In Short Supply? Cycles and Trends in California Housing

• • •

Hans P. Johnson
Rosa M. Moller
Michael Dardia

2004

Public Policy Institute of California
1994–2004

Library of Congress Cataloging-in-Publication Data
Johnson, Hans P.
In short supply? : cycles and trends in California housing / Hans P. Johnson, Rosa M. Moller, and Michael Dardia.
p. cm.
ISBN: 1-58213-079-5
1. Housing—California. 2. California—Population. 3. California—Economic conditions. I. Title: Cycles and trends in California housing. II. Moller, Rosa Maria. III. Dardia, Michael. IV. Title.

HD7303.C2J64 2004
333.33'8'09794—dc22 2004001896

Foreword

During the 1990s, there was a disturbing and widely noted decline in the construction of new housing units in California. In the 1980s, almost 2.1 million units were built, averaging 207,000 a year. The following decade, new production fell to 1.1 million for an average of 110,000 per year. This decline has been attributed to a myriad of causes, from demanding housing codes and construction requirements to tighter growth controls and planning guidelines. Taken together, the story goes, these factors have made new construction ever more difficult. This difficulty, in turn, has led to the dramatic falloff in production and its predictable consequence: high and increasing housing costs.

After reviewing the data, Hans Johnson, Rosa Moller, and Michael Dardia have concluded that a housing shortage does exist, but that it is much smaller than implied by the reduction of new construction in the 1990s. Slower population growth, unprecedented outflows of domestic migrants, greater numbers of immigrants and children (who consume less housing than other demographic groups), and business cycle swings all contributed to a much lower demand for housing in the 1990s. The authors assign nearly 80 percent of the downturn in housing production to these demand-side variables and argue that the actual housing shortfall statewide is closer to 138,000 units—not the 1,000,000 units implied by a simple comparison of production figures over the two decades.

Almost the entire shortage has occurred in the Bay Area, Los Angeles, and San Diego—the state's most populous regions. Pressure on the housing stock is nothing new for these areas. At least since the end of the Second World War, some California homebuyers have been willing to pay huge premiums to live where the amenities are, and the authors note that large macroeconomic trends may explain more of this willingness than levels of new construction do. This part of the analysis once again points to the role demand has played in shaping the state's housing market over the last two decades. Acceptable in theory, this

finding is unlikely to console first-time homebuyers in the state's largest metropolitan areas. Here the study acknowledges the supply side of the equation by noting other research that indicates these regions were the least receptive to new production during this period.

Although the authors find little or no evidence of shortage in the rest of the state, they note that residents of many of those regions face affordability challenges. To the untrained eye, it may be difficult to distinguish between housing shortages and affordability challenges, but the authors correctly attend to the substantial variation in the state's regional housing markets. From a public policy perspective, this variation is especially important insofar as it points policymakers away from a single, statewide response. Once again, PPIC research has underscored the regional diversity of California's markets, and if the policy lesson sounds familiar, it has proven difficult to master.

David W. Lyon
President and CEO
Public Policy Institute of California

Summary

By many measures, California appears to be in the midst of a severe housing crisis. New construction is anemic compared to past levels. Prices are high in many regions and in some areas, such as the Bay Area, exorbitant. Vacancy rates, especially for rental units, are low. And the number of persons per housing unit has continued to increase in California even as it has declined in the rest of the nation. Other measures, however, suggest that the crisis is not so severe, or even that there is no crisis in much of the state. The median value of homes in the state was lower in 2000 than in 1990, once inflation is taken into account. In addition, incomes rose faster than rents or housing prices in much of the state. Housing prices and rents remain higher in California's largest metropolitan areas than in the rest of the nation, but this could be a long-standing phenomenon related to incomes and amenities. Nationally, new housing construction was markedly slower in this business cycle as well. Finally, the source of California's population growth—children and immigrants—could explain the higher household sizes.

In this report, we explore California's housing markets and attempt to explain why housing construction has lagged in the 1990s compared to previous business cycles. Can the sluggish pace of construction in the 1990s be explained by unique macroeconomic developments and demographic changes that took place in that period? To address this question, we analyze the effects of macroeconomic and demographic factors on California's housing market.

We find that the slowdown in new construction in the 1990s can largely be explained by these factors, but we also find evidence of housing shortages in the state's largest metropolitan areas. The slowdown of housing construction in the 1990s was experienced nationally as well as in California, suggesting that the sluggish pace of new construction in the 1990s is at least partly explained by the national macroeconomic

events of that period. The more pronounced slowdown in California can be attributed to the severity of the 1990 recession, the slow pace of the recovery, and the demographic changes that took place in the state. In particular, we found that

- There is evidence of a shortage in the supply of new housing units in California in 2000, but the magnitude of the shortage is much lower than has been estimated by others. Our best estimates are that the shortage of housing units in the state is around 138,000 units, far lower than the estimates often cited in the media. This suggests that most (over 80 percent) of the apparent shortage in California's occupied housing units can be attributed to demographic differences between California and the rest of the nation.
- Regional variations in California's housing markets are large, with almost all of the shortage in new housing units originating in the Bay Area, Los Angeles, and San Diego, the state's most populous regions.
- The slowdown in population growth during the 1990s can explain much of the slowdown in new housing construction. Adjusting for census undercounts, California's population grew by 3.8 million people in the 1990s, far lower than the 6.2 million increase of the 1980s. Slower population growth in the 1990s can be attributed to tremendous and unprecedented flows of domestic migrants out of California.
- In addition to the slowdown in population growth, the composition of California's population growth in the 1990s explains much of the apparent lack of new housing in the state, with immigrants and children constituting a much larger share of the state's growth in the 1990s than in the 1980s. Immigrants and children tend to consume less housing than other demographic groups. Children do not form their own households, and immigrants often live in larger, extended-family households (even where housing prices are relatively low). Once we control for these and other demographic differences between

California and the nation, we observe similar trends in the creation of new households.

- More than 80 percent of *annual* changes in new construction are explained by changes in macroeconomic and demographic factors. This explained portion varies by region, ranging from 67 percent for the North Coast region to as much as 90 percent for the Central Eastern area.
- Business cycle effects are an important determinant of annual fluctuations in housing construction. In particular, changes in new construction are closely related to changes in the business cycle (as measured by changes in unemployment). Construction slowed considerably during the recession of the early 1990s.
- Changes in macroeconomic factors (such as changes in interest rates, income, prices, and expectations of inflation) driven by changes in economic growth (in the United States and the rest of the world) and by U.S. economic policies are closely related to changes in new construction.
- Developments in the financial markets partly determined the slower pace of new construction in the 1990s. Investors see real estate and stocks as substitutes. Investments in stocks in the late 1990s had a dampening effect on new home construction, as expected returns on housing decreased relative to investments in stocks.

Furthermore, we suspect that builders' and developers' expectations of profits may have been influenced by lower expectations of inflation resulting from the way that the Federal Reserve conducted monetary policies and the unusual low inflation in the period. Profit expectations were also influenced by demographic changes, specifically lower rates of household formation that accompanied reduced population growth in key age groups and with domestic out-migration. These demographic changes led to decreased investment in new construction as builders and developers expected slower growth in the demand for new housing. In some markets, expectations may have fallen too far, leading to an underproduction of new housing units. This underproduction could

have been exacerbated by restrictive land-use policies, especially in the Bay Area and Los Angeles markets.

These findings do not mean that there are no hardships with respect to housing supply and new construction in California. There may be serious problems in markets for low-income housing, and there is evidence of a housing shortage in the state's largest metropolitan areas. However, they do suggest that the supply crisis may be overstated, and that our position in 2000 was perhaps better, and certainly not much worse, than in 1990.

Contents

Foreword iii
Summary v
Figures xi
Tables xiii
Acknowledgments xv

1. INTRODUCTION 1
   What Are the Assertions Regarding a Housing Shortage? 1
   How Can a Housing Shortage Be Measured? 3
   Outline of This Report 4

2. TRENDS AND PATTERNS IN CALIFORNIA HOUSING 7
   Prices and Rents 7
   Affordability 16
   New Construction 21
   How Is Population Growth Accommodated? 23
      New Housing Units 23
      Increases in Household Size 25
      Declines in Vacancy Rates 28
   Jobs and Housing 30
   Summary 31

3. CAN MACROECONOMIC FACTORS EXPLAIN CALIFORNIA'S HOUSING MARKETS? 35
   Business Cycles, Macroeconomic Events, and Construction . . 36
   A Simple Housing Market Model 42
   Factors Affecting Housing Demand 43
   Supply Determinants 44
   Ten Regional Housing Markets in California 45
   Results of the Model of California Housing Markets 46
   Summary 51

4. CAN DEMOGRAPHIC CHANGES EXPLAIN CALIFORNIA'S HOUSING MARKETS? 53
Demographic Determinants of Demand 55
Population Growth 55
Age 56
Gender 56
Nativity and Ethnicity 58
Marital Status 60
Householder Rate Model: Temporal Trends in the Probability of Forming a Household 61
Temporal Trends in Householder Rates 61
Differences in Householder Rates Between California and the Rest of the United States 65
Householder Rates in California Metropolitan Areas 67
Estimating the Shortage of Occupied Housing Units 70
Summary 75
5. CONCLUSION AND POLICY CONSIDERATIONS 79
Appendix
A. A Housing Market Model 89
B. Householder Rate Models 103
C. Panel Data Analysis of Housing Supply 107
References 115
About the Authors 121
Related PPIC Publications 123

Figures

2.1. Median Home Prices in California, 1975–2002, Nominal and Real (2000 $) 8
2.2. Annual Inflation-Adjusted (Real 2000 $) Median Home Prices in Selected Counties in California, 1989–2000 . . . 9
2.3. Median Home Prices in the United States and California, 1998–2000, in Current Dollars 10
2.4. Share of Households That Can Afford the Median-Priced Home in Major Counties in California, 1990 and 2000 17
2.5. New Multifamily and Single-Family Housing Construction in California, 1967–2002 21
2.6. New Housing Construction in the United States and California, Indexed to 1.0 in 1986 (Peak Year of Production), 1973–2002 22
3.1. California Construction and Employment Cycles 36
3.2. Expectations of Inflation, 1972–2001 40
3.3. Term Structure (Difference Between the Long-Term and Short-Term Interest Rates), 1971–2001 41
3.4. Comparison of Actual Changes in California New Housing Construction and Model Fitted Values, 1967–2000 50
4.1. Growth in Child and Adult Populations in California, by Decade 55
4.2. Probability of Being a Householder in California, by Age, 2001 57
4.3. Change in California Population, by Age Group and Decade 58
4.4. Change in Foreign-Born and U.S.-Born Populations in California, by Decade 59
4.5. Decennial Change in Population in California, by Marital Status 60

4.6. Probability of Being a Householder in California and the Rest of the United States, 1976–2001 62
4.7. The Effect of Demographic Changes on the Probability of Being a Householder in the Rest of the United States, 1976–2001 63
4.8. The Effect of Demographic Changes on the Probability of Being a Householder in California, 1976–2001 64
4.9. Difference in Householder Probabilities Between California and the Rest of the United States 65
4.10. Age-Standardized Householder Rates in California and the Rest of the United States, by Ethnicity and Nativity, 2000 67
4.11a. Difference in Householder Rates: California Metropolitan Areas Less the Rest of the United States, No Demographic Controls, 2000 68
4.11b. Difference in Householder Rates: California Metropolitan Areas Less the Rest of the United States, with Controls for Age, Gender, Ethnicity, and Nativity, 2000 69
4.12. Estimates of the Undersupply of Housing in California Based on Householder Rates in California and the Rest of the United States, by Decade 72
4.13. New Occupied Housing Units, by Decade: Actual Versus Necessary for California (Controlling for Demographic Differences) 73
4.14. Decennial Shortage of New Occupied Housing Units . . . 74
4.15a. Estimates of the Undersupply of Occupied Housing Units in California Metropolitan Areas Based on Householder Rates in California and the Rest of the United States, No Demographic Controls, 2000 76
4.15b. Estimates of the Undersupply of Occupied Housing Units in California Metropolitan Areas Based on Householder Rates in California and the Rest of the United States, Controls for Age, Gender, Ethnicity, and Nativity, 2000 77
C.1. Comparison of Actual and Predicted Annual Housing Production in California, 1973–1999 111

Tables

2.1. Median Value of Owner-Occupied Housing Units in California's Counties, 1980, 1990, and 2000 12
2.2. Median Gross Rent in California's Counties, 1980, 1990, and 2000 14
2.3. Rent and Homeowner Costs as a Percentage of Income 19
2.4. Ratio of Household Population Change to Total Housing Units Change in California's Counties: 1970s, 1980s, and 1990s 24
2.5. Number of Persons per Occupied Household, 1970–2000 26
2.6. Vacancy Rates in California's Counties, 1990 and 2000 29
2.7. Nonfarm Jobs per Housing Unit in California's Counties, 1990 and 2000 32
3.1. Effect of Explanatory Factors on Changes in New Housing Construction: Results of the Macroeconomic Model, by Region 47
A.1. Analysis of Changes in New Construction in California, by Region (Time-Series Results, No Lags) 97
A.2. Time-Series Results Allowing for Lagged Responses 99
C.1. Panel Regression Results 108
C.2. Results of County-Level Analysis of Annual Housing Production 110
C.3. Housing, Developable Land, and Resistance to Growth (1990–1999) 113

Acknowledgments

We have benefited from the comments, suggestions, and assistance of a number of people. We thank Anthony Downs, Bill Fulton, Paul Lewis, Dowell Myers, Dean Misczynski, and John Quigley for their reviews of an earlier draft of this report. Michael Teitz has provided encouragement for this project from its inception and has contributed many helpful comments. Joyce Peterson and Peter Richardson have provided important structural and editorial assistance. The authors are responsible for any errors of fact or interpretation.

1. Introduction

Despite a strong economic performance overall during the late 1990s, California's housing production appears to have failed to keep pace with either population or job growth. Indeed, the state's most recent economic boom seems to have created a shortage of housing—particularly in highly populated coastal areas—as evidenced by a rapid rise in home prices. Some observers have pointed to the trend toward larger household sizes as further evidence of a housing shortage.

This report attempts to explain why housing construction has lagged in the 1990s compared to previous business cycles. The study addresses the question of whether the sluggish pace of construction in the 1990s can be explained by unique macroeconomic developments and demographic changes that took place in that period. To address this question, we analyze the effects of macroeconomic and demographic factors on California's housing market. Our macroeconomic model examines factors that economists have found to be the most important predictors of changes in new housing construction. Our demographic model considers whether the composition of the state's population growth has had an effect on household formation and therefore on housing demand. Our results provide important information on the responsiveness of California housing markets to changes in demographics and economic growth.

What Are the Assertions Regarding a Housing Shortage?

The popular perception—shared by policymakers and the public alike—is that California is in the midst of a housing crisis that has been driven by the failure of new housing construction to keep up with the pace of growth in the state. It is easy to see why this is the general impression.

- From 1990 to 1999, 1.1 million housing units were built in California, or an average of 110,000 per year; from 1980 to 1989, almost 2.1 million were built (207,000 per year). The ratio of new residents to new housing units rose from 3.1 over the 1980s to 3.9 over the 1990s.
- The median home price in California increased from $193,334 in 1990 to $241,779 in 2000, and housing affordability[1] in 2000 was only 34 percent statewide and below 20 percent in most of the San Francisco Bay Area.
- The share of homeowners who spend more than 30 percent of their income on housing rose from 29.7 percent in 1989 to 31.5 percent in 1999.

These statistics are buttressed by any number of anecdotes about people having to leave their hometowns because of unaffordable housing and of employers unable to attract or retain workers because of exorbitant housing prices. All this evidence implies that there is a serious housing shortage in California.

Arrayed against these facts, however, are other figures that either fail to document the outcomes one would expect in the midst of a housing crisis or put the dire statistics into historical context.

- Although it is true that housing prices increased significantly over the 1990s, once we correct for inflation, the median home price in California was 3.5 percent *lower* in 2000 than it was in 1990.
- Likewise, home prices are strongly related to personal income, which increased at a noticeably faster pace than inflation from 1990 to 2000. Although housing affordability in California at the peak of the recent business cycle was only 34 percent, it was 20 percent at the previous peak in 1990. Similarly, in only three of the counties where affordability is tracked back to 1990 was affordability lower in 2000 than it was in 1990; in most

[1]Housing affordability is defined as the percentage of households that can afford the median priced single-family home. Annual figures are prepared by the California Association of Realtors.

counties, housing is more affordable now than it was in the last cycle. Outside the San Francisco Bay Area, housing affordability improved dramatically over the 1990s.

- Household size (the number of persons per household) has increased since 1990, but demographic changes explain most of the increases we observe (see Moller et al., 2002).
- Despite the fact that homeownership costs rose as a share of income in the 1990s, the percentage of renters who spent more than 30 percent of their income on rent fell from 47.7 percent to 44.7 percent.
- Although the homeownership rate in California lags the U.S. average (56.9 percent versus 66.2 percent), it nevertheless rose slightly, from 55.6 percent to 56.9 percent, from 1990 to 2000.

It is the contradiction between these two sets of facts that we address in this study.

How Can a Housing Shortage Be Measured?

We use several approaches and datasets to evaluate California's housing markets. Housing markets are better understood as regional rather than state phenomena. Some regions might be more supply-constrained than others—and macroeconomic and demographic forces could operate differentially between regions.

Identifying a housing shortage is difficult, depending in part on the measures chosen as evidence of a shortage. The simplest method, for example, would consider only rents and prices—increases could be taken as evidence of demand outstripping supply. This limited approach would be misleading, however, as it would fail to take into account many other determinants of housing prices, such as income and interest rates.

Because of the complexities of housing supply and demand, we have approached the issue of whether there is a shortage in the supply of new housing in two complementary ways. Our first approach is a traditional econometric model that analyzes the effects of factors commonly used to explain housing market patterns. These factors include interest rates, unemployment rates, income, and prices. We analyze the California housing market as a whole as well as ten regional markets. This

econometric approach allows us to identify the extent to which macroeconomic factors influence changes in new housing construction. These annual fluctuations can be quite dramatic and are clearly related to macroeconomic factors. Details of the econometric model are in Appendix A.

Our second method investigates the demographic determinants of housing demand by building a householder rate model. This approach is particularly important given the large demographic changes in many of the state's metropolitan areas. The demographic model provides us with important information on how the nature of California's population change influences the demand for housing. Because the population of the state does not vary dramatically from one year to the next, the effects are seen gradually over a 25-year period (1977 through 2001). Details of the demographic model are in Appendix B.

By developing multiple methods and measures of California's housing markets, we are able to assess the importance of very different inputs. In the end, we observe important changes in long-term demographic determinants of housing demand and identify important cyclical variations associated with business cycles.

Outline of This Report

Before proceeding to our detailed analyses of the state and regional housing markets, we summarize the major trends and indicators in housing and population in California. In Chapter 2, we provide descriptive measures of California's housing market, for both the state and its regions. These descriptive measures allow us to examine the most accessible and well-known indicators of housing markets in California, including new construction, prices, vacancy rates, and household size. We also provide comparisons with national trends when available and of interest. Chapter 3 presents our econometric model of California's housing markets, discusses the macroeconomic factors that help determine annual fluctuations in housing construction, and provides results of the macroeconomic models. Chapter 4 analyzes the effect of changes in the state's population on the consumption of housing in the state. A householder rate model is constructed to determine differences in household formation between demographic subgroups in California

(and its largest metropolitan areas) and the rest of the nation. Chapter 5 summarizes our findings and discusses their implications for policy.

Finally, it is important to note that this report does not assess all aspects of the California housing market. In particular, we do not focus on low-income housing in the state. Instead, we focus on the housing market as a whole. There is quite possibly a significant mismatch between the type of new housing units being built and the type of new households forming in the state. That and other topics are subjects of future research.

2. Trends and Patterns in California Housing

This chapter provides summary data on key measures of California's housing. We discuss prices and rents, affordability, new construction, population change, persons per household, jobs and housing, and vacancy rates. We use annual data series from the California Association of Realtors and the Department of Finance, as well as recently released decennial census data. Annual measures of change provide important evidence of business cycle events, whereas long-term demographic changes are assessed across decades.

Many of the measures suggest that California's position in 2000 was not appreciably different from its position in 1990. Nonetheless, these measures show considerably more housing stress in some of the state's largest metropolitan areas than in the rest of the nation

Prices and Rents

Between 1975 and 2002, the median home price in California rose over seven-fold, from $42,267 to $315,870.[1] These dollar figures are not adjusted for inflation and therefore give the impression of a larger rise in prices than is warranted. Figure 2.1 shows median home prices in California from 1975 to 2002 in both nominal and real (i.e., inflation-adjusted) terms. Once corrected for inflation, the median home price in California hit a peak of $266,846 in 1989 and then declined substantially to 1996. By 2000, the median home price was still lower than the 1989 peak, but subsequent increases led to a new high of almost $300,000 by 2002.

[1]Annual prices reported are averages of monthly prices compiled by the California Association of Realtors. These are the prices of *sold* houses; below, we present information on median values of *all* owner-occupied houses as estimated by their owners in decennial censuses.

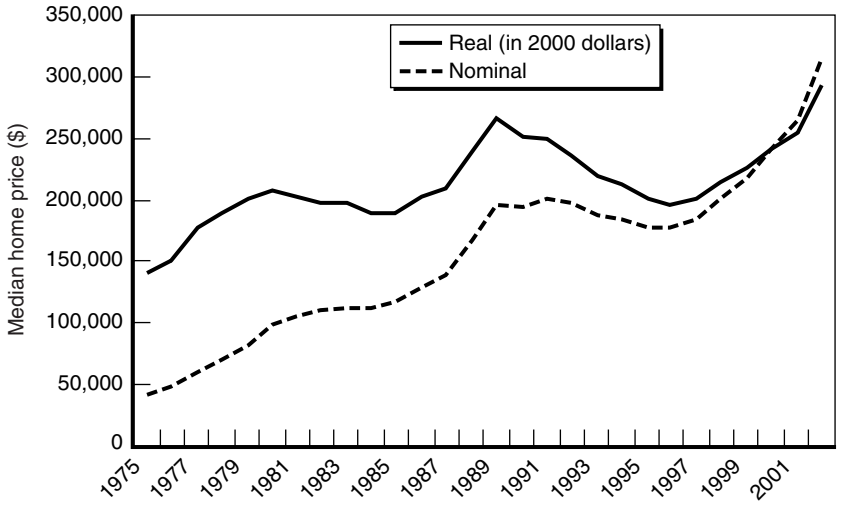


Figure 2.1—Median Home Prices in California, 1975–2002, Nominal and Real (2000 $)

The statewide median price is drawn from regions with quite different price levels. The importance of regional economic fortunes can be seen when the real and nominal median prices are compared across several of the largest counties in California. Figure 2.2 compares the median home price in Santa Clara, Los Angeles, and Orange Counties from 1989 to 2000 in real terms (adjusting for inflation). The early 1990s recession clearly took a toll on the Los Angeles housing market, less so in Orange County.

From Figure 2.2, it is clear that the median statewide home price does not reflect the state of regional housing markets: The median real home price in Los Angeles County in 2000 was still 26 percent below its previous peak in 1989; Orange County prices were basically unchanged; and prices in Santa Clara County had increased 45 percent faster than inflation. In fact, of the counties that the California Association of Realtors has tracked since 1990, the only counties outside the Bay Area that had real price gains during the 1990s were Monterey and San Diego. In most other markets, prices in 2000 were still lower in real terms and some were down 20 percent or more from 1990.

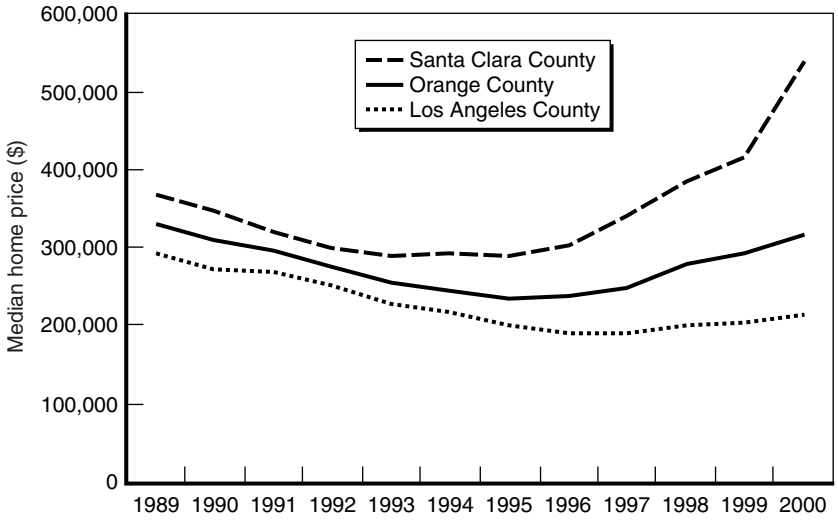
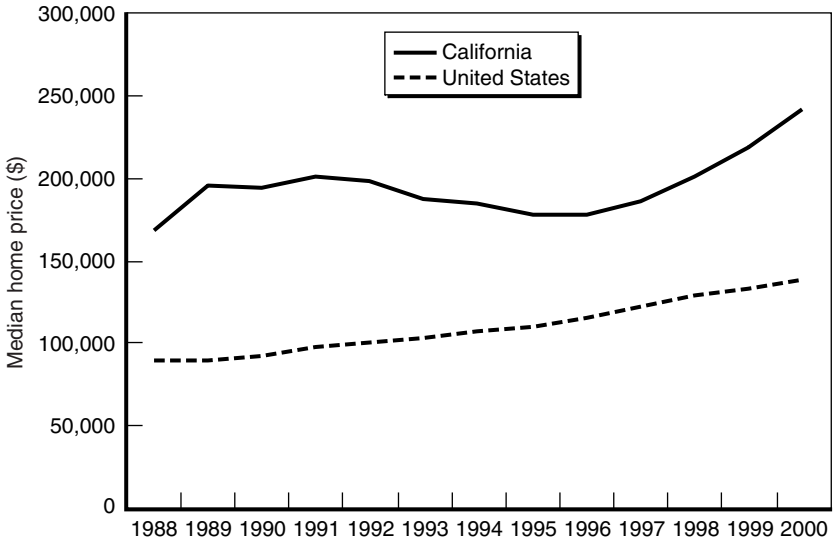


Figure 2.2—Annual Inflation-Adjusted (Real 2000 $) Median Home Prices in Selected Counties in California, 1989–2000

In 2000, the median home price (among houses sold) in California was $241,779—74 percent higher than the national median price of $139,000. Even though California is the largest state and is itself composed of several major metropolitan areas, it is small in comparison to the nation as a whole, and its metropolitan areas are more tightly linked to each other than to other areas in the nation. This proximity has made housing prices in the state significantly more volatile than national prices. Figure 2.3 shows how median home prices compare at the state and national levels (the national figure includes California).[2] The median price in California rose to 2.2 times the national median price in 1989, fell to 1.5 times in 1996 and 1997, and then rose back to 1.7 times the national median in 2000. However, not all regional markets in California are expensive by national standards. Median home prices in Fresno, Riverside, and San Bernardino Counties were less

[2]Throughout this report, we provide both California and national data. Our preferred comparison is California versus the rest of the nation, but where such information is not available—as in this case—we provide data for California and the nation (including California) and provide a note to that effect.



SOURCE: National Association of Realtors, data for the United States include California.

Figure 2.3—Median Home Prices in the United States and California, 1988–2000, in Current Dollars

expensive in 2000 than the national average, and Sacramento was only 5 percent higher.

Data from the decennial censuses allow us to identify long-term changes in rents and values in all of California's counties for rented housing units and for all owner-occupied housing units (not just those sold).[3] Patterns of change in rents and values of owner-occupied housing units were similar, with California and many of its counties experiencing much higher rents and housing values than the rest of the country, but with most if not all of the increase occurring during the 1980s rather than the 1990s. Indeed, in real terms, median values of owner-occupied housing units declined in California from 1980 to 1990

[3]We consider several measures of housing to identify local market conditions, comparing indicators from the most recent census with those of past censuses. Although these ten-year changes do not allow for the consideration of annual patterns of change, the 1980, 1990, and 2000 censuses all coincided with strong economic conditions. Thus, the decennial patterns are not affected by short-term business cycles and should provide us with an accurate picture of long-term trends at the local level in California.

(in nominal terms, values increased 9 percent). Regional variations are substantial (see Table 2.1). Were it not for declines in Los Angeles County, median values would have increased in the state from 1990 to 2000. As with rents, counties with the greatest declines in housing values were in the Los Angeles metropolitan area (five of the six counties with the greatest declines were Los Angeles, Ventura, San Bernardino, Riverside, and Orange). Still, a majority of counties (36) experienced an increase in real values between 1990 and 2000. And from 1980 to 2000, eight California counties experienced real increases in values of more than 50 percent. Increases were focused in the Bay Area (including Santa Clara, San Francisco, San Mateo, Alameda, Marin, and Napa Counties) and the Central Coast (Santa Cruz and San Benito Counties). By 2000, California's most expensive county, Marin, had home values over four times higher than the national average. Nonetheless, 15 of the state's 58 counties still had median home values lower than the national average of $119,600 in 2000, including two of the state's medium-sized metropolitan areas (Fresno and Bakersfield).

As shown in Table 2.2, 33 of the state's counties experienced declines in rents from 1990 to 2000, with the greatest declines in the Los Angeles metropolitan area (including Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties). In the Los Angeles area, the declines of the 1990s followed the spectacular increase in rents that occurred during the 1980s. These declines can be attributed to the strength and depth of the recession of the early 1990s—a recession that was especially pronounced in the Los Angeles area—and to a speculative bubble in prices around 1990. Only five counties experienced real increases in rents of more than 10 percent for the decade from 1990 to 2000, and only three were counties with large populations (San Mateo, Santa Clara, and San Francisco). Still, rents in much of California remain far higher than in the rest of the nation. By 2000, rents in 35 of California's 58 counties were higher than the national average; only two of the state's larger metropolitan areas, Fresno and Bakersfield, had average rents lower than those of the nation as a whole.

From these trends, it does not appear that prices in this business cycle are much different from prices in the previous one. As of 2000, most regional markets had not yet regained their 1989–1990 peak prices

Table 2.1

Median Value of Owner-Occupied Housing Units in California's Counties, 1980, 1990, and 2000

	Median Value (Real 2000 $)			% Change		
	1980	1990	2000	1980–1990	1990–2000	1980–2000
United States	98,848	103,425	119,600	5	16	21
United States excluding California	99,266	95,391	112,500	–4	18	13
California	180,316	251,583	225,000	40	–16	18
Far North						
Del Norte	105,644	111,484	121,100	6	9	15
Humboldt	120,917	114,591	133,500	–5	17	10
Lake	124,312	123,525	122,600	–1	–1	–1
Lassen	106,704	89,731	106,700	–16	19	0
Mendocino	148,071	159,910	170,200	8	6	15
Modoc	85,067	62,281	69,100	–27	11	–19
Nevada	169,072	199,919	205,700	18	3	22
Plumas	139,798	116,145	137,900	–17	19	–1
Sierra	123,675	105,398	128,600	–15	22	4
Siskiyou	111,796	87,659	100,300	–22	14	–10
Trinity	116,463	106,434	112,000	–9	5	–4
Upper Sacramento Valley						
Butte	125,372	121,713	129,800	–3	7	4
Colusa	100,340	88,177	107,500	–12	22	7
Glenn	101,825	86,882	94,900	–15	9	–7
Shasta	129,403	117,828	120,800	–9	3	–7
Sutter	126,857	118,735	120,700	–6	2	–5
Tehama	102,250	89,083	103,100	–13	16	1
Yuba	94,400	86,882	89,700	–8	3	–5
Sacramento Metro						
El Dorado	177,558	201,862	194,400	14	–4	9
Placer	165,254	218,176	213,900	32	–2	29
Sacramento	137,040	167,031	144,200	22	–14	5
Yolo	141,283	177,908	169,800	26	–5	20
San Joaquin Valley						
Fresno	131,949	107,211	104,900	–19	–2	–20
Kern	116,038	106,693	93,300	–8	–13	–20
Kings	99,067	91,155	97,600	–8	7	–1
Madera	127,494	110,966	118,800	–13	7	–7
Merced	112,644	116,663	111,100	4	–5	–1
San Joaquin	119,645	156,025	142,400	30	–9	19
Stanislaus	127,494	159,262	125,300	25	–21	–2
Tulare	103,734	95,039	97,800	–8	3	–6

Table 2.1 (continued)

	Median Value (Real 2000 $)			% Change		
	1980	1990	2000	1980–1990	1990–2000	1980–2000
Bay Area						
Alameda	180,952	291,722	303,100	61	4	68
Contra Costa	200,681	281,104	267,800	40	–5	33
Marin	320,325	459,530	514,600	43	12	61
Napa	165,890	236,433	251,300	43	6	51
San Francisco	221,894	381,711	396,400	72	4	79
San Mateo	263,897	441,273	469,200	67	6	78
Santa Clara	232,077	372,518	446,400	61	20	92
Solano	143,192	190,597	178,300	33	–6	25
Sonoma	187,528	259,740	273,200	39	5	46
Central Coast						
Monterey	183,498	254,172	265,800	39	5	45
San Benito	155,283	265,567	284,000	71	7	83
San Luis Obispo	164,617	276,055	230,000	68	–17	40
Santa Barbara	220,621	322,668	293,000	46	–9	33
Santa Cruz	199,620	330,696	377,500	66	14	89
Sierras						
Alpine	184,346	146,573	184,200	–20	26	0
Amador	140,858	155,378	153,600	10	–1	9
Calaveras	138,737	148,127	156,900	7	6	13
Inyo	169,709	153,436	161,300	–10	5	–5
Mariposa	134,070	128,057	141,900	–4	11	6
Mono	224,864	203,415	236,300	–10	16	5
Tuolumne	144,040	158,485	149,800	10	–5	4
Inland Empire						
Riverside	143,616	179,720	146,500	25	–18	2
San Bernardino	134,494	166,384	131,500	24	–21	–2
South Coast						
Los Angeles	186,680	289,780	209,300	55	–28	12
Orange	229,319	324,092	270,000	41	–17	18
Ventura	197,923	315,287	248,700	59	–21	26
San Diego						
Imperial	101,401	93,356	100,000	–8	7	–1
San Diego	193,044	241,095	227,200	25	–6	18

SOURCE: Authors' calculations of decennial census data.

NOTES: Values are in 2000 dollars. Adjustments for inflation were made separately for California and the United States. Median values for counties in 1980 do not include owner-occupied condominiums. In 1990, the value of all owner-occupied dwelling units was 1.0 percent lower than the value of non-condominium owner-occupied units. In California, the difference was only 0.6 percent.

Table 2.2

Median Gross Rent in California's Counties, 1980, 1990, and 2000

	Median Gross Rent ($)			% Change	
	1980	1990	2000	1980–1990	1990–2000
United States	508	589	602	16	2
United States excluding California		560	581		4
California	600	803	747	34	–7
Far North					
Del Norte	465	546	519	18	–5
Humboldt	496	530	537	7	1
Lake	513	596	567	16	–5
Lassen	490	533	561	9	5
Mendocino	532	610	600	15	–2
Modoc	378	425	429	12	1
Nevada	605	774	746	28	–4
Plumas	458	474	525	3	11
Sierra	403	548	513	36	–6
Siskiyou	443	474	471	7	–1
Trinity	435	475	487	9	2
Upper Sacramento Valley					
Butte	484	568	563	18	–1
Colusa	409	458	494	12	8
Glenn	460	460	458	0	0
Shasta	509	559	563	10	1
Sutter	443	501	506	13	1
Tehama	443	474	486	7	3
Yuba	435	496	488	14	–2
Sacramento Metro					
El Dorado	717	737	702	3	–5
Placer	560	745	780	33	5
Sacramento	520	682	659	31	–3
Yolo	496	660	687	33	4
San Joaquin Valley					
Fresno	501	562	534	12	–5
Kern	509	570	518	12	–9
Kings	458	532	533	16	0
Madera	465	548	562	18	3
Merced	488	557	518	14	–7
San Joaquin	473	633	617	34	–3
Stanislaus	507	624	611	23	–2
Tulare	479	522	516	9	–1

Table 2.2 (continued)

	Median Gross Rent ($)			% Change	
	1980	1990	2000	1980–1990	1990–2000
Bay Area					
Alameda	564	811	852	44	5
Contra Costa	624	874	898	40	3
Marin	791	1,067	1,162	35	9
Napa	596	818	818	37	0
San Francisco	605	846	928	40	10
San Mateo	713	996	1,144	40	15
Santa Clara	709	1,001	1,185	41	18
Solano	522	764	797	46	4
Sonoma	613	835	864	36	3
Central Coast					
Monterey	613	809	776	32	–4
San Benito	484	708	765	46	8
San Luis Obispo	592	742	719	25	–3
Santa Barbara	636	847	830	33	–2
Santa Cruz	643	923	924	44	0
Sierras					
Alpine	740	535	659	–28	23
Amador	509	640	685	26	7
Calaveras	513	616	599	20	–3
Inyo	484	533	516	10	–3
Mariposa	426	508	502	19	–1
Mono	656	712	682	9	–4
Tuolumne	530	647	611	22	–6
Inland Empire					
Riverside	573	741	660	29	–11
San Bernardino	552	720	648	31	–10
South Coast					
Los Angeles	588	811	704	38	–13
Orange	759	1,023	923	35	–10
Ventura	672	976	892	45	–9
San Diego					
Imperial	465	510	504	10	–1
San Diego	596	791	761	33	–4

SOURCE: Authors' calculations of decennial census data.

NOTES: Rents are in 2000 dollars. Adjustments for inflation were made separately for California and the United States.

once inflation is accounted for, and only the San Francisco Bay Area had seen significant real price increases. What matters from a policy perspective, however, is how these price changes affect residents in these markets. An indicator that helps us to see these effects is housing affordability. Hence, we next examine trends in affordability in the largest counties in the state.

Affordability

Affordability makes the state's housing supply a compelling policy issue. Housing is the most reliable indicator of a region's cost of living. It is also the largest budget item for most households and represents the bulk of most homeowners' net worth. There are many potentially useful ways to characterize affordability, but the definition used by most analysts, and one of the measures we consider, is the share of an area's households that can afford the median-priced home at current interest rates and loan standards.[4] This measure has two potential flaws in the context of this report, and they work in opposite directions. First, not everyone is in the market for a single-family home. Some households are not likely to be in the market at a given time and, more important, many households already own homes at lower-than-current prices, regardless of whether they could afford to buy their home at current prices. Second, the affordability index evaluates only the ability of households to purchase the median-priced home. Even in a market characterized by a plentiful supply of homes, we would expect only about half of the households to be able to purchase the median-priced home (assuming similar distributions of household income and home prices). Using decennial census data, we consider two additional measures of affordability: the share of renters who face high rent burdens (defined as paying more than 30 percent of their household income on rent), and the share of homeowners who face high housing cost burdens (defined as

[4]This assumes a 20 percent down payment, with mortgage payments not to exceed 30 percent of monthly pre-tax income. Affordability figures are calculated by the California Association of Realtors for this group of counties from 1990 on.

paying more than 30 percent of their income on housing costs, including mortgage payments).

In addition to being affected by home prices, affordability is driven by personal income and interest rates. Over the last ten years, interest rates have fallen and personal incomes have risen relative to inflation, and these trends have mitigated the effects of rising home prices (and in fact contributed to those rising prices). Figure 2.4 shows the affordability in 1990 and 2000 for 17 of the largest counties in California. Counties in the greater San Francisco Bay Area (including Monterey and Santa Cruz) are grouped together on the left side of the graph, and they show the dramatic difference in affordability between that region and the rest of the state. It is also clear that this gap existed in the previous business cycle, although the more affluent parts of the greater Los Angeles area were in the same range as some Bay Area counties. Only Contra Costa and Sonoma Counties were noticeably less affordable in 2000 than they were in 1990. The rest of the Bay Area and San Diego faced the same affordability situation as they did at the previous peak, and the other

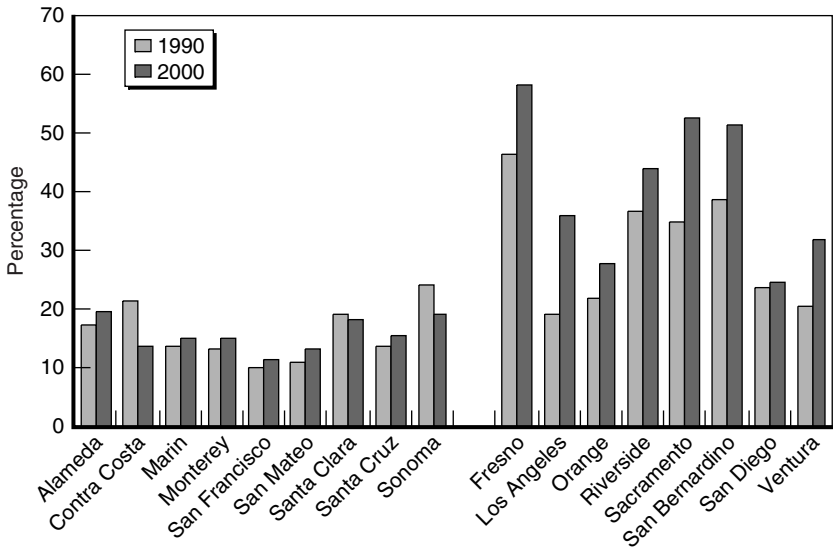


Figure 2.4—Share of Households That Can Afford the Median-Priced Home in Major Counties in California, 1990 and 2000

counties were much more affordable than previously. This level of affordability is obviously aided by the fact that interest rates in the latter half of the 1990s were substantially lower than they were in the 1980s, but it does seem to conflict with the notion of a statewide housing shortage that arose in the 1990s.

Still, California has far more homeowners and slightly more renters under financial stress because of high housing costs than the rest of the nation (see Table 2.3).[5] As bad as the situation is in California, it did not appear to appreciably worsen in the 1990s. In 14 counties, including some with the most expensive housing in the state (Ventura, Santa Clara, Orange, Contra Costa, San Mateo, Marin, Alameda, and Santa Cruz), the proportion of homeowners paying more than 30 percent of their income for housing remained unchanged or even declined, although the levels remained high. In those counties, rising incomes at least kept pace with rising housing costs. Substantial increases in homeowner costs relative to income occurred primarily in the Upper Sacramento Valley, San Joaquin Valley, and in some mostly rural mountainous counties. In many of those areas, housing costs are among the *lowest* in the state. Relatively low wages and incomes would seem to be more of a culprit than high housing costs for homeowners in those areas.

For renters in California, the situation actually improved slightly from 1990 to 2000. Statewide, in 48 counties the proportion of renters paying more than 30 percent of their income in rent either did not change or declined. Increases in the proportion occurred primarily in less populated counties outside the state's metropolitan areas. San Francisco had one of the largest declines and one of the lowest proportions of renters paying more than 30 percent of household income for rent—a consequence of rapidly increasing incomes and, probably, rent control and out-migration of those with lower incomes. Places with high rents relative to incomes tended to be counties with relatively high poverty rates. Among the state's larger metropolitan areas, Fresno had

[5]This section presents data from the decennial censuses for all renters and homeowners. Calculations of income as a percentage of rent or homeowner costs are based on incomes for the year preceding the census, whereas rents and homeowner costs were those experienced at the time of the census.

Table 2.3

Rent and Homeowner Costs as a Percentage of Income

	% of Homeowners Paying More Than 30% of Household Income		% of Renters Paying More Than 30% of Household Income	
	1990	2000	1990	2000
United States	20	22	41	40
United States excluding California	18	21	40	39
California	30	31	48	45
Far North				
Del Norte	13	23	45	51
Humboldt	18	25	50	54
Lake	27	31	51	47
Lassen	18	22	39	45
Mendocino	23	26	46	43
Modoc	16	19	32	38
Nevada	27	32	50	48
Plumas	20	24	48	41
Sierra	25	24	29	36
Siskiyou	19	23	44	46
Trinity	21	27	49	46
Upper Sacramento Valley				
Butte	20	26	55	53
Colusa	18	25	29	39
Glenn	18	23	42	36
Shasta	20	30	48	48
Sutter	19	27	43	40
Tehama	21	26	45	42
Yuba	20	28	46	44
Sacramento Metro				
El Dorado	30	32	48	43
Placer	28	29	47	41
Sacramento	24	27	48	43
Yolo	22	27	52	53
San Joaquin Valley				
Fresno	22	29	48	48
Kern	22	27	44	46
Kings	21	25	39	42
Madera	23	31	45	45
Merced	21	30	46	43
San Joaquin	24	29	45	46
Stanislaus	24	29	47	45
Tulare	21	29	48	44

Table 2.3 (continued)

	% of Homeowners Paying More Than 30% of Household Income		% of Renters Paying More Than 30% of Household Income	
	1990	2000	1990	2000
Bay Area				
Alameda	31	31	46	42
Contra Costa	31	30	46	42
Marin	32	32	50	46
Napa	26	29	48	40
San Francisco	26	30	45	37
San Mateo	32	31	43	42
Santa Clara	31	29	43	40
Solano	31	30	43	42
Sonoma	31	32	49	44
Central Coast				
Monterey	29	33	46	42
San Benito	32	37	35	40
San Luis Obispo	31	32	53	51
Santa Barbara	29	32	53	51
Santa Cruz	34	34	53	48
Sierras				
Alpine	37	25	29	36
Amador	21	25	39	43
Calaveras	23	32	48	41
Inyo	19	19	40	37
Mariposa	22	28	39	37
Mono	30	39	32	41
Tuolumne	25	27	44	48
Inland Empire				
Riverside	33	32	50	47
San Bernardino	30	31	49	46
South Coast				
Los Angeles	31	35	49	46
Orange	33	32	47	44
Ventura	35	32	48	42
San Diego				
Imperial	21	29	47	47
San Diego	32	32	49	45

SOURCE: Authors' calculations of decennial census data.

NOTE: Incomes are from the year preceding the census, whereas rents and homeowner costs were those experienced at the time of the census.

the highest proportion of renters paying more than 30 percent of their income in rents, yet Fresno had among the lowest rents in the state and experienced a decline (in real terms) in median rents from 1990 to 2000.

Poverty and low incomes seem to be a more important factor in the location of financial stress with respect to housing than does the cost of the housing itself.

New Construction

One of the most compelling pieces of evidence regarding a possible housing shortage is the 47 percent decline in construction between the 1980s and the 1990s. From 1980 to 1989, almost 2.1 million housing units were built in California, for an average of 207,000 per year; from 1990 to 1999, only 1.1 million were built, for an average of 111,000 per year. The drop in construction was most severe in the case of multifamily units, where construction in the decade 1990–1999 fell by 70 percent from the pace in the 1980s. Multifamily units made up 53 percent of the total units in the previous peak year of 1986 but only 29 percent in 2000. In contrast, single-family construction fell by only 27 percent over the same period. Figure 2.5 shows annual housing construction from 1967 to 2002 for both single- and multifamily units. The break between the pattern of new construction in the last three

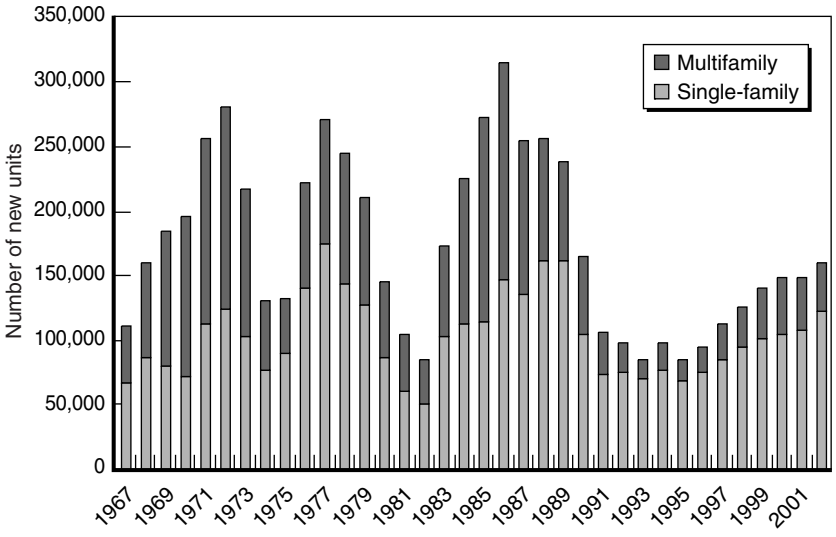
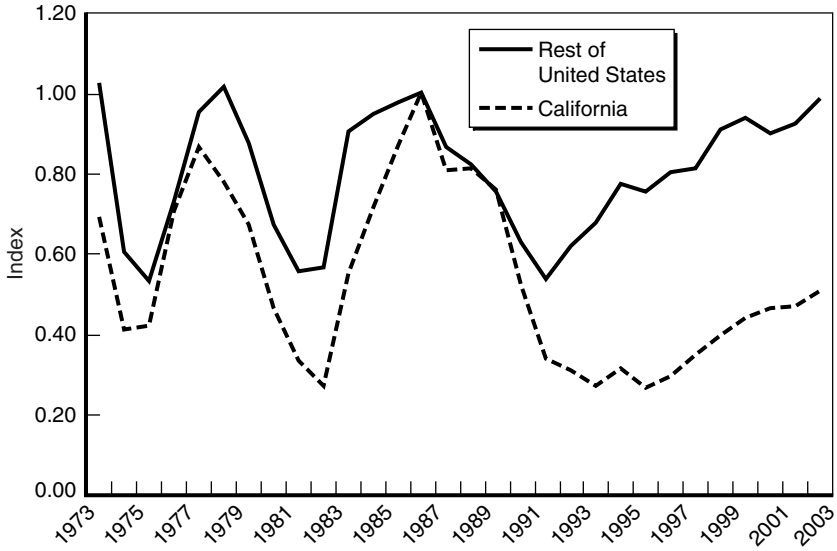


Figure 2.5—New Multifamily and Single-Family Housing Construction in California, 1967–2002

housing cycles and the current one is often "Exhibit A" in the argument for a housing supply crisis in the state.

This change in the cyclical pattern of new construction also took place nationally. Although the acceleration in new construction after 1982 was higher in California than in the rest of the United States, the situation reversed after the second half of 1989, when the reduction in the number of new units was much more dramatic in California. From its trough in 1991, annual production in the rest of the United States increased by 88 percent by 2002. In California, the increase in annual production from 1991 to 2002 was only 51 percent, but the increase from its lowest production year (1993) to 2002 was 88 percent. Figure 2.6 shows the ratio of annual production to the peak-year production for the United States and California, with 1986 production indexed to 1.0.

Housing production in California trailed that of the nation at least in part because the state had something of a double-dip construction recession. Not only did construction in the state take two years longer to



SOURCE: Authors' calculations of U.S. Census Bureau data.

Figure 2.6—New Housing Consruction in the United States and California, Indexed to 1.0 in 1986 (Peak Year of Production), 1973–2002

rebound than it did at the national level, but it stumbled again a year later (in 1995). Since 1995, new housing construction has increased markedly but remains far below the 1986 peak.

How Is Population Growth Accommodated?

New Housing Units

Housing growth has not kept pace with population growth in California's counties. Both for the state as a whole and in 49 of California's 58 counties—including all the large urban counties in the state—the ratio of population change to the change in housing units was much greater in the 1980s and 1990s than in the 1970s (see Table 2.4).[6] Statewide, this ratio doubled between the 1970s and 1980s. The ratio increased again from the 1980s to the 1990s, but much less dramatically. Counties with extremely high gains in household population relative to the number of net new housing units in the 1990s include places with very high housing prices, such as San Mateo, Santa Barbara, Santa Clara, and Alameda Counties. For those counties, the increase in the ratio could be an indication that high housing costs are leading people to live with more roommates or family members than they otherwise would. For other counties with large population growth relative to housing growth, such as Los Angeles and Colusa Counties, the nature of the population growth at least partly explains the high ratio; with immigrants and children forming a large share of population growth in those counties, housing demand is lower than if the population growth was primarily among U.S.-born adults.[7] Perhaps most noteworthy, though, is that the dramatic increase in the ratio between population growth and new occupied households occurred in the 1980s as well as in the 1990s. In almost half of California's counties (28 of 58), the ratio either remained unchanged or declined in the 1990s as compared to the 1980s. Thus, population growth outpacing housing

[6]The only exceptions were the relatively lightly populated mountainous counties of Lassen, Siskiyou, Modoc, Mono, Inyo, Plumas, Trinity, Sierra, and Alpine.

[7]Chapter 4 considers how the nature of California's population growth in the 1990s might have affected the demand for new housing.

Table 2.4

Ratio of Household Population Change to Total Housing Units Change in California's Counties: 1970s, 1980s, and 1990s

	1970–1980	1980–1990	1990–2000
United States	1.19	1.53	2.32
United States excluding California	1.13	1.28	2.19
California	1.63	3.10	3.92
Far North			
Del Norte	1.59	2.06	1.97
Humboldt	0.85	1.71	1.42
Lake	1.54	2.35	2.06
Lassen	1.90	1.86	1.35
Mendocino	1.67	2.75	1.79
Modoc	1.14	0.94	–1.53
Nevada	1.96	2.08	2.01
Plumas	1.63	0.95	0.71
Sierra	2.04	0.79	6.72
Siskiyou	1.46	1.42	0.40
Trinity	1.65	0.84	–0.09
Upper Sacramento Valley			
Butte	1.79	2.54	2.12
Colusa	0.90	3.42	5.09
Glenn	1.85	3.61	2.48
Shasta	1.88	2.28	1.89
Sutter	1.61	3.15	3.37
Tehama	1.60	2.66	2.01
Yuba	1.09	4.00	1.87
Sacramento Metro			
El Dorado	1.98	2.40	3.11
Placer	1.74	2.30	2.55
Sacramento	1.29	2.67	3.13
Yolo	1.47	2.88	3.13
San Joaquin Valley			
Fresno	1.71	3.58	3.60
Kern	1.56	3.15	3.09
Kings	1.81	3.52	3.47
Madera	2.20	3.86	2.99
Merced	1.76	5.09	3.26
San Joaquin	1.46	4.19	3.51
Stanislaus	1.91	3.45	3.99
Tulare	2.15	3.98	3.84
Bay Area			
Alameda	0.60	2.77	4.82
Contra Costa	1.32	2.24	3.75
Marin	0.80	0.88	2.72

Table 2.4 (continued)

	1970–1980	1980–1990	1990–2000
Napa	1.52	2.83	3.21
San Francisco	–5.87	3.78	3.19
San Mateo	0.74	3.07	6.72
Santa Clara	1.65	2.94	4.85
Solano	2.18	2.83	3.47
Sonoma	2.07	2.36	3.03
Central Coast			
Monterey	1.83	3.52	4.41
San Benito	2.34	3.28	3.92
San Luis Obispo	1.72	2.46	2.30
Santa Barbara	1.37	2.88	6.11
Santa Cruz	2.16	3.63	3.49
Sierras			
Alpine	1.49	0.04	0.49
Amador	1.76	1.99	2.33
Calaveras	1.28	1.77	2.23
Inyo	0.99	0.47	0.00
Mariposa	1.70	1.71	1.89
Mono	0.84	0.63	2.44
Tuolumne	1.47	1.96	1.73
Inland Empire			
Riverside	1.64	2.61	3.62
San Bernardino	1.78	2.96	4.80
South Coast			
Los Angeles	1.43	4.40	6.07
Orange	1.95	3.04	4.56
Ventura	2.17	3.02	3.64
San Diego			
Imperial	1.97	3.53	3.33
San Diego	1.90	2.79	3.48

SOURCE: Authors' calculations of decennial census data.

growth is as much a 1980s phenomenon as a 1990s phenomenon in much of California.

Increases in Household Size

If much of California's population growth was not accommodated through new housing, how was it accommodated? Some population growth can be accommodated through previously unoccupied housing, and some can be accommodated by increases in household sizes. Table 2.5 shows changes in the number of persons per occupied household from 1970 through 2000. Since 1980, household sizes have been

Table 2.5

Number of Persons per Occupied Household, 1970–2000

	1970	1980	1990	2000
United States	3.11	2.75	2.63	2.59
United States excluding California	3.13	2.76	2.61	2.56
California	2.95	2.68	2.79	2.87
Far North				
Del Norte	3.05	2.64	2.63	2.58
Humboldt	3.00	2.55	2.49	2.39
Lake	2.50	2.36	2.38	2.39
Lassen	2.93	2.70	2.66	2.59
Mendocino	2.94	2.61	2.57	2.53
Modoc	2.93	2.62	2.49	2.39
Nevada	2.70	2.55	2.51	2.47
Plumas	2.81	2.60	2.41	2.29
Sierra	2.67	2.40	2.45	2.32
Siskiyou	2.90	2.59	2.48	2.35
Trinity	2.89	2.63	2.49	2.29
Upper Sacramento Valley				
Butte	2.82	2.46	2.48	2.48
Colusa	2.95	2.69	2.84	3.01
Glenn	3.02	2.75	2.77	2.84
Shasta	3.04	2.66	2.58	2.52
Sutter	3.16	2.75	2.75	2.87
Tehama	3.04	2.65	2.60	2.62
Yuba	3.27	2.76	2.85	2.87
Sacramento Metro				
El Dorado	2.89	2.62	2.66	2.63
Placer	3.04	2.71	2.66	2.63
Sacramento	3.08	2.56	2.58	2.64
Yolo	3.07	2.59	2.63	2.71
San Joaquin Valley				
Fresno	3.20	2.83	2.96	3.09
Kern	3.19	2.82	2.92	3.03
Kings	3.35	3.04	3.08	3.18
Madera	3.20	2.98	3.05	3.18
Merced	3.35	2.97	3.17	3.25
San Joaquin	3.03	2.71	2.94	3.00
Stanislaus	3.09	2.78	2.91	3.03
Tulare	3.25	2.99	3.12	3.28
Bay Area				
Alameda	2.84	2.53	2.59	2.71
Contra Costa	3.19	2.69	2.64	2.72
Marin	2.94	2.43	2.33	2.34
Napa	2.92	2.55	2.54	2.62
San Francisco	2.34	2.19	2.29	2.30
San Mateo	2.97	2.58	2.64	2.74

Table 2.5 (continued)

	1970	1980	1990	2000
Santa Clara	3.23	2.76	2.81	2.92
Solano	3.14	2.82	2.88	2.90
Sonoma	2.92	2.56	2.55	2.60
Central Coast				
Monterey	3.11	2.85	2.96	3.14
San Benito	3.29	3.12	3.15	3.32
San Luis Obispo	2.82	2.51	2.53	2.49
Santa Barbara	2.99	2.62	2.73	2.80
Santa Cruz	2.70	2.54	2.66	2.71
Sierras				
Alpine	2.72	2.84	2.47	2.50
Amador	2.74	2.49	2.41	2.39
Calaveras	2.76	2.54	2.50	2.44
Inyo	2.78	2.45	2.35	2.31
Mariposa	2.60	2.48	2.42	2.37
Mono	2.83	2.43	2.48	2.43
Tuolumne	2.78	2.55	2.46	2.36
Inland Empire				
Riverside	2.97	2.69	2.85	2.98
San Bernardino	3.11	2.82	2.97	3.15
South Coast				
Los Angeles	2.83	2.69	2.91	2.98
Orange	3.21	2.78	2.87	3.00
Ventura	3.43	3.00	3.02	3.04
San Diego				
Imperial	3.52	3.24	3.26	3.33
San Diego	2.94	2.62	2.69	2.73

SOURCE: Authors' calculations of decennial census data.

increasing in California while they have been declining in the rest of the United States. Increases in household sizes in California appear to be driven at least partly, perhaps solely, by changes in the demographic composition of the state's population. In particular, immigrants, especially Latino immigrants, tend to have larger families and more often live with extended family members than do U.S.-born residents of the state. Large flows of immigrants accounted for much of California's population growth in the 1980s and 1990s. In 2000, household sizes were highest in counties with large Latino populations, including Imperial, San Benito, and the San Joaquin Valley counties. Counties with declining and relatively low household sizes were primarily rural, mostly white non-Hispanic, counties in the northern and mountainous

areas of the state. Areas of the state with the most expensive housing are not necessarily those with the greatest household sizes. For example, San Francisco, Marin, Alameda, and San Mateo Counties all had average household sizes lower than the state average in 2000. Higher household sizes and crowding seem to be more driven by demographic effects than prices (see Moller et al., 2002).

Declines in Vacancy Rates

Population growth can also be accommodated as formerly unoccupied housing units become occupied. Vacancy rates declined substantially in California and in almost all of the state's counties between 1990 and 2000 (Table 2.6).[8] Low vacancy rates are an indication of housing demand outstripping supply. The percentage of homes for sale is only slightly lower in California than in the entire United States, but the percentage of rental units available for rent is much lower. Homeowner vacancy rates were exceptionally low (0.8 percent or less) in most Bay Area counties (including San Mateo, Santa Clara, Alameda, Marin, Contra Costa, San Francisco, and Sonoma) and in the Central Coast (Santa Barbara and Santa Cruz Counties). The tight supply of houses in these areas at the time of the 2000 census was reflected in rising home prices. The number and percentage of homes for sale was relatively high in the northern mountain counties of the state but also in the Inland Empire and Kern County.

Rental vacancy rates show similar geographic patterns, with exceptionally low rates—less than 3 percent—in most of the Bay Area (particularly San Mateo, Santa Clara, Marin, Sonoma, Alameda, San Francisco, Contra Costa, and Napa Counties) and all of the Central Coast (including Santa Cruz, San Benito, Santa Barbara, and Monterey Counties). In Southern California, Ventura County had a vacancy rate of only 2.6 percent. However, in 20 of California's counties, rental vacancy rates actually rose between 1990 and 2000. In much of the San

[8]The vacancy rate is the percentage of housing units that are either for rent or for sale. The homeowner vacancy rate is the number of housing units for sale divided by the number of owner-occupied housing units plus the number for sale. The rental vacancy rate is the number of housing units for rent divided by the total number of housing units that are rented or available for rent.

Table 2.6

Vacancy Rates in California's Counties, 1990 and 2000

	Homeowner Vacancy Rate		Rental Vacancy Rate	
	1990	2000	1990	2000
United States	2.1	1.7	8.5	6.8
United States excluding California	2.1	1.8	8.9	7.3
California	2.0	1.4	5.9	3.7
Far North				
Del Norte	3.1	3.0	8.7	10.6
Humboldt	1.3	1.7	4.8	4.7
Lake	3.9	4.1	6.7	10.3
Lassen	2.2	4.1	9.6	13.4
Mendocino	1.1	1.4	5.1	3.3
Modoc	3.6	5.1	7.8	9.3
Nevada	1.8	1.3	5.2	3.1
Plumas	2.2	2.9	7.6	9.9
Sierra	1.9	0.7	12.0	11.3
Siskiyou	2.1	3.0	7.8	9.2
Trinity	2.4	3.8	10.2	8.5
Upper Sacramento Valley				
Butte	1.4	2.1	4.0	5.2
Colusa	1.0	2.3	4.7	3.0
Glenn	0.9	1.5	3.2	8.2
Shasta	1.5	2.2	4.0	5.9
Sutter	1.0	1.5	4.4	4.8
Tehama	1.4	2.3	5.4	8.6
Yuba	1.0	1.8	4.7	6.7
Sacramento Metro				
El Dorado	2.0	1.2	5.3	5.8
Placer	1.6	1.2	7.5	6.4
Sacramento	1.5	1.4	6.8	4.8
Yolo	1.0	0.9	3.6	3.4
San Joaquin Valley				
Fresno	1.5	1.6	5.5	5.5
Kern	2.1	2.6	6.4	8.2
Kings	1.3	1.8	5.9	5.6
Madera	1.4	1.7	3.3	4.5
Merced	1.0	1.4	3.3	4.2
San Joaquin	1.8	1.2	4.5	3.8
Stanislaus	2.2	1.3	4.8	3.2
Tulare	1.3	1.8	4.1	5.8
Bay Area				
Alameda	1.4	0.7	5.5	2.5
Contra Costa	1.7	0.8	6.4	2.7
Marin	1.7	0.7	4.0	2.2
Napa	2.0	1.3	4.8	2.8

Table 2.6 (continued)

	Homeowner Vacancy Rate		Rental Vacancy Rate	
	1990	2000	1990	2000
San Francisco	1.7	0.8	5.7	2.5
San Mateo	1.7	0.5	4.3	1.8
Santa Clara	1.4	0.5	4.5	1.8
Solano	2.1	0.9	6.0	3.7
Sonoma	1.7	0.8	5.1	2.4
Central Coast				
Monterey	2.2	1.4	3.8	2.9
San Benito	3.1	1.0	4.3	2.7
San Luis Obispo	2.8	1.1	5.8	3.2
Santa Barbara	2.0	0.8	5.0	2.8
Santa Cruz	2.4	0.8	4.3	2.5
Sierras				
Alpine	1.5	0.9	55.3	8.4
Amador	2.1	1.9	5.3	4.4
Calaveras	3.6	2.1	6.2	6.2
Inyo	3.0	1.8	4.9	6.9
Mariposa	2.1	2.4	14.5	7.7
Mono	5.1	2.1	37.6	20.9
Tuolumne	2.3	2.2	5.9	6.9
Inland Empire				
Riverside	4.9	2.5	9.9	7.2
San Bernardino	3.2	3.1	8.8	7.3
South Coast				
Los Angeles	1.9	1.6	5.9	3.3
Orange	1.8	0.9	6.6	3.0
Ventura	2.0	0.9	4.9	2.6
San Diego				
Imperial	1.6	1.4	5.0	4.9
San Diego	2.0	1.0	6.2	3.1

SOURCE: Authors' calculations of decennial census data.

Joaquin Valley, the Upper Sacramento Valley, and the northern mountain counties, rental vacancy rates increased. In 2000, rental vacancy rates were relatively high in the Inland Empire, but not as high as in 1990. In the Bay Area, rental vacancy rates have risen substantially since 2000.

Jobs and Housing

Another way to consider whether counties are building a sufficient number of new housing units is to examine changes in jobs relative to

changes in housing units. Areas that add a significant number of jobs but not a significant amount of housing could be said to be creating a jobs-housing imbalance. Table 2.7 provides ratios of jobs per housing unit in 1990 and 2000. Only three counties had both a jobs-housing ratio greater than the state's in 1990 *and* experienced substantial increases in the ratio in the 1990s (San Mateo, Santa Clara, and Yolo). Another three counties had a jobs-housing ratio greater than the state's in 1990 and experienced moderate increases in the 1990s (Santa Barbara, Monterey, and Orange). Together, these six counties could be said to have accommodated substantial numbers of new jobs, but not substantial numbers of new housing units. Only eight of California's counties experienced a decline in the ratio, and all but one are relatively small counties. The one exception is Los Angeles County. Notably, Los Angeles County experienced a decline in its jobs-housing ratio, so that by 2000 its ratio was similar to that of the state as a whole. Los Angeles County's role as a job center in Southern California waned during the 1990s, with that county being the locus of California's severe recession of the early 1990s.

Summary

Substantial variation in housing conditions exists across the state, although some common patterns emerge. Most notably, we find some indicators of housing demand outstripping supply: New housing production did not keep pace with population growth; already low vacancy rates in many counties declined even further in the 1990s, especially for rental units; real prices increased in most counties in the 1990s; and households in the state became more crowded in most counties. However, for many indicators, the trends of the 1990s were much less notable than those of the 1980s. For example, price increases were much more substantial in the 1980s than in the 1990s. Within the state, the Bay Area often stood out, with other housing markets in other regions of the state showing few if any signs of a lack of overall supply. The general picture is one of a tight housing market, but with the 1980s exhibiting more remarkable changes than the 1990s.

Table 2.7

Nonfarm Jobs per Housing Unit in California's Counties, 1990 and 2000

	1990	2000	Change
California	1.15	1.22	0.07
Far North			
Del Norte	0.77	0.75	–0.01
Humboldt	0.88	0.90	0.03
Lake	0.38	0.42	0.04
Lassen	0.78	0.81	0.03
Mendocino	0.83	0.89	0.06
Modoc	0.54	0.59	0.06
Nevada	0.56	0.64	0.08
Plumas	0.54	0.54	0.00
Sierra	0.42	0.46	0.03
Siskiyou	0.72	0.66	–0.06
Trinity	0.42	0.41	–0.02
Upper Sacramento Valley			
Butte	0.80	0.86	0.06
Colusa	1.07	1.12	0.05
Glenn	0.84	0.78	–0.06
Shasta	0.84	0.88	0.04
Sutter	0.64	0.73	0.09
Tehama	0.59	0.71	0.11
Yuba	0.72	0.71	–0.01
Sacramento Metro			
El Dorado	0.49	0.62	0.13
Placer	0.78	1.01	0.23
Sacramento	1.11	1.18	0.06
Yolo	1.18	1.42	0.23
San Joaquin Valley			
Fresno	0.95	1.00	0.05
Kern	1.01	1.04	0.03
Kings	0.97	1.03	0.06
Madera	0.81	0.97	0.15
Merced	0.93	0.93	0.00
San Joaquin	1.01	1.08	0.07
Stanislaus	1.00	1.07	0.07
Tulare	1.07	1.12	0.05
Bay Area			
Alameda	0.56	0.63	0.06
Contra Costa	0.89	0.95	0.06
Marin	0.94	1.08	0.14
Napa	0.95	1.18	0.23
San Francisco	1.70	1.73	0.03
San Mateo	1.17	1.44	0.27

Table 2.7 (continued)

	1990	2000	Change
Santa Clara	1.52	1.78	0.26
Solano	0.80	0.85	0.05
Sonoma	0.90	1.06	0.16
Central Coast			
Monterey	1.15	1.25	0.11
San Benito	0.91	0.92	0.01
San Luis Obispo	0.86	0.97	0.11
Santa Barbara	1.16	1.26	0.11
Santa Cruz	1.03	1.07	0.04
Sierras			
Alpine	0.52	0.65	0.12
Amador	0.65	0.74	0.10
Calaveras	0.36	0.35	0.00
Inyo	0.83	0.85	0.02
Mariposa	0.62	0.55	–0.07
Mono	0.48	0.54	0.06
Tuolumne	0.56	0.56	0.00
Inland Empire			
Riverside	0.66	0.80	0.14
San Bernardino	0.76	0.91	0.14
South Coast			
Los Angeles	1.31	1.25	–0.06
Orange	1.35	1.44	0.10
Ventura	1.08	1.17	0.09
San Diego			
Imperial	1.23	1.13	–0.09
San Diego	1.03	1.16	0.13

SOURCE: Authors' calculations of decennial census data and California Employment Development Department data.

3. Can Macroeconomic Factors Explain California's Housing Markets?

In this chapter, we seek to determine whether the apparent lack of new housing construction in the late 1990s can be mostly explained by changes in macroeconomic factors, such as interest rates, unemployment rates, income, and prices. These economic factors are determined by market changes in the U.S. economy and in the rest of the world, and changes in the U.S. economic policies. To analyze these influences, we use a simple economic model of the housing market. Housing production in the United States and California is characterized by its cyclical behavior (periods of rapid increases in construction followed by periods of contraction), with large annual fluctuations in new housing construction. These features are captured in our model, which considers the influence of macroeconomic factors on construction in the short and longer term.

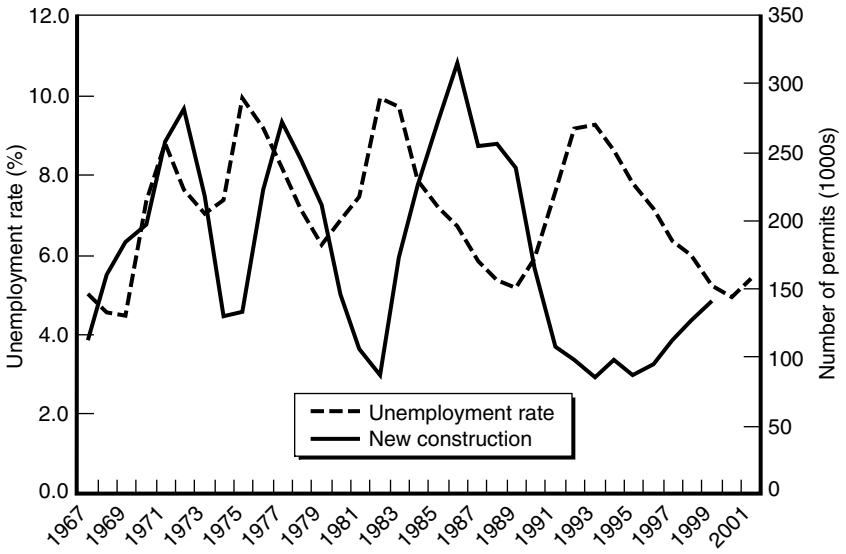
Our analysis of macroeconomic influences on housing reveals that much of the puzzling trend observed in new construction in California in the 1990s (i.e., slow growth in housing production in a context of rapid economic growth) is a result of the unusual economic environment driven by major increases in productivity, technological breakthroughs, macroeconomic policies, and financial events of that period along with the demographic determinants of demand discussed in the next chapter. The portion of the changes in new construction that are not explained by these factors might be related to specific characteristics of local markets, such as local land-use policies and zoning decisions regarding new housing. We discuss those factors in the final chapter. In this chapter, we first describe how new construction is affected by macroeconomic events (including fiscal and monetary policies) and examine some major

differences in the economic environment between the period before the recession of 1990–1991 and the rest of the 1990s. We then turn to our macroeconomic model.

Business Cycles, Macroeconomic Events, and Construction

Historically, increases in unemployment are closely related to downturns in construction activity. This point is illustrated by Figure 3.1, which compares new residential construction and unemployment rates in California. The figure shows that in 1974–1975, 1981–1982, and 1990–1993, years of economic recession, construction activity decreased sharply. Conversely, upturns in construction have coincided with economic booms.

The figure also shows that from 1983 through 1986, construction grew rapidly, but the recovery in the California housing markets from the U.S. recession that started in 1990 was very slow compared to previous recoveries (see Figure 3.1).



SOURCE: Center for Continuing Study of the California Economy (1993).

Figure 3.1—California Construction and Employment Cycles

The robust performance of construction activity during the 1970s and early 1980s coincided with important changes in the demography and the economic environment of the state, which significantly increased the demand for housing units:

1. High population growth with a large increase in the number of people in the prime household formation ages (discussed in the next chapter).
2. Significant increases in per capita income, expectations of future high inflation, and changes in tax policy that increased the attractiveness of housing assets. Rising inflation expectations caused the price of long-lived, tax-favored assets such as housing to jump significantly. Furthermore, in 1986, a tax policy change phased out interest deductions on consumer debt except for that secured by home mortgages. This made ownership of housing even more attractive by providing an avenue for acquiring tax-favored debt.
3. Low real interest rates (which were even negative at times before 1981), making the cost of loans very low. A decrease in the real interest rate decreases the user costs of housing and increases the attractiveness of new investment in housing.

Beginning in 1986, construction activity started to decrease when economic growth temporarily slowed down. The economy gained strength in 1987 and 1988 but turned sluggish again in 1989 and 1990, with a consequent decline in construction (see Figure 3.1). Macroeconomic forces that led to the slowdown in construction included a new oil shock, restrictive monetary policy, large federal budget deficits, and concerns about inflation. These factors put upward pressure on interest rates and decreased residential investment. This was a period of tighter credit with lower availability of loans—a problem that was compounded by higher standards of capital requirements imposed by bank regulators. Lending to businesses was considered risky and the collateral value on residential and commercial real estate loans fell with declining real estate values (resulting from less demand for housing).

The combination of high interest rates and loss of deposits to money market funds that started in the early 1980s created liquidity problems

for many depository institutions that found it increasingly difficult to meet withdrawal demands. For thrift institutions—the main source of mortgage lending—the problem arose principally from borrowing on a short-term basis to make longer-term loans. As rates rose, the thrifts had to pay higher rates to retain deposits, but they could earn the higher yields only as their long-term assets gradually matured and the funds were invested in higher-yielding assets. For commercial banks, the main problem was losses from defaults on international loans, energy development loans, and agricultural loans. Between 1980 and 1984, 189 banks failed—an average of 38 per year—and the number of institutions insured by the Federal Savings and Loan Insurance Corporation fell by 20 percent. Furthermore, in mid-1984 one of the nation's largest banks had to be rescued by a multibillion-dollar package arranged by the federal regulatory agencies. During the same year, one of the nation's largest savings and loan associations ran into trouble.

Starting in early 1988, the Federal Reserve began to raise short-term interest rates. This together with weak conditions in the credit market strongly affected construction activity in California, which declined sharply by the second half of 1989. Long-term investments became less attractive, the economy slowed down considerably, and domestic out-migration sharply reduced the demand for housing. Housing prices started to fall.

In 1989, policymakers responded to sluggish growth (and lower inflation) with a more expansionary monetary policy. The Federal Reserve began to cut short-term interest rates in mid-1989 and then cut rates more aggressively in late 1990, for a cumulative decline of about 4 percentage points by December 1990. The U.S. economy started growing modestly and unevenly during 1992, when core inflation and interest rates were at their lowest levels in a generation.

Since 1992, the Federal Reserve has been successful in pursuing lower interest rates and keeping inflation under control. By the end of 1993, inflation was low and the public's expectations of higher prices declined significantly. Congress passed a significant long-term deficit reduction package, raising taxes and lowering spending for the next five years. A strong deficit reduction allowed the Federal Reserve to continue keeping interest rates low.

Macroeconomic policies in the mid-1990s helped both the U.S. and California economies by curbing inflationary expectations and influencing financial markets. For example, starting in mid-1996, monetary authorities signaled that they would control potential inflationary pressures from the tight labor markets (as low unemployment obligates firms to offer higher wages). In 1997, Federal Reserve policymakers publicly agreed that there was still room for economic growth driven by increases in productivity. The federal budget deficit decreased sharply and capital investment grew significantly as did labor productivity.

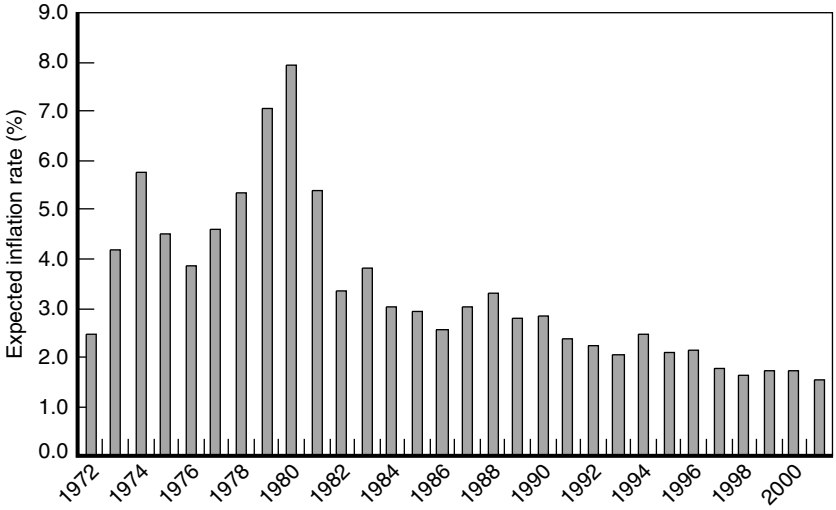
By the mid-1990s the performance of the U.S. economy was excellent. The economy was growing rapidly, the unemployment rate declined to its lowest level in 25 years, and inflation was not a problem. This was a period of low interest rates and easy credit. The stock markets were booming, fostered by optimism stemming from a series of technological breakthroughs in electronics, biotechnology, and communications. However, construction activity in both the United States and California did not pick up as fast as in previous recoveries (see Figures 2.6 and 3.1).

Why, despite record-low mortgage rates, were the housing markets, particularly in the single-family sector, not keeping pace with the accelerated economic growth? The trend observed after 1990 is largely the result of the unusual events that took place in three areas: (1) financial events and macroeconomic policies related to balancing the budget and interest rate adjustments targeted by the Federal Reserve, (2) economic changes that deeply affected the California economy, and (3) demographic changes in the population.

The weak recovery in new construction of the 1990s is at least partly explained by the public's expectations of significantly lower inflation resulting from increases in productivity, the way monetary policy was conducted, and the climate of optimism in the financial markets that drove the attention of investors to alternative markets. These expectations of low inflation and strong stock market returns made investments in real estate much less attractive relative to other investments. Not only did these macroeconomic factors curb expectations of housing appreciation, the demographic composition of

the state (as discussed in the next chapter) also reduced expectations of future returns on housing construction. Builders and developers integrated a demographically driven slowdown in the demand for housing in their projections of future real estate values.
Figure 3.2 illustrates the point that expectations of future inflation were decreasing.[1] Figure 3.3. shows the difference between long-term and short-term interest rates. Decreases in this difference are associated with lower levels of construction, as investors prefer shorter-term investments when the yields of longer-term investments decrease.[2] This difference shrank significantly after 1994 and remained unusually low until 2000, given the economic performance of the economy of these years.

The severity and length of the California recession together with the demographic composition of the state also help explain why construction in California took longer to recover. The U.S. recession that started by

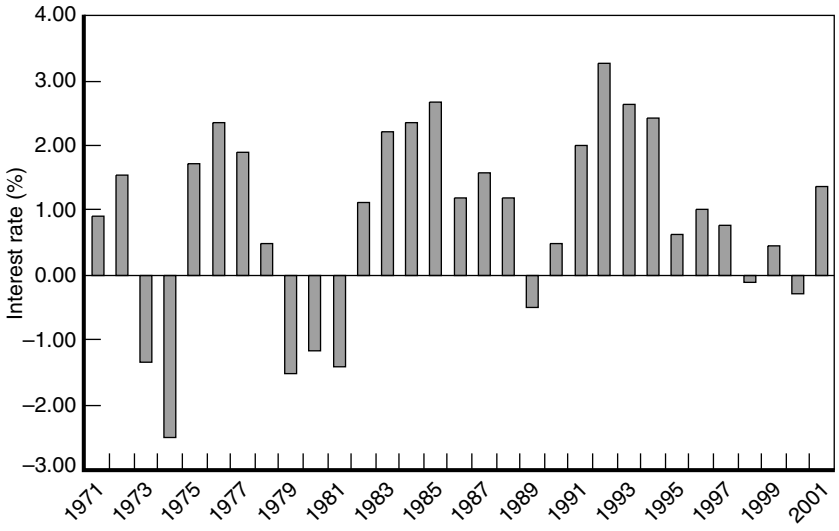


SOURCE: Livingston Survey (described in Appendix A).

Figure 3.2—Expectations of Inflation, 1972–2001

[1]The expectation variable is calculated as the median one-year-ahead expected inflation rates as reported by the Livingston Survey (see Appendix A)

[2]See Appendix A.



SOURCE: Federal Reserve.

Figure 3.3—Term Structure (Difference Between the Long-Term and Short-Term Interest Rates), 1971–2001

mid-1990 and finished in March 1991 had a deep and long-term effect on the state. For California, the 1990 recession was the longest recession since the Great Depression of the 1930s, whereas the U.S. contraction lasted less than a year. By the end of 1993, the U.S. economic recovery was well established, but the California economy was still weak. Consequently, California had a much greater downturn in construction activity than other states. Home prices dropped dramatically in high-priced areas including Los Angeles, San Diego, and Orange Counties.

The California recovery was slower than that in the rest of the country because it was hampered by several factors, including (1) large household and business debt burdens, (2) high vacancy rates in commercial real estate, (3) tight credit practices by many lenders, (4) stagnant growth in much of the rest of the world, reducing the demand for California exports, (5) a dramatic outflow of domestic migrants, and (6) a decrease in federal purchases, especially of military goods and services.

Because of California's high share of U.S. aerospace employment, the state was also particularly affected by the federal defense-spending cuts that were initiated in 1986 and intensified by 1989. Between the second quarter of 1990 and the second quarter of 1993, California lost 528,000 jobs—142,000 in the aerospace industry alone. Most of the job losses took place in Southern California. This sharp slowdown in economic activity also negatively affected residential construction, particularly in Southern California.

A Simple Housing Market Model

To systematically evaluate the effect of macroeconomic factors on housing markets in California, we develop a model of the state's housing markets.[3] Two specific features in our analysis make it different from previous research. First, we address the effects of macroeconomic factors on *both* sides of the market for new housing (demand and supply). Most of the studies dealing with the housing sector tend to concentrate on the demand side (Hanushek and Quigley, 1982; Mayer and Somerville, 1996). Second, unlike cross-sectional analyses of data for specific regions or cities, we use a time-series analysis because we seek to understand why new housing construction in California was more sluggish in the 1990s than in other periods of economic growth. This approach allows us to evaluate the influence of macroeconomic factors in explaining the annual variations in new housing construction in California. To control other influences on the housing market, such as quality of life characteristics and the influence of local policies, we divided California into ten regions sharing similar quality-of-life and local policy traits. The determination of each region is explained below. We focus on changes in new construction of *total* housing units, as measured by the number of permits issued for housing units. Some authors separate single-family construction from multifamily data in an effort to account for potential differences between the two. However, others do not separate these sectors because the substitution between single-family and multifamily units is very ambiguous (Boldin, 1993). We followed the latter approach. Finally, we developed an alternative econometric model using

[3]Our housing market model and the methodology are presented in Appendix B.

a panel analysis. The results of that model are consistent with the model presented here and are discussed in Appendix C.

Factors Affecting Housing Demand

We included the following macroeconomic factors affecting the aggregate demand for housing: changes in income, employment, and interest rates (cost of mortgages), actual and expected appreciation of real estate (housing price increases), and the price of alternative investments (stock prices). We also included controls for the growth and demographic composition of the population, although changes in these variables tend to occur more slowly.

Measures of income and unemployment levels are usually incorporated in typical housing demand equations. As income and employment increase, the demand for new housing is expected to increase. Higher current housing prices decrease the current demand for housing, whereas expectations of higher future housing prices increase demand. Our model describes expected appreciation or expected housing valuation as a function of expected inflation (see Appendix A).

Furthermore, because housing is both a commodity and an investment, real estate can be seen as a substitute asset for stocks, particularly when inflation is high. In periods of high economic growth, housing and stock prices tend to move together; however, in inflationary environments, houses have done better than stocks. Historically, stocks have better returns when inflation is lower (Wasserman, 1998). Thus, returns on stocks are also a determinant of housing demand because they are an alternative investment.

Typically, housing demand or supply equations use either mortgage rates or the prime rate as a proxy for the cost of credit. The higher the interest rate, the lower the demand for housing. We looked at the difference between the long-term and short-term interest rate because it measures the tightness of credit better than the level of either interest rate separately. It is also a better measure because a large spread between the long- and short-term interest rates indicates expectations of rising inflation. The relationship between this spread and the demand of housing is expected to be positive. (See Appendix A for a more complete explanation.)

Changes in population growth, the age structure of the population, and immigration also affect the demand for housing. As the population grows, more housing is needed, but a high proportion of children in the population leads to smaller increases in housing demand. These changes are analyzed directly and in more detail in the householder rate models of Chapter 4. Demographic changes also affect expectations of future housing prices—a key determinant of new construction.

In addition to macroeconomic and demographic forces, other factors influence the demand for housing in specific areas, such as the availability of amenities and the quality of life in a region. For example, housing is more expensive in areas with good weather, art centers, parks, cinemas, and low crime rates. However, measuring the effect of quality of life in the demand for housing is very difficult, and economists have studied these effects from different angles. With the exception of Gabriel, Mattey, and Wascher (1996 and 1999), who constructed a time-series of quality-of-life rankings, virtually all the research on quality-of-life estimates has focused on the relative ranking of localities at a single point in time. Most economists have entered the quality-of-life debate arguing that price differences across locations in wages or land rents should compensate for the differences in the quality characteristics of locations. Rosen (1979) and Roback (1982) inferred quality levels from differences in the price of housing across locations. Other authors following similar approaches include Hoehn et al. (1987), Blomquist et al. (1988), Gyourko and Tracy (1992), and Stover and Leven (1992). We control for differences in quality of life by dividing the state into regions with similar geographic and socioeconomic characteristics. The determination of these regions is explained later in this chapter.

Supply Determinants

The supply side of the housing market is also affected by changes in expected housing appreciation, changes in economic activity (unemployment), construction costs, interest rates, the availability of land, and local policies. Housing appreciation leads to higher levels of new construction.

Because the cost of capital is the main cost to developers and builders, interest rates and new construction are negatively related. The

higher construction costs are, the lower the level of new construction. High economic growth, lower stock prices relative to real estate prices, and expectation of higher returns on long-lived assets have a positive influence on the decision to invest in real estate.

The amount of available land for new residential developments also determines the amount of new construction in an area. Because we model changes in housing construction from one year to the next, we assume zero changes in available land (see the model description in Appendix A).

Local policies also influence the supply of housing. These policies include slow-growth ordinances and the preference of local governments for commercial rather than residential development because of public finance pressures. Using two surveys of 490 Californian cities and counties, Levine (1999) examined the effects of local growth-control enactment between 1979 and 1988 on net housing construction. He found that local growth-management measures displaced new construction, particularly rental housing. He also found that measures that limited available land or downsized existing zoning had stronger effects than other measures.

Ten Regional Housing Markets in California

To control differences attributable to quality of life and local policies, we grouped counties into ten regional markets and tested our model for each of these regions. These regions have common characteristics related to quality of life as well as the type of regulations (measures of growth control) enacted in their localities. Our regions are basically the same as those used by Glickfeld and Levine in their 1990 study on land use regulation. These regions and their constituent counties are

1. North Coast: Del Norte, Humboldt, Mendocino
2. North Central: Butte, Colusa, Glenn, Lake, Shasta, Siskiyou, Sutter, Tehama, Trinity, Yuba
3. North Eastern: Lassen, Modoc, Nevada, Plumas, Sierra
4. San Francisco Bay Area: Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, San Francisco

5. Stockton-Sacramento: El Dorado, Placer, Sacramento, San Joaquin, Stanislaus, Yolo
6. Central Coast: Monterey, San Luis Obispo, Santa Barbara, El Dorado
7. Central Inland: Fresno, Kern, Kings, Merced, San Benito, Tulare
8. Central Eastern: Alpine, Amador, Calaveras, Inyo, Madera, Mariposa, Mono, Tuolumne
9. Los Angeles–San Bernardino: Ventura, Los Angeles, Orange, San Bernardino, Riverside
10. San Diego

Following the Glickfeld and Levine regions allows us to qualitatively consider the role of land-use regulations as elaborated in their work.

Results of the Model of California Housing Markets

Our simple housing market model indicates that macroeconomic policies and global events explain a large part of the annual changes in new construction in California and in specific regions. Most of the explanatory factors showed the expected signs, but not all factors turned out to be significant in each region.[4] Table 3.1 summarizes the results of the model, showing the relationship (positive or negative) between demographic and macroeconomic factors and changes in new home construction for each of the ten regions and the state.[5] Results are shown for the lagged effects model.[6] Because not all determinant factors affect demand and supply of housing in all California regions at the same speed or intensity, lags are necessary to understand those effects. For

---

[4]Our results are solid, considering that (1) we are dealing with first differences rather than levels, (2) the short historical period for our time-series analysis, and (3) the limitations imposed by data quality (such as county unemployment rates and costs).

[5]Appendix Table A.2 shows the coefficients of each determinant and the level of significance of each factor included in that estimating equation.

[6]The results obtained when we used lags were significantly better than the ones obtained when we related current changes in the determinants of housing to current changes in new housing construction (shown in Appendix Table A.1).

Table 3.1

Effect of Explanatory Factors on Changes in New Housing Construction: Results of the Macroeconomic Model, by Region

Explanatory Factor	North Coast	North Central	North Eastern	Bay Area	Stockton-Sacramento	Central Coast	Central Eastern	Central Inland	Los Angeles–San Bernardino	San Diego	California
Change in population	++	++	++	+	++	++	++	++	+	–	+
Change in income	++	(a)	+	+	++	–	+	++	+	+	++
Lagged new construction	– –	– –	– –	– –	– –	– –	– –	– –	–	–	–
Change in unemployment	–	– –	–	– –	– –	– –	–	– –	–	–	–
Change in difference of long-term/short-term interest rate	+	+	++	++	++	++	–	++	++	++	++
Change in appreciation (expected inflation)	+	+	++	– –	+	+	+	–	–	–	–
Change in real stock prices	–	– –	– –	–	– –	– –	– –	– –	–	–	– –
Change in real cost	–	–	– –	–	– –	–	– –	– –	–	+	–
R squared (variation explained)	0.67	0.78	0.78	0.76	0.85	0.77	0.90	0.72	0.77	0.76	0.83

SOURCE: Appendix Table A.1.

NOTES: ++ means that the relationship is positive and statistically significant. + means that the relationship is positive but not statistically significant. – means that the relationship is negative but not statistically significant. – – means that the relationship is negative and statistically significant.

[a]Variable not included because of colinearity with real cost.

example, some regions may respond faster than others to changes in interest rates, income, or expected appreciation. Some factors may affect some regional housing markets more rapidly than others. Increases in the difference between the long- and short-term interest rates—a measure of credit availability—may stimulate new construction in the following year if, for example, the decisions to build are made one year before construction, or perhaps 18 months or more before the date of the permit issue. Thus, changes in the price of alternative investments, expected appreciation, and even the level of income may not affect construction inmediately but one year or more later. Moreover, population changes may affect the market more rapidly by changing market prices.

First, we discuss our findings for each of the factors in the model, and then discuss the results more generally.

Population growth did not turn out to be a significant factor in the general equation for California, but it was a statistically significant factor in various regions. Results did not change significantly when we introduced the number of non-Hispanic adults rather than total population. (The demographic model presented in the next chapter evaluates the effects of California population on housing demand in more detail.)

Income appeared to be significant in the explanation of changes in new construction in California and various regions. The Los Angeles–San Bernardino area was one of the exceptions. Income is expected to be a short-run determinant of residential construction. Many authors omit this factor completely from their models on investment on residential construction (see Grebler and Maisel, 1963). However, authors such as Klein (1966) suggest that the correct role for income is through its short-term effect on the value of housing. If builders start their plans during a recession and income begins to rise rapidly, builders may alter their original plans and could expand or speed their existing construction. On the demand side, higher levels of income are positively related to housing purchases.

Lagged new construction (or the change in the housing stock) was a significant factor in the explanation of changes in new construction.

Higher increases in the housing stock in the previous year are associated with less current new construction.

Changes in new construction were closely related to changes in the business cycle, as measured by changes in unemployment. Increases in unemployment lead to less construction.

Costs played a significant role in explaining changes in new construction in only four regions. Our cost measurement showed the expected negative association with new construction (negative signs) in most of our equations. In other words, everything else constant, higher building costs lead to less new construction.

Our results corroborate the hypothesis that developments in financial markets determined, in part, the slower pace of new construction in the 1990s. All regional equations showed a negative association between stock prices and changes in new construction. In both California and most regions, stock prices appear to be statistically significant in their association with changes in new construction. Results indicate that investors see real estate and stocks as substitutes. A more refined analysis of this relationship could provide a deeper insight on this issue.

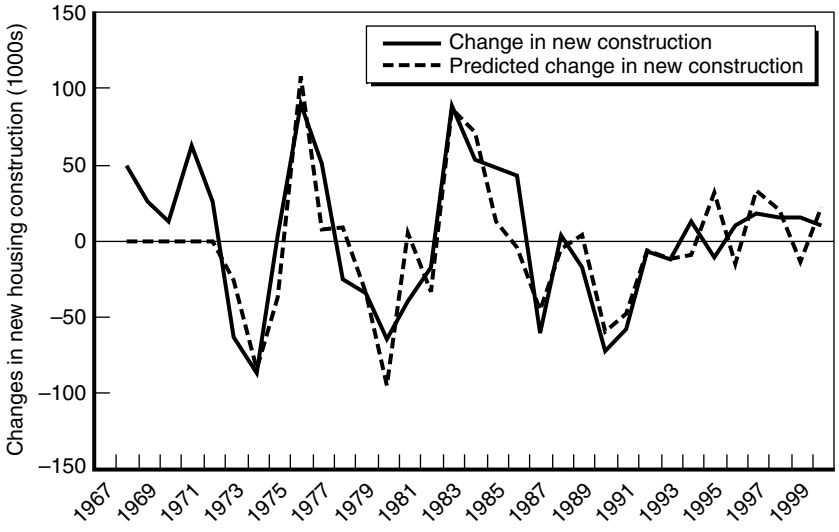
The association between annual changes in credit conditions (the difference between long-term and short-term interest rates) and annual changes in construction was statistically significant in most of the equations.

The influence of expected appreciation (measured by expected inflation) appeared to be less significant than we would have expected. One possible explanation is that the effects of the difference between long-term and short-term interest rates is already accounting for the effect of changes in expected appreciation. Another possibility is that our proxy for expected inflation is a better measure for the United States as a whole than for California (see Appendix A).

Results of our model for the state of California as a whole and for ten California regions suggest that more than 80 percent of annual changes in new construction in California is explained by the influence of macroeconomic policies and demographic changes (see the last row of Table 3.1). This means that there is a large proportion of the annual variation in construction beyond the control of state policy. The

explained portion varies by region, ranging from 67 percent for the North Coast, 76 percent for the Bay Area, 77 percent for the Los Angeles and San Bernardino area, 85 percent for the Sacramento-Stockton area, and 90 percent for the Central Eastern area. Figure 3.4 shows actual changes in residential new construction and projected values from our California housing model. Generally, our housing market model does a good job of predicting annual changes in new construction, including the low levels recorded in the 1990s.

The model performed well particularly in central regions and areas that did not appear to have major shortages. For the most populated regions, such as the Bay Area, San Diego, and the Los Angeles–San Bernardino regions, where the state has the highest cumulative housing shortages, the results are slightly weaker. Perhaps this indicates that housing markets in these regions are heavily determined by local characteristics as well as the influence of local policies and growth controls.



SOURCE: CRIB and time-series model.

Figure 3.4—Comparison of Actual Changes in California New Housing Construction and Model Fitted Values, 1967–2000

Summary

In this chapter, we discussed macroeconomic forces that help determine housing construction and developed an econometric model of new housing construction in California. In short, the results suggest that macroeconomic events of the 1990s can explain much of the slowdown in new housing construction in the state. Our results were consistent statewide and for ten regions of the state, although they were not as robust in some of the state's largest metropolitan areas.

4. Can Demographic Changes Explain California's Housing Markets?

Population growth and housing growth go hand in hand: The more people added to the state, the greater the housing demand. However, not all population growth is equal when it comes to housing demand. Some groups require more housing than other groups. Large increases in the child population and small increases in the adult population (i.e., more children per adult) will lead to less housing demand than will small increases in the child population and large increases in the adult population. Adults form new households, children do not. Similarly, immigrants are more likely to live in extended families. Thus, the amount of housing consumed by immigrants is less, on average, than the amount of housing consumed by U.S. natives.[1]

In this chapter, we explore the demographic determinants of California's housing demand. First, we examine demographic trends that shape California's housing demand. We discuss trends in the most important of those demographic trends, including population change itself, age structure, gender, nativity, and marital status. Next, we construct a householder rate model. The model estimates the probability that a person with a certain set of characteristics will be a householder.[2] High probabilities translate into high housing demand, and low probabilities imply low housing demand. The demographic characteristics that determine householder rates include age, race and

[1]Average household sizes are higher for immigrants even where housing costs are lower than U.S. averages.

[2]Each occupied housing unit has one householder. The householder is the person in whose name the housing unit is owned or rented. If more than one person owns or rents the unit, only one member of the household is chosen as the householder. A householder is also referred to as a head of household.

ethnicity, nativity, gender, and marital status. (The complete model and data are described in Appendix B.) Finally, to quantify the demographic component of housing demand in California, we develop simulations of housing demand using the householder rate model. In contrast to business cycle effects, demographic changes tend to be felt more strongly in the long run, as annual fluctuations are not large for most demographic measures. Thus, our focus here is on long-term changes.

The householder rate model does have limitations. First, changes in vacancy rates are not explicitly considered in the model. In California, some of the increase in the number of occupied households between 1990 and 2000 occurred as formerly vacant housing units became occupied. Second, a restricted supply of housing may prevent some people from moving to California. These potential migrants cannot be measured by this model.

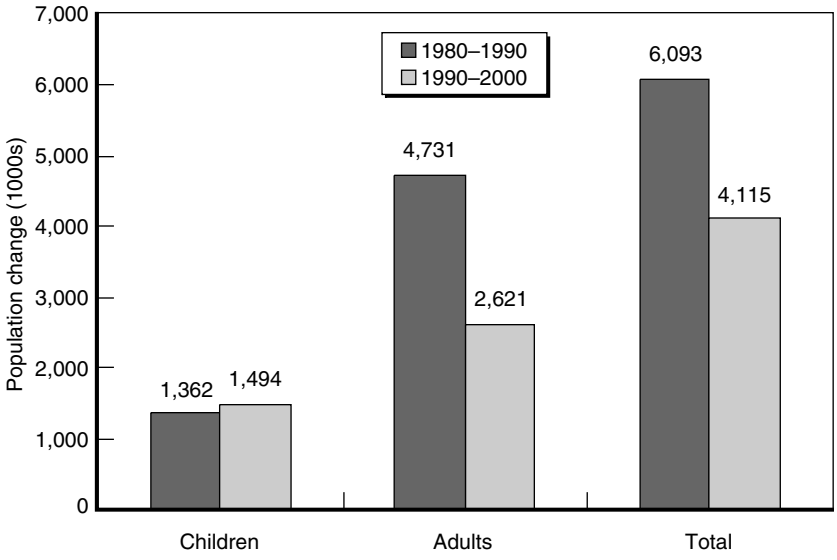
The results suggest that the nature of California's population growth explains much of the apparent lack of new housing in the state. In particular, in the 1990s a relatively fast growth in child and immigrant populations did not translate into the same level of housing demand as did past population growth, which was driven by domestic migrants and baby boomers aging into prime household formation years. Without controlling for demographic characteristics, householder rates have *risen* in the United States but *declined* in California. Once we control for demographic determinants of household formation, however, differences between California and the rest of the United States are substantially reduced. Indeed, once we control for demographic characteristics—age being the most important—the direction of change is the same in both the United States and California; in both places, householder rates declined in the 1980s. Moreover, with demographic controls, temporal patterns of change in the 1990s are virtually identical between California and the rest of the United States. These findings indicate that California's household formation rates were not particularly different from those of the rest of the nation during the 1990s. Thus, although the increase in new housing units might not have kept pace with overall population growth, the nature of the state's population growth can explain a large part of the apparent discrepancy. From a demographic

standpoint, California's housing markets do not appear to be functioning differently from those in the rest of the United States.

Demographic Determinants of Demand

Population Growth

California's population growth slowed considerably in the 1990s. On a percentage basis, the 1990s were the state's slowest-growing decade since records have been kept (see Figure 4.1). Indeed, official growth in the state was only slightly higher than that in the rest of the United States. Absolute gains in the state's population were large—over 4 million people from 1990 to 2000. In the 1980s, however, the state added over 6 million new residents, and thus absolute gains in the 1990s were over 30 percent lower than those of the 1980s. If we adjust official census tabulations of the population for the respective undercounts in 1980, 1990, and 2000, population growth during the 1990s appears even lower relative to that of the 1980s: Total population change was



SOURCE: Authors' calculations of decennial census data.

Figure 4.1—Growth in Child and Adult Populations in California, by Decade

3.8 million in the 1990s, compared to 6.2 million for the 1980s. (Official census counts place the decennial change at 4.1 million in the 1990s, and 6.1 million in the 1980s.) Slower population growth relative to that of previous decades led to less housing demand in the 1990s than in the 1980s.

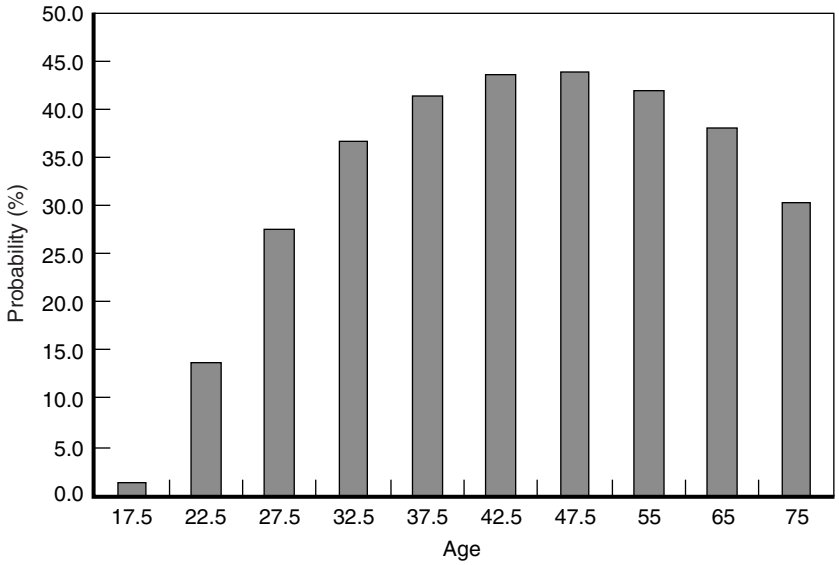
Age

The number of children in California continued to grow substantially during the 1990s, but increases in the number of adults were much lower than during the 1980s. During the 1990s, California's child population increased 19 percent, compared to only 12 percent for adults in the state. This pattern is in contrast to the 1980s, when the state's adult population grew faster than the state's child population. Remarkably, absolute population growth for children was greater in the 1990s than in the 1980s, whereas population growth for adults from one decade to the next declined by almost half (Figure 4.1). Thus, not only did lower population growth during the 1990s lead to less demand for new housing than in the 1980s, but the relatively large share of children in that growth also led to less demographic-based demand.

Among adults, the likelihood of forming a household is dependent on age (Figure 4.2). Household formation increases dramatically as people age from young adulthood (people in their 20s) to middle ages (adults between the ages of 35 and 44). Population increases in these age groups will lead to greater housing demand than increases in other age groups. In the 1980s, population growth in California was strong in these age groups, as baby boomers entered these prime householder years (Figure 4.3). During the 1990s, however, the much smaller baby bust cohorts replaced the baby boom cohorts, and the population of 20 to 35 year olds actually declined.

Gender

Women are less likely to be householders than men—primarily because most married couples list the husband as the householder on census forms rather than the wife. However, over time women have become more likely to form their own households, both because the share of never-married mothers has increased and because of past (before



SOURCE: Authors' calculations of 2001 CPS data.

Figure 4.2—Probability of Being a Householder in California, by Age, 2001

the 1990s) increases in divorce rates (Myers, 1992).[3] Still, by 2000 only 30 percent of women age 15 and over were householders compared to over 60 percent of men.

Population growth in California in the 1990s consisted of more women than men: Among people age 15 and over, population growth totaled 1.6 million for females, compared to only 1.4 million for males. This is in direct contrast to the 1980s, when the population of males age 15 and over increased 2.5 million, compared to only 2.1 million women. More research is necessary to understand why the gender ratio of California's population growth switched from primarily male to primarily female, but it could be related to the Immigration Reform and Control Act of 1986. This act provided legal status for formerly undocumented immigrants, an overwhelmingly male group. After gaining legal status in the late 1980s, many formerly unauthorized

[3]Among married couples, women have been increasingly listed as the householder, although the percentages are still low.

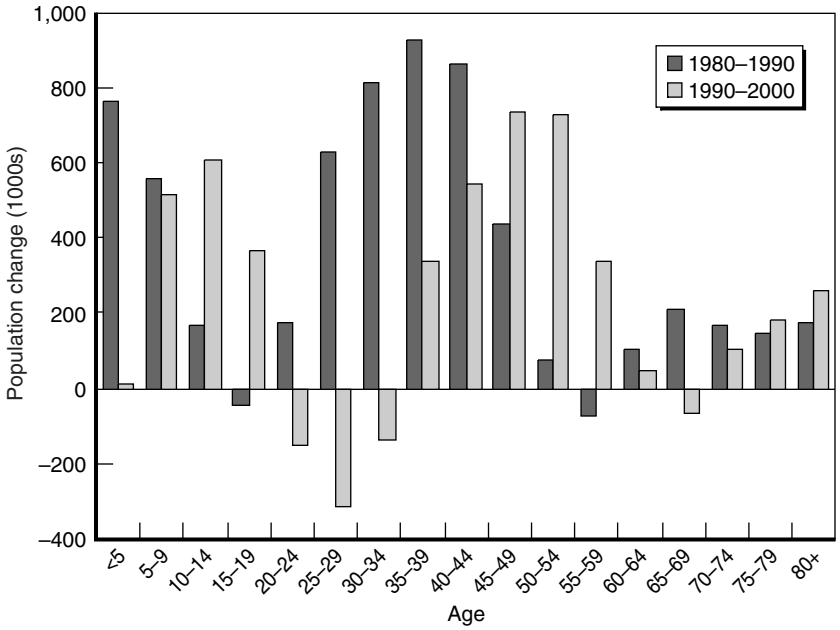


Figure 4.3—Change in California Population, by Age Group and Decade

immigrants were joined in the United States by their family members, including wives. Whatever the cause, this shift to a greater increase in female than male population growth in the 1990s led to less housing demand than if the increase were more composed of men. Finally, increases in the ages at which men and women marry have implications for housing demand. These factors are taken up below.

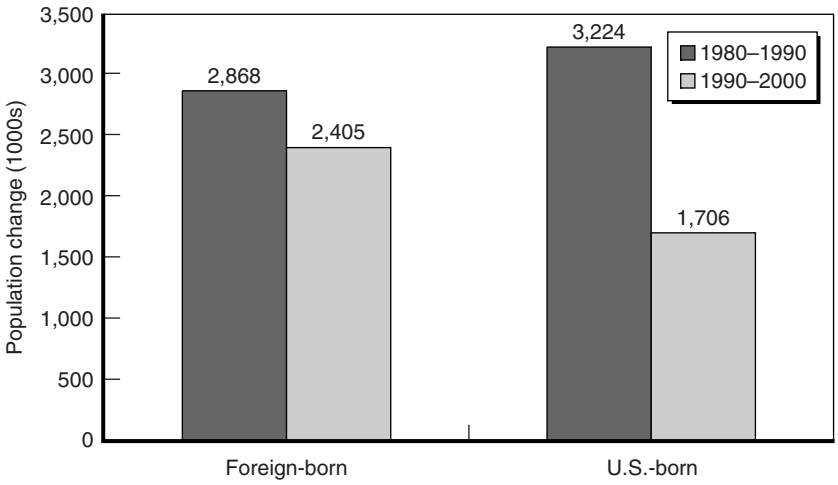
Nativity and Ethnicity

Population growth attributable to immigration leads to less housing consumption than population growth among U.S. natives. Foreign-born residents of California tend to live in larger families and households than U.S. natives. In 2000, the average number of people in households headed by foreign-born persons was 3.5 in California, compared to 2.5 for households headed by U.S. natives.[4] In the 1980s, California

[4]Authors' calculations based on 2000 Census Supplementary Survey data.

experienced large increases in both foreign-born and U.S.-born populations, as natural increase, domestic migration, and international migration to the state were large. In the 1990s, international migration to and natural increase in California remained strong, even as the state lost many domestic migrants to other states. The result, as shown in Figure 4.4, was a much greater relative increase in the foreign-born population than the U.S.-born population in the 1990s. This change contributed to a decline in the demand for new housing.

Changes in the ethnic composition of the state's population, which are strongly related to migration flows, also dampened new housing demand. For example, non-Hispanic whites are more likely to live alone than other groups and thus tend to consume more housing. Relatively few international migrants to California are non-Hispanic whites, whereas large proportions of California's domestic out-migrants during the 1990s were white. As a consequence, California's non-Hispanic white population declined during the 1990s after having increased during the 1980s. This decline had a dampening effect on the demand



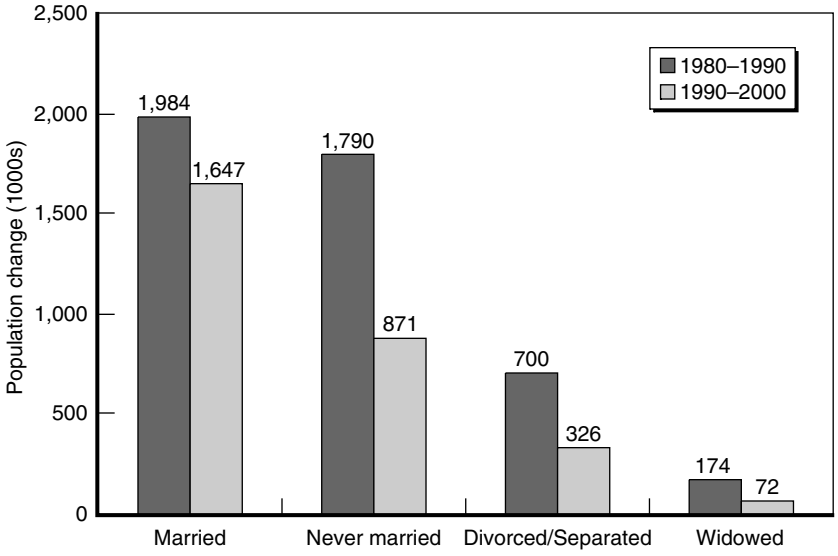
SOURCE: Authors' calculations of decennial census data.

Figure 4.4—Change in Foreign-Born and U.S.-Born Populations in California, by Decade

for new housing in the 1990s. California's largest population increase in the 1990s occurred among Hispanics, the ethnic group with the lowest householder rates.

Marital Status

Marital status is also an important determinant of household formation and thus housing demand. Divorced and widowed adults are much more likely to form their own households than never-married adults. Married *couples* have high household formation rates, but married *individuals* tend to have lower household formation rates than divorced or widowed adults; it takes two to make a couple, and only one is considered the householder. During the 1990s, the number of married adults increased almost as much as in the 1980s (Figure 4.5). In contrast, increases in the number of adults of other marital statuses were much lower in the 1990s than in the 1980s. The sharp drop in number of divorced adults is partly a reflection of lower divorce rates in the



SOURCE: Authors' calculations of decennial census data.
NOTE: Children younger than age 15 are excluded.

Figure 4.5—Decennial Change in Population in California, by Marital Status and Decade

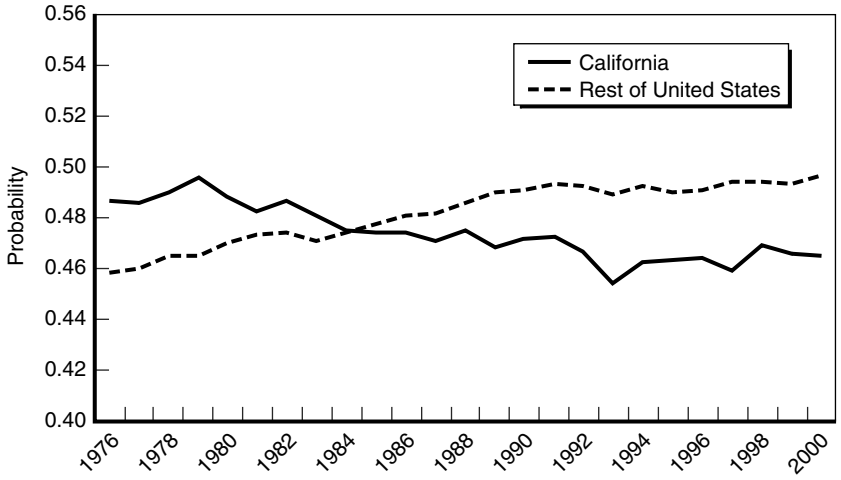
1990s. These changes in marital status in the 1990s tend to dampen housing demand.

Householder Rate Model: Temporal Trends in the Probability of Forming a Household

The demographic changes discussed above have consequences for the demand for housing in California. To quantify these consequences altogether and evaluate temporal changes in household formation, we develop statistical models to estimate the probability that an individual has formed his or her own household. The probability of being a householder, also referred to as the householder rate, depends on an individual's demographic characteristics. Higher probabilities are associated with more housing, lower probabilities with less housing. Because householder rates, and thus housing consumption, vary with demographic characteristics, California's unique demographic changes have important implications for housing demand in the state. We compare temporal trends in California with those in the rest of the country. To consider the role of various demographic factors, we adjust those trends first by controlling for temporal differences in the demographic composition of the population and second by controlling for differences between California's population and that of the rest of the country. Details of the data and methods can be found in Appendix B.

Temporal Trends in Householder Rates

Across time and without controlling for demographic factors, householder rates have been moving in opposite directions in California and the rest of the nation. In California, rates have been decreasing, whereas in the rest of the United States they have been increasing. By the start of the 21st century, householder rates in California were lower than at any time in the past quarter century. At the same time, householder rates in the United States were higher than at anytime in the past 25 years (Figure 4.6). In other words, persons age 15 and over are less likely to be the head of a household in California in 2001 than in 1976, whereas that probability has risen in the rest of the United States. The declines in California and increases in the United States occurred

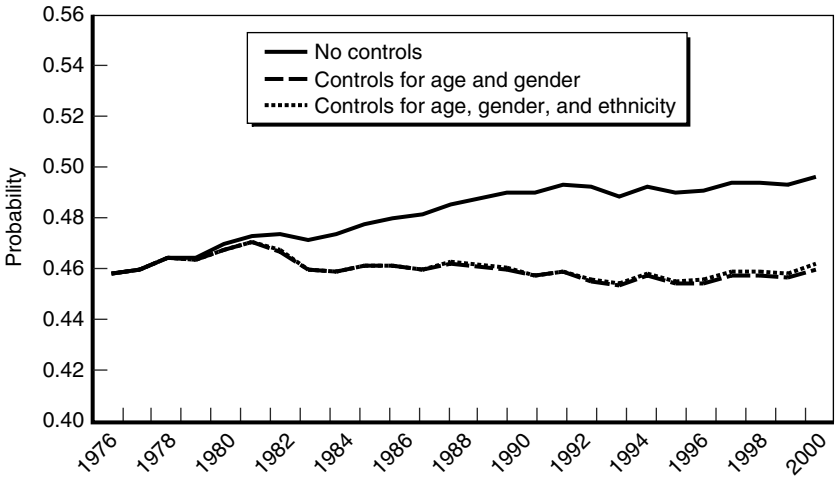


SOURCE: Authors' simulation from CPS data for 1976 to 2001.
NOTE: Children younger than age 15 are excluded.

Figure 4.6—Probability of Being a Householder in California and the Rest of the United States, 1976–2001

almost entirely in the late 1980s. In both the United States and California, householder rates changed little in the 1990s. This difference in overall householder rates translates directly into more people per household in California than in the rest of the nation. Many have concluded that this difference reflects California's unique housing crisis.

However, the pattern of change in householder rates in the United States is somewhat different when we control for demographic changes in the population over time. These demographic controls allow us to evaluate the effect of various demographic determinants on the probability of being a householder. Controlling for gender, age, and ethnicity, we observe much less temporal change in householder rates in the rest of the United States than in the uncontrolled model (Figure 4.7). Among the demographic shifts that have led to higher householder rates in the nation, the most important factor is age. In 1975, all baby boomers were children or young adults (younger than age 30), ages at which householder rates are relatively low. By 2001, baby boomers were ages 37 to 55, ages at which householder rates are high. Simply put, in most of the nation, housing consumption outpaced growth in the

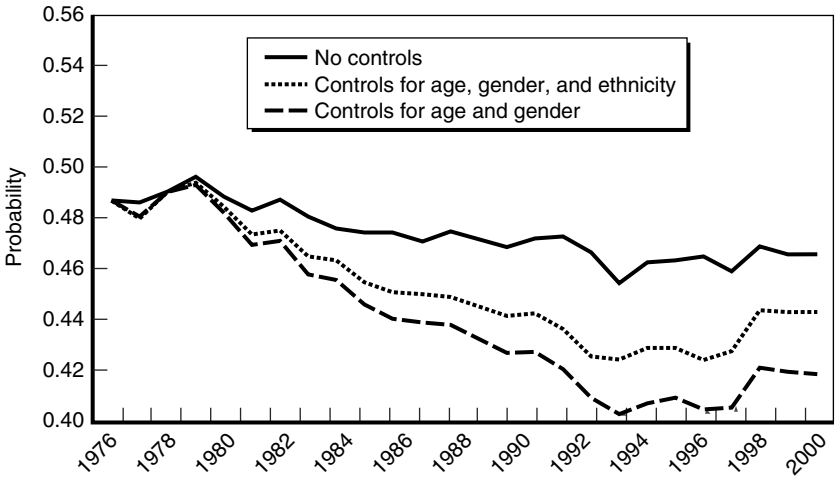


SOURCE: Authors' simulation from CPS data for 1976 to 2001.
NOTE: Controls maintain the demographic composition of the rest of the United States in 1976.

Figure 4.7—The Effect of Demographic Changes on the Probability of Being a Householder in the Rest of the United States, 1976–2001

nation's population because baby boomers entered their prime years of household formation. If we control for changes in age structure over time, householder rates in most of the United States would have changed very little over the past 25 years. In contrast, changes in the ethnic composition of the nation's population have not played a very important role. This is at least partly because those changes have not been very pronounced in most of the nation. Thus, much of the increase in householder rates from the late 1970s to the late 1990s in most of the United States is simply an artifact of demographic changes in the nation's population, specifically the aging of the baby boomers.

Controlling for demographic factors in California also changes temporal patterns in overall householder rates. Controlling for age and gender, householder rates in the state declined tremendously from the late 1970s to the early 1990s (Figure 4.8). Were it not for the aging of the baby boomers, householder rates would have declined even more than they actually did. That is, once we control for age, we see even more dramatic declines in the probability of being a householder over



SOURCE: Authors' simulation from CPS data for 1976 to 2001.
NOTE: Controls maintain the demographic composition of California in 1976.

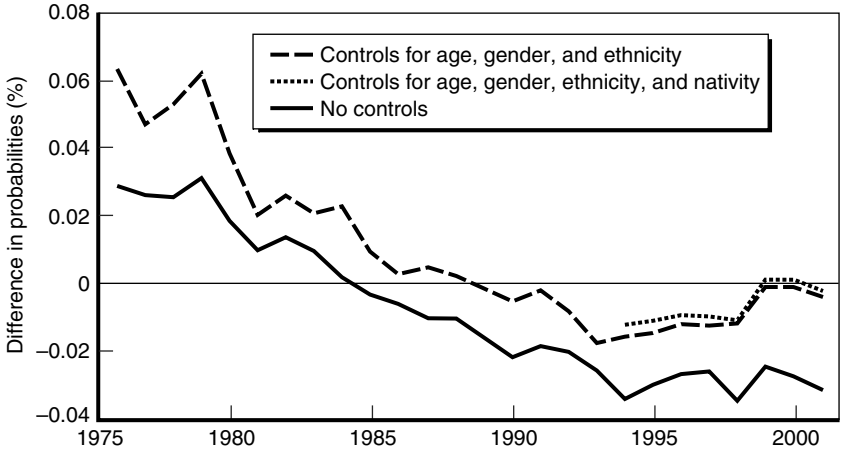
Figure 4.8—The Effect of Demographic Changes on the Probability of Being a Householder in California, 1976–2001

time than in the model with no controls. This strong effect of the baby boom is similar to that observed for the rest of the United States. Unlike the case in the rest of the nation, however, the racial and ethnic composition of the state's population also affected the temporal pattern of change in householder rates. In California, the state's changing racial and ethnic population mattered almost as much as age. Declines in the probability of being a householder are *less* pronounced once we control for race and ethnicity. This means that part of the decline in householder rates in California could be attributed to a demographic shift in the state's population from racial and ethnic groups that have relatively high householder rates to groups that have relatively low householder rates. Thus, declines in householder rates in California would have been even more severe were it not for the baby boomers aging into prime householder years. However, those declines would have been less substantial if the racial and ethnic composition of the state had not changed so much.

Differences in Householder Rates Between California and the Rest of the United States

Differences in householder rates between California and the rest of the country provide an indicator of housing consumption in California and the rest of the country. When the difference is positive, Californians could be said to be consuming more housing in comparison to people in the rest of the country, and when the difference is negative, Californians are consuming less. In the late 1970s, California had substantially *higher* overall householder rates than the rest of the nation (Figure 4.9, no controls). By the mid-1990s and continuing to 2001, the state had householder rates that were substantially *lower* than in the rest of the United States.

The dramatic decline in householder rates in California relative to the rest of the nation is still evident when we control for demographic differences between California and the rest of the United States (Figure 4.9, controls). In the late 1970s, Californians were much more likely to be householders than people of similar age, gender, and ethnicity in the



SOURCE: Authors' simulation from CPS data for 1976 to 2001.
NOTE: These lines represent householder rates in California minus those in the rest of the United States.

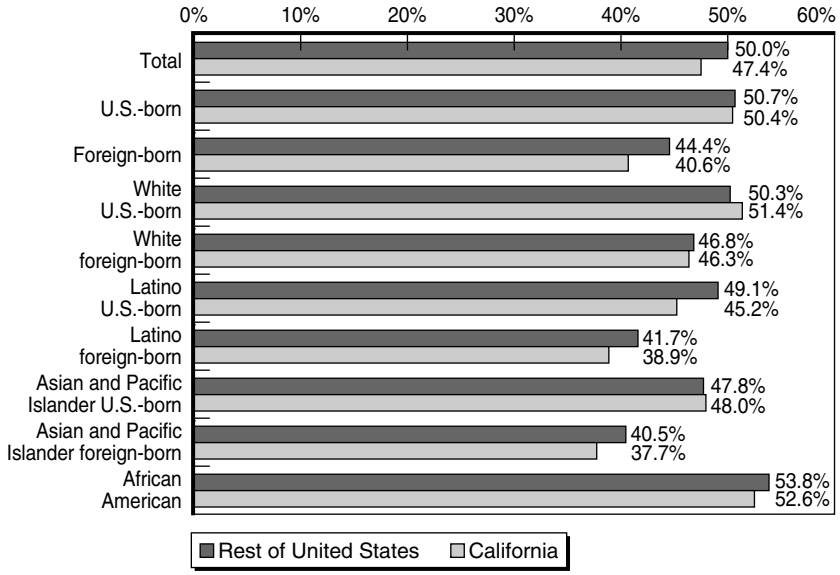
Figure 4.9—Difference in Householder Probabilities Between California and the Rest of the United States

rest of the nation. By 1993, householder rates were lower in California, even controlling for demographic differences. However, householder rates increased in California relative to rates in the nation in the late 1990s, so that by 1999 householder rates in California were similar to those in the rest of the nation once we control for demographic differences. In other words, when we compare Californians to their demographic counterparts in the rest of the nation, the probability of being a householder is about the same in both places. Thus, California has changed from a place with unusually high householder rates—given its population composition—to a place with householder rates that are what we would expect given the state's population composition in comparison with the rest of the country. Today, California's demography explains much of the apparent lack of housing consumption in the state relative to the nation.

The importance of the state's unique demography is evident when we examine householder rates for population subgroups. Overall, householder rates are almost 3 percentage points lower in California than in the rest of the United States (Figure 4.10).[5] However, for U.S.-born adults, householder rates are similar in California and the rest of the United States (50.7 percent in California compared to 50.6 percent in the rest of the United States). Indeed, among U.S.-born groups, whites and Asians in California actually have *higher* householder rates than their counterparts in the rest of the nation. California's lower overall householder rates are due to lower rates among U.S.-born Latinos and the foreign-born. In particular, recent Mexican immigrants have extremely low householder rates throughout the United States. Those rates are even lower in California than in the rest of the United States (25.6 percent versus 30.0 percent, not shown in Figure 4.10). Combined with California's relatively high share of Mexican immigrants, these low rates explain much of California's apparent shortfall in householder rates.

---

[5]The Census Supplementary Survey has higher householder rates in the rest of the United States and lower ones in California than the 1999 or 2001 CPS. Differences in age-standardized rates are 3.1 percent in the Census Supplementary Survey, versus 1.7 and 2.3 in the 1999 and 2001 Current Population Surveys.



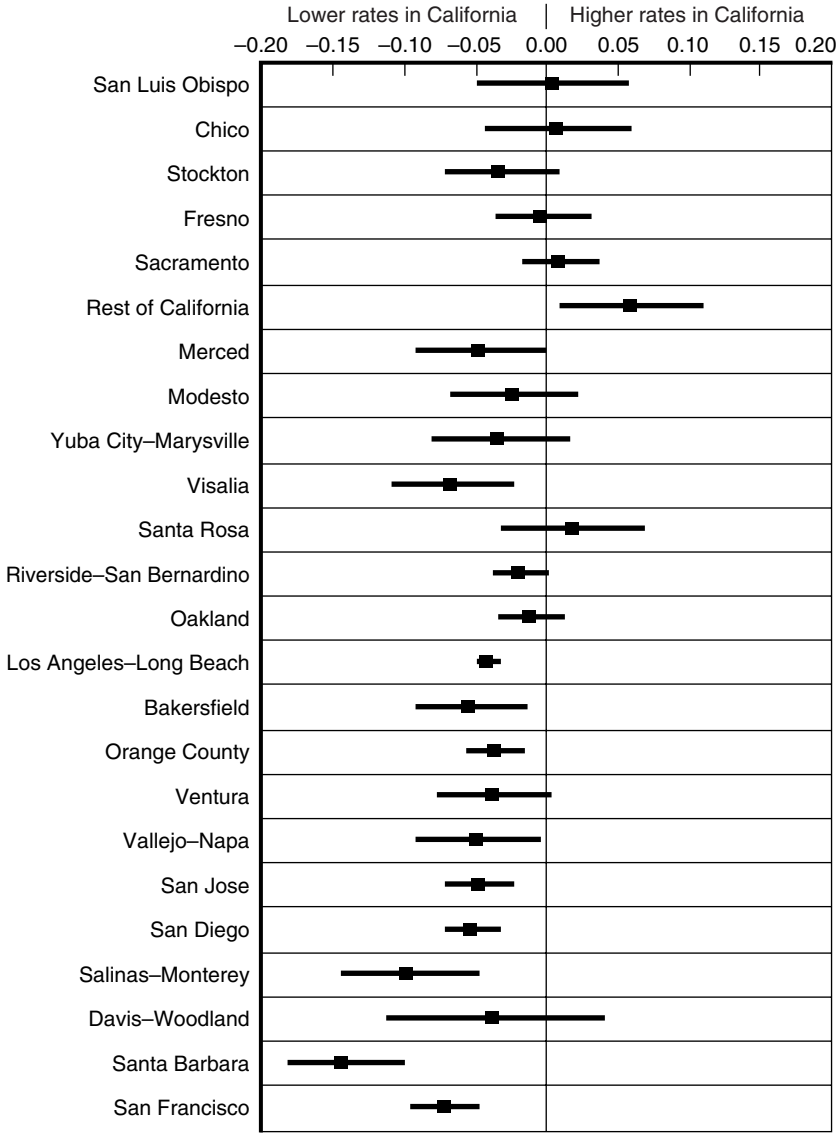
SOURCE: Authors' estimates based on 1999–2001 CPS and the 2000 Census Supplementary Survey.

Figure 4.10—Age-Standardized Householder Rates in California and the Rest of the United States, by Ethnicity and Nativity, 2000

Householder Rates in California Metropolitan Areas

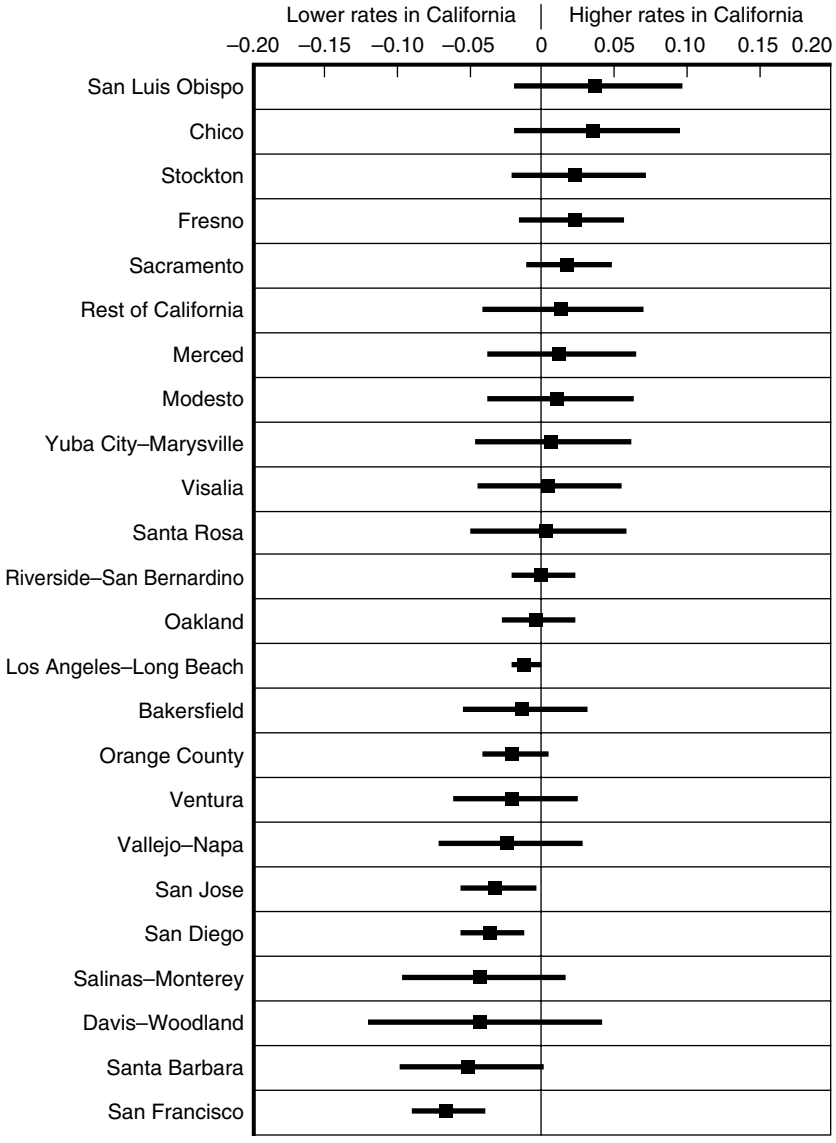
Householder rates vary across California's regions as well. Thus, although we find that demographic factors explain much if not all of the difference in householder rates between California and the rest of the United States, the picture for specific metropolitan areas within the state might also differ. Using the Current Population Surveys from 1999 to 2001, we compare householder rates for primary metropolitan statistical areas in California with householder rates in the rest of the country. Appendix B describes the methods used to develop the estimates.

Without controlling for demographic differences, the probability of being a householder is lower in most of California's metropolitan areas than in the rest of the nation (Figure 4.11a). Among the state's larger metropolitan areas, only Sacramento and Fresno appear to have householder rates that are similar to those in the rest of the country.



NOTE: Figure shows point estimates and 90 percent confidence intervals.

Figure 4.11a—Difference in Householder Rates: California Metropolitan Areas Less the Rest of the United States, No Demographic Controls, 2000



NOTE: Figure shows point estimates and 90 percent confidence intervals.

Figure 4.11b—Difference in Householder Rates: California Metropolitan Areas Less the Rest of the United States, with Controls for Age, Gender, Ethnicity, and Nativity, 2000

Thirteen metropolitan areas had householder rates that were significantly lower than rates in the rest of the country, including Los Angeles–Long Beach, San Francisco, San Diego, Orange County, Riverside–San Bernardino, and San Jose.

Controlling for demographic factors, however, a different picture emerges. In 11 metropolitan areas, householder rates are either *higher* than or no different from rates in the rest of the country, and in another six metropolitan areas, householder rates are not significantly different from those in the rest of the United States (Figure 4.11b). Only six metropolitan areas had lower estimated householder rates than in the rest of the country when we control for demographic composition. Nonetheless, those six include some of the state's largest metropolitan areas: Los Angeles–Long Beach, San Francisco, Orange County, San Diego, and San Jose. In those metropolitan areas, adults are less likely to be householders than their demographic counterparts in the rest of the country. The effect of the demographic controls varies by metropolitan area. In Los Angeles–Long Beach, the controls erase most of the difference in householder rates between the metropolitan area and the rest of the nation, whereas in San Francisco the demographic controls make little difference. This, of course, is due to the nature of the population in these two metropolitan areas. Los Angeles–Long Beach has a much larger share of demographic subgroups that tend to have low householder rates, especially foreign-born Latinos, than does the rest of the country or San Francisco.

Estimating the Shortage of Occupied Housing Units

We use the results of our statistical analyses to estimate the state's shortage of occupied housing units by comparing householder rates in California to those in the rest of the United States. We do so once without controlling for demographic differences and again controlling for demographic differences. In essence, we answer the following questions:

- How many occupied housing units would California have if it had the same *overall* householder rates as those in the rest of the country?

- How many occupied housing units would California have if it had the same householder rates by *demographic subgroup* as in the rest of the country?

The difference between the number of actual occupied housing units in California and the number that the state would have if it had the same householder rates as in the rest of the nation, controlling for demographic subgroup, is taken as an estimate of California's housing shortage. We develop statewide estimates and estimates for specific metropolitan areas in the state. To ensure greater precision with large sample sizes, we restrict the estimates to decennial census years. Because such data were not yet available for 2000 when this report was written, we use the Census 2000 Supplementary Survey in conjunction with Current Population Survey data to develop estimates for 2000. Details of the approach are in Appendix B.

It is important to keep in mind that these are estimates of *occupied* housing units rather than *total* housing units. The two differ by the number of unoccupied housing units, including those for seasonal use as well as those for rent or sale. To the extent that California's vacancy rates are low and have declined over the past decade, these estimates understate the shortage of total housing units; that is, householder rates are higher in California than they would be if the vacancy rate had not declined during the 1990s. This could be remedied by assuming some ideal occupancy rate—something we do not pursue here.[6] It is also important to keep in mind that householder rates in the rest of the United States are taken as the standard for comparison. One could argue that those rates are problematically low, especially for certain groups, and embody a national housing shortage.

The results, as shown in Figure 4.12, indicate that California has gone from a position of housing excess in 1970 and 1980 to increasingly

---

[6]Vacancy rates for rental units in California declined from 5.9 percent in 1990 to 3.7 percent in 2000. Statewide, these vacancy rates are at "normal" levels, typically regarded as being in the range of 3 to 5 percent (Landis et al., 2000). In the Bay Area and the counties of Santa Cruz, Monterey, Santa Barbara, and Ventura, rental vacancy rates in 2000 were lower than 3 percent. Since 2000, however, vacancy rates have risen substantially in Bay Area counties (U.S. Department of Housing and Urban Development, 2003).

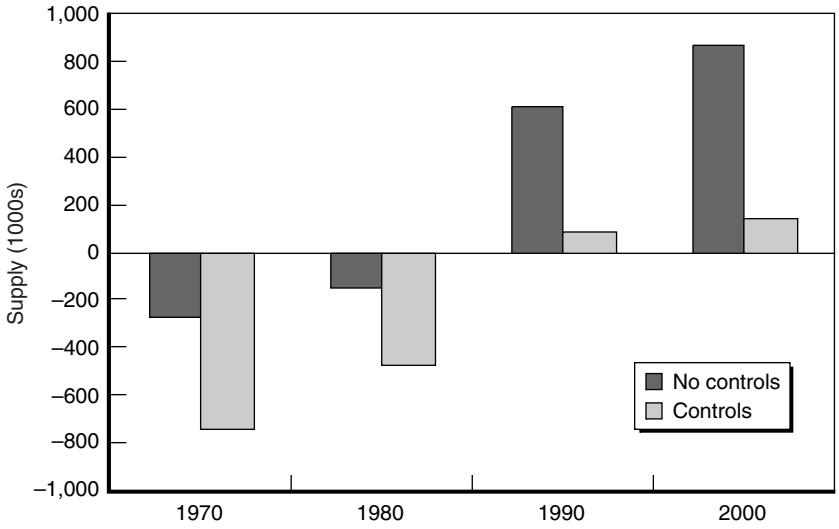


Figure 4.12—Estimates of the Undersupply of Housing in California Based on Householder Rates in California and the Rest of the United States, by Decade

large shortages in 1990 and 2000. The extent of the shortage depends very much on whether we control for differences between California's population and that of the rest of the country. With no controls for the demographic composition of the state's population, California's housing shortage in 2000 is estimated to be 870,000 units. Most of that shortage was generated in the 1980s. During that decade, California went from an excess of 147,000 housing units to a shortage of 610,000 units, a difference of 757,000 units. In comparison, during the 1990s the shortage worsened by another 260,000 units.

However, when we control for demographic differences between California's population and that of the rest of the country, the shortage appears much smaller—about 138,000 units. This suggests that most (84 percent) of the apparent shortage in California's occupied housing units can be attributed to demographic differences between California and the rest of the nation. We also find that most of this shortage was generated in the 1980s rather than the 1990s. The increase in the shortage of occupied housing units, controlling for demography, was 55,000 units during the 1990s. In contrast, during the 1980s the state went from an excess of 476,000 occupied housing units to a shortage of

83,000 based on the model with demographic controls. The increase in number of occupied housing units in California during the 1990s was very close to the number that would be necessary to maintain the differential that the state started with in 1990 (Figure 4.13). Even without demographic controls, California's housing shortage is much more a creation of the 1980s than the 1990s (Figure 4.14).

The shortage of occupied housing units in California is concentrated in the state's largest metropolitan areas. Still, many of the state's metropolitan areas, including some larger metropolitan areas such as Sacramento and Fresno, exhibit little or no shortage in housing units (Figure 4.15a). When we take into account the demographic composition of each metropolitan area, the shortages are not so severe as when we do not adjust for age, gender, ethnicity, and nativity (Figure 4.15b). Demographic controls are especially important in Los Angeles. For example, the shortage in the Los Angeles metropolitan area decreases from a point estimate of 314,000 units to 101,000 units when we control for Los Angeles' unique demographic composition. In contrast, adjusting for the demographic composition in the San Francisco metropolitan area makes little difference, as that metropolitan area's

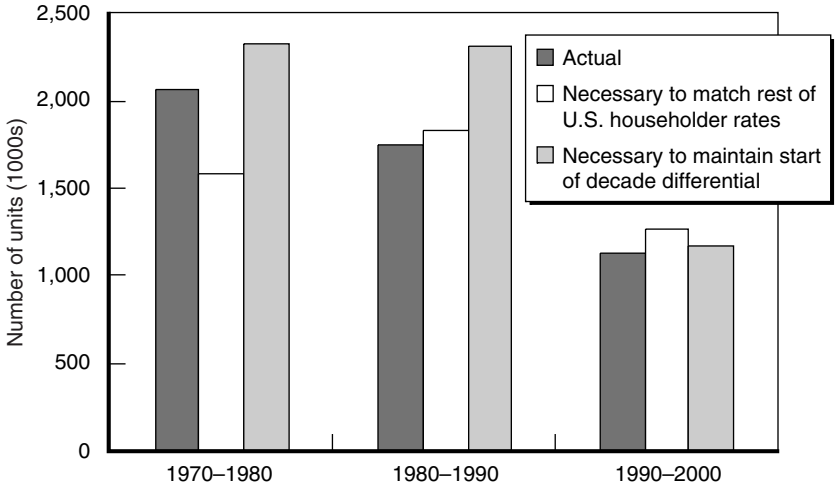


Figure 4.13—New Occupied Housing Units, by Decade: Actual Versus Necessary for California (Controlling for Demographic Differences)

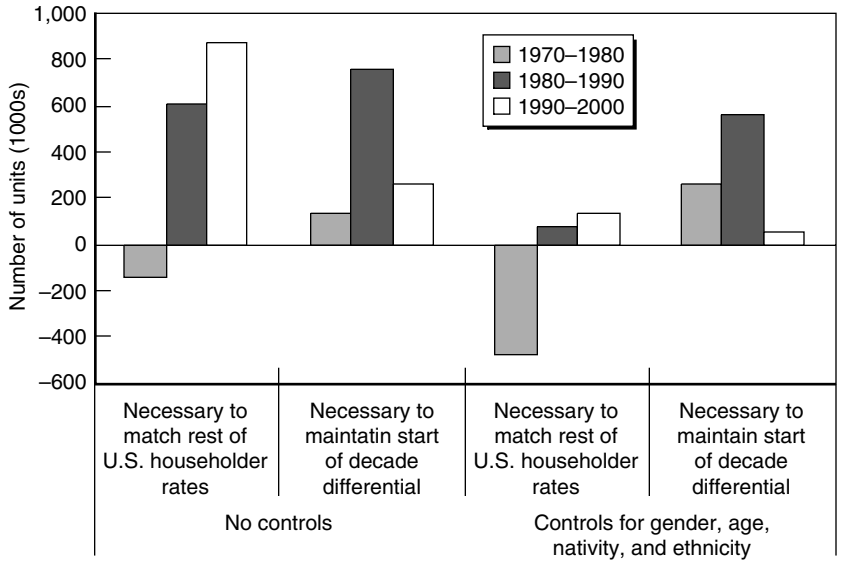


Figure 4.14—Decennial Shortage of New Occupied Housing Units

population does not have large shares of subgroups with low householder rates.

These estimates of California's housing shortage appear conservative when compared with oft-cited numbers. For example, the California Building Industry Association estimates that the state needs 220,000 new housing units each year to keep pace with population growth but that the state is producing only a little over half that amount (Weintraub, 2002). The California Department of Housing and Community Development projects that California will need at least 200,000 new housing units each year to 2020 (Landis et al., 2000), but the state has averaged less than 117,000 new permits per year between 1990 and 2001 (California Budget Project, 2002). The California Budget Project puts the shortage of affordable units at 651,000 statewide and 289,000 in Los Angeles County (California Budget Project, 2002). A Fannie Mae Foundation report places the shortfall in new housing during the 1990s at 548,000 units—an estimate that was derived from an approach similar to the householder rate approach developed in this report except that it does

not adjust for demographic composition (Myers and Park, 2002).[7] Indeed, none of the estimates of the shortage of new construction in California adequately consider the demographic composition of the state's growth.

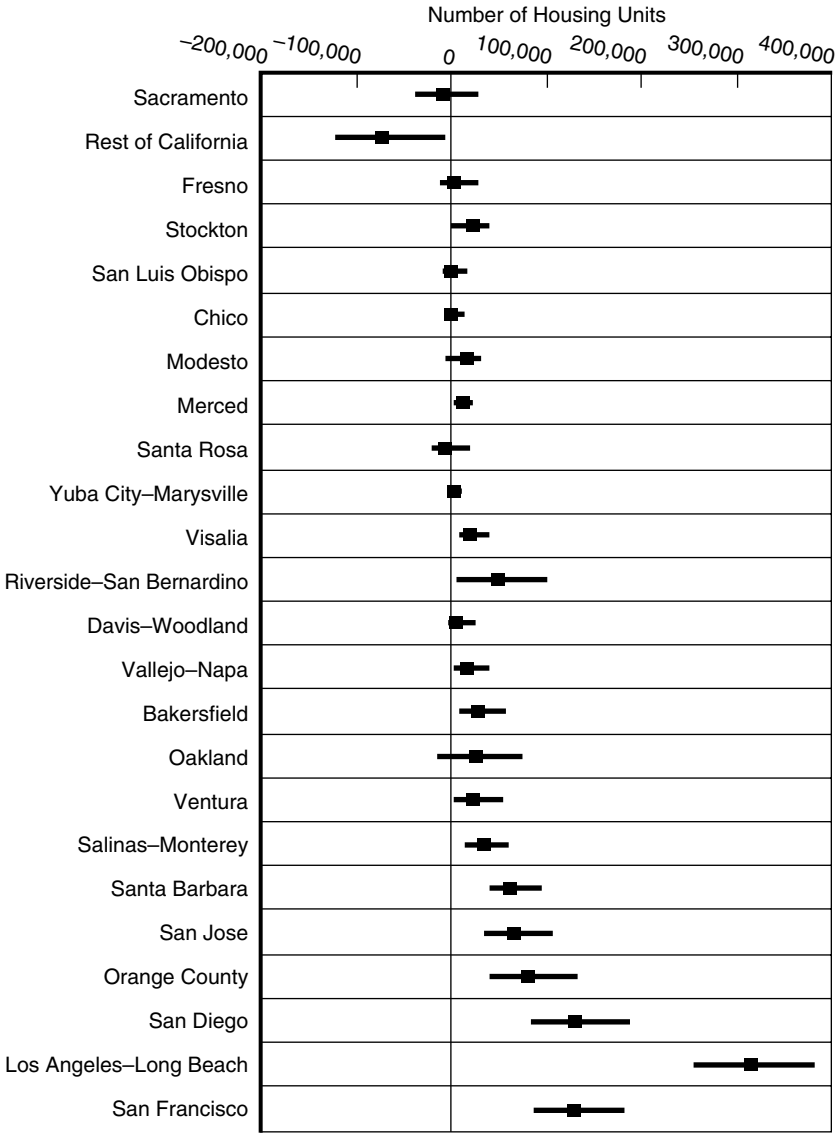
Our estimates also suggest that the creation of the shortage primarily occurred in the 1980s rather than the 1990s. Many analysts note that the increase in new housing units during the 1980s was almost twice as great as in the 1990s, arguing that the shortage in new housing units is primarily a 1990s phenomenon (e.g., Myers and Park, 2002). We find that the increase in occupied housing units in California during the 1980s did not keep pace with the state's strong population growth in general and the changing age structure of the state in particular. Our models suggest that, given the large numbers of baby boomers aging into the prime householder ages during the 1980s and with tremendous population growth, the number of new occupied housing units necessary to match householder rates in the rest of the United States was a great deal higher than actually achieved in the state. Although the shortage did indeed worsen in the 1990s, the relative contribution to the shortfall was much smaller in the 1990s than in the 1980s.

Summary

In this chapter, we have shown that California's relatively anemic increase in new housing units during the 1990s is at least partly due to the nature of the state's population growth. In particular, population growth slowed in the 1990s compared to the 1980s and growth became more concentrated among groups—children and immigrants, for example—that consume less housing than other groups. We find evidence of housing shortages in key areas of the state, but these shortages are lower than commonly cited figures.

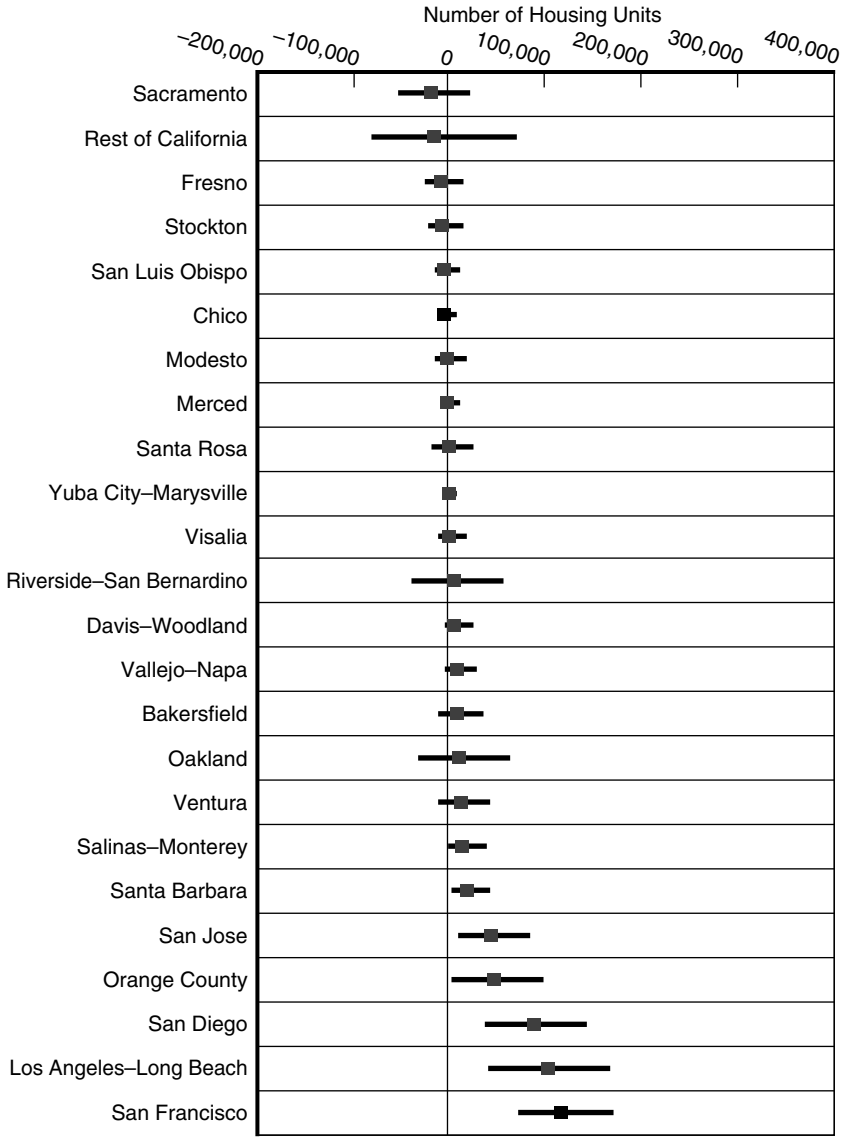
---

[7]Also, even our unadjusted householder rate model restricts the analysis to people age 15 and older, whereas the Fannie Mae Foundation report uses an average household size approach that includes all members of the household regardless of age. To the extent that much of California's population growth was among children who do not form their own households, the Fannie Mae approach will overstate housing needs even relative to the householder rate model without controls.



NOTE: Negative values reflect an oversupply; positive values reflect an undersupply.

Figure 4.15a—Estimates of the Undersupply of Occupied Housing Units in California Metropolitan Areas Based on Householder Rates in California and the Rest of United States, No Demographic Controls, 2000



NOTE: Negative values reflect an oversupply; positive values reflect an undersupply.

Figure 4.15b—Estimates of the Undersupply of Occupied Housing Units in California Metropolitan Areas Based on Householder Rates in California and the Rest of United States, Controls for Age, Gender, Ethnicity, and Nativity, 2000

5. Conclusion and Policy Considerations

This report evaluates the effect of business cycles and demographic factors on the demand and supply of housing in California. We found that more than 80 percent of annual changes in construction in California can be explained by the influence of macroeconomic effects and demographic changes, leaving small room for local and state policies. Our results suggest that the sluggish response of construction to the latest economic recovery could be explained by:

- Slower population growth in the 1990s compared to the 1980s, which slowed the demand for housing. The nature of that growth, too, explains much of the apparent lack of new housing in the state, with immigrants and children accounting for most of this growth, but consuming proportionately fewer housing units than other demographic groups.
- The severity and duration of the economic recession that took place in 1990 in California, leading to low housing valuation.
- The Federal Reserve's monetary policy, which decreased the public's expectations of future inflation and caused the price of long-lived assets to decline.
- High returns on alternative investments (such as stocks and mutual funds) that led to a decrease in new housing investment.
- Decrease in builders' and developers' expectations of profits on new housing construction, because of both changes in future inflation and interest rates and a slowdown in housing demand resulting from demographic changes.

Although our analysis runs through the 1990s, there is little reason yet to believe that the results would be altered by very recent events.

Since 2000, housing supply has continued to increase while job growth has stopped. Declining interest rates have fueled further price gains in most regions and have countered the severe job and income losses in the Bay Area. Most analysts expect housing prices to decline (in real terms) once interest rates rise from 40-year lows, and some have argued that the Bay Area is especially prone to declines (Leamer, 2002).[1]

Our results suggest that the housing supply crisis may be overstated—at least in the context of the entire state—and that our position today is perhaps better, and certainly not much worse, than where it was in 1990. The housing cycle in the 1990s is quite different from the three previous cycles but this is also true at the national level—although the falloff in production is not nearly as pronounced as it is in California. Indeed, some of the same arguments over whether there is a housing shortage or a housing bubble are also taking place at the national level. Housing prices have not fallen despite the recession that began in 2001, raising the specter of a housing bubble akin to the stock market bubble. Other observers are much more concerned about the slower rate of housing production in this cycle and warn of an ongoing shortage nationwide. A recent analysis, however, suggests that even if housing prices nationally have outpaced their rental equivalents, a few years of flat home prices and normal rent increases would bring the two markets back into alignment.[2] Any policy responses to problems in the state's housing market need to be mindful of both the important connection between underlying macroeconomic and demographic forces and real estate investment, as well as the regional nature of housing markets.

Our findings suggest that there is not a large *statewide* crisis in housing production in California. This is not to say that there are no legitimate concerns in the state with regards to housing. In this report,

---

[1]Of the Bay Area, Leamer (2003) states: "Expect a long agonizing decline in prices like we had in LA in the early 1990s."

[2]This analysis (Krainer, 2003) also demonstrated the importance of the after-tax mortgage rate in the owner cost of housing. Not only do declining mortgage rates reduce the new owner's cost but, through refinancing, reduces the ongoing cost of ownership for existing homeowners. Both effects serve to prop up housing prices even in a weak economy.

we have not considered other issues such as housing affordability for low-income families, the condition of rental housing, or overcrowding.[3] Previous research suggests that the state does have problems in these areas. For example, in our earlier report we found that overcrowding occurs more frequently in California than in the rest of the United States but also that poverty and demographics were greater determinants of overcrowding than were high housing prices (Moller et al., 2002). Overcrowding is much more common in poor areas of the state with relatively low-priced housing than it is in expensive places such as the Bay Area.[4]

The mismatch between the type of new housing that is constructed and the needs of the newest Californians is a particularly important topic for future research. Given that houses are long-lived assets, rapid demographic change can increase demand for a particular type of housing unit that easily outstrips new supply. Much of the population increase in the 1990s came from an increase in family size, primarily among low-income immigrant families. Such families are typically renters, and the rental housing stock in many areas is not sufficiently oriented toward large households. In addition, as shown in Chapter 2, production of rental (i.e., multifamily) housing fell much more dramatically than did production of single-family housing.

Although the amount of new housing units produced in California is largely explained by macroeconomic and demographic factors, housing shortages do exist in the state's largest metropolitan areas: the Bay Area, coastal Los Angeles (Los Angeles, Orange, and Ventura Counties), and San Diego County. The magnitude of the shortages is much lower by our estimates than those put forth by others, and even some of these shortages may be worked off after several years of job losses (most dramatically in the Bay Area) and the completion of new housing. Prices in these regions are higher partly because of their strong desirability as

---

[3]We addressed this issue in a previous report (Moller et al., 2002).

[4]Using 1990 census data, Myers et al. (1996) also found that demographic factors and income were more important than housing affordability in explaining differences in overcrowding between metropolitan areas.

places to live—their amenity value—and partly because of obstacles to new supply. These obstacles can be regulatory or financial, or both. There are ongoing battles, even in the midst of a widely reported housing crisis, by groups who oppose most new greenfield development (often termed "sprawl") and by those who oppose most infill development in their communities (often referred to as the NIMBY[5] syndrome. These actions serve to reduce the supply of new housing in areas where developers have found demand for it.

Two of the regions of California with evidence of housing shortages are also the least receptive to new housing construction. According to a PPIC survey of city managers in 1998, respondents in the Los Angeles region and the Bay Area were much more likely to state that residential growth issues were "often" or "always" controversial (Lewis and Neiman, 2000). They were also more likely than respondents in other regions to state that there was little or no vacant land available for new development (Lewis and Barbour, 1998).

Using GIS and mapping techniques, researchers in a study for the California Department of Housing and Community Development (HCD) concluded that sufficient vacant land exists statewide for 20 years of expected population growth, but restrictions in some key urban areas—including some Bay Area and South Coast counties—are likely to present serious obstacles in the future (Landis et al., 2000). According to the authors of the HCD study

> The key constraint on the State's development capacity is political, not environmental. As this analysis reveals, the careless adoption of even moderately-limiting urban growth boundaries by high-growth counties in the Bay Area and Central Valley would constrain land supplies below the levels required to meet future housing production needs.

In many cases, voters have directly restricted new housing growth. Dozens of local jurisdictions in California have passed measures to limit growth (Glickfeld and Levine, 1992; Lewis and Neiman, 2000; Landis et al., 2000). Solimar Research Group has documented 389 slow-growth ballot measures in California from 1986 through 2000, with 59 percent of them passing. Of course, ballot measures are not the only way citizens

[5]The acronym stands for Not In My Back Yard.

express their displeasure with new developments. City councils often reflect the lack of support for new housing of their constituents and have simply failed to allow new housing developments or delayed their approval long enough for developers to drop their proposed projects. A recent study of housing affordability in the nation's metropolitan areas found that in those areas with the least affordable housing, land-use controls were the most compelling explanation for high relative prices (Glaeser, Gyourko, and Saks, 2003). It also demonstrated that there was little change in affordability by metropolitan area between 1989 and 1999—supporting our conclusion that much of what is driving concerns about new housing supply is cyclical.

There can be financial obstacles to new housing supply as well. In response to charges that litigation costs were contributing to the sharp decline in multifamily construction, the state legislature recently proposed several bills to restrict construction defect litigation and encourage remediation efforts over litigation. Even without opposition from local residents, infill development can often be more expensive to construct than the market will bear. A recent study undertaken for the California Department of Housing and Community Development (Landis, 2003) categorizes the barriers to infill production. Although a number are political in nature, several are purely economic: a shortage of adequate lot sizes, greater need for infrastructure upgrades, high land prices, lack of economies of scale, and greater design costs to work within existing land uses. Even for greenfield development, there can be sizable expenses in addition to direct construction costs. Most local jurisdictions in California have resorted to the use of development fees and special districts to recoup the cost of new housing (new housing leads to increased demand for schools, parks, and basic infrastructure). A study of these fees in Contra Costa County reported typical costs of $20,000 to $30,000 per new housing unit (Dresch and Sheffrin, 1997) and news reports pegged fees in Santa Clara County at over $30,000 per unit. Even jurisdictions not facing pressure from residents to restrict growth can be reluctant to allow large-scale development that might trigger more demand for public services. Most city managers believe that the additional tax revenues generated from new housing development do not

cover the full cost of the public services they require (Lewis and Barbour, 1999).

The state is active in California's housing markets through a number of funding programs. These programs are generally targeted to meet specific housing needs and are not necessarily designed to increase the supply of new housing as a whole. Although it is beyond the scope of this research to evaluate the efficacy of such programs, their sheer number and size (in terms of expenditures) suggest that they do affect California's housing markets, and at least some lead to greater housing construction than would otherwise occur in the state.

The undersupply of new housing in the Bay Area, coastal Los Angeles, and San Diego County is cause for concern. Increasing employment in those areas in the late 1990s exacerbated the jobs-housing imbalance and led many workers to live in areas far removed from their jobs. High and increasing housing prices reflect both existing amenities and the shortage in those areas, and these prices can create affordability problems for middle- and low-income households that do not already own their own homes.

Any policy intended to increase the supply of new housing in the state's largest metropolitan areas must address the inherent conflict between existing homeowners and renters (as well as new entrants to the region). Current homeowners reap direct financial benefits from any restriction on new housing supply that raises the price of existing homes. But their opposition to new development does not necessarily reflect personal financial interest alone. Many homeowners have made their largest financial investment in a community with certain characteristics, and their local government is expected to reflect their concerns. New infill development can increase traffic congestion, overwhelm the capacity of local public facilities, and require an increased tax burden on current residents. Although often opposed by statewide and even national groups, new greenfield development can sometimes conflict with the priorities of current residents as well. Part of the character of their local community may be proximity to open spaces and scenic views that would be lost to new housing development. In light of these forces, the problems facing potential new residents are often less apparent and urgent to most policymakers.

Policies could be implemented to make new residential development a more financially attractive option to local officials. These policies could come in the form of both rewards and punishments. For example, the state could impose financial penalties on jurisdictions that do not provide their "fair share" of new housing.[6] These penalties could include withholding of funds for missing housing goals as well as rewards for meeting them (Lewis, 2003). Jurisdictions that meet their state-determined share of new housing could be rewarded financially by having the state offset some of the costs of providing new infrastructure. Reducing local reliance on sales tax dollars and increasing local access to property tax revenue might also increase the attractiveness of new housing to local officials. Of course, there have been no shortage of proposals and recommendations to reallocate property and sales tax revenues to reduce the fiscalization of land use, and the specific details of any legislation will determine the support and opposition it faces. If implemented, such a policy will help illuminate just how much of an influence the fiscalization of land use has really had on housing supply.

Citizen opposition to new development might be an even greater impediment to new housing construction in the Bay Area and coastal Los Angeles. Citizens can express their opposition to new development in myriad ways, from passing initiatives that limit growth to electing city councils that restrict growth to intervening in the planning and approval process for new developments. When combined with the fiscal concerns regarding housing versus other land uses, such citizen opposition often squelches new housing. Policies to address citizen opposition must consider the source of that opposition. Opposition to new housing is not necessarily based on housing per se but originates from concerns about the effect of the new development on the environment and existing infrastructure. Specifically, concerns are often raised about increasing traffic congestion, loss of open space, and overcrowding of schools and other public facilities. Policies that address these concerns could lessen opposition to new growth. In some cases, educating the public about the

[6]Compliance with the state's housing element does not seem to result in an increased supply of housing (Lewis, 2003).

consequences of *not* planning and allowing for new housing could change local opinion.

Finally, policies could be enacted to address the jobs-housing imbalance by focusing on jobs rather than housing. For example, the state could encourage job growth in areas with relatively abundant housing (especially in inland areas adjacent to the state's most undersupplied regions). A common response across the country to population pressures has been the growth of once outlying regions as economic centers in their own right. As a natural outgrowth of job growth in the inner Bay Area, satellite job centers have bloomed in Pleasanton and Livermore; further job growth in these locations could provide shorter commutes for residents in neighboring counties. For cities and counties with housing shortages, the state could reward jurisdictions that meet some standard of zoning for adequate housing when approving new employment-generating land uses and penalize those jurisdictions that do not meet such goals. The Jobs/Housing Balance Incentive Program is an example of this kind of effort, providing financial rewards for new housing construction in high job growth areas where housing has not kept pace with construction.[7]

All of these policy options are controversial and would create winners and losers. Our primary finding, that the state's housing shortage is smaller than previously thought and concentrated in three regions—albeit the state's most populous regions—suggests that any policies designed to address the housing shortage should focus on the situations in those regions. How the regional housing markets fare when interest rates rise from their historic lows—and how high the Bay Area's housing prices remain if job growth is delayed much longer—will clarify how much new intervention may be required. An important, related policy question is whether the state should provide incentives for more housing construction in the built-out and environmentally protected coastal areas or instead increase housing by supporting infrastructure development in less built-out areas adjacent to existing job centers. In the final analysis,

---

[7]In "high employment demand areas," the program provides incentives of $1,300 per unit for new units above some baseline standard (California Department of Housing and Community Development, 2003). In the context of developer fees of $30,000 or more per unit, this may not provide a large incentive in the tightest markets.

the conflict between local control of land-use decisions and increasing new housing construction is not one that is likely to be resolved any time soon.

Appendix A

A Housing Market Model

Our housing model used to assess the influence of macroeconomic factors on California housing was summarized in a single equation that explains residential new construction. This equation is derived from a model of residential housing markets in equilibrium and relates changes in new construction to changes in the factors that determine the levels of housing demand and supply. The effects of governmental economic policies and other worldwide influences are measured through changes in interest rates, unemployment, income, expected inflation, and stock prices. These are factors that affect both the demand and supply of new housing. Our housing model takes into account the fact that the adjustment of new housing construction to changes in housing demand is not instantaneous.

A Simple Model for the Housing Market

The demand for housing (Dh) is determined by

$$Dh = Dh(Ph, Ps, E(p), Pop, I, Y, A) \qquad (A.1)$$

where:

Ph	=	price of housing
Ps	=	price of stock
E(p)	=	expected price of housing, or expected inflation
Pop	=	population variables (structure of the population, immigration, population growth)
I	=	interest rates
Y	=	income
A	=	amenities.

The supply of housing (Sh) is determined by

$$Sh = Sh(Ph, Ps, E(p), I, C, Pol) \qquad (A.2)$$

where

Ph	=	price of housing
Ps	=	price of stock
E(p)	=	expected price of housing, or expected inflation
I	=	interest rates (mortgage rates)
C	=	construction costs
Pol	=	policy variables.

The optimal amount of housing is found when supply and demand are in equilibrium:

$$Sh^* = Dh^*. \qquad (A.3)$$

However, equilibrium is not instantaneous. It takes time for changes in supply to meet changes in demand. We introduce a simple stock adjustment model, where the equilibrium stock of housing is Sh*(Ph, Ps, E(p), I, C, Pol). We represent the adjustment process as

$$Sh_t - Sh_{t-1} = g(Sh_t^* - Sh_{t-1}) \quad 0 < g < 1. \qquad (A.4)$$

Equation (A.4) specifies that the change in Sh will respond only partially to the difference between the desired stock of housing and the past value of stock of housing. The adjustment coefficient g determines the rate of response. Substituting for Sh* in Equation (A.4), and solving for Sh_t yields

$$Sh_t - Sh_{t-1} = g(Sh^*(Ph, Ps, E(Ph), I, C, Pol) - Sh_{t-1}). \qquad (A.5)$$

Using the fact that Sh* = Dh*, and that, in equilibrium, quantities determine prices, the price of housing disappears from the equilibrium equation. Using the fact that $Sh_{t-} - Sh_{t-1}$ = NC = new construction, and taking first differences of these equations, we obtain

$$\begin{aligned} NC_t - NC_{t-1} = g^*[f^* t(E(Ph)_t - E(Ph)_{t-1}, Ps_t - Ps_{t-1}, \\ I_t - I_{t-1}, C_t C_{t-1}, Y_t - Y_{t-1}, Pop_t - Pop_{t-1}, I_t - I_{t-1}) - NC_{t-1}] \end{aligned} \qquad (A.6)$$

where $S_t - S_{t-1}$ is equal to new construction if we disregard the demolition of housing stock.

E(Ph) was estimated independently.

A lagged variable of new construction ($NC_{t-1} - NC_{t-1}$) was also incorporated to include the effect of previous changes in new construction on current new construction, when it was estimated to be necessary to control persistent effects on the disturbances.

Measurement of Variables

NC	=	new construction	Number of permits issued for total family units as by the Construction Industry Research Board (CIRB)
Ps	=	price of stock	Estimated from Standard and Poor's 500 (S&P) at http://chart.yahoo.com/t?a=10&b=01&c=55&d=10&e=23&f=01&g=m&s=%5Espc&y=0&z=%255. An alternative way to measure the return on stocks is the S&P earnings yield (E/P) (Kaiser, 1999). We used changes in the S&P, since the historical series is already adjusted by dividends and stock splits.
E(p)	=	Expected price of housing, or expected inflation	To measure expected appreciation we use various alternative approaches. We worked with our own projections of expected prices, based on an adaptive expectation model using two and three lags of California changes in the Consumer Price Index (CPI) and the CPI housing component in California and the United States. In a similar way, we also modeled changes in

			California median home prices. Finally, we used different expected inflation rates as reported in the Livingston Surveys. The Livingston Survey data are discussed below. Since we are working with flows, we have included change of expected appreciation (or prices). The advantages of working with price changes rather than levels are discussed in Fratantoni and Schuh (2000).
Pop	=	population variables (population growth)	California Department of Finance annual estimates
I	=	interest rates	We estimated the effect of both mortgage rates and the prime rate. Builders indicate that their costs of funds depend on the prime rate rather than the Treasury bills or mortgage rates. We found that statistically it was better to work with the difference between the long-term and the short-term rate. We used the difference between Treasury securities maturing in ten years and commercial paper maturing in three months.
Y	=	personal income	California Department of Finance.
A	=	amenities	This variable was controlled by using a regional approach grouping counties of similar characteristics.

C	=	construction costs	In the estimation of the model, we tried to include various construction cost indexes published by the Census Bureau, but we did not get good results. Then we used the construction regional cost index compiled by CIRB, which estimates costs for nine regions. Because the board's classification of counties in regions differed from ours, we built our own regional cost indexes by assigning to each county the cost estimated by the CIRB for the region where the CIRB assigned that county. Then, we used the number of total permits to estimate a new weighted average cost for our ten regions.

Some Methodological Remarks on Our Time-Series Approach

We estimated our reduced-equation model for each region (see above).[1] We also estimated an aggregate equation for new construction in California. To avoid the problem of measuring the housing stock for various regions, we worked with first differences. Furthermore, we estimated the model using a Prais-Winsten regression. This method takes into account previous effects that persist over time affecting the error terms of subsequent specifications.[2] We also tried ARIMA specifications, but this type of approach did not provide better results than the ones obtained with the Prais-Winsten regression. The ARIMA

---

[1]The model was reduced to one equation.

[2]We also used this method for cross-pooled time-series analysis since, in addition to the effects that often persist over time affecting the error terms, there are also effects if the random shock affecting economic activity in one region causes economic activity in an adjacent region because of close economic ties between the regions. The Cochrane-Orcutt method is a procedure to control the correlation between errors from one period to another. The Prais-Winsten method is the Cochrane-Orcutt method when it incorporates its special transformation to estimate the correlation coefficient between the error term of current and previous periods to the first observations in the time-series.

method controls for both the effect of past values and the effect of current and lagged random disturbances (unmeasured effects).

Modeling Expected Appreciation

Since we do not have many observation points in our time series, we calculated expected appreciation, E(p), independently to include it in our estimating equation as an exogenous factor.

First we calculated our own expected prices series. Since all prices tend to move together and are highly correlated, we used projected inflation rates and median housing prices as measures of expected appreciation. There are various theories on expectation formations. Adaptive expectations assume that expectations are based only on past knowledge. Rational expectations believe that expectations are based on all information available and an understanding of how the market works. Extrapolative expectations are based on the past but follow along a trend line into the future.

To calculate our own inflationary expectations, we used two approaches. First we used an adaptive expectation model that included distributed lags of price changes. We chose this model because various studies have rejected the notion that people form their expectations rationally. For example, Hamilton and Schwab (1985) raised doubts as to the general applicability of the rational expectations model. Collins, Lipman, and Groeneman (1992) also reject the applicability of rational expectations to the real estate market.

Our second approach was to use expected inflation rates as reported by the public at each year included in our time-series. This was accomplished by using various measures of expected inflation one and two years ahead for each year, as reported by the Livingston Survey.[3] The Livingston Survey data performed better in our estimating equations and provided more alternatives for modeling expected prices, since reports include the public perception for one year and two years ahead. Although we also explored alternative sources for expected prices such as one-year-ahead expected prices as calculated by the DRI model, and Green Book forecasts (a briefing document with macroeconomic

[3]Described below.

forecasts—including inflation—prepared by staff economists at the Board of Governors about three days before each Federal Open Market Committee meeting), we used the Livingston Survey. The Green Book forecasts become available to the public only five years after they are made; DRI forecasts were highly correlated with some other determinants of new construction.

None of the various measures of inflation yielded very good and consistent results for all our ten regional equations. However, most equations showed better results when we used expected inflation rates as reported by the Livingston Survey (median rates of projected inflation) instead of our own projections.

The Livingston Survey

The Livingston Survey dataset contains a forecast of economic variables from a survey of forecasters. Joseph Livingston, a columnist for the *Philadelphia Inquirer*, began the survey in June 1946. Livingston continued the survey until 1990, when the Federal Reserve Bank of Philadelphia took it over.

The survey is conducted twice a year, in June and December. The survey forecasts 18 macroeconomic variables describing national output, prices, unemployment, and other macroeconomic data. Each variable in the survey asks for forecasts of the level of the variable in the current quarter, in the next quarter, and in the same quarter in the following year. It also asks for the annual average of the variable for the current year (six months ahead), and one year ahead. For example, for the Consumer Price Index in the survey of June 1992, it asks for forecasts of the monthly level of the CPI in June 1992, December 1992, and June 1993, and the annual average of the CPI in 1992 and 1993.

The survey is administered to affiliates of non-financial businesses, academic institutions, commercial banking, government, Federal Reserve Bank, insurance companies, and labor unions. One problem is that the affiliations for each participant change over time.

In this study, we used the one-year-ahead forecasted CPI from the current month of the survey. This variable is reported from the December surveys and predicts the average level of the CPI for the next calendar year. We used the median values of this variable because they

gave better results than the average values. We also tried forecasts for two years ahead. However, the one-year-ahead forecast provided better statistical results.

The CPI data reported by the survey have different base years. We worked with the CPI series adjusted to the base 1982 = 100.

For more information on the Livingston Survey, see http://www.phil.frb.org/files/liv/document.html.

Modeling the Influence of Interest Rates on Housing Markets

Interest rates and new construction are negatively related. Typically, housing demand or supply equations estimate the effect of either mortgage rates or the prime rate. Builders indicate that their cost of funds depends on the prime rate rather than the Treasury bills or mortgage rates. We looked at the difference between the long-term and short-term interest rate as measured by the difference between two types of securities: Treasury securities maturing in ten years and commercial paper maturing in three months. This differential is expected to be positively related to new residential construction.

The difference between the long-term and short-term interest rate indicates that the expectations of future inflation are rising, driving short-term rates up. When short-term rates are above some long-run average, investors may expect them to fall and receive capital gains. On the other hand, if investors expect capital losses, the differential between long- and short-term rates will widen. If they expect capital gains, the differential will narrow. At the moment of the change in expectations, long-term rates will rise relatively faster than short-term rates.

The spread between the long-term and short-term interest rates also represents a better measure of the tightness of credit than does the level of either interest rate. Easy monetary policy through its effects on expectations about capital gains will lead to a large spread between long-term and short-term interest rates, and tight money to a small spread. During periods of tight money, lending institutions will give higher priority to loans for business investment. Other sources such as bond and stock markets are effectively closed to all but the largest residential builders.

Table A.1

Analysis of Changes in New Construction in California, by Region (Time-Series Results, No Lags)

	North Coast	North Central	North Eastern	Bay Area	Stockton-Sacramento	Central Coast	Central Eastern	Central Inland	Los Angeles–San Bernardino	San Diego	California
R^2	0.67	0.6	0.82	0.64	0.7	0.6	0.89	0.76	0.57	0.72	0.64
F test	3.57	3.44	7.77	3.13	4.11	2.59	14.34	5.62	2.27	4.41	4.24
Probability	0.02	0.02	0	0.03	0.01	0.06	0	0	0.09	0.01	0
Metropolitan Statistical Area	223	810	226	5498	3922	1067	298	2408	20594	5649	35891
Change in population											
Coefficient	**0.077**	**0.123**	**0.12**	0.091	0.126	0.071	0.134	0.134	0.157	*–0.126*	0.072
t	2.1	2.78	2.1	1.4	1.14	1.43	3.91	1.57	1.14	–1.47	0.68
Probability	0.05	0.01	0.05	0.18	0.28	0.18	0	0.14	0.27	0.16	0.51
Change in income											
Coefficient	**0.231**		0.153	*–0.013*	0.066	0.098	**0.461**	0.191	0.146	0.316	74.049
t	2.32	(a)	0.77	–0.22	1.46	0.9	3.41	1.6	0.87	0.93	0.65
Probability	0.04		0.45	0.83	0.17	0.38	0	0.13	0.4	0.37	0.53
Lagged new construction											
Coefficient	**–0.665**	**–0.579**	**–0.681**	**–0.822**	**–1.094**	**–0.47**	**–0.593**	**–1.343**	**–0.5**	–0.125	–0.32
t	–1.74	–2.97	–4.46	–3.64	–4.57	–2.81	–5.02	–5.34	–1.87	–0.08	–1.48
Probability	0.1	0.01	0	0	0	0.01	0	0	0.08	0.94	0.16
Change in unemployment											
Coefficient	–21.285	**–423.648**	**–80.57**	–721.119	**–1018.914**	**–955.54**	–33.921	–614.251	–13335.94	–3497.584	**–39508.48**
t	–0.31	–2.67	–1.53	–0.35	–2.27	–2.14	–0.42	–1	–1.35	–1.31	–2.83
Probability	0.76	0.02	0.15	0.74	0.04	0.05	0.68	0.33	0.2	0.21	0.01

Table A.1 (continued)

	North Coast	North Central	North Eastern	Bay Area	Stockton-Sacramento	Central Coast	Central Eastern	Central Inland	Los Angeles–San Bernardino	San Diego	California
Change in difference of long-term minus short-term interest rate											
Coefficient	10.54	*–1.845*	*–63.259*	*–1385.153*	–1625.548	43.925	–201.784	*–731.818*	466.545	**3251.318**	**16318.46**
t	0.19	–0.01	–1.26	–1.28	–2	0.17	–2.92	–1.57	0.07	2.36	2.12
Probability	0.85	0.99	0.23	0.22	0.07	0.87	0.01	0.14	0.94	0.03	0.05
Change in appreciation (expected inflation)											
Coefficient	11.814	*–46.034*	21.873	2721.669	996.303	233.906	–266.904	733.462	*–0.305*	*–945.606*	*–11197.75*
t	0.09	–0.17	0.31	1.93	0.94	0.72	–2.37	1.01	0	–0.53	–1.15
Probability	0.93	0.87	0.76	0.07	0.37	0.49	0.03	0.33	1	0.6	0.26
Change in real stock prices											
Coefficient	–325.812	–909.265	–407.326	*3183.985*	–2462.197	–1254.795	**–456.879**	*2313.619*	–16880.39	–1723.627	–14505.81
t	–1.55	–1.67	–2.81	0.68	–0.8	–1.68	–2.62	1.15	–1.27	–0.4	–0.67
Probability	0.14	0.12	0.01	0.51	0.44	0.12	0.02	0.27	0.23	0.7	0.51
Change in real cost											
Coefficient	–31416	–91444	**–84595**	–1496151	–1572724	*37061*	**–110850.1**	–110850	–115914.3	*401967*	–2481687
t	–1.47	–0.79	–2.38	–1.08	–1.56	0.34	–3.37	–1.07	–0.05	0.81	–0.85
Probability	0.16	0.44	0.03	0.3	0.14	0.74	0.01	0.3	0.96	0.43	0.4
DW (Durbin Watson stat.)	2.02	1.95	2.13	1.33	1.61	1.96	2.13	1.24	2	2.03	2.1

[a]Income highly correlated to real cost.

NOTES: Cell entries in boldface are statistically significant. Cell entries in italics are of the wrong sign but not statistically significant. Cell entries that are shaded are of the wrong sign and are statistically significant. All other cell entries are statistically significant with the right sign.

Table A.2

Time-Series Results Allowing for Lagged Responses

	North Coast[a]	North Central	North Eastern	Bay Area	Stockton–Saramento	Central Coast	Central Eastern	Central Inland	Los Angeles–San Bernardino	San Diego	California
R^2	0.67	0.78	0.78	0.76	0.85	0.77	0.90	0.72	0.77	0.76	0.83
Adjusted R^2	0.48	0.69	0.66	0.64	0.76	0.63	0.85	0.56	0.63	0.62	0.76
F Test	3.57	8.31	6.24	6.10	9.59	5.77	16.07	4.57	5.78	5.42	11.48
Probability	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Metropolitan Statistical Area	223	670	229	4385	3675	845	311	2009	16110	5195	28256
Change in population											
Coefficient	0.077	0.207	0.225	0.018	0.205	0.072	0.226	0.108	0.081	–0.119	0.035
t	2.10	5.53	2.51	0.33	2.34	2.05	5.44	1.87	0.64	–1.50	0.45
Probability	**0.05**	**0.00**	**0.03**	0.75	**0.04**	**0.06**	**0.00**	0.08	0.53	0.16	0.66
Change in income											
Coefficient	0.231		0.227	0.730	0.123	–0.030	0.225	0.372	0.005	0.390	229.561
t	2.32	(b)	1.15	1.50	2.63	–0.29	1.72	2.68	0.03	1.37	2.31
Probability	**0.04**		0.27	0.16	**0.02**	0.78	0.11	**0.02**	0.98	0.19	**0.03**
Lagged new construction											
Coefficient	–0.665	–0.803	–0.876	–0.201	–0.910	–0.388	–0.959	–0.969	–0.210	–0.025	–0.235
t	–1.74	–4.67	–3.70	–2.02	–3.68	–3.37	–5.64	–4.63	–0.98	–0.180	–1.51
Probability	**0.10**	**0.00**	**0.00**	**0.06**	**0.00**	**0.01**	**0.00**	**0.00**	0.34	0.86	0.15
Change in unemployment											
Coefficient	–21.285	–472.151	–78.797	–4257.78	–2942.576	–1250.212	–98.087	–1167.395	–16303.760	–983.431	–16178.720
t	–0.31	–4.24	–1.56	–3.05	–4.85	–3.51	–1.10	–1.76	–1.68	–0.45	–1.41
Probability	0.76	**0.00**	0.14	**0.01**	**0.00**	**0.00**	0.29	**0.10**	0.12	0.66	0.18

Table A.2 (continued)

	North Coast[a]	North Central	North Eastern	Bay Area	Stockton–Saramento	Central Coast	Central Eastern	Central Inland	Los Angeles–San Bernardino	San Diego	California
Change in difference between long–term and short–term interest rate		L.1	L.1	L.1	L.1	L.1	L.1	L.1	L.1	L.1	L.1
Coefficient	10.540	133.363	103.594	2364.337	3161.962	475.901	–60.133	1269.820	7604.326	3026.018	16271.780
t	0.19	1.14	1.80	2.55	4.52	2.34	–0.93	3.21	1.82	3.20	3.96
Probability	0.85	0.27	**0.09**	**0.02**	**0.00**	**0.03**	0.37	**0.01**	**0.09**	**0.01**	**0.00**
Change in appreciation (expected inflation)			L.1	L.1			L.1		L.1		
Coefficient	11.814	111.535	145.153	–3116.065	1186.058	180.400	44.106	–198.192	–7361.258	–1044.524	–8959.499
t	0.09	0.51	1.95	–2.61	1.18	0.74	0.44	–0.26	–1.12	–0.66	–1.20
Probability	0.93	0.62	**0.07**	0.02	0.26	0.47	0.67	0.80	0.28	0.52	0.25
Change in real stock prices		L.1	L.1	L.1	L.1	L.1	L.1	L.1	L.1	L.1	L.1
Coefficient	–325.812	1744.118	–531.920	–3566.201	–4676.496	–1217.889	–1129.649	–2638.260	–4665.539	–81.903	–39150.930
t	–1.55	–3.78	–2.06	–1.18	–1.800	–2.11	–4.48	–2.10	–0.43	–0.02	–2.36
Probability	0.14	**0.00**	**0.06**	0.26	**0.09**	**0.05**	**0.00**	**0.06**	0.68	0.98	**0.03**
Change in real cost											
Coefficient	–31416.4	–64667.98	–89322.48	–146346.1	–1584431.0	–15447.310	–126930.90	–623250.00	–786015.400	63737.95	–758840.40
t	–1.47	–0.890	–2.36	–0.37	–3.84	–0.20	–4.08	–2.140	–0.46	0.14	–0.36
Probability	0.16	0.38	**0.03**	0.72	**0.00**	0.85	**0.00**	**0.05**	0.65	0.89	0.73
C	473.449	1262.604	378.205	605.766	–3400.848	1047.274	813.804	6334.513	–9865.349	1421.356	–6027.783
	0.99	1.9	1.41	0.14	–1.16	2.06	2.43	2.460	–0.59	0.54	–0.28
	0.34	0.08	0.18	0.89	0.27	0.06	0.03	0.03	0.56	0.60	0.78

Table A.2 (continued)

	North Coast[a]	North Central	North Eastern	Bay Area	Stockton–Saramento	Central Coast	Central Eastern	Central Inland	Los Angeles–San Bernardino	San Diego	California
DW (Durbin Watson stat.)	2.02	2.26	1.97	2.05	2.15	2.00	2.37	2.05	2.10	2.08	2.08

[a]Original equation (lags did not improve the results).

[b]Income highly correlated to real cost.

NOTES: Cell entries in boldface are statistically significant. Cell entries that are shaded are of the wrong sign and are statistically significant. All other cell entries are statistically significant with the right sign.

Appendix B

Householder Rate Models

We use several sources of data to estimate householder rates for two types of models: the annual models and the decennial models. The *annual models* are based on the annual March supplements of the Current Population Survey from 1976 through 2001; the decennial models rely on the censuses of 1970, 1980, and 1990, and the Census Supplementary Survey of 2000 combined with CPS data from 1999 and 2001. The annual models allow us to examine changes that occur each year and thus to observe the effects of business cycles, but they suffer from the relatively small sample size of the CPS. Because the sample size is not large, our ability to identify trends in local housing markets and for specific demographic groups is limited. The decennial models allow for an examination of rates for specific demographic groups and metropolitan areas, as sample sizes are much larger, but do not allow for an examination of annual changes.

The annual models are logistic regression models of the probability that an individual age 15 and older is a householder. We develop three types of annual models. In one type, the key independent variable is whether the individual lives in California. The model is run separately for each year 1976 through 2001. Coefficients for the intercept and the California variable are used to estimate the probability of being a householder in California and the rest of the United States. Demographic variables are added sequentially. These variables are gender, age, ethnicity, and, starting in 1994, nativity.[1] The model with all demographic variables is called the model with demographic controls. The coefficient for the California variable in the model with demographic controls provides an overall measure of how different

[1]Before 1994, the March supplement of the CPS did not contain information on nativity.

California's householder rates are from those in the rest of the country separate from the effects of the demographic factors.

In a second type of annual model, data are restricted to California and the key independent variable is the year of the survey. Coefficients for the intercept and the year variable are used to estimate the probability of being a householder in California over time. Demographic variables are added sequentially. The coefficient for the year variable in the model with no demographic controls provides an estimate of temporal changes in householder rates in California. The coefficient for the year variable in the model with demographic controls provides an overall measure of how much of the change in householder rates in California can be attributed to temporal changes that are not caused by changes in the demographic composition of the state's population.

The third type of annual model is similar to the second type, except the data are restricted to the rest of the United States.

The *decennial models* allow for an examination of patterns of change and differences between subgroups (for U.S.-born versus foreign-born Latinos) as well as for lower levels of geography (metropolitan areas). In the models comparing California to the rest of the United States, the probability of being a householder is first estimated with no controls (the only independent variable being an indicator for California residence), and then with a series of demographic controls (age, gender, ethnicity, and nativity). The models are run separately for each census year. As in the annual models, the parameter estimate for the California indicator variable provides a measure of the difference between householder rates in California and those in the rest of the nation. The California metropolitan area models are similar, with the exception of replacing the California indicator variable with a series of metropolitan area indicator variables for the 23 metropolitan areas (and an additional indicator for "rest of California") identifiable in the CPS. Because the Census Supplementary Survey of 2000 does not provide substate geographic identifiers, only the 1999 and 2001 CPS data were used in the metropolitan area model. The CPS shows smaller differences in householder rates between California and the rest of the country than does the Census Supplementary Survey (which shows that California's householder rates are 3.1 percentage points lower than the nation's but

only 1.7 percentage points lower in the 1999 CPS and 2.3 percentage points lower in the 2001 CPS).

Throughout the report, we have converted the logistic regression results to rates or probabilities. All of the parameter estimates are based on weighted regressions, although standard errors and confidence intervals are based on unweighted regressions. We use weighted regressions because our goal is to estimate householder rates for the entire population. For example, the results of the California annual model (a weighted logistic regression with the dependent variable being an indicator of whether the adult is a householder and the only independent variables being year dummies for 1976 through 2000) are the same as a simple tabulation of the proportion of California's adults who are householders for each year from 1976 through 2001.

Appendix C

Panel Data Analysis of Housing Supply

In this appendix we follow the same basic economic model of housing supply used in Chapter 3 (and also described in more detail in Appendix B). We take advantage of the number of separate counties in the state to analyze housing supply in California from 1972 to 2001 in a way that permits us to compare the number of housing units produced[1] in each county to the number predicted by our model. We use the same variables as the time-series analysis but predict the number of new housing units based on a common response across regions to changes in the explanatory variables. As before, the variables are population, personal income, previous construction, unemployment, credit market conditions, inflation expectations, stock prices, and construction costs. Factors specific to each county—such as the amount of developable land remaining and the presence of growth controls and other regulatory constraints on housing—are controlled for with a variable representing each county. This is the same approach taken in many studies of the national housing market, so it is not unreasonable to assume that the underlying relationship between, for example, construction costs and housing production is the same regardless of which county we are examining. This approach is more restrictive than the approach taken in the time-series analysis but it produces estimates of supply shortfalls that are comparable to the housing unit figures estimated in the householder analysis in Chapter 3.

Table C.1 reports the results of two panel regressions. The first column shows the log of new housing units regressed on the log of total population and the second column shows the log of new units regressed on the log of adult population. The first column specification is more

[1]We actually use data on the number of housing permits issued in each year, but for most counties, in most years, the share of permits that are produced exceeds 90 percent.

Table C.1

Panel Regression Results (t-values in parentheses)

	Model 1	Model 2
Log (county population)	.0249 (0.18)	—
Log (county adult population)	—	0.2887 (2.41)
Real county income per capita	–3.98 e–07 (–0.86)	–5.46 e–07 (–1.18)
County unemployment rate	–0.0367 (–6.45)	–0.0361 (–6.41)
Difference in long- and short-term interest rates	0.0262 (1.83)	0.0308 (2.14)
Expected inflation	–0.0069 (–0.39)	–0.0005 (–0.03)
Real stock prices	–0.0464 (–3.79)	–0.0461 (–3.93)
Real county construction costs	–0.0109 (–6.87)	–0.0123 (–8.27)
County fixed effects	Suppressed	Suppressed
Constant	9.0286 (5.96)	6.4946 (5.42)
R^2	0.0731	0.7683
No. of observations (58 counties)	1,392	1,392

consistent with that from the time-series models and the second column better reflects the demographic drivers of housing demand as discussed in the householder analysis.

The model incorporating the counties' adult, rather than total, population changes is a much better fit and gives results that are more consistent with those found both in the time-series and householder analyses.[2] Total population change is not statistically significant whereas change in the adult population is, as we expected. Although it is not significant, the sign on per capita income is consistent with those hypotheses that predict more resistance to new housing as a community's income levels increase. When unemployment rates rise in a county, new housing supply falls. Easier credit conditions, measured as the difference between long and short rates, are associated with an increase in housing production. Increases in either inflation expectations or stock market returns have negative signs—implying lower production—but only stock market returns were significant. Last, increased construction costs are strongly associated with lower levels of housing production.

Because we are using lagged terms, and because data for some variables are missing in the earliest years of the period we are interested

[2]Note that because of the structure of the fixed-effects approach, the lagged value for units produced is omitted from the models.

in, we effectively predict housing supply at the county level for the period from 1973 to 1999. The total number of new housing units produced is explained fairly well by the model incorporating adult population rather than total population. Our major result in this analysis is that slightly more housing was produced in the 1980s business cycle than was predicted in the model, and significantly less housing was produced in the 1990s than predicted. Of the explanatory variables included in the model, only inflation expectations were not significant in at least some of the alternative forms that were examined.[3] The only issue about interpreting the results in a fixed-effect model is that the net over- and undersupply over the entire period is constrained to be zero, which may be too binding a constraint even though the analysis covers almost three complete housing cycles.

The housing oversupply at the state level in the 1980s cycle was approximately 4 percent of the total number of units predicted; the undersupply in the 1990s cycle was 15–17 percent of the predicted total (Table C.2)—at least through 1999. (The numeric comparisons are made from cycle trough to cycle trough to capture all of the new construction within each building cycle, but the results are similar when we simply compare the number of units predicted by decade.) The estimated shortfall of 15–17 percent of the predicted new supply over the decade works out to be a deficit of approximately 17,000 housing units per year for California as a whole.

Most studies of housing dynamics use the change in total population as the measure of population change, and we saw in Chapter 3 that this will overpredict the amount of new housing required. The detailed demographic data needed for the analyses in Chapter 3 are available only in census years, but we can use counties' adult population on an annual basis for these models to better handle the issue of family size. It should also be noted that most of the discussions of the housing situation in California have described an undersupply on the order of 40–50 percent

[3]In addition to several panel regressions, we estimated the model as a cross-section with all years' data being estimated as a function of first differences to obtain estimates divorced from any time dimension. We also examined the sensitivity of the results to changing the starting or ending dates by one year. In all of these cases, most variables showed the same pattern of coefficient magnitudes and statistical significance.

Table C.2

Results of County-Level Analysis of Annual Housing Production (All Units)

	Actual	Predicted	Over-/ Undersupply (%)
1973–1982			
Cross-section analysis	1,759,855	1,738,761	1.2
Panel analysis	1,542,991	1,523,094	1.3
1983–1993			
Cross-section analysis	2,179,996	2,093,717	4.0
Panel analysis	2,179,996	2,095,823	3.9
1994–1999			
Cross-section analysis	659,543	768,944	–16.6
Panel analysis	659,543	758,639	–15.0

of the required level. Our estimate is less than a third that size—even without the additional demographic characteristics that were used in the householder analysis. Using another standard, a comparison of national and state housing production from 1991 to 2000 yields an aggregate shortfall of approximately 30 percent—assuming that California should have produced housing at the same rate of growth that the nation did. If we allow for the fact that California emerged from recession two years later than the nation did, the implied shortfall shrinks to only 10 percent.

In Figure C.1, we show the difference between the number of new housing units predicted by our panel regressions and the actual production. There seems to have been at least some oversupply at the 1980s peak, but the shortfall in the 1990s is more evident and more consistent from year to year. Even the predicted peak is at an annual production figure that is 46 percent below the 1980s peak and 38 percent below the 1970s peak (although it is not yet clear whether this cycle will eventually have the kind of clearly defined peak that has characterized previous cycles).

It should not be surprising that the San Francisco Bay Area has the largest shortfall in new housing, or that the shortfall seems to have accelerated during the Internet boom. It was mentioned above that the percentage changes in real per capita income and real home prices in the Bay Area matched quite closely, but even when income is accounted for

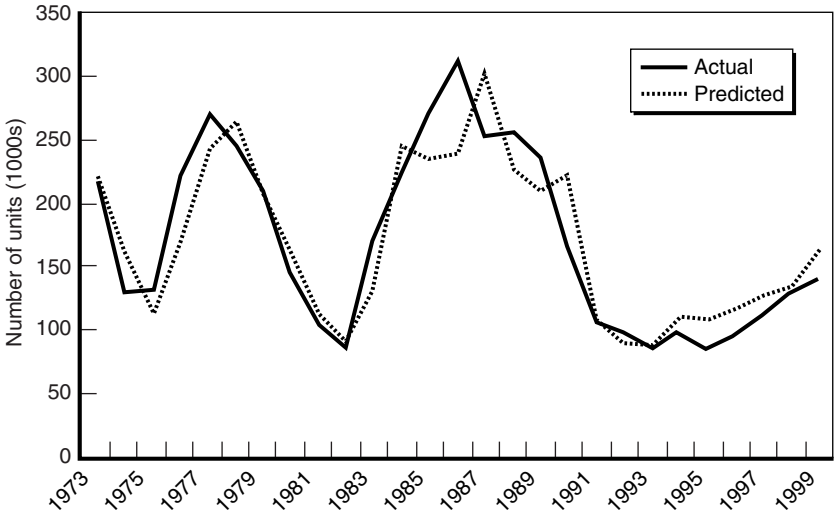


Figure C.1—Comparison of Actual and Predicted Annual Housing Production in California, 1973–1999

there is a significant and growing gap. For the current cycle from 1994 to 1999, the shortfall is estimated to be 21 percent, compared to an overproduction of 3 percent in the 1980s.

San Diego also shows a consistent gap in housing production in the 1990s but it also had a sizable overproduction during the 1980s peak. The shortfall from 1994 onward is 20 percent, although production rose sharply after 1996; overproduction in the 1980s was 6 percent. These numbers are consistent with the notion that the 1980s was characterized by at least some level of overbuilding in response to the tax incentives for real estate development as well as similar patterns in construction employment relative to that in other sectors.

The Sacramento area grew rapidly in the 1990s and, in terms of employment and output change, it suffered only a mild recession in the early 1990s. It is the only major metropolitan area to have both actual and predicted housing production that is approaching the peak levels seen in the previous cycles. The region did not see overbuilding in either of the last two cycles and—despite the rapid rate of housing production since 1995—it still had an estimated shortfall of almost 5 percent in the last five years of our forecast period. So far in this business cycle, it still

seems to be in relatively strong shape in terms of both employment and new construction.

It is the last, and largest, metropolitan area that has the greatest potential effect on the statewide housing balance. By some measures, such as construction employment, Los Angeles experienced something of a construction bubble in the 1980s and its deflation was compounded by the collapse of the aerospace industry. According to our analysis, there was a slight overproduction of housing in the 1970s and a corresponding shortfall in the early 1980s recession. In the growth phase of the 1980s business cycle, the region once again produced more housing than the model predicted—almost 69,000 units from 1983 to 1990—and undersupplied housing during the deep recession and during the current growth period. Despite the persistent shortfall of housing in the greater Los Angeles region throughout the 1990s, the region essentially balanced the prior excess supply with the current shortfall.

By examining the actual and predicted values for each county in the region, it appears that the largest imbalance comes from Los Angeles County itself. Overproduction there was a relatively small 10 percent in the 1980s and underproduction in the 1990s amounted to almost 30 percent of the predicted new supply. New 1980s construction in the other counties in the region outpaced the predicted values by 3 percent in Orange County, 10 percent in Riverside and San Bernardino, and 53 percent in Ventura. In the 1990s, the shortfalls amounted to 15 percent in Riverside and San Bernardino and 10 percent in Orange and Ventura Counties. Some of the "oversupply" in Ventura County in the 1980s can probably be explained by the evolving commuting connections with its much larger neighbor county—if there is more developable land in an adjacent county, that is where construction is more likely to occur in the absence of regulatory barriers. The integrated labor markets of these counties imply that any short-run imbalances in one county may reflect the relative conditions of the individual county labor and land markets (in addition to receptivity to development). However, it is difficult to square sizable shortfalls during the 1990s with the fact that median house prices in Los Angeles County declined by 26 percent from 1989 to 2000—even after correcting for inflation.

Finally, the results of the model without fixed effects are compared to two important factors—a region's ability and willingness to accommodate growth. The first factor is the amount of developable land within the county; the second is community resistance to growth. Table C.3 displays these three numbers for the regions that had sufficient responses on a city manager survey regarding attitudes about growth: deviation between predicted and actual housing production from 1990 to 1999; remaining developable land as a share of total (from Landis et al., 2000), and a population-weighted index of city managers' appraisals of their city's resistance to new development (from a comprehensive survey conducted by Lewis and Neiman, 2000, with 1 = least resistance and 5 = most resistance).

It is hard to divine a strong pattern among these five observations, but it is interesting to note that the region with the largest shortfall of new housing (San Francisco Bay Area) is the one with the greatest relative share of available land but the strongest political resistance to growth. This observation is consistent with a number of studies that have shown a relationship between growth barriers and home supply and prices.[4] The region with the next largest shortfall (San Diego) is more accommodative of growth but has a smaller supply of surplus land.

Table C.3

Housing, Developable Land, and Resistance to Growth (1990–1999)

	San Francisco Bay Area	Los Angeles, Orange, Ventura Counties	Riverside, San Bernardino Counties	San Diego County	Sacramento Region
Actual–predicted new units, %	–21	–7	–15	–20	–5
Developable land as a share of total, %	44.9	22.3	20.8	28.9	59.8
Resistance to growth	2.58	2.34	2.30	2.18	2.09

[4]See Malpezzi (2001) for an overview of the major findings from the literature about the effects of growth control and zoning on housing.

References

Blomquist, Glenn, Mark Berger, and John Hoehn, "New Estimates of the Quality of Life in Urban Areas," *American Economic Review*, Vol. 78, 1988, pp. 89–107.

Boldin, Michael D., "Econometric Analysis of the Recent Downturn in Housing Construction: Was It a Credit-Crunch? *Federal Reserve Bank of New York, Research Paper # 9332*, December 1993.

Browne, Lynn Elaine, "National and Regional Housing Patterns," Federal Reserve Bank, *New England Economic Review*, July/August 2000.

California Budget Project, *Locked Out 2002: California's Affordable Housing Crisis Continues,* Sacramento, California, 2002.

California Department of Housing and Community Development, "Guidelines for the Jobs Housing Balance Incentive Grant Program," 2003, available at http://www.hcd.ca.gov/ca/jhbig/jhbig20030123guide.pdf.

Carlstrom, Charles, and Christy D. Rollow, "Regional Variations in White-Black Earnings," Federal Reserve Bank of Cleveland, *Economic Review*, Quarter 2, 1998.

Center for Continuing Study of the California Economy, *California Economic Growth 1993,* 1993, available at http://www.ccsce.com/about_ccsce.html.

Collins, Susan, Barbara Lipman, and Sid Groeneman, "Experience and Expectations: The Home Price Predictions of Owners and Renters," National Association of Realtors, Washington, D.C., August 1992.

Dresch, Marla, and Steven M. Sheffrin, *Who Pays for Development Fees and Exactions?* Public Policy Institute of California, San Francisco, California, 1997.

Fratantoni, Michael, and Scott Schuh, "Monetary Policy, Housing Investment, and Heterogeneous Regional Markets," May 2000.

Fulton, William, Rolf Pendall, Mai Nguyen, and Alicia Harrison, "Who Sprawls Most? How Growth Patterns Differ Across the U.S.," Brookings Institution, Washington, D.C., 2001.

Fulton, William, Paul Shigley, Alicia Harrison, and Peter Sezzi, *Trends in Local Land Use Ballot Measure, 1986–2000*, Solimar Research Group, Ventura, California, 2000.

Gabriel, Stuart A., Joe P. Mattey, and William L. Wascher, "Compensating Differentials and Evolution of the Quality-of-Life Among U.S. States," Working Papers in Applied Economic Theory 96-07, Federal Reserve Bank of San Francisco, 1996.

Gabriel, Stuart A., Joe P. Mattey, and William L. Wascher, "House Price Differentials and Dynamics: Evidence from the Los Angeles and San Francisco Metropolitan Areas, *FRBSF Economic Review*, No. 1, 1999.

Gavin, William T., and Rachel J. Mandal, "Forecasting Inflation and Growth: Do Private Forecasts Match Those of Policymakers? *Federal Reserve Bank of St. Louis*, September 28, 2000.

Glaeser, Edward L., Joseph Gyourko, and Raven Saks, *Why Is Manhattan So Expensive? Regulation and the Rise in House Prices,* Harvard Institute of Economic Research Discussion Paper 2020, November 2003.

Glickfeld, Madelyn, and Ned Levine, "The New Land Use Regulation 'Revolution': Why California's Local Jurisdictions Enact Growth Control and Management Measures," Graduate School of Architecture and Urban Planning, University of California, Los Angeles, California, June 1990.

Glickfeld, Madelyn, and Ned Levine, "Regional Growth . . . Local Reaction: The Enactment and Effects of Local Growth Control and Management Measures in California," Lincoln Institute of Land Policy, Cambridge, Massachusetts, 1992.

Grebler, L., and S. J. Maisel, "Determinants of Residential Construction: A Review of Present Knowledge," in *Commission on Money and Credit, Impacts of Monetary Policy*, Prentice-Hall, Englewood Cliffs, New Jersey, 1963, pp. 496–505.

Gyourko, Joseph, and Joseph Tracy, "The Structure of Local Public Finance and the Quality of Life," *Journal of Political Economy*, Vol. 99, No. 4, 1992, pp. 774–806.

Hamilton, Bruce W., and Robert M. Schwab, "Expected Appreciation in Urban Housing Markets," *Journal of Urban Economics,* Vol. 18, 1985, pp. 103–118.

Hanushek, Eric A., and John M. Quigley, "The Determinants of Housing Demand," *Research in Urban Economics*, Vol. 2, 1982, pp. 221–242.

Hoehn, John, Mark Berger, and Glenn Blomquist, "A Hedonic Model of Interregional Wages, Rents, and Amenity Values," *Journal of Regional Science*, Vol. 27, 1987, pp. 605–620.

Kaiser, Ronald W., "Using Capital Markets' Value Cycles in Allocating to Real Estate vs. Stocks or Bonds," *Journal of Real Estate Portfolio Management*, Vol. 5, No. 1, 1999.

Klein, L. R., *The Keynesian Revolution,* 2nd ed., Macmillan, New York, 1966, p. 233.

Krainer, John, "House Price Bubbles," *Federal Reserve Bank of San Francisco Economic Letter*, No. 2003-06, 2003.

Landis, John D., "Opening the Doors to Infill Housing," PowerPoint presentation, Department of City and Regional Planning, UC Berkeley, 2003.

Landis, John D., Michael Smith-Heimer, Michael Larice, Michael Reilly, Mary Corley, and Oliver Jerchow, *Raising the Roof: California Housing Development Projections and Constraints 1997–2020, Statewide Housing Plan*, Department of Housing and Community Development, Sacramento, California, 2000.

Leamer, Edward E., "Bubble Trouble? Your Home Has a P/E Ratio Too," UCLA Anderson Forecast Report, 2002.

Leamer, Edward E., "Update June 2, 2003; Bubble Trouble? Your Home Has a P/E Ratio Too," UCLA Anderson Forecast Report, 2003.

Levine, Ned, "The Effects of Local Growth Controls on Regional Housing Production and Population Redistribution in California," *Urban Studies*, Vol. 36, No. 12, 1999, pp. 2047–2068.

Lewis, Paul, *California's Housing Element Law: The Issue of Local Noncompliance*, Public Policy Institute of California, San Francisco, California, 2003.

Lewis, Paul, and Elisa Barbour, *California Cities and the Local Sales Tax,* Public Policy Institute of California, San Francisco, California, 1999.

Lewis, Paul, and Elisa Barbour, "Development Priorities in California Cities: Results from a PPIC Survey," *Occasional Paper*, Public Policy Institute of California, San Francisco, California, 1998.

Lewis, Paul, and Max Neiman, "Residential Development and Growth Control Policies: Survey Results from Cities in Three California Regions," *Occasional Paper*, Public Policy Institute of California, San Francisco, California, 2000.

Maisel, S. J., "A Theory of Fluctuations in Residential Construction Starts," *American Economic Review*, Vol. 53, No. 3, June 1963.

Malpezzi, Stephen, "NIMBYs and Knowledge: Urban Regulation and the 'New Economy,'" working paper, Center for Urban Land Economic Research, University of Wisconsin, Wisconsin-Madison, 2001.

Mayer, Christopher J., and C. Tsuriel Somerville, "Using Empirical and Theoretical Models of Housing Supply," Working Paper No. 96-12, Federal Reserve Bank of Boston, December 1996.

Moller, Rosa, Hans Johnson, and Michael Dardia, *What Explains Crowding in California?* California Research Bureau, Sacramento, California, February 2002.

Myers, Dowell, *Analysis with Local Census Data*, Academic Press, San Diego, California, 1992.

Myers, Dowell, and Julie Park, "The Great Housing Collapse in California," FannieMae Foundation, 2002.

Myers, Dowell, William C. Baer, and Seong-Youn Choi, "The Changing Problem of Overcrowded Housing," *Journal of the American Planning Association,* Vol. 62, 1996, pp. 66–84.

Roback, Jennifer, "Wages, Rents, and the Quality of Life," *Journal of Political Economy,* Vol. 90, 1982, pp. 1257–1278.

Rosen, Sherwin, "Wage-Based Indexes of Urban Quality of Life," in P. Mieszkowski and M. Strazheim (eds.), *Current Issues in Urban Economics*, John Hopkins University Press, Baltimore, Maryland, 1979, pp. 74–104.

Stover, Mark Edward, and Charles Leven, "Methodological Issues in the Determination of the Quality of Life in Urban Areas," *Urban Studies*, Vol. 29, No. 5, 1992, pp. 737–754.

U.S. Department of Housing and Urban Development, *U.S. Housing Market Conditions, 3rd Quarter 2003,* 2003, available at http://www.huduser.org/periodicals/ushmc/fall03/ushmc_fall03.pdf.

Wasserman, Miriam, "Appreciating the House. Housing as an Investment," Federal Reserve Bank of Boston, *Regional Review,* 1998.

Weintraub, Daniel, "The Prices for Housing Soar—Along with Demand," *Sacramento Bee,* December 1, 2002.

About the Authors

HANS JOHNSON

Hans Johnson is a demographer at the Public Policy Institute of California. His research interests include international and domestic migration, population estimates and projections, and state and local demography. Before joining PPIC as a research fellow, he was the senior demographer at the California Research Bureau, where he conducted research for the state legislature and the governor's office on population issues. He has also worked as a demographer at the California Department of Finance, specializing in population projections. He holds a Ph.D. in demography from the University of California, Berkeley.

ROSA MOLLER

Rosa M. Moller is a senior economist at the California Research Bureau, where she has written and co-authored reports and technical briefs on a wide range of issues for the legislature and state government. Before joining the California Research Bureau in 1991, she worked on various socioeconomic and demographic studies for the United Nations, including the Economic Commission for Latin America. She received her Ph.D. in economics from the University of California, Davis, and a B.A. and M.A. in sociology from the Catholic University of Chile in Santiago.

MICHAEL DARDIA

Michael Dardia is vice president at The SPHERE Institute. His research interests cover workforce development, redevelopment, regional economics, and public finance and taxation issues. Before joining SPHERE, he was a research fellow at the Public Policy Institute of California and a consultant to the RAND Corporation. He is a member of the California Workforce Investment Board's Economic Advisory Council and has participated in numerous other state and local government advisory groups. He edits the growth and employment series of the *California Policy Review* and writes the regional highlights for the *Bay Area Economic Pulse.* He earned his Ph.D. in policy analysis from the RAND Graduate School.

Related PPIC Publications

Who Pays for Development Fees and Exactions?
Marla Dresch and Steven M. Sheffrin

Planned Developments in California: Private Communities and Public Life
Tracy M. Gordon

California's Housing Element Law: The Issue of Local Noncompliance
Paul G. Lewis

Cities Under Pressure: Local Growth Controls and Residential Development Policy
Paul G. Lewis and Max Neiman

PPIC publications may be ordered by phone or from our website
(800) 232-5343 [mainland U.S.]
(415) 291-4400 [Canada, Hawaii, overseas]
www.ppic.org