Your House Just Doubled in Value?
Don't Uncork the Champagne Just Yet!

BY WENLI LI AND RUI YAO

More and more the United States is becoming a nation of homeowners. Along with this rise in ownership, an increasing share of households' wealth is invested in housing. However, house prices fluctuate over time. Some studies offer evidence that changes in house prices have had a large effect on total output and total consumption. In this article, Wenli Li and Rui Yao present their recent research, which tries to quantify the effects of house-price changes on both consumption and the well-being of American households. Their study looks at the economy as a whole, as well as different demographic groups.

The United States is increasingly becoming a country of homeowners. As reported recently by the Census Bureau, close to 70 percent of households now own their primary residence. Homeownership is no longer just an American dream; watering lawns, sweeping sidewalks and cleaning drain gutters is no longer the sole privilege of middle-income and affluent households. With the rise in the homeownership rate, an increasing share of household wealth is tied to housing.[1] According to the Federal Reserve Board's Flow of Funds account, residential property accounts for over 30 percent of total household assets, and home equity accounts for over 20 percent of total household net worth.

House prices, however, fluctuate over time (Figure 1). As can be seen in the figure, since 1975 the country has had two episodes of prolonged negative returns (adjusted for inflation) on housing: one from the late 1970s to early 1980s and the other in the early 1990s. Since 1996, however, the return on housing has been moving up steadily, exceeding 15 percent in real terms in the second quarter of 2004.

There has been some speculation and some evidence that house-price movements have had a large impact on total output and total consumption. For instance, Global Economic Research wrote in its recent publication that "the U.S. housing market has been a significant driver of U.S. economic growth in recent years and has contributed more to GDP than many analysts expected. We estimate that housing accounted for 10 percent to 15 percent of the growth in real GDP in 2004, more than double its normal share in the economy."[2] Some academic researchers have found that house-price appreciation also has a sizable effect on consumption. Economists Karl Case, John Quigley, and Robert Shiller find that an additional dollar of housing wealth increases total household consumption by 3 to 15 cents. Similarly, John Benjamin, Peter Chinloy, and Donald Jud find that housing wealth increases household consumption by 8 cents.

In their recent working paper, Fed Chairman Alan Greenspan and Federal Reserve Board staff economist James Kennedy estimate that cashouts through mortgage refinancing and net extensions of home equity loans less

[1] The rise of housing wealth's share in total household net worth started in 2000 after the stock bubble burst.

[2] See the article by Joseph Carson.

Wenli Li is an economic advisor and economist in the Research Department of the Philadelphia Fed.

Rui Yao is an assistant professor of economics and finance, Zicklin School of Business, Baruch College, New York City.

unscheduled repayments amounted to about $300 billion between 2003 and 2004, or roughly 13 percent of the increase in the household real estate assets during that same period as reported in the U.S. flow of funds account.

Our recent research tries to quantify the effects of changes in house price on both consumption and the well-being of American households, both in the economy as a whole and across different demographic groups.[3] We find that the effects are small for the economy as a whole, but they vary substantially across households of different ages, homeownership status, and amount of assets.

WHAT'S SPECIAL ABOUT HOUSING AND HOUSING WEALTH GAINS?

As discussed in a previous *Business Review* article, residential housing is unique because it combines a flow of services with an investment good.[4] The homeowner gets to live in the house in lieu of renting and receives a potential return on the equity in the house.

As of yet, there is no financial product that permits a complete separation of these two functions of residential houses—consumption and investment—for homeowners. To put it simply, when households live in their own house, they necessarily bear the risk that the value of their house will fluctuate over time. In that sense, owner-occupied housing is also an investment. In principle, renting would accomplish this separation. More precisely, households can live in a rented house and then invest in other properties. But there are good reasons why most renters wish to become homeowners. First, rents may rise. As economists Todd Sinai and Nicholas Souleles have argued, owning one's home provides insurance against the risk that rents will rise by purchasing future housing services at today's price. Second, housing services are, in general, cheaper for homeowners, since renters have few incentives to maintain the rental unit and landlords charge a higher price to cover for possible damages. Finally, homeowners also get tax breaks. They can deduct their interest payment on mortgage loans on first and second homes from their income tax, as long as these loans total less than $1.1 million, and they do not pay tax on the implicit income they receive from being their own landlords.

Housing wealth is less liquid than many other types of financial wealth. The conventional fee for selling one's house is 6 percent of the house value. And the time and effort involved far exceeds a trip to the ATM or a call to your mutual fund company or broker. In addition, saving in the form of housing exposes households to idiosyncratic (household-specific) risks, unlike the well-diversified portfolio of financial assets in most models of lifetime savings and consumption used by economists. For example, if employers relocate, households may need to move at a time when they are unwilling or unable to sell their houses.[5]

These differences suggest that economists may need to modify their models of savings and consumption in a world populated by homeowners. The reason is three-fold. First, in traditional models, there is a sharp distinction between consumption and savings, but housing is both a consumption good and a savings vehicle. Second, in traditional models, consumers save

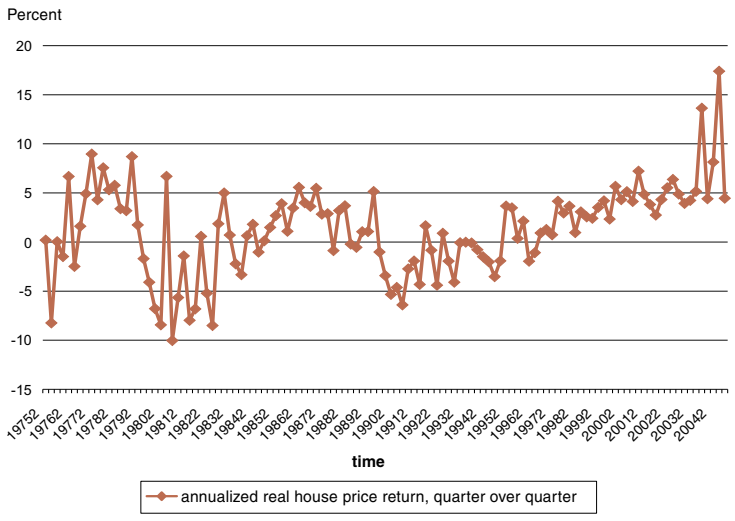
[3] See our working paper.

[4] See Wenli Li's *Business Review* article.

[5] In the short run, as demand for housing goes up, rents may come down. But eventually, rents will go up as property value goes up. Since we all need to live somewhere, Sinai and Souleles argue that the actual idiosyncratic risk of owning a house is somewhat lower because ownership hedges against the risk of rents rising.

FIGURE 1

Real Rate of Return of House Prices



Note: The rates of return are calculated using the house price index, a weighted repeated sales index constructed by the Office of Federal Housing Enterprise Oversight, deflated by the core consumer price index (which excludes the often volatile food and energy prices) from the Bureau of Labor Statistics. The core CPI compares prices for a fixed list of goods and services to a base period. Currently, the base, which equals 100, is average prices in the period 1982-84. Returns adjusted for inflation are called real returns.

to insure against a rainy day, so-called precautionary savings. These models do not take into account the transaction cost of using past savings to finance current consumption needs, as is the case with accessing home equity. Third, in traditional models, savings decisions are not affected by constraints on a household's wealth. Current institutional arrangements, however, often constrain homeowners from borrowing a mortgage that exceeds 80 percent of the house value unless private mortgage insurance is purchased.[6]

The new set of models that economists have developed in recent years to deal with housing issues explicitly model households that plan over their life cycle and make housing decisions along two dimensions: renting versus owning, and the size of the house for those who choose to own. These households also make mortgage decisions and other financial investment decisions, such as buying stocks and bonds. Notably, these households face borrowing constraints that preclude them from borrowing today against their future income. Researchers have used variations of such models to study, among many other things, households' optimal mortgage choice, portfolio decisions in the presence of housing, and the cost of subsidizing mortgage interest payments.[7] Our paper is the first to study directly the consumption and welfare consequences of changes in house prices using a model in which households explicitly maximize their lifetime welfare.[8]

HOUSE PRICES AND CONSUMPTION

Middle-Aged Homeowners' Consumption Is Not Sensitive to Changes in House Price. Contrary to many accounts in the popular and business press, some economists, most prominently Ed Glaeser, have argued that changes in housing price should have little impact on the consumption and welfare of an average homeowner, even if housing is a large share of the average individual's wealth. The reason is that when house prices increase, the assets of the household that owns a home obviously increase. At the same time, however, the price of housing services—the price the household would have to pay in order to rent the same house—has also increased, thus offsetting that gain. The household is not richer, since housing expenses appear on both sides of the household's balance sheet. Imagine a homeowner who has lived for some years in Manhattan. He has probably reaped an enormous capital gain from his house, but he would also find it very expensive to buy another house in Manhattan if he decides to sell his current house to capture the capital gains.

However, this logic holds only if today's house is much like tomorrow's house, i.e., the homeowner lives in the same house, as is the case with an average household: a middle-aged homeowner who has accumulated adequate savings to buy his desired house and who has yet to retire to Palm Beach, Florida. For these households, the increase in housing wealth cancels out the increase in the price of their housing services. The net cancellation, however, does not accurately reflect the decisions faced by homeowners who are either young or old, nor those faced by renters.

Contrary to many accounts in the popular and business press, some economists have argued that changes in housing price should have little impact on the consumption and welfare of an average homeowner.

Young Homeowners' Consumption Is More Sensitive to Changes in House Price. Young households' main wealth lies in their future earnings, which are not easy to borrow against. To a significant extent, young households' housing choices are limited by the down payment they can afford. Economists say that such homeowners are *borrowing constrained*. House-price appreciation effectively increases their assets and relaxes their borrowing constraint. Since they now have more home equity, young homeowners typically respond to the increase in house price by cashing out some of the home equity through mortgage refinancing so that they can spend the money on

[6] Financial innovations have relaxed, but not abolished, the down payment requirement for buying a house.

[7] See, respectively, the articles by John Campbell and Joao Cocco; the article by Joao Cocco and the one by Rui Yao and Harold Zhang; and the article by Martin Gervais. Patrick Bajari, C. Lanier Benkard, and John Krainer also study the welfare implications of house-price changes but in a complete market setting with perfect information.

[8] Economists refer to this class of models—which have become standard in modern macroeconomics—as dynamic stochastic equilibrium models. Every modeling exercise requires simplifying assumptions to keep things manageable. To single out the impact of house-price changes, we assume that household income does not change with house prices. In reality, however, house prices and household income are positively correlated—that is, they tend to rise or fall together—especially in a local market. Our argument remains true in this new environment, with the added effect that the changes in income will reinforce the impact of changes in house price, in both an economic upturn and a downturn.

other consumption goods.

Imagine a young couple who owns a $150,000 home with 20 percent equity ($30,000). The household does not have any other financial wealth, and it lives on a budget. Suppose that the price of the house increased 10 percent. The household now has $15,000 more in home equity. The couple may decide to cash out $900—through refinancing, home equity loans, or second mortgages—and buy that big TV they wanted but couldn't afford. In other words, the 10 percent appreciation in house price increased their nonhousing spending by $900.

It is worth pointing out that the consumption consequences of house-price appreciation depend on the extent of house-price increases and their persistence. For example, the initial house-price appreciation eases young homeowners' borrowing constraint and thus increases their consumption. Once these young homeowners overcome the liquidity problems, future house-price appreciation will not help them much in that regard. Furthermore, young households will respond more to more persistent house-price changes, given the transaction cost.

Old Homeowners' Consumption Is Also More Sensitive to Changes in House Price. Since old homeowners face a relatively short remaining life span, they are less concerned about long-term consumption. The risk of fluctuating rents in the future is not as important to them as it is to middle-aged and young homeowners. In other words, the increase in the price of the house they own increases their wealth more than it does the cost of housing consumption over their remaining lives. Therefore, they are more likely to sell their houses or downsize when house prices increase in order to capture the wealth gains. As a result, their nonhousing consumption, for example, travel, increases correspondingly.

Consider an 80-year-old couple who, according to the National Center for Health Statistics, have a life expectancy of another five to six years. Suppose the couple owns a $100,000 house with 100 percent equity. Suppose the price of their house rises 10 percent. The couple may decide to sell the house and get $110,000—$10,000 more than they would have gotten otherwise—and then rent a similar house at an annual cost of 6 percent of the house value. If house prices and rents stay unchanged for the next five years and assuming a zero discount rate, the couple gains $110,000 by selling the house, pays $33,000 for renting a similar house for five years (=$110,000*0.06*5), and still winds up with $77,000 in cash.[9] With the additional cash in hand, the couple can go on a cruise to celebrate their anniversary, a choice that may have been too expensive for them before, instead of waiting till the end of the fifth year to cash out the $110,000 from the house. Having said this, the couple does have to sell the house to get the cash right now. Therefore, their balance sheet may look worse than before, a price they pay to obtain the liquidity.

The consumption consequences of house-price appreciation depend on the extent of house-price increases and their persistence.

Of course, this effect on old homeowners may be weakened to the extent that old people may prefer leaving a house to their heirs rather than leaving money, since a house has more sentimental value for family members than for strangers who buy the house.

Renters Reduce Consumption When House Price Increases. Since rental housing and owner-occupied housing are substitutes, their prices typically move in the same direction.[10] Thus, if house prices increase, rents are also likely to increase. As a result, renters may reduce their consumption in order to pay the higher rent and increase their savings for a down payment on a house.

Consider a renter who rents a $100,000 house and pays $6,000 a year for rent. Suppose the house appreciates 10 percent, to $110,000, and the landlord adjusts the rent accordingly. The renter ends up paying $600 more a year for renting the same house. This extra money will have to come from someplace; the renter will have to cut his current consumption or dip into his (existing) savings. If the renter still plans to buy a house, he will have to cut current consumption in order to continue living in the same house and still save for the down payment on a future house, which has also gotten more expensive.

When house prices rise sufficiently, renters may decide that they may never have enough wealth to buy a house. As a result, renters may stop saving for a down payment. Nevertheless, they still need to cut current consumption to pay for the higher rents if they choose to stay in the same house.

Summarizing the Demographic Effects. In our working paper, we

[9] Obviously, the longer the couple needs to rent, the smaller will be the financial benefits of selling their house now to capture the capital gains.

[10] Substitutes are goods purchased in place of another good when its price rises. For example, if the price of houses goes up, the demand for rental units may rise and so rents would rise. If the price of houses falls, the demand for rental units may decline, so rents fall.

find that an additional dollar of housing wealth raises the consumption of young homeowners (those in their twenties and early to mid-thirties) by 5 to 6 cents, middle-aged homeowners (those in their late thirties to mid-sixties) by 4 cents, and old homeowners (those in their mid-sixties and above) by 8 cents (Figure 2). These are called the marginal propensities to consume out of housing wealth.

These numbers are largely in line with those found in recent empirical studies. Using data on UK households, John Campbell and Joao Cocco estimate the largest effect of house prices on consumption—11 cents on the dollar—for old homeowners, and almost no effect for young renters.[11] Using data on U.S. households, Andreas Lehnert also finds that the percentage increase in consumption for a given change in wealth depends crucially on a household's age, ranging from 0 percent for middle-aged homeowners to 4 percent for young homeowners and 8 percent for relatively old homeowners.

As a comparison, the marginal propensities to consume out of housing wealth found in our paper and those cited above are slightly larger than the marginal propensities to consume out of stock market wealth. Econometric specifications of total consumption such as those included in the Federal Reserve Board's model, as outlined in the article by Flint Brayton and Peter Tinsley, generally show that an additional dollar of stock market wealth raises the level of consumer spending by 3 to 5 cents.

WHEN CONSUMPTION RISES BECAUSE OF RISING HOUSE PRICES, HOUSEHOLDS AREN'T ALWAYS BETTER OFF

Although homeowners will increase their consumption when their housing wealth rises, these increases in consumption do not necessarily make all homeowners better off. But how do economists measure well-being? One way is to ask a household a hypothetical question: How much would your lifetime consumption have to increase to make you indifferent between the current situation where house prices remain unchanged and a permanent increase in house prices of a certain percentage (10 percent as in the case of our working paper)?[12] Since households of different homeownership status (rent versus own), ages, or assets have different needs for housing services, the answers will clearly be very different for different households.

Young Homeowners Are Worse Off. Young households' income is likely to rise steeply over most of their lifetime, and the size of their families is likely to expand over time. Therefore, their desired house size–one that matches their future income and family size–exceeds what they can afford with their current income and wealth. Thus, they will upgrade over time. The typical housing ladder for young households is an apartment, a starter house, and then a larger house. Even if all houses increase in value at the same rate, a big house typically appreciates more in dollars than does a small house.[13] As a result, the wealth gains young homeowners receive from their current houses are not enough to offset the cost of acquiring future housing services that are likely to exceed their current services.

Consider a young homeowner in

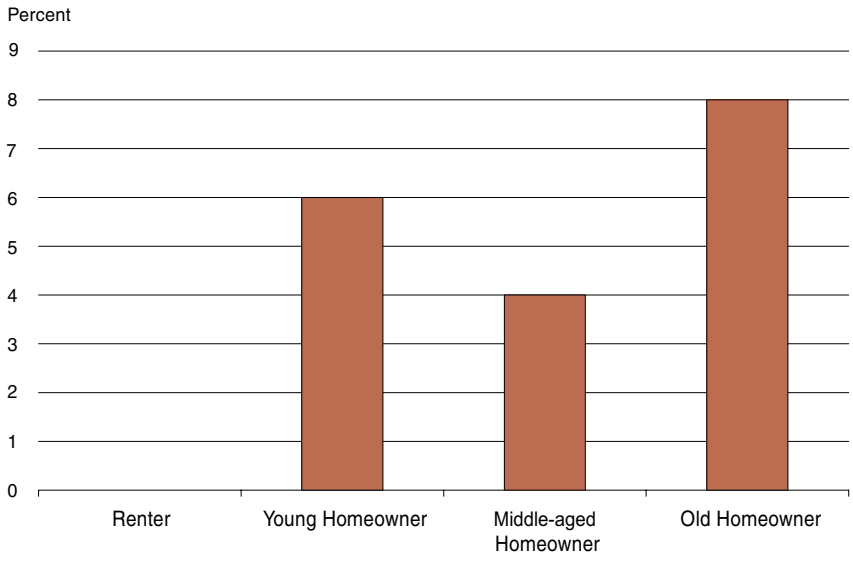
[11] See Campbell and Cocco's 2004 article.

[12] Economists call this the change in compensated demand.

[13] Joseph Gyourko and Joseph Tracy find that between the mid-1980s and the late 1990s, high-end houses tended to have a higher real rate of appreciation than low-end houses. However, they argue that some of it is because the quality of high-end houses has improved more than that of lower-end houses.

FIGURE 2

Consumption Changes as a Percentage of Housing Wealth Changes



Note: Renters do not participate in housing wealth gains since they do not own houses. As a result, their consumption out of housing wealth gains is not defined.

his late twenties who owns a condo worth $100,000 and plans to move to a house worth $200,000 after marriage. Assume that house price appreciates 10 percent, and the condo is now worth $110,000 and the house, $220,000. Before the house-price increase, the young homeowner needed only $100,000 in addition to his gains from selling his own house to buy the new house; now he needs $110,000, or $10,000 more. The young homeowner will have to either postpone the purchase of the new house or buy a smaller one.

Middle-Aged and Old Homeowners Benefit from House-Price Appreciation as Wealth Effects Dominate Their Consumption Needs. For middle-aged homeowners, income has peaked and family size has stabilized. Their house size matches their income and wealth profiles as well as their families' needs. Therefore, they will not change their house size for the foreseeable future. House-price appreciation thus increases their assets without changing their cost of acquiring future housing services.

For example, consider a middle-aged couple who have two children, both in primary school, and who own a house worth $350,000. The couple most likely will not experience dramatic changes in its income, since both members have been working at their careers for a number of years and their children will remain at home for the next five to 10 years. Since this family does not have any plans to move, a 10 percent house-price appreciation increases its assets by $35,000 without increasing its cost of acquiring housing services. The household can then spend the additional wealth on other consumption goods over its remaining life span.

Old homeowners, who are generally looking to downsize, also benefit from house-price appreciation. House-price appreciation allows them to capture additional housing wealth gains and reduce their housing costs. For example, imagine a 65-year-old couple who own a $300,000 house and who intend to move to a $100,000 condo. After the 10 percent house-price appreciation, the couple sell the house for $330,000 and buy the condo for $110,000. Their wealth gain is $220,000, $20,000 more than the wealth gain they would have received before the house-price appreciation. This additional wealth will help boost their other consumption as well as their bequest.

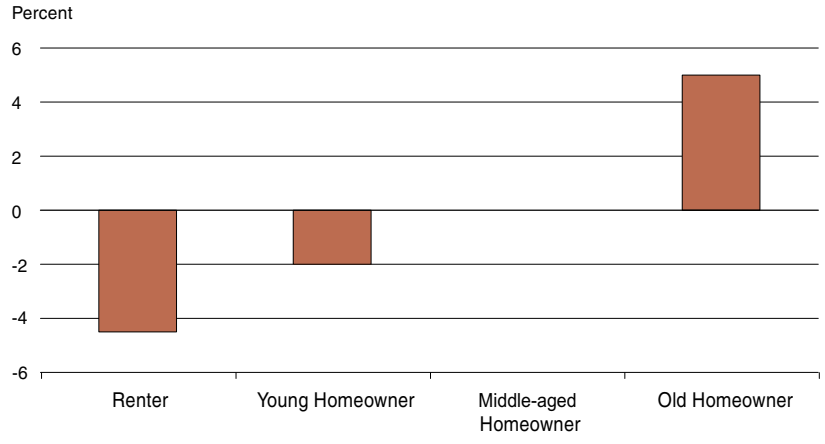
Renters Are Strictly Worse Off When Housing Price Increases. Think of a renter who pays $6,000 a year for an apartment worth $100,000. If we assume rent is 6 percent of the house value, after house-price appreciation, he pays $6,600 a year, $600 more for the same housing services. To make it worse, suppose the renter plans to buy the apartment, which is being turned into a condo by his landlord. Before he needed to pay only $100,000; now he needs to pay $110,000, or $10,000 more. As with the young homeowner, the renter will have to either cut current consumption to continue to live in the apartment or buy a smaller condo.

> The effects of house-price changes on total consumption and consumer welfare obviously depend on the demographics of the economy.

As we show in our working paper, house-price appreciation of 10 percent yields a loss of 4.5 percent in welfare for renters and a 2 percent loss in welfare for young homeowners. At around age 50, the welfare gains reach breakeven. Only households beyond the age of 65 receive a welfare gain exceeding 2 percent.

FIGURE 3

Change in Welfare from a 10 Percent House-Price Appreciation



Note: The welfare consequence is defined as changes in a household's lifetime consumption so as to make it indifferent between the current situation where house prices remain unchanged and a permanent 10 percent house-price appreciation. For example, an old homeowner would need to be given 5 percent more lifetime consumption to be as well off without an increase in house prices as with a 10 percent increase in house prices. In contrast, a renter would be willing to pay 4.4 percent in consumption to avoid the 10 percent increase in house prices.

An Example of the Effects of a Change in Housing Wealth

Consider an economy that consists of one renter, one homeowner in his early 30s, one homeowner in his mid-50s, and one homeowner in his 80s. The renter rents a $150,000 house, the young homeowner lives in a $200,000 house, the middle-aged homeowner owns a $350,000 house, and the old homeowner has a $300,000 house (to keep things simple, let's forget about the landlord).

Now let's assume that all houses appreciate 10 percent. As a result, the young homeowner gains $20,000, the middle-aged homeowner gains $35,000, and the old homeowner gains $30,000. The total housing wealth gains for households in this economy is thus $85,000 (=$20,000 + $35,000 + $30,000). Further assume that the marginal propensity to consume that results from this increase in housing wealth—that is, the increased consumption arising from a $1 increase in wealth—is 0.06 for homeowners younger than 35, 0.04 for homeowners between 35 and 75, and 0.10 for homeowners above age 75. The total consumption gain for the homeowners is $5,600 (=20,000 * 0.06 + 35,000 * 0.04 + 30,000 * 0.1).

Assuming a rental cost of 6 percent of the house value, the renter needs to pay $900 more in rent because of the house-price appreciation (=0.1*150,000*0.06). He will need to find this rent money. Suppose the money comes from lower current consumption and the renter increases savings by $100 for the furure purchase of a house. Then the total consumption of the homeowners and the renter has increased by $4,600 (=$5,600 -$900 - $100), implying a marginal propensity to consume out of the $85,000 increase in housing wealth of 5.4 percent (=$4,600/$85,000).

Suppose house prices stay high, and households in the economy grow older and move into the houses formerly occupied by the next oldest household. In addition, the old homeowner dies, and a new renter is born into the economy. Compared to the economy before house prices appreciated, the new renter pays $900 more in rent. The new young homeowner pays $20,000 more for the new house. The new middle-aged homeowner loses $15,000 (he made $20,000 but pays $35,000 more for his new house). The new old homeowner gains $5,000. The old homeowner's heirs are better off by $30,000, the appreciation of his house. We illustrate the points in Tables 1 and 2.

TABLE 1

Housing Wealth and Consumption

	Renter	Young homeowner	Middle-aged homeowner	Old homeowner
Rents/house value before house-price appreciation	House value: $150,000 Annual rent: $9,000=$150,000*0.06	House value: $200,000	House value: $350,000	House value: $300,000
Rents/house value gains after house price appreciates 10%	$900 =$150,000*0.1*0.06	$20,000 =$200,000*0.1	$35,000 =$350,000*0.1	$30,000 =$300,000*0.1
Marginal propensity to consume out of housing wealth		0.06	0.04	0.1
Consumption gains	-$1000 =-$900-$100 assuming the renter increases savings by $100 for future house purchase	$1200 =$20,000*0.06	$1400 =$35,000*0.4	$3000 =$30,000*0.1

continued on page 32

An Example of the Effects ... *(continued)*

TABLE 2

Housing Wealth and Consumer Welfare

	Renter	Young homeowner	Middle-aged homeowner	Old homeowner
Rents/house value before house-price appreciation	House value: $150,000 Annual rent: $9,000=$150,000*0.06	House value: $200,000	House value: $350,000	House value: $300,000
Rents/house value gains after house price appreciates 10%	$900 =$150,000*0.1*0.06	$20,000 =$200,000*0.1	$35,000 =$350,000*0.1	$30,000 =$300,000*0.1
Wealth gains/losses after upgrading to the next house	-$20,000	-$15,000 =$20,000-35,000	$5,000 =$35,000-30,000	$30,000
memo	New renter loses $900			

IMPLICATIONS FOR THE ECONOMY AS A WHOLE

The effects of house-price changes on total consumption and consumer welfare obviously depend on the demographics of the economy. One thing that is certain is that although individual groups—notably the old, the young, and renters—may experience significant changes in their wealth, the overall change in wealth may be small, since the individual effects may, to some degree, cancel each other in aggregation. (See *An Example of the Effects of a Change in Housing Wealth*.) In our analysis, we find that a permanent house-price increase of 10 percent leads to a slight decrease (0.9 percent) in overall welfare.

So far in our analysis, we assumed that house-price appreciation is the same for all places. Obviously, housing markets are local markets. If you live in an area where house-price appreciation is strong and move into an area with low appreciation, you can gain. In the longer term, however, appreciation across areas will likely equalize precisely because of this type of movements. We do not consider these differential regional markets here. (See *What If Housing Prices Fall?* for a brief discussion of the situation in which housing prices depreciate.)

CONCLUSIONS

Homeownership occupies a pedestal next to apple pie and motherhood as part of the American dream. Spurred by demographic trends, a strong economy, and preferential government policy, the homeownership rate has increased significantly in recent years. Today, close to 70 percent of households own their houses, and a substantial amount of households' wealth is now tied to housing.

Do these statistics imply that changes in housing prices will have significant effects on households' consumption and welfare? The answer is, it depends on whom you're asking.

Since a house is both an asset and a necessary outlay (we all need to live somewhere), house-price increases do not make a typical household richer. In other words, changes in house price have limited effects for a *typical* household and for the *overall* economy. The *distributional* effects, however, can be large. In particular, increases in house prices effectively transfer wealth from renters to homeowners and from young to old. By contrast, decreases in house prices transfer wealth from homeowners to renters and from old to young.

What If Housing Prices Fall?

So far, we have focused our attention on the effects of house-price appreciation, drawing on the recent experience of the residential housing market. A natural question is: What happens if house prices depreciate? This question is especially important in light of recent concerns of a possible housing bubble in the U.S.

A housing bubble here means that house price is significantly higher than its fundamental value. There are several common ways of thinking about housing's fundamental value. One is to consider the ratio of housing prices to rents, an equivalent to the price-to-dividend ratio for stocks. Since rent is a measure of the flow of housing services, in the long run, there should be a stable relationship between rents and housing prices. Another way is to consider the ratio of housing prices to household income. Of course, regulatory and tax changes can alter the long-run relationship between rents and housing prices as well as income and housing prices. Interested readers can read articles by Joshua Gallin (2003, 2004), and Charles Himmelberg, Christopher Mayer, and Todd Sinai (2005), among many others.

Our argument applies equally to the situation with house-price depreciation. Middle-aged homeowners' consumption will remain least responsive to the decline in house price for the same reasons discussed earlier. Young homeowners have to cut their consumption, since they can no longer rely on home equity to help smooth consumption. Note that these homeowners do not have much liquid savings they can cut. Similarly, old homeowners, who are already depleting their savings to support consumption, also need to cut their consumption now that they are not as wealthy as they used to be. Renters, by contrast, will increase their consumption, since they now pay less in rent and do not need to save as much as they used to in order to buy a house.

Despite the decline in consumption, young homeowners may still benefit from a depreciation in house prices if the decline in their future housing cost is significant enough to offset the short-term drop in consumption due to their worsened liquidity. Middle-aged and especially old homeowners, on the other hand, are worse off because the decline in housing costs for their remaining life may not be enough to compensate them for the decline in their wealth. Renters, by contrast, are strictly better off, since they suffer no wealth loss, yet benefit from lower future housing cost.

If the house-price depreciation becomes too severe, however, many homeowners may choose to default on their mortgage. Things would then become more complicated. Those who had more equity before the depreciation would obviously lose more financially. However, since lenders may decide not to lend to these people in the future, those households with longer expected life spans (generally the young and middle-aged) will suffer more from the reduced access to future credit.

REFERENCES

Bajari, Patrick, C. Lanier Benkard, and John Krainer. "House Prices and Consumer Welfare," *Journal of Urban Economics*, forthcoming.

Benjamin, John, Peter Chinloy, and Donald G. Jud. "Real Estate Versus Financial Wealth in Consumption," *Journal of Real Estate Finance and Economics*, 29 3 (2004), pp. 342-54.

Brayton, Flint, and Peter Tinsley. "A Guide to FRB/US," Federal Reserve Board Finance and Discussion Series Working Paper 1996-42 (October).

Campbell, John, and Joao F. Cocco. "Household Risk Management and Optimal Mortgage Choice," *Quarterly Journal of Economics,* 118 (2004), pp. 1149-94.

Campbell, John, and Joao F. Cocco. "How Do House Prices Affect Consumption? Evidence from Micro Data," Harvard University and London Business School Working Paper.

Carson, Joseph G. "Home Appraisal: Housing Cycle Should Continue to Fuel Consumer Spending," Global Economic Research, www.alliancebernstein.com.

Case, Karl E., John M. Quigley, and Robert T. Shiller. "Comparing Wealth Effects: The Stock Market versus the Housing Market," University of California Working Paper.

Cocco, Joao F. "Portfolio Choice in the Presence of Housing," *Review of Financial Studies* (2005), pp. 535-67.

Gallin, Joshua. "The Long-Run Relationship between House Prices and Rents," Federal Reserve Board Finance and Economics Discussion Series 2004-50.

Gallin, Joshua. "The Long-Run Relationship between House Prices and Income: Evidence from Local Housing Markets," Federal Reserve Board Finance and Economics Discussion Series 2003-17.

Gervais, Martin. "Housing Taxation and Capital Accumulation," *Journal of Monetary Economics*, 49, 7 (2002), pp. 1461-89.

Glaeser, Edward. "Comments and Discussion on Karl E. Case's Real Estate and the Macroeconomy," *Brookings Papers on Economic Activity*, 2 (2000), pp. 146-50.

Greenspan, Alan, and James Kennedy. "Estimates of Home Mortgage Originations, Repayments, and Debt on One-to-Four Family Residences," Federal Reserve Board Finance and Economics Discussion Series 2005-41.

Gyourko, Joseph, and Joseph Tracy. "A Look at Real Housing Prices and Incomes: Some Implications for Housing Affordability and Quality," Federal Reserve Bank of New York *Economic Policy Review*, 5 (1999), pp. 63-77.

Himmelberg, Charles, Christopher Mayer, and Todd Sinai. "Assessing High House Prices: Bubbles, Fundamentals and Misperceptions," Columbia University Working Paper (September 2005).

Lehnert, Andreas. "Housing, Consumption, and Credit Constraints," Federal Reserve Board *Finance and Economics Discussion Series* 2004-63.

Li, Wenli. "Moving Up: Trends in Homeownership and Mortgage Indebtedness," Federal Reserve Bank of Philadelphia *Business Review* (First Quarter 2005), pp. 26-34.

Li, Wenli, and Rui Yao. "The Life-Cycle Effects of House Price Changes," Federal Reserve Bank of Philadelphia Working Paper 05-7 (2005).

Sinai, Todd, and Nicholas S. Souleles. "Owner-Occupied Housing as a Hedge Against Rent Risk," *Quarterly Journal of Economics*, forthcoming.

Yao, Rui, and Harold H. Zhang. "Optimal Consumption and Portfolio Choices with Risky Housing and Borrowing Constraints," *Review of Financial Studies*, 18 (Spring 2005), pp. 197-239.