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Comparing Wealth Effects: The Stock Market versus the Housing Market

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Abstract

We examine the link between increases in housing wealth, financial wealth, and consumer spending. We rely upon a panel of 14 countries observed annually for various periods during the past 25 years and a panel of U.S. states observed quarterly during the 1980s and 1990s. We impute the aggregate value of owner-occupied housing, the value of financial assets, and measures of aggregate consumption for each of the geographic units over time. We estimate regression models in levels, first differences and in error-correction form, relating consumption to income and wealth measures. We find a statistically significant and rather large effect of housing wealth upon household consumption.

KEYWORDS: consumption, nonfinancial wealth, housing market, real estate

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I. Introduction

It has been widely observed that changes in stock prices are associated with changes in national consumption. In regression models relating changes in log consumption to changes in log stock market wealth, the estimated relationship is generally positive and statistically significant. Under a standard interpretation of these results, from a suitably specified regression, the coefficient measures the "wealth effect" - the causal effect of exogenous changes in wealth upon consumption behavior.

There is every reason to expect that changes in *housing* wealth exert effects upon household behavior that are quite analogous to those found for stock market wealth, and yet there has been virtually no comparative research on this issue. Moreover, the housing wealth effect may be especially important in recent decades, as institutional innovations (such as second mortgages in the form of secured lines of credit) have made it as simple to extract cash from housing equity as it is to sell shares or to borrow on margin.[1]

Wealth may take many forms, and as noted below, there is ample reason to think that the tendency to consume out of stock market wealth is different from the tendency to consume out of housing wealth.

In this paper, we provide empirical evidence on the issue by relying upon two bodies of data: a panel of annual observations on 14 countries measuring aggregate consumption, the capitalization of stock market wealth, and aggregate housing wealth; and an analogous panel of quarterly observations on U.S. states estimating consumption, stock ownership, and aggregate housing wealth. These data exploit variations in the geographical distribution of stock market and housing market wealth among the U.S. states and the substantial variations in the timing and intensity of economic activity across developed countries.

Figures 1 and 2, scatter diagrams of log changes in consumption against log changes in wealth, provide an overview of these relationships. Figures 1A and 1B, based on panels of annual observations on countries, suggest that annual changes in consumption are positively correlated with contemporaneous changes in housing wealth, but not with stock market wealth. Figures 2A and 2B, based on annual aggregates of quarterly data for the United States, reveal similar patterns.

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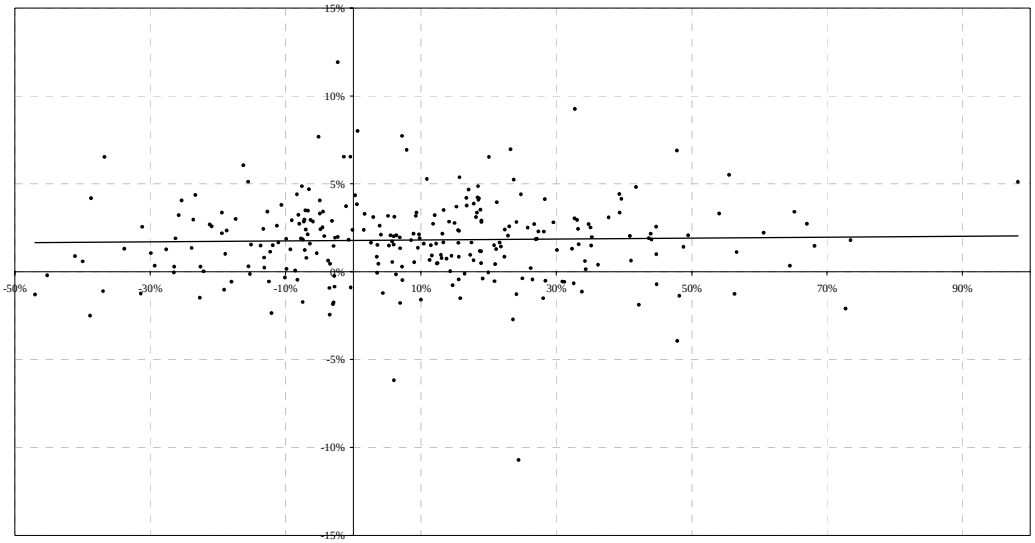
[1] Indeed, in a speech to the Mortgage Bankers Association, Federal Reserve Chairman Alan Greenspan ruminated, "One might expect that a significant portion of the unencumbered cash received by [house] sellers and refinancers was used to purchase goods and services… However, in models of consumer spending, we have not been able to find much incremental explanatory power of such extraction. Perhaps this is because sellers' extraction [of home equity] is sufficiently correlated with other variables in the model, such as stock-market wealth, that the model has difficulty disentangling these influences" (Greenspan, 1999).

Figure 1
Overview of International Data
(All variables are real and are measured per capita)

A. Log Annual Change in Consumption vs. Log Change in Stock Market Wealth
Across Countries and Years



B. Log Annual Change in Consumption vs. Log Change in Housing Wealth
Across Countries and Years

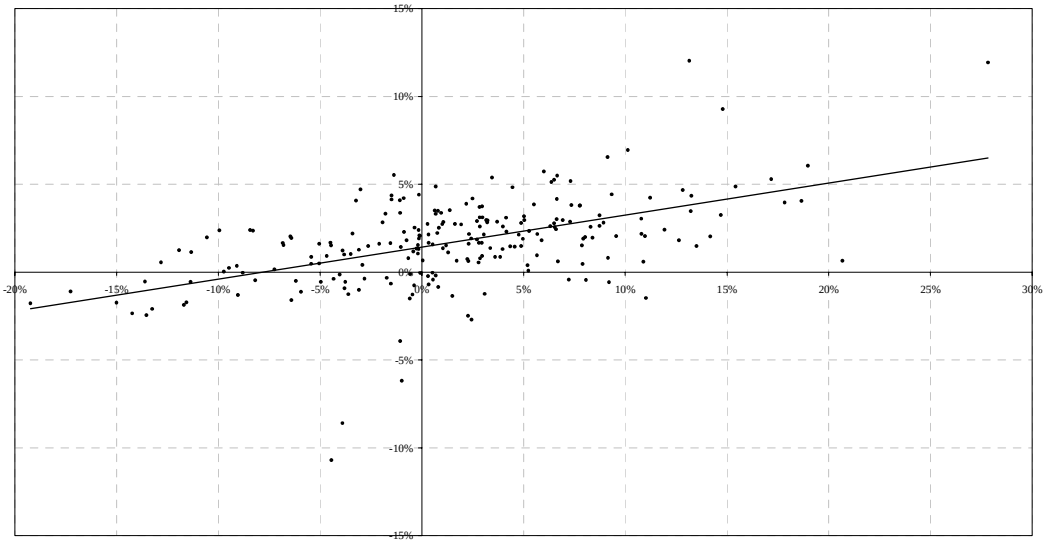
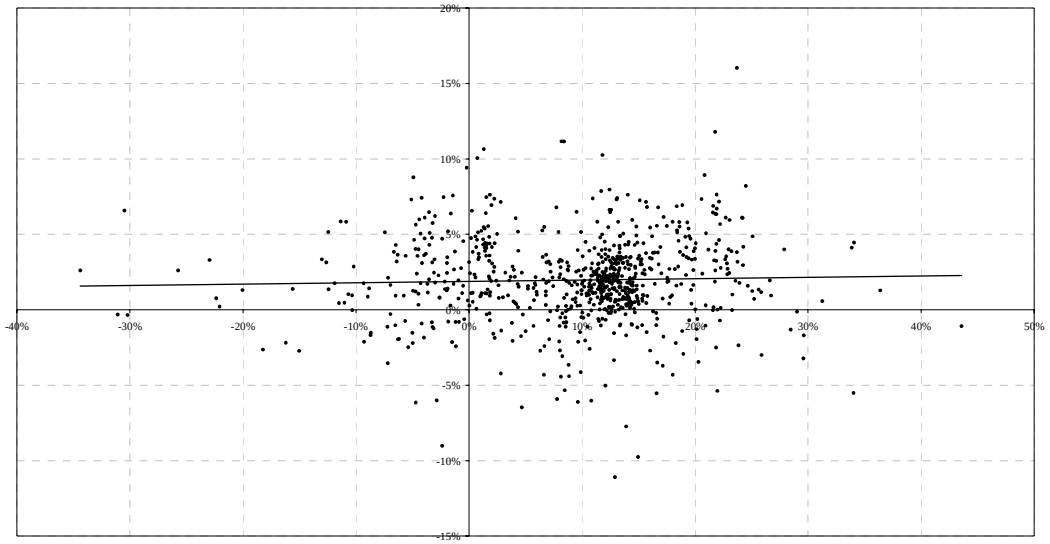
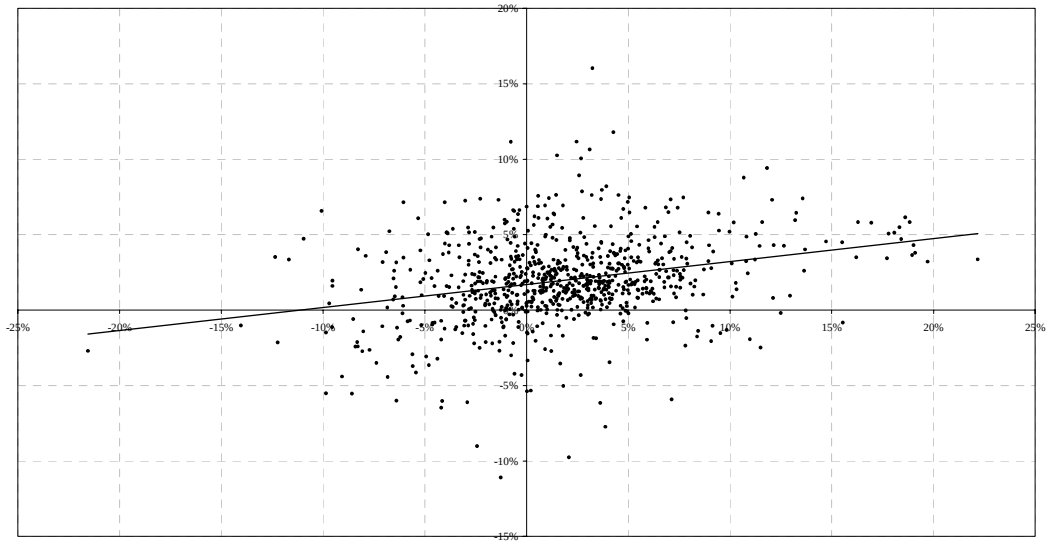


Figure 2
Overview of U.S. State Data
(All variables are real and are measured per capita)

A. Log Annual Change in Consumption vs. Log Change in Stock Market Wealth
Across States and Years



B. Log Annual Change in Consumption vs. Log Change in Housing Wealth
Across States and Years



Of course, our systematic analysis allows us to go beyond these scatter diagrams, and to control for various factors as well as test for significance. Our method is eclectic; we present analyses in levels, first differences, and in error-correction-model (ECM) forms, and with alternative assumptions about lag lengths, about error terms, and fixed effects.

Section II below provides a brief theoretical motivation for the distinction between housing and financial wealth and a review of the limited evidence on the effects of housing wealth on consumption and savings behavior. Section III describes the data sources, imputations, and the computations used to create the two panels. Section IV presents our statistical results, and some final thoughts on the direction of causality and the estimation of structural consumption models. Section V is a brief conclusion.

II. Differential Wealth Effects: Theories and Evidence

A simple formulation of the life cycle savings hypothesis suggests that consumers will distribute increases in anticipated wealth over time and that the marginal propensity to consume out of all wealth, whether from stocks, real estate, or any other source, should be the same small number, something just over the real interest rate. But, such a broad theoretical notion is no substitute for research identifying the empirical relation between changes in consumption and wealth.

Research designed to quantify an effect of changes in wealth on changes in consumption, going back to Ando and Modigliani (1963), has largely used aggregate measures of wealth that emphasize the stock market and make no credible attempt to measure housing wealth with any accuracy. Although the evidence is not unambiguous, there appears to be some time-series evidence of a stock market wealth effect; see Poterba (2000) for a survey.

Evidence for a stock market wealth effect has also been carried beyond time-series evidence. Starr-McCluer (1998) used data on individual households from the 1997 Michigan SRC Survey of Consumers, which asked special questions about consuming and saving at a time following significant stock market price increases. The great majority of those surveyed, 85 percent, reported that the trend in the stock market had no effect on their consumption expenditures. However, those respondents who reported holdings in excess of $250,000 were significantly more likely to say that they spent more as a result of the increase in stock prices. Because of the importance of these respondents in aggregate consumption, Starr-McCluer interprets the survey as evidence of a modest wealth effect upon consumption arising from the stock market.

Dynan and Maki (2001) used data on individual households in the Consumer Expenditure Survey, 1983 through 1989, to conclude that those households who own stocks react to stock price changes with changes in consumption in the same direction within a couple of years, while those who do not own stocks exhibit no consumption response to variations in the stock market.

But it is hardly safe to extrapolate the wealth effect for the stock market to the real estate market. There are, in fact, many reasons why consumption may be differently affected by the form in which wealth is held. First, increases in measured wealth of different kinds may be viewed by households as temporary or uncertain. Second, households may have a bequest motive which is strengthened by tax laws that favor holding appreciated assets until death. Third, households may view the accumulation of some kinds of wealth as an end in itself. Fourth, households may not find it easy to measure their wealth, and may not even know what it is from time to time. The unrealized capital gains held by households in asset markets may be transitory, but asset prices can be measured with far more precision in thick markets with many active traders. Fifth, people may segregate different kinds of wealth into separate "mental accounts," which are then framed quite differently. The accumulation of real estate wealth may be viewed as the placing of a hedge against life's uncertainties, and indeed it has been found that homeownerhip rates are higher in localities that have more uncertain rental rates (Sinai and Souleles, 2003). The psychology of framing may dictate that certain assets are more appropriate to use for current expenditures while others are earmarked for long-term savings (Shefrin and Thaler, 1988).

Each of these concerns suggests a distinction between the impact of housing wealth and stock market wealth on consumption. The extent to which people view their currently-measured wealth as temporary or uncertain may differ between the two forms of wealth. People may have quite different motives about bequeathing their stock portfolios and bequeathing their homesteads to heirs. The emotional impact of accumulating stock market wealth may be quite different from that of real estate wealth, particularly owner-occupied housing. People are, perhaps, less aware of the short-run changes in real estate wealth since they do not receive regular updates on its value. Stock market wealth can be tracked daily online or in the newspaper.

Differential impacts of various forms of wealth on consumption have already been demonstrated in a quasi-experimental setting. For example, increases in unexpected wealth in the form of large lottery winnings lead to large effects on short-run consumption (see Imbens, Rubin, and Sacerdote, 1999). Responses to surveys about the uses put to different forms of wealth imply strikingly different "wealth effects" (Shefrin and Thaler, 1988). By analogy, it is entirely reasonable to expect that there should be a different impact of real estate and housing wealth, as compared with stock market wealth, on consumption.

Exogenous changes in housing wealth could also have an impact different from lottery winnings or stock market windfalls by affecting the consumption behavior of renters and younger cohorts of consumers, as well as older homeowners. An exogenous increase in house values and housing wealth means that younger renters must save more today to become homeowners tomorrow. In

principle, some or all of any increased consumption made by current owners could be offset by increased savings of renters who aspire to become homeowners.

The empirical importance of housing wealth for consumption has not been widely explored. An early study by Elliott (1980) relied upon aggregate data on consumer spending, financial wealth, and nonfinancial wealth, finding that variations in the latter had no effect upon consumption. Elliott's analysis suggested that "houses, automobiles, furniture, and appliances may be treated more as part of the environment by households than as a part of realizable purchasing power" (1980, p.528). These results were challenged by Peek (1983) and Bhatia (1987) who questioned the methods used to estimate real nonfinancial wealth. More recently, Case (1992) reported evidence of a substantial consumption effect during the real estate price boom in the late 1980s using aggregate data for New England.

Using data on individual households from the Panel Study of Income Dynamics (PSID), Skinner (1989) found a small but significant effect of housing wealth upon consumption. Sheiner (1995) explored the possibility noted above that home price increases may actually increase the savings of renters who then face higher down payment requirements to purchase houses. Her statistical results, however, were quite inconclusive.

A more suggestive relationship was reported by Yoshikawa and Ohtake (1989) who found that savings rates for Japanese renter households planning to purchase homes was higher with higher land prices, but that the incidence of household plans to purchase housing was sufficiently lower with higher land prices, so that the net effect of higher prices was to increase consumption by renters as well as owners.

Analogous results were found for renters in Canada by Engelhardt (1994); higher housing prices substantially reduced the probability that renter households saved for a down payment. A $4000 increase in house prices decreased the probability of saving by one percentage point, and led to a reduction in accumulated assets of $1200.

From surveys of U.S. homebuyers assembled by a major title and trust company, it was estimated that transfers from family members provided down payment assistance for twenty percent of first-time homebuyers, accounting on average for half of the down payment (Engelhardt and Mayer, 1998). Transfers from others reduced household savings by 30-40 cents per dollar. (See also Engelhardt and Mayer, 1994.)

Thus it appears that higher housing prices may reduce, rather than increase, the savings of renters. Moreover, to the extent that higher housing prices increase the resources (leveraged at about four to one) available for intrafamilial transfers,

this may further reduce the savings of those renters who expect to become homeowners.

Campbell and Cocco (2004) used United Kingdom data on individual households from the UK Family Expenditure Survey linked with the Nationwide data set of regional home price indexes to study the effects of changes in home values on the consumption of renters versus homeowners. They found a statistically significant impact of housing prices on consumption among older homeowners, but no significant impact among young renters.

Engelhardt (1996) also provided a direct test of the link between house price appreciation and the consumption of current homeowners, also using the PSID. He estimated that the marginal propensity to consume out of real capital gains in owner-occupied housing is about 0.03, but this arose from an asymmetry in behavioral responses. Households experiencing real gains did not change their savings and consumption behavior appreciably, while those experiencing capital losses did reduce their consumption behavior.

Much of the limited evidence on the behavioral response to changes in housing wealth has arisen from consideration of the "savings puzzle." During the late 1990s, personal savings as measured in the National Income and Product Accounts fell sharply, to nearly zero by 2000. But it was shown that if unrealized capital gains in housing were included in both the income and savings of the household sector (as suggested by the original Haig-Simons criteria), then the aggregate personal savings rates computed were much higher (Gale and Sabelhaus, 1999).

Similarly, Hoynes and McFadden (1997) used micro data (PSID) to investigate the correlation between individual savings rates and rates of capital gains in housing. Consistent with the perspective of Thaler (1990), the authors found little evidence that households were changing their savings in non-housing assets in response to expectations about capital gains in owner-occupied housing.

One other study of the "wealth effect" which has disaggregated housing and stock market components of wealth is an analysis of the Retirement History Survey by Levin (1998). Levin found essentially no effect of housing wealth on consumption.

All of these micro studies of consumer behavior rely upon owners' estimates of housing values. Evidence does suggest that the bias in owners' estimates is small (see below), but these estimates typically have high sampling variances (Kain and Quigley, 1972; Goodman and Ittner, 1992). This leaves much ambiguity in the interpretation of statistical results.

III. The Data

We address the linkages between stock market wealth, housing wealth, and household consumption using two distinct bodies of panel data we have assembled in parallel for this purpose. The data sets have different strengths and weaknesses, which generally complement each other for the study of these relationships.

The first data set consists of a panel of annual observations on 14 developed countries for various years during the period of 1975-1999. The second data set consists of a panel of quarterly data constructed for U.S. states from 1982 through 1999.

The international data set is the more comprehensive, and exploits a wider spectrum of geographic variation. However, it relies upon consumption measures derived from national income accounts, not our imputations, and there is reason to suspect that housing prices and housing wealth in this panel are measured less accurately. There are also substantial institutional differences among countries, such as variations in the taxation of wealth and capital gains and in constraints affecting borrowing and saving.

The second data set, the U. S. state data, exploits the fact that the distribution of increases in housing values has been anything but uniform across regions in the U.S., and the increases in stock market wealth have been quite unequally distributed across households geographically. This panel offers the advantage that data definitions and institutions are uniform across geographical units. In addition, the sample size is large. One disadvantage of this data set arises because one key variable must be imputed to the various states on the basis of other data measured at the state level. Another disadvantage of these data is that the U.S. stock market has trended upwards during most of the sample period, and the period may have been unusual (Shiller, 2005). On the other hand, the sample period ends before the millennium home price boom, which affected many areas around the world, but which began in earnest only after 2000.

Both data sets contain substantial time series and cross-sectional variation in cyclical activity and exhibit substantial variation in consumption and wealth accumulation.

A. International Data

It was possible to obtain data for a panel of 14 developed countries during the period 1975-1996.[2] We estimate stock market wealth, housing market wealth, and consumption for each country for each year.

Estimates of aggregate stock market wealth for each country were obtained from the Global Financial Database which reports domestic stock market capitalization annually for each country. To the extent that the fraction of the stock market wealth owned domestically varies among countries, this can be accounted for in the statistical analysis reported below by permitting fixed effects to vary across countries. We can introduce country-specific time trends to control for variations over time in home country investment bias.

Estimates of housing market wealth were constructed by using:

$$(1) \qquad V_{it} = R_{it} N_{it} I_{it} \ ,$$

where

V_{it} = aggregate value of owner occupied housing in country i in year t,
R_{it} = homeownership rate in country i in year t,
N_{it} = number of households in country i in year t, and
I_{it} = housing price index for country i in year t (I_{i1} = 1, for 1990:I).

Indexes of annual housing prices I_{it} were obtained from the Bank of International Settlements (BIS), which consolidated housing prices reported for some 15 industrialized countries (see Kennedy and Andersen, 1994, or Englund and Ioannides, 1997). The BIS series for the United States was quite short, so the national OFHEO-Freddie Mac series (described further below) is used for the U.S.

Note that our measure V_{it} of housing wealth deliberately takes no account of the size or quality of new construction or of improvements in existing homes. Our housing wealth measure may be described as wealth of homeowners assuming they own a standard, unchanging home. We define housing wealth in this way in order to focus on effects of changes in the market price of housing on consumption. Had we instead used the total value of homes as our measure of wealth, then we would likely find a relation between housing wealth and consumption merely because housing consumption is a component of aggregate consumption. Should consumption increase for any reason, it would be natural to suppose that there would be a feedback into housing wealth through changes in

[2] The countries include: Belgium (1978-1996), Canada (1978-1993), Denmark (1978-1996), Finland (1978-1996), France (1982-1996), Germany (1991-1995), Ireland (1982-1987, 1994-1995), Netherlands (1978-1996), Norway (1980-1996), Spain (1975-1996), Sweden (1975-1996), Switzerland (1991-1996), the United Kingdom (1978-1996), and the United States (1975-1997).

home size and quality: part of the increase would be attributable to improvements in homes.

Consistent and comparable data on housing prices for a benchmark year were not available for the panel of countries, so we are not able to make cross-country comparisons with these data on the level of housing prices. This means that regression estimates without fixed effects for each country (which control for country-specific benchmarks) are meaningful only under very restrictive assumptions.

Data on the number of owner-occupied housing units were obtained from various issues of the *Annual Bulletin of Housing and Building Statistics for Europe and North America*, published by the United Nations. The series describing the owner-occupied housing stock was not complete for all years in all countries. More complete data existed for the total housing stock of each country. Where missing, the owner-occupied housing stock was estimated from the total housing stock reported for that year and the ratio of the owner-occupied housing stock to the total housing stock for an adjacent year. Missing data points were estimated by linear interpolation.[3]

Figure 3 reports the evolution of housing market wealth in the 14 countries relative to its aggregate per capita value in 1990. The variations over time in housing market wealth are striking.

Consumption data were collected from the International Financial Statistics database. "Household Consumption Expenditure including Nonprofit-Institution-Serving Households" is used for in the European Union countries that rely upon the *European System of Accounts (ESA1995)*. "Private Consumption" is used for other countries, according to the *System of National Accounts (SNA93).* Data on aggregate consumption, housing values and stock market valuations, by country and year, were expressed per capita in real terms using UN population data and the GNP deflator for each country.[4]

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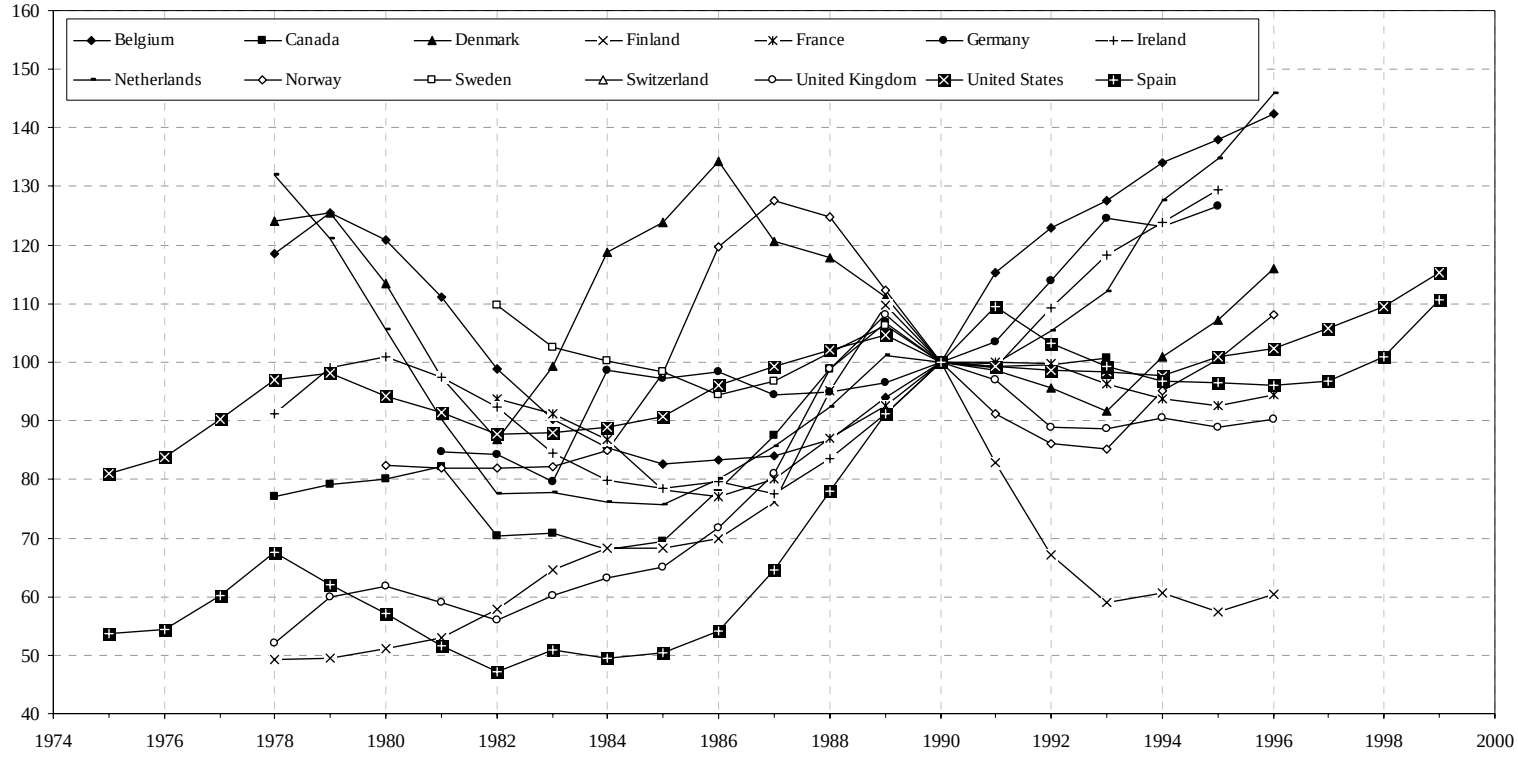
[3] In addition, we are grateful for unpublished estimates of the stock of owner-occupied housing supplied by Paloma Taltavull de La Paz (for Spain) and the value of owner-occupied housing by Barot Bharot (for Sweden).

[4] By construction, the measure of consumption for each country includes an imputation for the services of the owner-occupied housing stock consumed in each year. It was infeasible to assemble a comparable panel of these imputations for the fourteen countries, and thus it proved impossible to subtract this measure of consumption services from aggregate consumption. The potential importance of this omission can, however, be illustrated. For the United States it is possible to obtain a consistent annual series measuring the consumption services of owner-occupied housing during the period 1962-2000, and thus to compute an adjusted consumption series. (These data are reported in NIPA table 2.4.5, lines 1 and 49.) The correlation between the adjusted and unadjusted consumption series is 0.99959 in real terms and 0.99999 in nominal terms.

Figure 3
Evolution of Real Per Capita Owner-Occupied Housing Wealth Across Countries
(1990 = 100)



B. U.S. State Data

Analogous to our international data, we also estimate stock market wealth, housing market wealth and consumption for each U.S. state, quarterly, for the period 1982-1999.

Estimates of aggregate financial wealth were obtained annually from the Federal Reserve Flow of Funds (FOF) accounts and compared to the aggregate capitalization of the three major U.S. stock markets. From the FOF accounts, we computed the sum of corporate equities held by the household sector, pension fund reserves, and mutual funds. The FOF series has risen in nominal terms from under $2 trillion dollars in 1982 to $18 trillion in 1999. It is worth noting that more than half of the gross increase between 1982 and 1999 occurred during the four years between 1995 and 1999. The total nominal increase for the 13 years between 1982 and 1995 was $7.5 trillion; the total nominal increase during the 4 years between 1995 and 1999 was an astonishing $8.4 trillion. Nearly all variation in the FOF aggregate arises from variation in the capitalization of the stock market. To distribute household financial assets geographically, we exploit the correlation between holdings of mutual funds and other financial assets. We obtained mutual fund holdings by state from the Investment Company Institute (ICI). The ICI data are available for the years 1986, 1987, 1989, 1991 and 1993. We assumed that for 1982:I through 1986:IV, the distribution was the same as it was in 1986; similarly we assumed that the 1993 distribution held for the period 1993-1999. We further assumed that direct household holdings of stocks and pension fund reserves were distributed in the same geographical pattern as mutual funds. These are clearly strong assumptions.

We made considerable efforts to check these series against other data, but there are few alternative sources. The Survey of Consumer Finances (SCF) produces regular estimates of household wealth, including stock market wealth, from a stratified random sample of top wealth holders. Survey data are available for 1989, 1992, 1995, 1998 and 2001, and national aggregate data are published for those years. The staff at the Board of Governors of the Federal Reserve (Fed) maintain that this survey information is insufficient to estimate stock market wealth at the level of individual states. However, Andreas Lehnert of the Fed arranged for special tabulations to be made available to us, aggregating micro data on stock market wealth to the level of census region for each year of the SCF survey. These data can be compared to the ICI data available for 1986, 1987, 1989, 1991 and 1993, also aggregated to the nine census regions.

In the one year common to the two bodies of data, 1989, the simple correlation between the two series is 0.934; the correlations are also quite high among the

data for other years which do not match. The t-ratios associated with these correlations are large, but of course, the sample size is small.[5]

Estimates of housing market wealth were constructed from repeat sales price indexes applied to the base values reported in the *1990 Census of Population and Housing* by state. Weighted repeat sales (WRS) indexes (see Case and Shiller, 1987, 1989) constructed by Fiserv CSW, Inc. are available for this entire period for only 16 states. However, the Office of Federal Housing Enterprise Oversight (OFHEO) publishes state-level repeat value indexes quarterly. These indexes are produced by Fannie Mae and Freddie Mac and are available for all states.

The Case-Shiller indexes are the best available for our purposes, and wherever possible we use them.[6] The WRS and the OFHEO indexes are highly correlated, however, and we use the OFHEO indexes where WRS indexes are not available.

Equation (2) indicates the construction of the panel on aggregate housing wealth:

(2) $V_{it} = R_{it} N_{it} I_{it} V_{io}$,

where

V_{it} = aggregate value of owner occupied housing in state i in quarter t,

R_{it} = homeownership rate in state i in quarter t,

N_{it} = number of households in state i in quarter t,

I_{it} = weighted repeat sales price index, WRS or OFHEO, for state i in quarter t ($I_{i1} = 1$, for 1990:I), and

V_{io} = mean home price for state i in the base year, 1990.

The total number of households N as well as the homeownership rates R were obtained from the *Current Population Survey* conducted by the U.S. Census

[5] The complete matrix of correlation coefficients between the ICI series in various years and the SCF series is indicated below. We are grateful to Kevin Moore of the Fed for assembling these data.

	SCF				
ICI	1989	1992	1995	1998	2001
1986	0.928	0.686	0.929	0.818	0.889
1987	0.928	0.612	0.906	0.794	0.870
1989	0.934	0.672	0.937	0.828	0.895
1991	0.916	0.616	0.916	0.798	0.867
1993	0.938	0.703	0.912	0.848	0.920

[6] While OFHEO uses a similar index construction methodology (the WRS method of Case and Shiller, 1987), their indexes are in part based on appraisals at the time of refinancing rather than on arms-length transactions. The Case-Shiller indexes use various devices to filter out non-arms-length sales data.

Bureau annually and interpolated for quarterly intervals. Aggregate wealth varies as a result of price appreciation of the existing stock as well as additions to the number of owner-occupied dwellings but, similar to the international data, it does not vary because of changes in the size and quality of homes.

The baseline figures for state-level mean home prices V_{io} are derived from estimates of house values reported in the *1990 Census of Population and Housing*. As noted, several studies have attempted to measure the bias in owner estimates of house values. The estimates range from minus 2 percent (Kain and Quigley, 1972, and Follain and Malpezzi, 1981) to plus 6 percent (Goodman and Ittner, 1992). However, Goodman and Ittner point out that for many purposes, owners' estimates may indeed be the appropriate measures of housing wealth; household consumption and savings behavior is likely to be based upon perceived home value. The aggregate nominal value of the owner-occupied stock in the U.S. grew from $2.8 trillion in 1982 to $7.2 trillion in 1999. Figure 4 reports the evolution of real per capita owner-occupied housing wealth for a sample of U.S. states during the period 1982-1999. There is considerable variation in the course of housing wealth across states. For the states illustrated, the levels vary by 300 percent, and the timing of changes varies substantially.

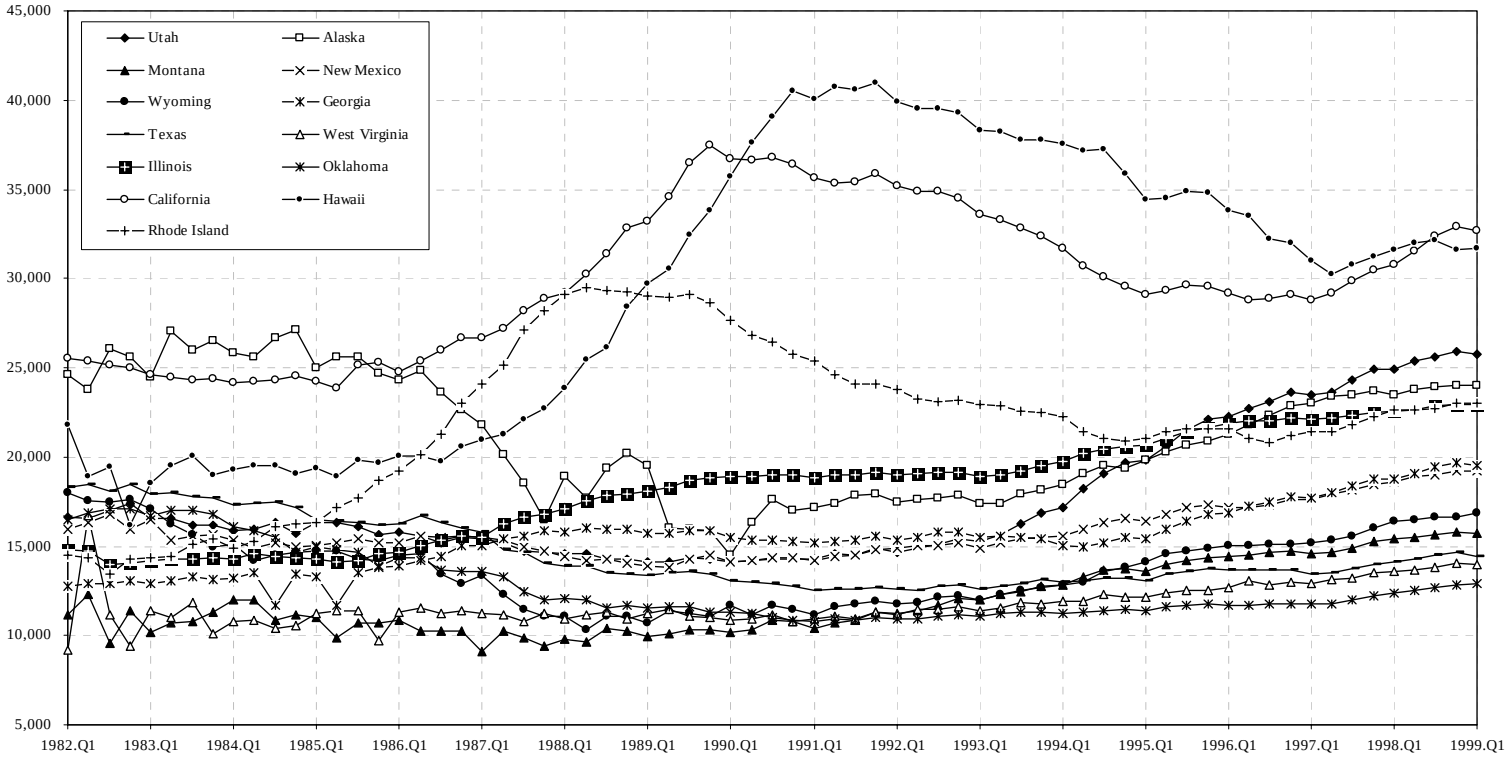
Unfortunately, there are no measures of consumption spending by households recorded at the state level. However, a consistent panel of retail sales has been constructed by Regional Financial Associates (RFA).[7] Retail sales account for roughly half of total consumer expenditures.[8] The RFA estimates were constructed from county level sales tax data, the *Census of Retail Trade* published by the U.S. Census Bureau, and the Census Bureau's monthly national retail sales estimates. For states with no retail sales tax or where data were insufficient to support imputations, RFA based its estimates on the historical relationship between retail sales and retail employment. Data on retail employment by state are available from the Bureau of Labor Statistics. Regression estimates relating sales to employment were benchmarked to the *Census of Retail Trade* available at five-year intervals. Estimates for all states were within five percent of the benchmarks.

Retail sales can be expected to differ systematically from consumption spending for several reasons. Clearly, in states with relatively large tourist industries, recorded retail sales per resident are high. Nevada, for example, with 26 percent of its labor force employed in tourism, recorded per capita retail sales of $3,022 in 1997:I, third highest among the 50 states. In addition, states with low or no sales tax can be expected to report high retail sales per resident. For

[7] We are grateful to Mark Zandi of RFA for making these data available.

[8] In 1997, for example, gross domestic product was $8.08 trillion, household consumption spending was $5.49 trillion, and retail sales amounted to $2.63 trillion.

Figure 4
Evolution of Real Per Capita Owner-Occupied Housing Wealth in Selected U.S. States
(Constant 90:Q1 Dollars)



example, with no sales tax New Hampshire recorded per capita retail sales of $3,200 in 1997:I, highest among the 50 states. Most states, however, were more tightly clustered around the mean of $2,385 in 1997:I.

To the extent that these systematic differences between retail sales and consumption are state specific, this can be accounted for directly in multivariate statistical analysis. Data on retail sales, house values, and stock market valuation, by state and quarter, were expressed per capita in real terms using the *Current Population Survey* and the GDP deflator.

IV. Statistical Results

Tables 1 through 5 report various econometric specifications of the relationship. All include fixed effects (i.e., a set of dummy variables for each country and state). Model I is the basic specification representing the effects of both housing and stock market wealth upon consumption. We also include two other specifications, to provide further information on the nature of estimated wealth effects and their robustness. Model II for each specification also includes state and country specific time trends. Model III includes year-specific fixed effects as well as fixed effects for countries and states. For the panel of states, Model III also includes seasonal (i.e., quarterly) fixed effects.

Note that, when interpreting the estimated coefficients for wealth in Model III, the effects of an overall change in stock market wealth on consumption are controlled for in the regressions. Thus, in Model III the estimated wealth coefficients reflect only interregional differences in the growth of wealth.

In each of the four tables, the first three columns present regression results for the panel of countries (228 observations on 14 countries), while the next three columns report the results for the panel of states (3498 observations on 50 states and the District of Columbia).[9]

Table 1 presents basic ordinary least squares relationships between per capita consumption, income, and the two measures of wealth. As the table indicates, in the simplest formulation, the estimated effect of housing market wealth on consumption is significant and large. In the international comparison, the elasticity ranges from 0.11 to 0.17. In the cross-state comparison, the estimated elasticity is between 0.05 and 0.09. In contrast, the estimated effects of financial wealth upon consumption are smaller. In the simplest model, the estimate from the international panel is 0.02. In the other two regressions, the estimated coefficient is insignificantly different from zero, perhaps reflecting the more restricted ownership of non-financial wealth in Western European countries. In the cross-state comparisons, the estimated effect of financial wealth is highly

[9] The state panel is not quite balanced. The series includes quarterly observations from 1982:I through 1999:IV for all states but Arizona. The time series for Arizona begins in 1987:I.

Table 1
Ordinary Least Squares
Consumption Models Based Upon Country Data: Annual Observations 1975-1999
and State Data: Quarterly Observations 1982-1999
Country/State Fixed Effects
All variables are real (deflated by GDP deflator) and measured per capita in logarithms
(t ratios in parentheses)

Dependent variable: Consumption per capita

	International Data			U.S. State Data		
	I	II	III	I	II	III
Income	0.660	0.349	0.287	0.567	0.705	0.559
	(9.69)	(5.63)	(3.27)	(31.95)	(28.56)	(22.84)
Stock Market Wealth	0.019	0.002	-0.010	0.056	0.028	0.063
	(2.05)	(0.25)	(-0.87)	(14.19)	(5.86)	(10.53)
Housing Market Wealth	0.131	0.110	0.166	0.084	0.047	0.086
	(5.33)	(7.35)	(6.90)	(11.56)	(6.97)	(11.57)
Country/State Specific Time Trends	No	Yes	No	No	Yes	No
Year/Quarter Fixed Effects	No	No	Yes	No	No	Yes
R^2	0.9991	0.9998	0.9993	0.9241	0.9587	0.9305
t-Ratio	4.664	7.090	6.987	3.919	2.408	2.541
p-value for H_0	0.000	0.000	0.000	0.000	0.016	0.011
p-value for H_1	1.000	1.000	1.000	1.000	0.992	0.994

Note: H_0 is a test of the hypothesis that the coefficient on housing market wealth is equal to that of stock market wealth.
H_1 is a test of the hypothesis that the coefficient on housing market wealth exceeds that of stock market wealth.

significant, but its magnitude is about sixty percent as large as the estimated effect of housing wealth.

The table also reports the t-ratio for the hypothesis that the difference between the coefficient estimates measuring housing and financial market effects is zero. A formal test of the hypothesis that the coefficient on housing market wealth is equal to that of stock market wealth (against the alternative hypothesis that the two coefficients differ) is presented, as well as a test of the hypothesis that the coefficient on housing market wealth exceeds the coefficient on financial wealth. The evidence suggests that housing market wealth has a more important effect on consumption than does financial wealth.

Table 2 reports the results when the effects of first order serial correlation are also estimated.[10] The estimated serial correlation coefficient is highly significant and large in magnitude. The coefficients of housing market wealth change only a little. For the panel of countries, the estimated elasticity ranges from 0.11 to 0.14; for the panel of states, the estimate ranges from 0.04 to 0.06. In five of the six regressions reported, the hypothesis that the effects of housing market wealth are larger than those of financial wealth is accepted by a wide margin.

Table 3 presents results with all variables expressed as first differences. In this formulation, the coefficient on housing market wealth is significant in all specifications, while the coefficient of financial wealth is essentially zero. Consumption changes are highly dependent on changes in income and housing wealth, but not stock market wealth.

Appendix Table 1 presents tests for the presence of unit roots in the individual time series data we analyze. For most, but not all, of the state series we can reject the hypothesis of unit roots in the data. The table also presents a test for the presence of a *common* unit root in the fourteen country and 51-state panels for each of the four data series (Maddala and Wu, 1999). The presence of a common unit root is rejected by a wide margin for each of the series for both panels.[11]

Despite this, Table 4 presents the model in first differences including the lagged (log) ratio of consumption to income. This is the error-correction model (ECM) often employed in the presence of unit roots. The model represents a co-integrated relation between consumption and income, where income includes income from the stock market and housing. Note that the lagged ratio of consumption to income has a coefficient that is negative and significant in all

[10] These models rely on sequential estimation using the Prais-Winsten estimator.

[11] The specific test we report in Appendix Table 1 uses a model with no intercept and no trend in conducting the augmented Dickey-Fuller (ADF) tests. The table also relies upon a four-quarter lag for the state panel, and a one-year lag for the international panel. The conclusions presented in the table are unchanged if the ADF model includes an intercept and/or a trend; they are also insensitive to the lag structure.

Table 2
Generalized Least Squares Consumption Models with Serially Correlated Errors
Country/State Fixed Effects
All variables are real (deflated by GDP deflator) and measured per capita in logarithms
(t ratios in parentheses)

Dependent variable: Consumption per capita

	International Data			U.S. State Data		
	I	II	III	I	II	III
Income	0.679	0.309	0.388	0.647	0.432	0.336
	(12.30)	(4.84)	(5.07)	(40.20)	(18.16)	(13.94)
Stock Market Wealth	0.007	-0.004	-0.003	0.042	0.007	0.026
	(1.16)	(-0.69)	(-0.33)	(11.87)	(1.53)	(4.87)
Housing Market Wealth	0.108	0.115	0.136	0.039	0.054	0.062
	(4.62)	(6.52)	(5.92)	(4.14)	(6.25)	(6.96)
Serial Correlation Coefficient	0.854	0.564	0.817	0.878	0.784	0.866
	(23.77)	(9.57)	(19.49)	(107.43)	(73.55)	(101.44)
Country/State Specific Time Trends	No	Yes	No	No	Yes	No
Year/Quarter Fixed Effects	No	No	Yes	No	No	Yes
R^2	0.9998	0.9999	0.9998	0.9839	0.9855	0.9863
t-Ratio	4.282	6.525	5.987	-0.311	4.543	3.425
p-value for H_0	0.000	0.000	0.000	0.756	0.000	0.001
p-value for H_1	1.000	1.000	1.000	0.378	1.000	1.000

Note: H_0 is a test of the hypothesis that the coefficient on housing market wealth is equal to that of stock market wealth.
H_1 is a test of the hypothesis that the coefficient on housing market wealth exceeds that of stock market wealth.

Table 3
Ordinary Least Squares
Consumption Models in First Differences
Country/State Fixed Effects
All variables are real (deflated by GDP deflator) and measured per capita in logarithms
(t ratios in parentheses)

Dependent variable: Consumption per capita

	International Data			U.S. State Data		
	I	II	III	I	II	III
Income	0.266	0.239	0.254	0.332	0.325	0.274
	(4.06)	(3.49)	(3.34)	(14.12)	(13.73)	(11.15)
Stock Market Wealth	-0.008	-0.010	-0.007	0.001	0.002	0.003
	(-1.37)	(-1.67)	(-0.97)	(0.23)	(0.36)	(0.50)
Housing Market Wealth	0.128	0.147	0.141	0.034	0.030	0.038
	(6.21)	(6.56)	(6.37)	(3.58)	(3.11)	(3.94)
Country/State Specific Time Trends	No	Yes	No	No	Yes	No
Year/Quarter Fixed Effects	No	No	Yes	No	No	Yes
Regression R^2	0.3943	0.4346	0.4807	0.0729	0.0813	0.1458
Durbin-Watson	1.718	1.847	1.705	2.424	2.445	2.484
t-Ratio	6.341	6.725	6.518	2.876	2.437	3.097
p-value for H_0	0.000	0.000	0.000	0.004	0.015	0.002
p-value for H_1	1.000	1.000	1.000	0.998	0.993	0.999

Note: H_0 is a test of the hypothesis that the coefficient on housing market wealth is equal to that of stock market wealth.
H_1 is a test of the hypothesis that the coefficient on housing market wealth exceeds that of stock market wealth.

Table 4
Error Correction Consumption Models
Country/State Fixed Effects

$$\Delta C_t = \alpha \Delta C_{t-1} + \beta_1 \Delta Inc_t + \beta_2 \Delta Stock_t + \beta_3 \Delta House_t + \gamma [C_{t-1} - Inc_{t-1}] + \text{Fixed Effects} + \varepsilon_t$$

All variables are real (deflated by GDP deflator) and measured per capita in logarithms
(t ratios in parentheses)

Dependent variable: Change in Consumption per capita

	International Data			U.S. State Data		
	I	II	III	I	II	III
Change in Income	0.283	0.297	0.274	0.350	0.388	0.304
	(4.33)	(4.77)	(3.64)	(14.92)	(16.61)	(12.57)
Change in Stock Market Wealth	-0.003	0.001	-0.004	-0.009	-0.009	-0.003
	(-0.59)	(0.26)	(-0.58)	(-2.02)	(-2.06)	(-0.51)
Change in Housing Market Wealth	0.097	0.100	0.107	0.044	0.047	0.054
	(4.25)	(4.36)	(4.35)	(4.33)	(4.60)	(5.23)
Lagged Change in Consumption	0.131	0.117	0.150	-0.182	-0.149	-0.227
	(2.17)	(2.01)	(2.32)	(-10.75)	(-8.75)	(-13.44)
Lagged Ratio of Consumption to Income	-0.077	-0.333	-0.071	-0.049	-0.151	-0.051
	(-2.65)	(-7.04)	(-2.45)	(-6.87)	(-14.00)	(-6.77)
Country/State Specific Time Trends	No	Yes	No	No	Yes	No
Year/Quarter Fixed Effects	No	No	Yes	No	No	Yes
R^2	0.4248	0.5634	0.5044	0.1301	0.1787	0.2169
Durbin-Watson	1.858	1.897	1.898	2.028	2.009	2.055
t-Ratio	4.176	4.044	4.369	4.305	4.539	4.727
p-value for H_0	0.000	0.000	0.000	0.000	0.000	0.000
p-value for H_1	1.000	1.000	1.000	1.000	1.000	1.000

Note: H_0 is a test of the hypothesis that the coefficient on housing market wealth is equal to that of stock market wealth.
H_1 is a test of the hypothesis that the coefficient on housing market wealth exceeds that of stock market wealth.

regressions for both panels. Thus, transitory shocks, arising from changes in other variables in the model or the error term in the regression, will have an immediate effect on consumption but will eventually be offset unless the shocks are ultimately confirmed by income changes. Again, the results support the highly significant immediate effect of housing market wealth upon consumption; the effect is especially large relative to that of financial wealth.[12]

In Table 5 we introduce a lagged stock market response within the ECM framework. There are, perhaps, reasons to expect some time lags: household inattention, evaluation of household finances only at periodic intervals (such as annual tax reporting times), adjustment costs to changing consumption, and habit formation. Some of these reasons are confirmed with survey data on individual consumers' decisions. Kennickell and Starr-McCluer (1997) found that households have only imperfect knowledge of their own financial wealth, and so it would be expected that they should not all react instantaneously to changes in components of that wealth. Dynan and Maki (2001) have presented evidence using household data that the stock market wealth effect, to the extent that it is measurable, operates as a lagged adjustment process.[13] We amend our preferred specification to add a lagged term in the regressions.[14] We do not include lags on household housing wealth, given the strong serial correlation of home price changes, which would introduce substantial multicollinearity into the regression. The results reported in Table 5 including the lagged change in the stock market wealth variable are very similar to those reported in Table 4. The estimated effect of housing wealth is somewhat stronger in Table 5. Indeed, for the United States the estimates are fifty percent larger. The estimated effect of stock market wealth is also generally increased in Table 5. For Models I and II (which exclude year-specific fixed effects) the sum of the coefficients on stock market wealth is generally positive, but these effects are generally statistically insignificant.

[12] Our data measure financial and housing wealth levels at the end of each period, rather than their averages throughout each period. Therefore, we also estimated each of the 24 regressions reported in Tables 1 through 4 using one- and two-period leads and lags in the measures of housing and financial assets. The character of these results is consistent with those reported in the text: measures of housing wealth were significant; measures of financial wealth were sometimes insignificant. Where significant, the magnitude of the coefficient on housing wealth exceeded that of financial wealth. The results are robust. They are available upon request.

[13] Of course, there is also likely to be an even longer-term and much smaller effect of stock market wealth, operating over decades or even generations, but it is not realistic for us to estimate such an effect with our data.

[14] To make the lagged responses comparable for the panel of the United States and developed nations, we aggregate the quarterly state data to years and analyze the one-year lag in stock market wealth at the state level. Note that this reduces the degrees of freedom in the state panel by about 75 percent.

Table 5
Ordinary Least Squares
Error Correction Consumption Models with Lagged Yearly +Stock Market Wealth Effects
Country/State Fixed Effects

$$\Delta C_t = \alpha \Delta C_{t-1} + \beta_1 \Delta Inc_t + \beta_2 \Delta Stock_t + \beta_3 \Delta House_t + \gamma [C_{t-1} - Inc_{t-1}] + \beta_4 \Delta Stock_{t-1} + \text{Fixed Effects} + \varepsilon_t$$

All variables are real (deflated by GDP deflator) and measured per capita in logarithms
(t ratios in parentheses)

Dependent variable:	International Data			U.S. State Data		
Change in Consumption per Capita	I	II	III	I	II	III
Change in Income	0.239	0.241	0.256	0.370	0.493	0.358
	(3.30)	(3.58)	(3.18)	(7.43)	(10.27)	(6.44)
Change in Stock Market Wealth during the past year, $\Delta Stock_t$	-0.002	0.005	-0.006	-0.009	-0.003	-0.010
	(-0.28)	(0.80)	(-0.71)	(-0.94)	(-0.38)	(-0.67)
Change in Housing Market Wealth	0.094	0.092	0.104	0.094	0.104	0.081
	(4.06)	(3.98)	(4.08)	(4.89)	(5.11)	(4.23)
Lagged Change in Consumption	0.145	0.135	0.156	0.288	0.361	0.245
	(2.24)	(2.20)	(2.24)	(8.05)	(10.34)	(6.85)
Lagged Ratio of Consumption to Income	-0.081	-0.355	-0.074	-0.188	-0.514	-0.171
	(-2.78)	(-7.39)	(-2.51)	(-8.45)	(-15.36)	(-7.70)
Change in Stock Market Wealth during the past year compared to the previous year, $\Delta Stock_{t-1}$	0.010	0.013	0.005	0.008	0.009	0.010
	(1.45)	(2.15)	(0.58)	(0.96)	(1.09)	(0.68)
Country/State Specific Time Trends	No	Yes	No	No	Yes	No
Year Fixed Effects	No	No	Yes	No	No	Yes
R^2	0.4243	0.5710	0.5002	0.3032	0.4519	0.4478
t-Ratio	3.899	3.535	4.154	4.524	4.564	3.902
DF	187	173	168	703	652	689
p-value for H_0	0.000	0.001	0.000	0.000	0.000	0.000
p-value for H_1	1.000	1.000	1.000	1.000	1.000	1.000

Note: H_0 is a test of the hypothesis that the coefficient on housing market wealth is equal to that of stock market wealth.
H_1 is a test of the hypothesis that the coefficient on housing market wealth exceeds that of stock market wealth.

We also investigated the importance of simple demographics - the age distributions of each of the populations - since theory implies that the wealth effect should be different for different phases of the life cycle. For the panel of U.S. states, we relied upon estimates of the age distribution produced annually by the CPS since 1982. We computed the fraction of the population aged 60 or above by state and year and interpolated to quarters. For the panel of OECD countries, we aggregated the raw data reported in the Human Mortality Database. For 11 of the 14 countries in our panel, we were able to compute an estimate of the fraction of the population aged 60 and above for each relevant year. The age distribution is not available for the U.K., so we used the series reported for England and Wales. The raw data are not available for Belgium and Ireland, so we dropped these countries. We added interaction-effect terms to the Table 5 regressions, in an effort to estimate how the wealth effect is affected by age. The estimated age-interaction effect variables were not statistically significant, and these results are omitted here.

The state and country data do not show enough variation in age distribution over our sample period to allow good estimates of the interaction of wealth effect with age. However, it should be noted that Campbell and Cocco (2004), using data on individual households, did find evidence that the housing wealth effect is higher for older households.

Because of changes in institutional details, at least for the United States, there is concern that the housing wealth effect might change through time. The Tax Reform Act of 1986 (TRA86) greatly advantaged the use of housing equity for consumption (by eliminating the deductibility of all other interest payments for consumer credit). Passage of the act greatly encouraged financial institutions to establish lines of credit secured by home equity during the fourth quarter of 1986. Even if homeowners do not plan to access their home equity for consumption, their knowledge that this equity will increase would work towards diminishing the precautionary saving motive, a motive which has been shown to be an important determinant of consumption expenditure (Kennickell and Lusardi, 2004).

Appendix Table 2 presents variants of our preferred statistical models, the first differences and the ECM models, for the panel of U.S. states. In these regressions, we distinguish between the potential effects of housing wealth on consumption before and after the last quarter of 1986. In both the first differences and the ECM models, the estimated effects of housing market wealth upon consumption are substantially larger after the passage of TRA86. The point estimates are between two and ten times larger after the change in the tax law, and these differences are highly significant statistically. The comparisons are hardly

definite, and in two of the three specifications, they merely interpret a specific intercept shift.[15] But they are quite suggestive.

Finally, some evidence suggests that housing consumers may react differently to perceived increases in housing values compared to perceived declines in asset values. Genesove and Mayer (2001) have shown that home sellers behave differently, as suggested by Kahneman and Tversky's prospect theory, in reaction to declines in home prices, than in reaction to rises. Apparently the painful regret due to loss of home value has different psychological consequences than does the pleasant elation due to increase in home value, which frees up new opportunities to consume home equity. Appendix Table 3 provides additional evidence, again based upon the panel of U.S. states, using the same preferred models. The table compares the effects of increases in housing market wealth upon consumption with the effects of decreases in housing market wealth upon consumption. For each of the specifications, the results indicate that increases in housing market wealth have positive and significant effects upon consumption, but declines in housing market wealth have no effect at all upon consumption. A t-test soundly rejects the hypothesis that the consumption response to changes in housing wealth is the same for wealth increases and for wealth decreases.

For each of the twelve variants reported in Appendix Tables 2 and 3, the basic finding – that the effects of housing market wealth upon consumption are large relative to the effects of stock market wealth upon consumption – remains unchanged.

Drawing the various results reported in this paper together, we offer also some final thoughts on the inference of causality. There is naturally some skepticism about the estimation of simple macroeconomic structural relations (see, e.g., Cooley and Leroy, 1981 or Leamer, 1983). Underlying our analysis is an assumption that it is useful to think of causality as running from wealth components to consumption, and not that, for example, the two are determined by some third variable, such as a general measure of "confidence" in the economy. The results presented imply that it is useful to think of consumption as determined in accordance with one of our models. Recall that our measure of housing wealth excludes wealth changes due to changes in size or quality of homes, changes that are likely to correlate with variations in consumption merely because housing services are a component of consumption. We have alluded above to evidence from individual households that the reaction of consumption to stock market increases is stronger for stockholders than for non-stockholders, and that the reaction of consumption to housing price increases is stronger for homeowners than for renters. This supports our structural interpretation, especially in

[15] Note that specification II includes state-specific time trends as well as an intercept shift with time.

comparison to a model in which general "confidence" determines both consumption and asset prices. Our statistical results clearly demonstrate that the reaction of consumption to home prices increased after 1986, when tax law changes began to favor borrowing against home equity and when home equity loans became more widely available. They also document an asymmetry, as suggested by psychological theory, in households' reactions to home price increases as compared with households' reactions to price decreases.

V. Conclusion

The importance of housing market wealth and financial wealth in affecting consumption is an empirical matter. We have examined this wealth effect with two panels of cross-sectional time-series data that are more comprehensive than any applied before and with a number of different econometric specifications.

The numerical results vary somewhat with different econometric specifications, and so any numerical conclusion must be tentative. We find at best weak evidence of a stock market wealth effect. However, we do find strong evidence that variations in housing market wealth have important effects upon consumption. This evidence arises consistently using panels of U.S. states and industrial countries and is robust to differences in model specification.

For example, according to the results presented in Table 2 for Model I, a ten percent increase in housing wealth increases consumption by roughly 1.1 percent for the international panel, while a ten percent increase in stock market wealth has virtually no effect upon consumption. For the panel of U.S. states in Table 2 (Model I), a ten percent increase in housing wealth and in stock market wealth have about the same effect on consumption – an increase of 0.4 percent. According to the ECM model, Table 4 (Model I), the immediate effect of a ten percent increase in housing wealth is an increase in consumption of one percent for the panel of Western countries, while a ten percent increase in financial wealth has a negligible effect. According to the same model, the immediate effect of a ten percent increase in housing wealth is an increase in consumption of 0.4 percent for the panel of U.S. states while a ten percent increase in financial wealth has no effect. (Actually, the point estimate is negative.) Absent a second shock, the effect of a ten percent increase in housing wealth is reduced to 0.3 percent after four quarters and to 0.2 percent after ten quarters.

These calculations should not imply a false precision in the interpretation of our econometric models. Nevertheless, they do support the conclusion that changes in housing prices should be considered to have a larger and more important impact than changes in stock market prices in influencing household consumption in the U.S. and in other developed countries.

Appendix Table 1
P-Values for Unit Roots in Individual Time Series and
Fisher Tests for a Common Root in Panels of States and Countries
No Intercept, No Trend in ADF Specifications
All variables are real (deflated by GDP deflator) and measured per capita in logarithms

A. US States

p-Values from ADF Test with 4 Lags

State	Variable: Consumption	Income	Stock Wealth	Housing Wealth
AL	0.0000	0.1510	0.0061	0.0014
AK	0.0026	0.0054	0.0049	0.0000
AZ	0.0357	0.1690	0.0011	0.0033
AR	0.0301	0.0641	0.0041	0.0068
CA	0.0073	0.1059	0.0028	0.1106
CO	0.0209	0.2336	0.0256	0.0967
CT	0.0120	0.1685	0.0069	0.0918
DE	0.0254	0.2457	0.0010	0.0770
DC	0.0066	0.1439	0.0030	0.0153
FL	0.0157	0.0978	0.0118	0.0025
GA	0.0095	0.1882	0.0026	0.0611
HI	0.0713	0.0305	0.0107	0.1320
ID	0.0139	0.0623	0.0029	0.0072
IL	0.1293	0.0445	0.0032	0.1320
IN	0.1171	0.0319	0.0024	0.1264
IA	0.0318	0.0010	0.0056	0.1192
KS	0.0476	0.0652	0.0022	0.0029
KY	0.0344	0.0095	0.0032	0.0781
LA	0.0426	0.0265	0.0078	0.1268
ME	0.0345	0.1453	0.0019	0.0547
MD	0.0190	0.2702	0.0012	0.0578
MA	0.0111	0.1587	0.0062	0.1380
MI	0.1242	0.0829	0.0040	0.2486
MN	0.0592	0.0100	0.0057	0.0497
MS	0.0045	0.0884	0.0119	0.0262
MO	0.0485	0.1360	0.0019	0.1323
MT	0.0001	0.0005	0.0054	0.0050
NE	0.1397	0.0156	0.0040	0.0956
NV	0.0106	0.0724	0.0050	0.0175
NH	0.0082	0.1407	0.0015	0.1471
NJ	0.0367	0.1388	0.0060	0.1004
NM	0.0023	0.0797	0.0052	0.0332
NY	0.0519	0.1017	0.0058	0.0765
NC	0.0212	0.1267	0.0026	0.0593
ND	0.0175	0.0000	0.0077	0.0020
OH	0.1298	0.0993	0.0037	0.2245
OK	0.0044	0.0007	0.0044	0.1025
OR	0.0256	0.1112	0.0018	0.2073
PA	0.0474	0.2258	0.0026	0.2075
RI	0.0020	0.0907	0.0021	0.1207
SC	0.0407	0.0198	0.0025	0.0175
SD	0.0914	0.0026	0.0027	0.0000
TN	0.0301	0.1416	0.0048	0.0012
TX	0.0005	0.0280	0.0028	0.0181
UT	0.0410	0.2396	0.0040	0.2361
VT	0.0064	0.1099	0.0051	0.1294
VA	0.0551	0.2422	0.0014	0.0653
WA	0.0456	0.3260	0.0019	0.0546
WV	0.0282	0.0137	0.0032	0.0001
WI	0.0904	0.0626	0.0081	0.0496
WY	0.0216	0.0006	0.0021	0.0444
Fisher's λ	**413.8610**	**317.9160**	**571.4830**	**368.3870**
DF	102	102	102	102
P-Value	0.0000	0.0000	0.0000	0.0000

Appendix Table 1 (cont'd)

B. Individual Countries

		Variable			
	Country	Consumption	Income	Stock Wealth	Housing Wealth
p-Values from ADF Test with 1 Lag	Belgium	0.0182	0.1921	0.0400	0.1588
	Canada	0.1651	0.0247	0.0010	0.1248
	Denmark	0.0288	0.1645	0.0230	0.0156
	Finland	0.2856	0.0088	0.0057	0.0145
	France	0.0929	0.1069	0.0072	0.0316
	Germany	--	--	--	--
	Ireland	0.2177	0.2726	--	0.2011
	Netherlands	0.0990	0.1411	0.0339	0.1195
	Norway	0.0189	0.1602	0.0031	0.0347
	Sweden	0.2233	0.1851	0.0454	0.0377
	Spain	0.0579	0.0102	0.0276	0.0462
	Switzerland	0.0041	0.0779	0.0117	--
	United Kingdom	0.1684	0.0429	0.0563	0.0295
	United States	0.3281	0.0462	0.0299	0.0316
Fisher's λ		**67.0677**	**68.5220**	**101.3580**	**72.3881**
DF		26	26	24	24
P-Value		1.76E-05	1.09E-05	1.76E-11	9.45E-07

Note: Missing data preclude meaningful computations in cells marked "--".

Appendix Table 2: Pre vs Post 1986
Ordinary Least Squares
Consumption Models in First Differences and Error Correction Models
Country/State Fixed Effects
All variables are real (deflated by GDP deflator) and measured per capita in logarithms
(t ratios in parentheses)

Dependent variable: Change in Consumption per capita	Models in First Differences			Error Correction Models		
	I	II	III	I	II	III
Change in Income	0.326	0.318	0.267	0.346	0.386	0.301
	(13.82)	(13.43)	(10.88)	(14.78)	(16.53)	(12.45)
Change in Stock Market Wealth	-0.001	-0.001	0.005	-0.010	-0.011	-0.002
	(-0.28)	(-0.21)	(0.87)	(-2.34)	(-2.52)	(-0.31)
Pre 1986 Dummy * Change in Housing Wealth	0.012	0.008	0.014	0.025	0.023	0.033
	(1.06)	(0.70)	(1.34)	(2.14)	(1.93)	(2.77)
Post 1986 Dummy * Change in Housing Wealth	0.100	0.098	0.120	0.088	0.106	0.110
	(5.61)	(5.36)	(6.41)	(4.97)	(5.99)	(6.01)
Lagged Change in Consumption				-0.175	-0.139	-0.221
				(-10.28)	(-8.06)	(-12.98)
Lagged Ratio of Consumption to Income				-0.049	-0.155	-0.053
				(-6.98)	(-14.35)	(-7.01)
Country/State Specific Time Trends	No	Yes	No	No	Yes	No
Year/Quarter Fixed Effects	No	No	Yes	No	No	Yes
Regression R^2	0.0781	0.0865	0.1523	0.1325	0.1828	0.2202
t-Ratio	4.359	4.365	5.105	3.029	4.090	3.708
p-value for H_0	0.000	0.000	0.000	0.002	0.000	0.000

Note: H_0 is a test of the hypothesis that the coefficient on housing market wealth is equal the same before and after 1986.

Appendix Table 3: Housing Wealth Increases vs Decreases
Ordinary Least Squares
Consumption Models in First Differences and Error Correction Models
Country/State Fixed Effects
All variables are real (deflated by GDP deflator) and measured per capita in logarithms
(t ratios in parentheses)

Dependent variable: Change in Consumption per capita	Models in First Differences			Error Correction Models		
	I	II	III	I	II	III
Change in Income	0.329	0.322	0.273	0.345	0.383	0.302
	(13.97)	(13.58)	(11.12)	(14.73)	(16.39)	(12.46)
Change in Stock Market Wealth	-0.001	0.000	0.003	-0.011	-0.011	-0.003
	(-0.13)	(-0.02)	(0.51)	(-2.59)	(-2.61)	(-0.54)
Dummy for Housing Wealth Decreases * Change in Housing Wealth	-0.003	-0.020	0.016	-0.004	-0.005	0.033
	(-0.18)	(-1.16)	(1.01)	(-0.29)	(-0.34)	(2.09)
Dummy for Housing Wealth Increases * Change in Housing Wealth	0.070	0.077	0.059	0.106	0.109	0.080
	(4.67)	(4.76)	(3.79)	(5.99)	(5.94)	(4.34)
Lagged Change in Consumption				-0.174	-0.142	-0.225
				(-10.25)	(-8.32)	(-13.29)
Lagged Ratio of Consumption to Income				-0.053	-0.152	-0.051
				(-7.43)	(-14.19)	(-6.75)
Country/State Specific Time Trends	No	Yes	No	No	Yes	No
Year/Quarter Fixed Effects	No	No	Yes	No	No	Yes
Regression R^2	0.0755	0.0849	0.1465	0.1348	0.1828	0.2176
t-Ratio	3.097	3.615	1.714	4.274	4.069	1.693
p-value for H_0	0.002	0.000	0.087	0.000	0.000	0.091

Note: H_0 is a test of the hypothesis that the housing market wealth coefficient is the same for increases as it is for decreases.

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