5 percent for more leveraged owners in upper-income brackets during the 1956–63 period. Both papers find very high excess returns during the 1970s.

Apgar et al. (1990) construct a data set that shows the impact of changing

Table 2.1 **House Prices, Construction Costs, and Income, 1950–88 (average real annual percentage increase)**

	House Price (Series 1)[a]	House Price (Series 2)[b]	Construction Cost[c]	Per Capita GNP[d]	Median Family Income[e]
1950–60	—	−0.78	+0.56	+1.90	+3.20
1960–70	0.0	−0.33	+1.33	+3.10	+2.96
1970–80	+2.77	+1.66	+0.74	+1.33	+0.03
1980–88	−0.31	−0.74	−0.13	+1.65	+0.81

[a]U.S. Bureau of the Census, *Constant Quality Home Price Index, Construction Reports,* series C-27 (Washington, D.C.: Government Printing Office), since 1963 only.

[b]Residential investment component of the GNP deflator relative to the GNP deflator. Data Resources, database (Lexington, Mass.: McGraw-Hill). See figure 2.1.

[c]E. H. Boeckh Construction Cost Index, small residential structures, composite; U.S. Bureau of the Census, *Historical Statistics of the United States: Colonial Times to 1970,* series N-121 (Washington, D.C.: Government Printing Office), U.S. Bureau of the Census, *Statistical Abstract of the United States, 1990* (Washington, D.C.: Government Printing Office).

[d]*Historical Statistics,* series F-2, 224; *Statistical Abstract, 1990.*

[e]*Historical Statistics,* series G-179, 296; *Statistical Abstract, 1990.*

Table 2.2 **Family Income and House Prices: Selected Cities, 1950–80**

	Price/Income Ratio			
	1950	1960	1970	1980
New York	3.02	2.30	2.04	3.40
Boston	3.02	2.19	1.80	2.57
Los Angeles	2.68	2.12	1.94	4.16
Chicago	2.95	2.35	1.81	2.68
Dallas	2.17	1.69	1.50	2.15

Source: U.S. Bureau of the Census, *Housing Characteristics of the Population* (Washington, D.C.: Government Printing Office, 1950, 1960, 1970, 1980). Figures are the ratio of median reported home value to median household income.

prices on both owners and potential owners between 1967 and 1989. Table 2.3 reproduces a table from the Apgar study. The house price variable is constructed using the census constant quality index applied to the 1977 median value of house purchased by a first-time buyer. The table shows that unanticipated inflation in house prices reduced the total burden of owning for a first-time buyer to less than 10 percent of income in the late 1970s, while the cash burden climbed to 40 percent of income in 1980. The early 1980s saw dramatic increases in interest rates and much slower appreciation. The combination pushed up cash costs to a high of 44.5 percent of income and the total burden to a high of 37.2 percent of income in 1982.

2.2.1 Regional Differences in Price Behavior

While nationally house prices lagged inflation in the 1950s, 1960s, and 1980s and rose more rapidly than prices in general during the 1970s, there were marked differences across regions. To illustrate these differences, this section presents data on four metropolitan areas between 1970 and 1986. The data presented are from Case and Shiller (1987). They constructed weighted repeat sales (WRS) indices of appreciation based on forty thousand multiple sales of the same property drawn from a large sample of sales in the four cities.[2] Tables 2.4 and 2.5 summarize the data.

While substantial variance in performance can be seen across the four cities, all saw house prices at least keep pace with inflation as measured by the CPI. In Atlanta and Chicago, existing house prices remained remarkably constant in real terms over the sixty-five quarters of the sample period. While nominal prices nearly tripled, so did consumer prices in general. Real increases in Atlanta and Chicago averaged less than 1 percent per year.

The increases recorded in Dallas and San Francisco stand in marked con-

2. The Case and Shiller methodology is very similar to one proposed by Bailey, Muth, and Norse (1963). The raw data are from Atlanta, Chicago, Dallas, and San Francisco. The San Francisco data are from Alameda County.

Table 2.3 **Income and Housing Costs, U.S. Totals, 1967–89 (1989 dollars)**

Year	First-Time Buyer's Income	Owner Costs									Cost as % of Income, First-Time Buyers	
		House Price	Mortgage Rate (%)	Mortgage Payment	Other Costs	Before-Tax Cash	Tax Savings	After-Tax Cash	Expected Appreciation	Total Cost	Cash Burden	Total Burden
1967	27,016	55,822	6.40	3,351	2,701	6,052	317	5,735	1,645	4,673	21.2	17.3
1968	27,134	56,883	6.90	3,595	2,714	6,308	396	5,913	2,257	4,344	21.8	16.0
1969	26,816	58,380	7.68	3,987	2,716	6,703	508	6,195	3,201	3,863	23.1	14.4
1970	28,241	57,208	8.20	4,107	2,749	6,856	586	6,270	2,517	4,572	22.2	16.2
1971	28,213	57,818	7.54	3,897	2,831	6,728	410	6,318	2,612	4,307	22.4	15.3
1972	28,764	59,770	7.38	3,966	2,930	6,896	424	6,473	3,031	4,078	22.5	14.2
1973	27,860	61,161	7.82	4,235	2,913	7,148	385	6,764	4,047	3,661	24.3	13.1
1974	28,142	60,735	8.78	4,599	2,916	7,515	444	7,071	4,594	3,514	25.1	12.5
1975	26,885	62,145	8.97	4,787	2,934	7,721	520	7,201	5,286	2,802	26.8	10.4
1976	26,025	63,755	8.90	4,881	2,968	7,849	558	7,291	5,163	2,935	28.0	11.3
1977	25,828	67,579	8.83	5,139	3,044	8,183	160	8,023	6,285	2,622	31.1	10.2
1978	26,187	72,271	9.40	5,783	3,044	8,827	394	8,433	7,614	2,076	32.2	7.9
1979	25,211	75,787	10.63	6,726	2,944	9,670	592	9,078	8,754	1,980	36.0	7.9
1980	24,313	75,215	12.53	7,723	2,955	10,678	921	9,757	7,716	3,922	40.1	16.1
1981	24,112	74,190	14.51	8,727	3,003	11,730	1,233	10,497	6,250	6,502	43.5	27.0
1982	23,626	71,674	14.78	8,579	3,069	11,649	1,138	10,510	3,612	8,796	44.5	37.2
1983	24,130	71,118	12.29	7,175	3,101	10,276	887	9,389	2,245	8,666	38.9	35.9
1984	24,582	71,218	12.00	7,033	3,132	10,615	853	9,312	2,305	8,717	37.9	35.5
1985	24,772	70,167	11.18	6,507	3,101	9,608	750	8,858	1,924	8,298	35.8	33.5

(*continued*)

Table 2.3 (continued)

Year	First-Time Buyer's Income	Owner Costs									Cost as % of Income, First-Time Buyers	
		House Price	Mortgage Rate (%)	Mortgage Payment	Other Costs	Before-Tax Cash	Tax Savings	After-Tax Cash	Expected Appreciation	Total Cost	Cash Burden	Total Burden
1986	25,212	72,117	9.80	5,974	3,046	9,019	630	8,389	2,564	6,921	33.3	27.5
1987	24,978	73,715	8.94	5,664	2,976	8,639	445	8,194	3,340	6,003	32.8	24.0
1988	25,783	73,386	9.01	5,674	2,932	8,606	253	8,352	3,106	6,499	32.4	25.2
1989	26,000	72,628	9.81	6,021	2,900	8,921	322	8,599	2,750	7,208	33.1	27.7

Source: Apgar et al. 1990.

Notes: Annual income of families and primary individuals: 1970 from the *1970 Census of the Population;* 1967 to 1969 from the *Panel Survey of Income Dynamics;* 1971 and 1972 interpolated from the *Panel Survey of Income Dynamics* and *1970 Census of the Population;* 1973 to 1983 from the *American Housing Survey;* 1983 to 1989 from the *American Housing Survey* adjusted by the *Current Population Survey.* "First-time buyers" defined as married-couple renters aged 25 to 29. All dollar amounts expressed in 1989 constant dollars using the Bureau of Labor Statistics consumer price index (CPI-UX) for all items. CPI-UX deflator slightly revised from that used in previous *State of the Nation's Housing Reports.*

House price is *American Housing Survey* median value of house purchased by first-time home buyers aged 25 to 29 in 1977, indexed by U.S. Bureau of the Census, *Constant Quality Home Price Index: Construction Reports,* series C-27, which was recently revised to incorporate improved methodology for estimating the price of a home of constant quality; hence the index differs somewhat from that used in previous *State of the Nation's Housing Reports.* Mortgage rates equal Federal Home Loan Bank Board contract mortgage rate. Mortgage payments assume a thirty-year mortgage with 20 percent down. Other costs include property tax, insurance, fuel and utilities, and maintenance. After-tax cash cost equals mortage payment plus other costs, less tax savings of home ownership. Tax savings is based on the excess of housing (mortgage interest and real estate taxes) plus nonhousing deductions over the standard deduction. Nonhousing deductions are set at 5 percent of income through 1986. With tax reform, they decrease to 4.25 percent in 1987 and 3.5 percent from 1988 on. Total cost equals after-tax cash cost plus opportunity cost of down payment, amortization of fees, and closing costs, less expected equity buildup. Expected equity buildup is estimated as a weighted average of increases in house prices in the previous three years. (Weights are one-half for the previous year, one-third for the second year, and one-sixth for the third year.) *American Housing Survey* data indexed by Bureau of Labor Statistics consumer price indices for various components of housing cost.

Table 2.4 **Changes in Prices of Existing Single-Family Homes Computed Using the WRS Method (%)**

	Nominal Change		Real Change	
	Total	Average Annual Rate	Total	Average Annual Rate
1970:1–1986:2				
Atlanta	+196.1	+6.9	+3.4	+0.2
Chicago	+200.2	+7.0	+4.9	+0.3
Dallas	+309.3	+9.1	+43.0	+2.2
San Francisco	+496.6	+11.3	+99.0	+4.3
CPI-U[a]	+186.2	+6.7	—	—
1970:1–1975:1				
Atlanta	+40.8	+7.1	+2.0	+0.4
Chicago	+46.4	+7.9	+6.0	+1.2
Dallas	+39.2	+6.8	+0.8	+0.2
San Francisco	+53.8	+9.0	+11.4	+2.2
CPI-U[a]	+38.0	+6.7	—	—
1975:1–1981:1				
Atlanta	+55.9	+7.7	−6.8	−1.1
Chicago	+71.3	+9.4	+2.4	+0.4
Dallas	+124.5	+14.4	+34.2	+5.0
San Francisco	+187.0	+19.2	+71.6	+9.4
CPI-U[a]	+67.2	+8.9	—	—

[a]All items, all urban consumers.

Table 2.5 **Changes in WRS Indices and Changes in Median Prices of Existing Single-Family Homes in Four Cities, 1981–86**

	Change in Nominal Prices				Change in Real Prices			
	National Assn. Realtors		Weighted Repeat Sales		National Assn. Realtors		Weighted Repeat Sales	
	Total	Average Annual Rate	Total	Average Annual Rate	Total	Average Annual Rate	Total	Average Annual Rate
Atlanta[a]	+44.6	+8.5	+28.2	+5.7	+17.7	+3.7	+4.5	+1.0
Chicago[b]	+19.3	+3.4	+19.8	+3.4	−4.0	−0.8	−3.4	−0.7
Dallas[b]	+48.4	+7.8	+31.0	+5.3	+19.1	+3.4	+5.6	+1.0
San Francisco[c]	+45.4	+7.0	+25.8	+4.3	+16.2	+2.8	+0.9	+0.2
CPI-U[d]	+25.1	+4.1						

[a]1981:1 to 1985:3.

[b]1981:1 to 1986:2.

[c]1981:1 to 1986:3.

[d]All items, all consumers.

trast. Property values in Dallas rose an average of 2.2 percentage points per year faster than the CPI, while real increases in San Francisco averaged 4.3 percent per year. Such high and sustained real appreciation rates are remarkable. Real house prices in Dallas increased by nearly 43 percent. In San Francisco, they nearly doubled.

The second and third parts of table 2.4 look at two shorter periods of time. The first corresponds to the inflation/recession cycle of 1971–75. The second runs from the bottom of the 1974–75 recession to the period of very high interest rates in early 1981.

Between 1970 and 1975, house price increases were modest and fairly uniform. In all four cities, price increases totaled between 39 and 54 percent over the five years, while prices in general rose 38 percent. San Francisco led the pack with real increases of 2.2 percent per year.

The period from 1975:1 to 1981:1 shows anything but uniform house price increases across the cities. The first California boom (to be discussed below) is evident. Over the six years, annual appreciation of homes in the San Francisco sample averaged 9.4 percent in real terms. Meanwhile, real prices in Atlanta dropped nearly 7 percent for an average decline of 1.1 percent per year.

While house prices in Chicago increased at about the same rate as consumer prices in general, Dallas was experiencing a miniboom of its own. Homes in Dallas appreciated 34.2 percent, or an average of 5.0 percent in real terms.

Between 1981 and 1986, relative calm returned to all four of these markets, although other parts of the country, particularly the Northeast, boomed. Table 2.5 presents the National Association of Realtors (NAR) median price of an existing single-family home and WRS indices for the period. In no case did the real WRS index grow more than 1 percent per year. In Chicago, it fell 0.7 percent per year.

The same pattern is reflected in excess returns estimated in Case and Shiller (1990). Table 2.6 presents a summary of the nonleveraged excess returns estimated for the same three periods since 1970. Once again performance is fairly similar across the cities during the first half of the 1970s, while Dallas and San Francisco moved sharply ahead during the last half. The 1980s brought negative excess returns to Chicago and San Francisco, while Atlanta and Dallas had small positive excess returns.

Table 2.6 **Excess Returns to Investment in Single-Family Owner-Occupied Housing, 1970–86 (%)**

City	1971:1–1975:1	1975:1–1981:1	1981:1–1986:2
Atlanta	7.7	4.0	0.5
Chicago	5.6	6.0	−4.2
Dallas	7.5	11.9	1.5
San Francisco	9.2	15.1	−1.7

Source: Case and Shiller (1990).

Table 2.7 **Recent Housing Price Booms in the United States (%)**

Location	Period	Total Nominal Change in Median	Average Annual Nominal Change	Average Annual Real Change
California[a]	1976–80	106.9	19.9	9.3
Boston	1983–87	114.5	21.0	17.7
New York–New Jersey	1983–87	108.4	20.2	16.9
Washington, DC	1986–88	30.4	14.2	10.2
California[b]	1987–89	53.2	23.8	19.1
Honolulu	1987–90	101.6	26.3	21.2
Seattle	1988–90	63.3	27.7	22.3

Sources: National Association of Realtors, *Home Sales* (Washington, D.C.: NAR), monthly; CPI, Data Resources, database (Lexington, Mass.: McGraw-Hill).

[a]Figures based on San Francisco mean price. Unpublished data from the NAR.

[b]Based on figures for San Francisco, although similar price increases were recorded in Los Angeles and Orange Country.

2.2.2 Increased Volatility: The Booms

Perhaps the most important phenomenon in recent years has been the increased volatility evident in several cities. Table 2.7 describes seven booms that have occurred since the late 1970s. While the first California boom of 1976–80 was a dramatic event, in real terms it was just a hint of what was to follow.

The Boston and New York booms were similar to each other in magnitude, with real prices rising at 18 percent and 17 percent, respectively, over a four-year period. At peak in both cities, prices were rising at nearly 40 percent per year (see Case [1986] for the Boston pattern over the period based on repeat sales).

The second California boom was shorter lived, but perhaps more dramatic near the peak. The *Wall Street Journal* carried a front-page article on June 1, 1988, with the headline "Buyers' Panic Sweeps California's Big Market in One-Family Homes." Realtors reported multiple offers and prices rising at 4 percent per month, or over 50 percent per year, at the peak.

The most recent booms have been in Honolulu and Seattle. In Honolulu, the median price jumped from $186,000 in 1987 to $375,000 in the third quarter of 1990. In Seattle, the median was up from $88,700 in 1988 to $144,800 in the third quarter of 1990.

The downside of a boom is a bust. While booms have been dramatic and frequent, prices appear to be less volatile on the downside. The most dramatic decline in the NAR median home price was a 28.5 percent real drop recorded between 1985 and 1988 in the Houston metropolitan area. Since 1988, the median price in Boston has dropped 12 percent in real terms. The declines

Table 2.8 **Median Price of Existing Single-Family Homes, 1982 and 1989**

Metropolitan Area	1982	1989	Change (%)
Atlanta	53,300	84,000	51.9
Boston	80,200	182,800	127.9
Chicago	73,000	107,000	46.6
Dallas/Fort Worth	74,000	92,300	24.7
Denver	76,200	85,500	12.2
Detroit	47,500	73,700	55.1
Houston	77,200	66,700	−13.6
Kansas City	58,100	71,600	23.2
Los Angeles	113,400	215,500	90.0
Minneapolis	72,400	87,200	20.4
New York	70,500	183,400	160.1
Philadelphia	58,100	108,900	87.4
St. Louis	57,000	76,900	34.9
San Diego	98,600	175,200	77.7
San Francisco	124,900	260,600	108.6
Washington, DC	87,200	144,400	65.6
Coefficient of variation	.277	.475	—

Source: National Association of Realtors, *Home Sales Yearbook: 1989* (Washington, D.C.: NAR). Cities are the largest U.S. metropolitan areas (by population) for which the NAR has data back to 1982.

currently in Boston and New York appear from anecdotal evidence to be significantly greater than the declines in the median would suggest. Some areas have seen nominal declines of up to 25 percent. Nonetheless, there appears to be significant stickiness and resistance to sharp downward movements even where fundamental factors would suggest a collapse.

2.3 Regional Differences in House Price Levels

Differences in price performance across regions and increased volatility have led to differences in price levels across regions that are substantial and larger than they were in earlier years. Table 2.8 presents the median price of existing single-family homes in 1982 and 1989 in the largest sixteen U.S. metropolitan areas for which the data are available from the NAR. In 1982, the highest-priced city (San Francisco) had a median price that was 2.6 times the median price in the lowest-priced city (Detroit). In 1989, the highest city was 3.9 times higher than the lowest. Table 2.8 shows that the coefficient of variation across these sixteen cities grew from .277 in 1982 to .475 in 1989.

The only consistent series of metropolitan area–specific median home prices for years prior to 1981 is the Mortgage Interest Rate Survey, conducted annually since 1963 by the Federal Home Loan Bank Board.[3] The survey is con-

3. See Federal Home Loan Bank Board, Office of Thrift Supervision, "Rates and Terms on Conventional Home Mortgages, Annual Summary, 1989" (Washington, D.C.: Government Print-

ducted in thirty-two metropolitan areas. Based on this larger sample of cities, a coefficient of dispersion (CD) was calculated for each year between 1973 and 1989. While the level of the coefficient is lower in the larger sample, the pattern is the same. The CD stood at .164 in 1973, rising slowly to .188 by 1979. From 1979 to 1983, it jumped sharply from .188 to .245 and continued to climb to .272 by 1989.

Looking at similar homes in specific areas of the country reveals dramatic differences that cannot be seen in the aggregate data. For example, a three-bedroom, one-and-a-half-bath home on ten thousand square feet of land in a good neighborhood is currently worth $120,000 in a number of Midwest cities, $240,000 in the Northeast, and as much as $700,000 in parts of California.

While a great deal of attention has been paid to house prices in the United States, economists have devoted very little time to the study of land prices. In fact, there are virtually no generally available data on land prices in the United States.

It's not clear why this is so. Part of the reason is that most land is sold in combination with capital, and the task of separating the land from the capital value is difficult. Since nearly all property taxes in the United States are levied on the combined value of land and capital, there is no compelling reason for tax administrators to undertake to disentangle the two. Nonetheless, it remains a puzzle why so little academic attention has been focused on land prices.

It is a virtual certainty that the increase in volatility across regions is the result of differentials in land values. There is evidence that construction costs explain only a small fraction of the price increases recorded in several of the boom areas.[4] Table 2.1 shows that only a small part of the increase in house prices nationally between 1970 and 1980 was due to increased construction costs.

Figure 2.2 presents data from Boston based on over ten thousand individual sales of raw land, obtained from Middlesex County deed records. The figure shows the average price per square foot expressed in 1967 dollars for each year between 1915 and 1988. While no formal analysis of these data have been accomplished, it is easy to see a dramatic increase precisely during the boom years of 1985–87.

2.4 The Causes of Price Changes

This section of the paper briefly reviews some of what is known about why house prices have behaved the way they do. This is not an exhaustive review of the existing literature, but rather an abbreviated discussion of several recent issues.

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ing Office, 1989). In 1989 the responsibility for the survey was transferred to the Federal Housing Finance Board.

4. See Case (1986) and Case and Shiller (1990).

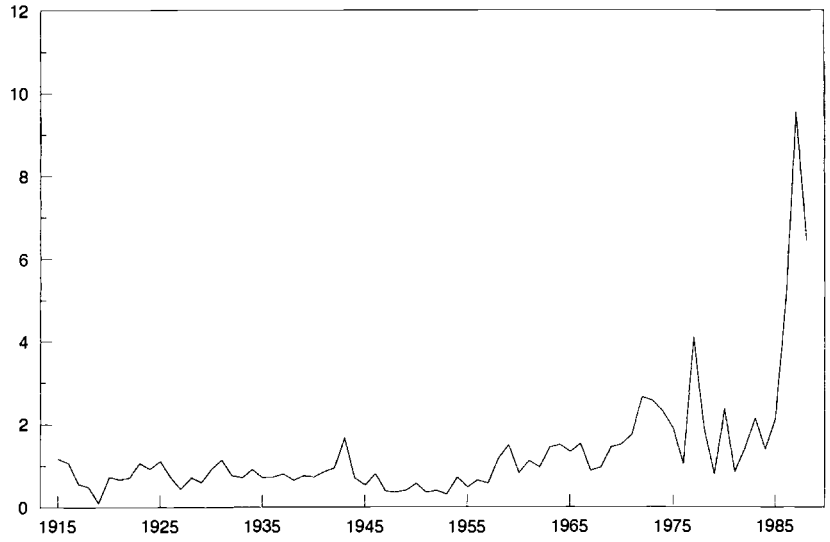

Fig. 2.2 Real median land prices in Middlesex County, Massachusetts, 1915–88, price per square foot (1982 dollars)

2.4 Demographics

The most often cited paper on house prices in recent years was written by Mankiw and Weil (1989, hereafter M&W). The focus of the M&W paper is the baby boom. Demographic data show that there was a jump in the birth rate in the United States between 1946 and 1964, resulting in a population bulge that has been working its way up the age distribution. The size of the bulge is quite dramatic. In 1960, 24.0 million people, or 13.3 percent of the population, were between the ages of twenty and thirty. By 1980, the number had grown to 44.6 million. That bulge began to enter the housing market during the 1970s, precisely at the time when house prices were booming.

To test for the effects of the baby boom, M&W construct a demand variable based on the relationship between the quantity of housing consumed and age in the 1970 census. After estimating the quantity of housing demanded by each age group, the population was "aged" to construct an estimate of demand over time as the size of each age cohort changes in predictable ways. The M&W measure of demand declines into the mid-1960s and then begins to climb through the 1970s, falling again in the 1980s.

As a measure of price change, M&W use the residential construction component of the GNP deflator relative to the deflator itself. This ratio is shown in figure 2.1, and it moves closely with the M&W measure of demand. Thus, when simple correlations are run, they show a powerful relationship.

The paper in part was designed to test a model suggested by Poterba (1984).

They use a simple version of the Poterba model to simulate the likely effects of the baby boom on prices. The model predicts that, since the age distribution of the population in the 1970s is known with certainty in the 1950s and 1960s, if demographics had a price effect, it should have been anticipated. Thus, both the upturn in the late 1960s and the downturn in the 1980s should have happened *before* the demand growth actually occurred. In essence, they conclude that the "naive" model, without forward-looking agents, seems to predict better.

The conclusion that caused a great deal of concern in the press and among housing-market participants, is that "if the historical relation between housing demand and prices continues into the future, real housing prices will fall substantially over the next two decades" (M&W, 235).

The response to the M&W article has been dramatic. The National Association of Home Builders, for example, published a twelve-page response, complete with color photographs, and had a national media conference to refute the conclusion. Mankiw was on national television several times, describing and defending the study.

Popular criticism focuses on one basic point. Although an interest rate variable is included, M&W estimate a model of price formation based essentially on a single demand-side variable. Previous work has shown the effect of employment growth, tax rates, interest rates, income growth, rent levels, and so forth on the demand side, and housing production and costs on the supply side.[5] Of critical importance, it is argued, are construction costs. If prices fall to the point where construction is no longer profitable, there will be exit from the home building industry, and housing starts will fall. If starts fall below the level of household formation, prices will stabilize. Since household formation remains positive over the next few decades, what is really important is the relationship between household formation and production.

One interesting fact that poses a puzzle for the M&W position is the relationship between population growth and house price movement in a cross-section of U.S. cities. Table 2.9 presents data on cities for whom the NAR has been publishing data since 1982. The simple correlation coefficient between 1970–80 population growth and nominal median house price change between 1980 and 1989 is −.506. The simple correlation coefficient between 1980–87 population growth and median house price change, again 1980–89, is −.355.

A casual glance down the columns reveals that the most rapidly growing cities were in the Southwest, an area that experienced a serious economic decline during the 1980s, while the slowest-growing areas were in the Northeast, where the economic environment was strong. In addition, housing production was very rapid in the Southwest and relatively slow to respond in the increase in demand in the Northeast. Thus, the explanation for the seeming paradox of a negative relation between demographics and house price growth in a cross-

5. See Case (1986), Case and Shiller (1990), and others.

Table 2.9 **Population Growth and House Prices, 1982–89 (%)**

City	Change in Population, 1970–80	Change in Population, 1980–87	Average Annual Change in Median House Price, 1982–89
Phoenix	4.4	3.6	0.7
Miami	3.4	1.5	2.1
Orange County, CA	3.1	1.9	8.7
Albuquerque	2.8	2.0	2.4
Denver	2.7	1.9	1.8
Atlanta	2.4	3.0	5.9
Dallas	2.2	3.3	3.0
Portland	1.9	0.8	2.7
Oklahoma City	1.8	1.7	−0.1
Los Angeles	1.4	2.4	9.0
Charlotte	1.4	1.6	5.5
San Francisco	1.2	1.4	10.4
Minneapolis	0.8	1.2	3.2
Columbus	0.8	0.8	4.0
Baltimore	0.5	0.6	6.2
Indianapolis	0.5	0.7	4.9
Kansas City	0.4	1.0	2.7
Albany	0.3	0.2	11.1
Chicago	0.2	0.4	5.5
Toledo	0.2	−0.1	2.4
Providence	0.2	0.4	14.5
Boston	−0.3	0.2	11.4
New York	−0.4	4.0	12.6
Buffalo	−0.8	−0.8	7.2

Sources: Median prices, National Association of Realtors, *Home Sales* (Washington, D.C.: NAR), monthly. Population growth, U.S. Bureau of the Census, *Statistical Abstract of the United States, 1990* (Washington, D.C.: Government Printing Office).

Note: For Albuquerque, Charlotte, and Toledo, data have been available only since 1983; for Phoenix and Miami, data have been available only since 1984.

section requires an analysis of supply and a number of other demand-side variables.

The academic response to M&W is just now beginning to emerge in the literature. Hendershott (1990) shows that the M&W equation in fact fits the data only from the 1950s and 1960s, and a forecast of the 1970–87 period is actually off by a factor of four. In addition, Hendershott estimates an expanded model that includes the real after-tax interest rate (entered as both a level and change) and real income growth (to capture the impact of increased labor force participation). Both interest-rate variables and the income growth variable are significant with the correct sign. The income variable indicates an elasticity of real prices with respect to real income of .3.

Hendershott's expanded equation predicts a cumulative real decline of 9–12

percent by the year 2007 if interest rates remain high relative to their historic norms and an *increase* of 4–7 percent if the real after-tax interest rate drops back to its 1947–87 mean.

2.4.2 The Efficiency of the Housing Market: Inertia in House Prices

In Case (1986), the suggestion is made that the upward volatility evident since the late 1970s is at least partially the result of speculative behavior. That is, the booms recorded above may at least in part be speculative bubbles.

Three papers of Case and Shiller have brought evidence to bear on the assertion. First, Case and Shiller (1989) find evidence of positive serial correlation in real house prices in four cities: Atlanta, Chicago, Dallas, and San Francisco. A change in price observed over one year tends to be followed by a change the following year in the same direction and between 25 percent and 50 percent as large. In addition, the paper finds evidence of inertia in a measure of excess returns estimated for the same four cities.

Second, Case and Shiller (1988) present the results of a survey of two thousand people who bought homes in May 1988 in Orange County (California), San Francisco, Boston, and Milwaukee. The results provide strong evidence that buyers are influenced heavily by an investment motive, that they have strong expectations of future price increases in housing, and that they perceive little risk. Responses to a number of questions suggest that emotion plays a significant role in housing purchase decisions. In addition, buyers do not agree about the causes of recent price movements.

Finally, Case and Shiller (1990) use time-series cross-section regressions to test for the forecastability of prices and excess returns using a number of independent variables. They find that the ratio of construction costs to price, changes in the adult population, and increases in real per capita income are all positively related to house prices and excess returns. The results add weight to the argument that the market for single-family homes is inefficient.

M&W also provide some support for the proposition that the housing market is an inefficient asset market when they fail to find a significant relationship between the rent price ratio and capital gains.

2.4.3 Downward Stickiness

An important stylized fact about the housing market in the United States that has not been well explored in the literature is that house prices are sticky downward. That is, when an excess supply occurs, prices do not immediately fall to clear the market. Rather, sellers have reservation prices below which they tend not to sell.

After the first California housing boom ran into a 21 percent prime and a 17 percent mortgage rate in July 1981, the number of sales fell sharply. The inventory of unsold properties on the market went to all-time high levels. At the same time, new construction dropped to record low levels. Nominal prices stopped rising in 1981, but fell only slightly despite a huge excess supply.

Boston and New York/New Jersey/Connecticut have experienced an excess supply and low demand since the fall of 1986. Prices stopped rising in nominal terms, as a large excess supply built up. But nominal prices stayed virtually flat through the spring of 1989, when they began to fall.

Significant reasons exist to predict such rigidity. First, there is no panic selling since the housing market is very different than the stock market. In the stock market, people can exit their equity positions quickly and without cost. The analog of a Treasury bill in the housing market is moving to a rental unit. For those with considerable equity that would mean paying a large capital gains tax (otherwise deferrable) and a 6 percent brokerage fee, as well as putting up with the aggravation of a move. The transactions costs are very high.

Many of the households that responded to the questionnaire in Case and Shiller (1988) were recent sellers as well as buyers. When asked what they would have done if their house had not sold for the price that they wanted to get, only a small fraction said that they would lower the price until the property sold. Most indicated that they had a reservation price below which they would not go.

If the market is downwardly rigid in nominal terms (at least in normal times), one could argue that the housing market is a "quantity clearing" rather than a "price clearing" market. That is, when an excess supply develops either from overbuilding or from a drop in demand, nominal prices stick while real prices drop slowly. At the same time, new production drops sharply, and sellers of existing homes resist downward movement by not selling. Thus, sales and starts would be expected to move with the cycle, while prices would remain fairly rigid.

Figure 2.3 presents a plot of existing house prices and sales, which seem to support the notion that the housing market is a quantity clearing market.

The best evidence of downward stickiness would be persistently high inventory. Unfortunately, no consistent source of data on inventories exists. While multiple-listing-service inventories might be tracked, properties are often listed when sellers are actively searching for buyers. Many stop listing after their house has been on the market for a long time. This produces a "discouraged seller" effect, similar to the discouraged worker effect, that can lead to a decline in formal listings when properties remain overpriced.

A Boston data service called Market Intelligence has produced a fairly good series on inventories, including bank-owned properties, properties under construction, and informal listings. The data show the number of properties implicitly or explicitly on the market, divided by the number of sales in the last year by location and type of property. During the fourth quarter of 1990, the inventory of unsold single-family homes in the Boston metropolitan area was approximately one year, while the inventory of unsold condominiums was closer to eighteen months. Many individual properties have been in the inventory for over two years. While there is no norm for such inventory numbers, the consensus among real estate professionals is that less than six months is

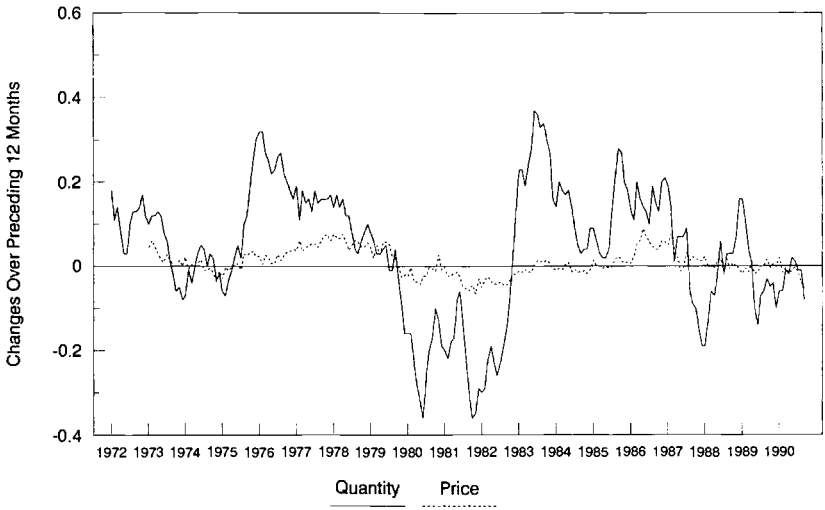

Fig. 2.3 Existing house sales and prices, changes in median price of existing single-family homes (constant dollars)
Source: National Association of Realtors, *Home Sales* (Washington, D.C.: NAR), monthly.

healthy. The behavior of inventories across regions is a potentially fruitful area for further research.

It is very important to note that prices "tend" to stick in the downward direction, as do wages. But there is certainly plenty of evidence that, when excess supplies exist for a long time as the economy worsens, prices begin to fall more sharply. This happened in the Southwest as an overbuilt market ran into a depression economy, and it has happened to some extent in New England and New York, where the evidence suggests substantial nominal declines depending on the specific area.

If house prices in the Northeast and in California were to break sharply downward, the banking problems currently being experienced in the United States would surely worsen. Consider for example the Boston metropolitan area. In the five eastern counties of Massachusetts, approximately 700,000 households own the housing unit that they occupy. The average nominal appreciation that occurred during the boom years of 1984–87 was $135,000. That implies an aggregate increase in value of $94.5 billion. Certainly a good part of that value was leveraged, as the volume of mortgage credit outstanding in New England exploded between 1984 and 1987. The corresponding figure for the New York metropolitan area (1983–87) is close to $400 billion. Estimating the impact of a 30 percent drop in single-family home equity on bank capital is beyond the scope of this paper. Given the magnitude of the assets created by the booms, however, there can be no doubt that the effect would be significant.

2.5 Consequences of Regional Differentials: Out-Migration and Slow Growth

There is ample evidence that regional differentials in home prices have increased during the 1980s. There is little evidence, however, about the effects of these differentials. Drier et al. (1988) provide anecdotal evidence that high house prices made it difficult for firms to attract workers to the region after prices boomed in 1985 and 1986. Clearly, if house prices lead to interregional migration, they can have an impact on employment growth. Case (1992) provides some evidence that high house prices retarded labor-force growth in New England between 1985 and 1987 and contributed to the labor shortage experienced in the region in 1987 and to a significant increase in wages in the region.

The most significant evidence of the impact of house prices on migration is in a recent paper by Gabriel, Shack-Marquez, and Wascher (1991). Gabriel develops a place-to-place migration model in which household moves depend on the relative housing costs and labor market opportunities in the origin and destination regions, as well as moving costs and other population characteristics. Estimates of a logistic model show that house prices are a significant determinant of regional migration patterns in the United States.

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