Preliminary

Wealth Effects and the Changing Economy

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Abstract:

This paper explores the household-level underpinnings of the observed aggregate relationship between consumption and wealth. There are important potential gains from studying wealth effects using data on individual households given that economic theory predicts that the response of consumption to movements in asset prices will differ depending on the source of those movements and on who is affected. Using data from the *Consumer Expenditure Survey*, I find that the consumption of stockholders had a strong positive correlation with current and lagged changes in stock prices in the 1980s and 1990s, whereas the consumption of non-stockholders did not. That pattern implies that changes in wealth had direct effects on spending as opposed to merely predicting changes in consumption because they signaled changes in future income. However, augmenting the sample with more recent data considerably weakens the result. A similar analysis of housing wealth effects for the years 1994-2008 suggests no near-term link between growth in house prices and growth in homeowners' consumption of nondurables apart from housing itself.

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1. Introduction

The effect of wealth on consumption is an issue of longstanding interest to economists. The relationship has been particularly important from a policy perspective over the last fifteen years, as the U.S. economy has experienced two major booms and busts in stock prices, as well as a dramatic run-up and reversal of home prices. Indeed, based on the observed aggregate relationship between wealth and consumption, many forecasters have argued that the declines in stock and home prices over the past several years have been an important force depressing household spending, first deepening the recession and later inhibiting the recovery.

A central question is whether the correlation between wealth and consumption in the aggregate reflects changes in asset prices directly influencing spending as opposed to mere predicting changes in spending because they signal changes in future income. Proponents of the latter channel point out that many changes in measured wealth (as captured in the aggregate measures) do not actually make households richer. For example, some increases in stock prices reflect productivity-driven upward revisions to expected future dividends while others reflect reductions in the rate at which future dividends are discounted. The former provide additional future resources and can be expected to raise spending, but the latter may not raise spending because the discounted value of planned future consumption is also revised up. A related point is often made about wealth increases associated with higher home prices: The present discounted value of future housing services is also higher, so (unless the household plans to downsize in the future) there are no additional future resources to put toward other types of consumption.

The direct link between wealth and consumption will also depend on who is affected. Older households might be expected to raise their consumption more than younger households in the face of a given increase in wealth because they are annuitizing the gain over fewer years. In addition, one might see a very large response to increases in the value of housing assets held by households that have been liquidity constrained and unable to consume at the otherwise optimal level (Iacoviello, 2003). The enormous house price increases that occurred during the recent housing boom, for example, significantly raised the collateral against which homeowners could borrow and thereby presented an opportunity for those homeowners to spend at much higher levels.

The role of wealth as collateral also allows for the effect of wealth on consumption to differ between increases and decreases in wealth and to differ over time due to financial innovation. For example, the effect might be stronger in asset price booms than in busts, as reductions in collateral do not generally force reductions in debt held (particularly for long-maturity loans). As another example, credit-market innovations have made it easier to borrow against home equity over time (notwithstanding some reversal of this trend in very recent years), which could strengthen a collateral-based wealth effect. In particular, the share of homeowners with home equity lines of credit rose from less than 1 percent in 1983 to 3 percent in 1989, 11 percent in 1998, and 18 percent in 2007 (see Kennickell and Shack-Marquez, 1992, and Bucks, Kennickell, Mach, and Moore, 2009).

These considerations suggest that there are important potential gains from studying wealth effects using data on individual households. Studies based on household data can examine whether changes in asset prices have different effects on the spending

of households that do and do not own certain assets. As a result, they can address the outstanding question of the degree to which the short-run link between measured aggregate wealth and aggregate consumption actually reflects a direct effect of wealth on consumption. A number of recent authors have challenged this view in the context of housing wealth (for example, Besley, 2007, Attanasio, Blow, Hamilton, and Leicester, 2009, and Iacoviello, 2009), arguing that changes in home prices do not (for the most part) directly influence the spending of homeowners but rather that a common factor drives both housing wealth and aggregate consumption. More generally, household data offers far richer variation with which to identify whether wealth effects vary by type of wealth and how wealth dynamics may have changed over time.

This paper builds on Dynan and Maki (2001), which used data from the U.S. *Consumer Expenditure Survey* (CE) to show that the consumption of stockholders was more closely correlated with contemporaneous and lagged stock price changes than that of non-stockholders between the early 1980s and late 1990s. In the present paper, I extend the sample by another decade—to include data through 2008. The additional years greatly increase the amount of stock market variation: whereas the variation in stock prices during the earlier sample was dominated by the boom in the latter part of the 1990s, the extended sample also contains the subsequent bust as well as the boom and bust that occurred a few years later. In addition, I adapt the methodology to an analysis of home prices and consumption, using the subsample of the data set for which state identifiers are available and thus state-level house price data can be matched to the observations.

As discussed in the next section, a number of studies have looked at wealth effects using household data, particularly in recent years. This paper stands out for its examination of changes in both stock prices and house prices; by applying the same framework to both assets, I can readily compare their effects. The paper is also among a small subset that considers wealth effects using the *Consumer Expenditure Survey*. A clear disadvantage of the CE data is that they do not have detailed information about changes in wealth; as a result, I match observations with aggregate information about asset price movements. That said, the data set has some notable advantages as well. First, it provides comprehensive information about household consumption, in contrast to other data sources on U.S. households where inferences must be drawn from a few types of spending or from residuals based on wealth, income, and credit use. Second, its quarterly data allow me to explore changes that correspond more closely to the timing of the observed aggregate wealth effect than is feasible using surveys that are done every two or three years such as the *Panel Study on Income Dynamics* (PSID) and the *Survey of Consumer Finances* (SCF). Third, with close to three decades of data to use, changes in effects over time can be observed.

To preview my results, I confirm earlier authors' findings of a significant relationship between changes in stock prices and the consumption growth of stockholders during the 1980s and 1990s. However, augmenting the sample with more recent data considerably weakens the result, raising serious questions about whether the link between stock market wealth and spending has diminished. A similar analysis of housing wealth effects for the years 1994-2008 (the period for which state identifiers are available) suggests no near-term link between growth in home prices and growth in homeowners'

consumption of nondurables and services apart from housing itself, although there is some evidence that younger renters respond to higher home prices by reducing their consumption. The lack of an apparent relationship between home prices and homeowners' consumption is robust to a number of variations, but more work needs to be done to understand what it implies about the housing wealth effect that is observed in aggregate data.

2. Previous Studies of Wealth Effects Using Household Data

Several previous papers have explored the link between stock prices and consumption growth at the household level. Much of this literature has focused on whether limited stock market participation can help to explain the equity premium puzzle. Mankiw and Zeldes (1991) were the first to document that the consumption of stockholders is more highly correlated with excess returns on the stock market than that of non-stockholders, using annual data on food consumption from the PSID. Vissing-Jørgensen (2002) and Brav, Constantinides, and Geczy (2002) produced similar findings using quarterly data on broader consumption from the CE, as did Attanasio, Banks, and Tanner (2002) using data from the U.K. *Family Expenditure Survey* (FES).

Poterba and Samwick (1995) pointed out that these types of analysis also speak to whether the "wealth effect" observed in macroeconomic data reflects a direct connection between wealth and consumption or common factors causing movements in both series. Poterba and Samwick confirmed the Mankiw-Zeldes results, although, drawing on other types of evidence, they concluded that direct wealth effects are fairly small. Dynan and Maki (2001) extended the analysis to include a broader measure of consumption from the

CE and to allow for stock prices to influence consumption with a lag, as appears to be the case with macro data. Their results suggest that the direct stock market wealth effect shows up relatively quickly and continues to boost consumption for a number of quarters.

A few papers have also attempted to estimate the quantitative impact of stock market wealth on consumption. The challenge in this strand of the literature is the lack of a good data set with which to explore the issue. The CE has detailed information about consumption and a short panel dimension, but it has very limited financial information and, in particular, no good measure of capital gains. Other data sets that have high-quality information about finances for a broad group of U.S. households—such as the SCF and, until fairly recently, the PSID—lack detailed information about consumption. That said, Dynan and Maki, using a proxy for capital gains in the CE, estimated a marginal propensity to consume out of an additional dollar of stock market wealth of between 5 cents and 15 cents. Juster, Lupton, Smith and Stafford (2006) examined 5-year saving measures in the PSID from 1984 through 1994 and concluded that the marginal propensity to consume is at the top end of this range or higher. Further, Bostic, Gabriel and Painter (2009) used a non-parametric matching method to combine data from the 1989-2001 waves of the SCF and CE and find an elasticity of consumption with respect to financial wealth of 0.02.[1]

The housing boom of the last decade has spurred a significant recent literature that examines housing wealth effects with micro data.[2] Campbell and Cocco (2007) and Attanasio, Blow, Hamilton, and Leicester (2009) explored the underpinnings of the

[1] The authors do not translate this elasticity into a marginal propensity to consume. However, the estimate is only about one-third as large as the elasticity they find with respect to housing wealth.
[2] These papers build off an earlier literature that includes Skinner (1994), Sheiner (1995), Engelhardt (1996), and Flavin and Yamashita (2002).

macro relationship between consumption and housing wealth through analyses of synthetic cohorts derived from the U.K. FES. Both studies examined the response of consumption to house price changes for different cohorts defined by age and homeownership, but they used different specification and estimation ranges and reached different conclusions. Campbell and Cocco's estimates, based on the period from 1988 to 2000, pointed to an important direct influence of wealth on consumption, through both conventional channels and collateral effects. Attanasio, Blow, Hamilton, and Leicester's results, based on the period from 1978 to 2001, are more supportive of the view that the macro relationship is driven by common causality.

As in the stock market literature, some recent papers have used household data to estimate the quantitative relationship between housing capital gains and consumption. Again, the results appear to be sensitive to the specification and the data source. Estimates of the average marginal propensity to consume out of housing wealth across all households vary widely, with Cooper's (2009) study of the 1969-2005 waves of the PSID suggesting that an additional dollar of housing wealth raises consumption by 3.5 cents, and Mian and Sufi's (2009) credit-record-based examination of the relationship between growth in household debt and home price appreciation between 2002 and 2006 implying an increase of an astonishing 25 to 30 cents. Different studies also reach different conclusions about the relative strength of housing wealth effects across different types of households. Cooper and Mian and Sufi found the strongest effects among households that are likely to be credit-constrained. Using the 1968 to 1993 waves of the PSID, Lehnert (2004) also found a statistically significant housing wealth effect among households for whom a relaxation of borrowing constraints is likely to be important,

although he found an even larger effect for households on the verge of retirement (and therefore likely to liquidate their gains soon). In their analysis of combined 1989-2001 SCF and CE data, Bostic, Raphael, and Painter found no significant difference in the strength of housing wealth effects for households that are credit-constrained versus those that are unconstrained.

A related strand of literature uses household data to consider the relationship between consumption and housing capital gains that have been liquidated through a cash-out refinancing. Hurst and Stafford (2004) explored the issue with PSID data from the early 1990s and found that liquidity-constrained households are likely to consume most of the equity they withdraw through a refinancing. Dynan, Canner, and Passmore (2002) studied responses to special questions about refinancing added to the University of Michigan *Surveys of Consumers* and found that 25 percent of cash-out refinancers reported using at least some of the liquidated housing wealth for consumption expenditures and 43 percent reported spending some on housing improvements. However, it is difficult to draw strong inferences about the housing wealth effect from these studies given that the decision to undertake a refinancing is endogenous to desired spending.

3. The Consumer Expenditure Survey

The CE is a quarterly survey of households that has been conducted continuously for close to four decades. The public-use microdata files include information about expenditures from up to four interviews per household, spaced three months apart. Information about the income and demographic profiles of respondents is also gathered,

primarily during the first and the fourth of those interviews. In the fourth interview, households are also asked a few questions about assets and liabilities, relating to both current levels and changes over the preceding year. After its final interview, a household is rotated out of the panel and replaced with a new randomly selected household. Roughly 5,000 households were interviewed each quarter through the late 1990s, at which point the panel size was stepped up to about 7,000 households per quarter. My sample was drawn from CE data files corresponding to the period 1983:Q1 (earlier data have more significant problems with quality) through 2008:Q4.

The expenditure data from the CE quarterly interviews are widely viewed as containing a high degree of measurement error.[3] Notwithstanding this noise, the large number of available observations allows relationships to be estimated with some precision. Another area of concern about the CE is its representativeness. The richest U.S. households have likely been underrepresented throughout the period during which the survey has been conducted (Sabelhaus, 1998). Thus, in order to draw conclusions about the underpinnings of macroeconomic relationships, one must assume that their behavior is similar to other households. A potentially larger problem is that the representativeness of the survey appears to have changed over time—for example, Dynan, Edelberg, and Palumbo (2009) noted that the aggregate saving rate implied by the CE has risen a bit since the mid-1980s even as the NIPA personal saving rate has moved sharply down.[4] This problem implies that great caution must be used in conducting synthetic-

[3] A separate CE survey asks respondents to track their expenditures over a two-week period with a diary. The diary information is probably considerably more accurate than the quarterly interview information, but I use the quarterly interviews because they allow me to calculate a change in consumption for each household.

[4] Indeed, concerns about this pattern and similar trends were a key motivating factor behind a day-long discussion of the CE at the 2009 NBER Summer Institute.

cohort-based analyses with the CE, as is commonly done with the U.K. FES, because trends in a given variable (or, worse yet, the correlation between two variables) might reflect the changing representativeness of the data rather than economic fundamentals. However, the changing representativeness does not pose much of a problem for my analysis, as I make use of the short-panel feature of the CE and estimate a cross-sectional regression where the dependent variable is the same-household change in consumption.

As noted above, the financial information in the CE is limited. The key variable used for my analysis is based on the question "Did you (or any members of your [consumer unit]) own any securities, such as stocks, mutual funds, private bonds, government bonds, or Treasury notes on the last day of last month?" Respondents who answer "yes" are asked for the estimated value of all such securities on the last day of the previous month.

Because the securities questions do not isolate holdings of stocks from other financial assets, I assume that all households reporting "yes" to this question are stockholders. Households holding defined contribution pension plans may not be including the value of these plans in their responses. The fraction of CE households holding securities—which ranges from 20 percent to 30 percent over my sample period—is considerably below the fraction holding equities either directly or through defined-contribution pensions reported by Dynan (2009) based on the *Survey of Consumer Finances*, which range from 30 percent in 1989 to 50 percent in 2008. The shortfall probably reflects a combination of richer households being underrepresented in the sample and some households not including their pension holdings (in which case there are stockholders among the households I identify as non-stockholders).

CE households who report holding securities are asked how the current amount held compares with the value of such securities one year earlier, the total purchase price (including broker fees) of any securities purchased during the past twelve months, and the amount received from sales (after subtracting broker fees) of any securities over the past twelve months. In principle, one could use the latter set of questions to construct a measure of capital gains, but I do not, both because it would limit my analysis to contemporaneous changes in wealth and because Dynan and Maki (2001) showed a significant bias toward reporting no change in the value of securities holdings. Instead, as discussed in more detail below, I relate each household's consumption growth to contemporaneous and lagged changes in aggregate stock prices, as captured by the Wilshire 5000. The use of aggregate data in the regressions implies that the values of the change in stock prices are the same for all households that entered the survey in a given month; the reported standard errors and p-values have been adjusted to allow for this clustering.

The CE also does not have useful direct information about the value of housing capital gains. It does provide the current market value of a household's home (asked just once) as well as the original price of the home, but the period over which the capital gain is measured differs across households and does not correspond to the period over which consumption is measured. As with stock market wealth, I assess housing wealth effects by relating each household's consumption growth to contemporaneous and lagged changes in aggregate home prices. In particular, I merge the CE data with information about state-level house price appreciation from First American CoreLogic (and again correct standard errors and p-values to allow for clustering). Unfortunately, information

about state of residence is suppressed for many households for privacy reasons (with the share suppressed for any given state varying over time). In addition, the CE documentation warns that the samples for any given state in any given year are too small for reliable state-level analysis. While these considerations militate against a state-level synthetic cohort analysis, they do not invalidate using state-level house price appreciation as an independent variable in cross-sectional regressions (assuming households in underrepresented states behave similarly to those in other states). Although a lack of state identifiers eliminates many observations, I am still left with more than 30,000 households for the housing analysis.

4. Empirical Approach

My main empirical approach is to estimate the following equation for different groups of households:

$$\Delta \ln C_{it} = \alpha_0 + \sum_{j=0}^{N} \beta_j \Delta \ln P_{t-j} + \gamma X_{it} + \varepsilon_{it} \qquad (1)$$

where $\Delta \ln C_{it}$ is the change in the log of real consumption, $\Delta \ln P_{it}$ is the change in the log of real aggregate stock or home prices, and X_{it} is a vector of control variables. Households are grouped by whether they own the asset or not (and by age as theory predicts that the strength of the wealth effect will vary over the lifecycle).

The timing of the changes warrants particular attention. Letting *t* pertain to the month of the fourth publicly available interview, C_{it} refers to the sum of real consumption in months *t*, *t* - 1, and *t* - 2 (these months are the reference period for that interview), and C_{it-3}, C_{it-6}, and C_{it-9} refer to consumption covered by the third, second, and first interviews, respectively. The change in consumption, $\Delta \ln C_{it}$, is the log-

difference between consumption in the fourth interview (C_{it}) and consumption in the first interview (C_{it-9}); the change in asset prices, $\Delta \ln P_{it}$, is the log-difference between the average values in the three months covered by each of those two interviews. Since the contemporaneous value of the change in asset prices corresponds to a three-quarter change, the first lag corresponds to the change over the three quarters preceding the first publicly available interview, the second lag corresponds to the change over the three quarters preceding that, and so on. This timing scheme is illustrated in Figure 1.

The measure of consumption includes all nondurables and services categories of aggregate consumption from the National Income and Product Accounts (NIPA) except for housing, education, and health care. The main component of housing expenditures for homeowners in the CE is mortgage payments—in contrast to the NIPA data where housing consumption by homeowners is the imputed service flow from housing (constructed from rental values). Likewise, health care spending is measured in the CE as out-of-pocket health spending rather than true health care consumption. And spending on educational services, which often have long-lasting benefits, more strongly resemble durables than nondurables despite being classified as services in the NIPA. I deflate consumption and other nominal variables (including asset prices) with a constructed PCE chain price index that covers the same categories of spending as the consumption measure.

The control variables include monthly dummies to allow for normal seasonal patterns in consumption (following, for example, Parker, 1999, and Souleles, 1999) and year dummies to allow for aggregate shocks unrelated to asset prices. I also control for age, age-squared, and family size as tasteshifters. In addition, the regressions include a

set of socioeconomic variables—the level of income, indicator variables for educational attainment, and an indicator variable for whether the head of household is white—that have been found to be significantly correlated with consumption growth, possibly because they are correlated with underlying preferences (see Lawrance, 1991). Finally, the specifications all control for growth in earnings, which may affect consumption through its signal about permanent income or directly because of liquidity constraints or myopic behavior.

My sample is drawn from the 1983 through 2008 waves of the CE. I exclude households with incomplete income responses, households that changed size or marital status, households lacking either a first or fourth publicly available interview, households living in student housing, households with more than one consumer unit, and households with implausibly small food consumption (less than $100 for any three-month period). Following Zeldes (1989) and much of the rest of the household consumption literature, I drop households that had extremely large (absolute value) changes in consumption between the first and fourth publicly available interviews (above the 99th percentile or below the 1st percentile).

The samples for the stock market analysis and the housing wealth analysis differ because of specific issues related to the variables of interest. For the stock market analysis, my sample also excludes households with missing or invalid readings for the wealth variables, as I cannot reliable identify stockholders in this group.[5] For the housing wealth analysis, my sample excludes households for which state of residence cannot

[5] Many of the public-use CE data sets from the early and mid-1990s contain miscoded data, listing households with invalid or missing responses to the securities question as having valid responses of $1. Since households are extremely unlikely to have actual holdings of $1, I drop observations with reported securities holdings equal to this amount.

reliably be identified. No information about state of residence is available in the public-use data sets prior to 1994.[6] Beginning in 1994, a state identifier appears in the sample, although it is suppressed or recoded for confidentiality reasons for all households in some states (affected states vary somewhat from year to year but comprise about one-fifth of states in most years) and for a small number of households in other states. I drop these households, which reduces the sample for the housing analysis by about 10 percent.

4. Stock Market Wealth Effects in the 1980s and 1990s

I begin my analysis of stock market wealth effects with an examination of the relationship between consumption growth and stock price changes in the 1980s and 1990s. I choose this period as the baseline in order to build on evidence established by earlier papers (Dynan and Maki, 2001, as well as the various papers testing the consumption CAPM model). In particular, a number of papers, using data from both the U.S. and the U.K, have found that the correlation between aggregate stock prices and household consumption growth was stronger for stockholders than for non-stockholders over this period.

Table 1 and Table 2 show estimates of the relationship between stock price growth and consumption growth for the period 1983-1998.[7] The first column of each table shows results for all households and the remaining columns show results for stockholders and non-stockholders separately. Following other authors, I split the sample in several ways: I first classify households as stockholders if they report real securities holdings greater than zero, then if they report real securities holdings greater than $1,000,

[6] State identifiers for earlier years can be obtained from the Bureau of Labor Statistics. Future work will expand the sample to include these earlier years.
[7] The end of this period corresponds to the end of the sample used by Dynan and Maki (2001).

and finally if they report real securities holdings greater than $10,000. For each of these divisions, I show a column of "non-stockholders" that has results based on the remaining households under that division.

Table 1 presents results from estimating equation (1) with the change in asset prices represented only by contemporaneous stock price growth—measured over the same period for which consumption growth is captured. The point estimates suggest a positive relationship between contemporaneous stock returns and the consumption growth of stockholders, but a relationship that is statistically significant only at the 10 to 20 percent level. The point estimates on stock returns are negative for non-stockholders, which might seem anomalous, but they, too, are fairly imprecisely estimated.

Turning to other results in Table 1, the contemporaneous change in income is insignificant for stockholders but positive and significant for the full sample and for the various sub-samples corresponding to non-stockholders. This result is consistent with the view that liquidity constraints cause the consumption of some lower-wealth households to be sensitive to income. The socioeconomic variables are largely insignificant, although the coefficients on age and the level of income are negative and significant for non-stockholders, suggesting that older, richer households in this sample have flatter consumption paths. These estimates do not square with traditional findings about the lifecycle pattern of consumption (the typical humped-shaped pattern documented, for example, by Carroll and Summers, 1991). However, it seems quite possible that such patterns might not be captured by a three-quarter change in consumption. Together, the explanatory variables account for only about 1 percent of the variation in consumption growth—consistent with other studies based on household survey data.

Adding lagged values of stock price growth changes the results in important ways, as can be seen in Table 2. For non-stockholders, the coefficients on stock returns continue to suggest little relationship between stock prices and consumption growth. However, for stockholders, the estimated response of consumption growth to contemporaneous stock price growth is much larger when these lags are included, and the lags themselves have positive estimated effects on consumption growth. The changes in the coefficients for the contemporaneous terms suggest a negative bias when the lags are omitted. This result is unsurprising given the apparent lags in the underlying relationship and the negative serial correlation in stock returns over my estimation period: If households are reacting in a given period to current *and* past wealth movements, and past movements tend to be in the opposite direction of current movements, the lagged responses to past changes tend to offset some of the contemporaneous response to current changes.

The results are fairly similar for the different divisions of stockholders and non-stockholders. For stockholders, the coefficients on the first lags of stock returns (corresponding to the three quarters preceding the first survey quarter) are similar in size to those on the contemporaneous terms and all are statistically significant at greater than the 1 percent level. The coefficients on the second lags are somewhat smaller, but statistically significant at greater than the 5 percent level in all cases. The coefficients on the third lags are positive but much smaller and not statistically significant. The implied timing of the wealth effect is therefore much the same as that found in most macro models, with the impact being largest in the first couple of years and trailing off after that.

The significance of the lagged terms for stockholders seem at odds with the standard life-cycle/permanent income models, which generally imply that lagged information should not help to predict current changes in consumption (Hall, 1978). Macro models often justify using lagged information by assuming that behavior is characterized by habit formation (for example, see Fuhrer, 2000). Alternatively households may adjust consumption relatively infrequently because of the costs associated with gathering information about changes in their portfolios and recalculating optimal consumption. Gabaix and Laibson (2002) show that, under plausible assumptions, infrequent adjustment at the household level will lead aggregate consumption to respond slowly to shocks to permanent income and lead the average across households (as we estimate here) to exhibit a gradual adjustment.

A recurring theme in the literature on housing wealth effects is the differential response across age groups to shocks to wealth. Table 3 explores this issue for stock market wealth, dividing households into groups depending on whether the average age of the head and spouse (if present) is less than 35, between 35 and 64, and 65 or older. Studies using household data often use a younger age to distinguish the oldest group, because retirement occurs earlier for many households. I was reluctant to do so in this case because the peak incidence of stock ownership occurs in the 55 to 64 age group (see Bucks, Kennickell, Moore, and Mach, 2008). That said, the results are not sensitive to the precise age at which older households are divided from those in the middle group. In this table, stockholders are defined as those households reporting securities holdings greater than zero.

No stock market wealth effect is evident among the youngest households. Even for those classified as stockholders, the sum of the coefficients on the stock price terms is close to zero and the standard errors on these coefficients are very large. One expects that young stockholders will change consumption less than their older counterparts in response to a given change in wealth—both because they have more years over which to annuitize the change and because they may have more flexibility to adjust their labor supply instead of consumption.[8] However, the most important explanation for the lack of apparent response to stock prices among these households may be that their holdings of stock are fairly low. According to Bucks, Kennickell, Mach, and Moore (2009), among stockholding families with heads less than 35, median holdings (including equities held directly and indirectly through mutual funds, retirement plans, and the like) ranged from $7,000 to $9,000 (in 2007 dollars) between 1998 and 2007. For comparison, median holdings in the 45-54 age group ranged from $45,000 to nearly $60,000 over the period. Given the low holdings of young stock owners, the changes in wealth induced by swings in stock prices may simply have been too small to induce a detectable response in the noisy CE consumption data.

By contrast, the consumption of stockholders in the middle age group has a strong and highly significant correlation with contemporaneous and lagged stock prices. For those households in this group that do not own stock, the coefficients on stock prices are not statistically different from zero. Those patterns suggest a strong direct relationship between stock prices and consumption for this age group. In further analysis (not shown) I regressed the labor income growth of stockholders and non-stockholders on stock price

[8] Younger households can have very high marginal propensities to consume out of income because of liquidity constraints, but such constraints probably are not very important to those households that own stocks.

changes to explore the possibility that the differential response of the two groups might also, or instead, reflect stock prices being a better leading indicator of the income of stockholders. However, current and lagged stock prices had little predictive power for the labor income of either group, with the coefficients imprecisely estimated and their sums generally negative.

Households with heads that are 65 and older have the strongest response to changes in their wealth—as predicted by theory given that these households have the shortest horizons. Moreover, the stockowners among these households tend to hold large amounts of stock: For example, Bucks, Kennickell, Mach, and Moore (2009) reported that median holdings for those in the 65 to 74 group ranged from $57,000 to $176,000 between 1998 and 2007. The sum of the coefficients on the wealth terms is about 25 percent larger than for the middle age group, albeit measured somewhat less precisely. The greater imprecision no doubt partly reflects the sample being considerably smaller; in addition, the spending patterns of older households may be more likely to be influenced by idiosyncratic factors such as shocks to health (a consideration that often leads researchers to drop these households from their analyses altogether).

Another notable result for the older group is that the consumption of the non-stockholding households also appears to be positively related to stock prices. The sum of the coefficients on the wealth terms is small but the terms are jointly statistically significant at less than the 0.1 percent level. The result seems unlikely to be explained by stock prices being a leading indicator of the labor income of these households given that most are out of the work force. A more plausible explanation is that the group includes households that do own stock but do not include them as part of their reported securities

holdings because the CE question is ambiguous about whether to report holdings in defined-contribution pension plans. To that point, only 22 percent of older CE households report holding securities, whereas Bucks, Kennickell, Mach, and Moore (2009) estimate shares that are double that amount for households in the 65 to 74 age group (and still considerably higher than 22 percent in the over-75 group).

5. Extending the Stock Market Analysis to Include the 2000s

The next step is to add to the sample the CE data that have become available since most of the previous work on stock market wealth effects was done. The most recent CE wave for which data are publicly available is the 2008 wave. Thus, I can add 10 additional years to the sample used for Tables 1 through 3. After applying the same restrictions as above, my sample almost doubles to 62,000 observations.

Table 4 and Table 5 have the same set-up as Table 2 and Table 3, respectively, but are estimated with the longer sample. Adding the additional data reduces the estimated link between stock prices and consumption dramatically. In Table 4, the sums of the coefficients on the terms corresponding to contemporaneous and lagged stock price growth remains positive for the various stockholding groups (and larger than their counterparts for non-stockholders), but they are much smaller than when the sample was restricted to data from the 1980s and 1990s. The standard errors are somewhat smaller but the coefficients (as a group) are not close to being statistically different from zero.

Likewise, Table 5 shows some of the same qualitative patterns as Table 3, but the results are considerably weaker. The stock market wealth effect is most evident among stockholders in the middle age group but the sum of the coefficients is much smaller,

with the coefficients only marginally significant. Stock market wealth again appears to bear no relation to the consumption of households with heads younger than 35 years old. For stockholders with heads over 65, the sum of the point estimates is again positive, but materially smaller than when the sample is restricted to data from the 1980s and 1990s.

One possible explanation for the apparent weakening of the relationship between aggregate stock prices and consumption growth when more recent data are added would be a significant deterioration in the quality of the CE data.[9] As noted above, CE users have expressed increasing concerns about the representativeness of the data, and one might expect less attentiveness among respondents to the long interview survey as incomes (and therefore opportunity costs) rise over time. However, a comparison of the other results in the tables does not particularly support this view. The R-squared statistics are lower, as one might expect given the reduced significance of the stock market terms, but not dramatically so. And, the estimated coefficients on the contemporaneous income growth terms are remarkably similar to those estimated using data only from the earlier period.

All told, the results suggest that changes in stock market wealth now have a considerably less important (if any) direct effect on the consumption of stockholding households—at least in the first couple of years—than they did in the past. To the extent that these households are adjusting their spending in response to stock-market-related changes in their lifetime resources, they appear to be doing so with a substantial delay.

What might have induced this apparent change in behavior? One possibility would be that the bursting of the late-1990s stock-market bubble made households less

[9] An analysis of the data from the last ten CE waves alone (not shown) shows essentially no relationship between stock prices and consumption growth for all of the various groupings of households.

likely to assume that any given move in stock prices is permanent. As can be seen in Figure 2, the boom was associated with a sharp and unprecedented rise in household stock-market wealth, which was followed by an equally dramatic reversal of this run-up. The crash appears to have induced at least some changes in household behavior. For example, the uptrend in stock market participation that had been observed for many years came to an abrupt halt around time of the crash with the share of households owning stocks peaking at 52 percent (Dynan, 2009). Since then, the share has eased off, even though the financial innovation that facilitated the increase presumably continued. That said, there is scant direct evidence of shifting perceptions regarding the permanence of stock market changes. Some (albeit fairly minor) support comes from the stock market confidence data published by the Yale School of Management: An index of investors' assessment of the likelihood of sharp moves in stock prices being reversed the next day trended up between the late 1980s and the early 2000s and remained in a high range thereafter.[10]

Another possible explanation is that the apparent change in behavior reflects changes in the population being examined. Lower-income households have been drawn into stockownership, as stock market participation has increased over time. This trend may have been reinforced in the particular sample I am using if the CE captures the higher-income population less well than in the past (as is sometimes conjectured). Although one does not typically expect less-affluent households to be less responsive to changes in their resources, their stock holdings are more concentrated in their retirement plans, making capital gains harder to access and more likely to be viewed as "off limit" from a mental accounting perspective. Furthermore, work by Choi, Laibson, Madrian,

[10] See http://icf.som.yale.edu/confidence.index/BuyIndex.shtml.

and Metrick (2009) suggests an even bigger divergence between the behavior of retirement plan holders and the predictions of conventional models—they find that 401(k) investors tend to *raise* their contributions after experiencing particularly good returns on their savings. More work needs to be done to explore whether these trends may explain my results.

6. Housing Wealth Effects

Because the CE state-level identifiers are available only since 1994, I do not attempt to do separate analyses for different time periods but rather focus exclusively on a sample that includes all data from the 1994 to 2008 waves. With my stock market wealth analysis (as well as the earlier literature on housing wealth effects) suggesting that wealth effects might vary importantly across households in different age groups, I estimate separate sets of regressions for homeowners and renters in different age groups.

Table 6 has results for regressions that include just the contemporaneous growth rate of house prices. There is no evidence of a significant positive correlation between home prices and growth in non-housing nondurables and services consumption in any of the age groups—in all cases, the coefficients are small and the standard errors are large. The only (marginally) significant coefficient on home prices implies a negative effect on consumption of young renters—possibly indicating that households hoping to buy a home in the future reduce their consumption when the amount they expect to have to pay rises (and vice versa). Among other notable results in Table 6, contemporaneous income growth has a significant positive coefficient for both owners and renters in both the young and middle age groups, but not for the oldest age group. Adding lags of home

price growth does not improve the fit of the equation (as it did for the stock price regressions), so I do not present the results.

The lack of a significant positive relationship between home prices and growth in this measure of consumption is robust to a number of variations in the analysis. Restricting the sample to households with larger homes, using home price growth calculated over a longer period (up to 4 years), substituting national home price growth for state-level home price growth, and dropping contemporaneous income growth from the equation all had little effect on this result. I also did not find a positive link when I estimated the equation over just the years of the recent housing boom.

The most straightforward interpretation of those results is that housing capital gains simply do not directly boost non-housing nondurable consumption for the average household (at least over the first few years following the gain). Such a finding is supportive of the view that the main drivers of the observed aggregate correlation between home prices and consumption are common factors that influence both series. However, there are other interpretations as well. The first is that the response to wealth occurs mainly through components of consumption that I do not capture. Both housing consumption and spending on durable goods are excluded here but are included in aggregate consumption.[11] The second is that I may have failed to detect a direct response of non-housing nondurable consumption to home prices because of limitations in the analysis. For example, there may be too little variation in home price growth across states and over my sample to identify a relationship (especially given the indicator

[11] I experimented with measures of consumption that included expenditures on durables, but those regressions also did not produce evidence of a direct housing wealth effect. However, studies of household-level consumption growth nearly always exclude spending on durables from their analyses on the view that the volatility of such spending makes the results unreliable.

variables for year of interview and state of residence that are included in the regressions). As can be seen in Figure 3, home prices rise fairly monotonically (albeit at somewhat different rates) in most states in my sample until the last few quarters of the sample period.

In any event, the issue warrants further attention. Given the large amount of evidence in the literature that some households are consuming at sub-optimal levels because of liquidity constraints, it seems likely that increases in housing collateral are relevant to the consumption of at least some households. In future work, I plan to incorporate data on housing loan-to-value ratios so that I can better identify households for which a rise in prices is most likely to change what they can borrow against home equity.

7. Conclusion

My results confirmed the findings of earlier studies that, in the 1980s and 1990s, movements in stock prices were correlated with the consumption growth of stockholders, but not that of non-stockholders. Moreover, lagged values of changes in wealth appeared to influence the consumption of stockholders, with the effect waning after a couple of years. Altogether, the results appear to be consistent with the view that the observed aggregate relationship between consumption and the stock market reflected the direct influence of stock market wealth on spending.

However, the results changed dramatically when more recent data were added to the sample, with the correlation of stock market wealth and the consumption of stockholders diminishing substantially. The most straightforward interpretation of these findings is that the direct short-run influence of stock market wealth on consumption has

waned and perhaps disappeared entirely. The cause of such a change is unclear, but one possibility is that the damage to household balance sheets wreaked by the stock market crash around the turn of the century led households to doubt the permanence of subsequent capital gains and losses. Another contributing factor may be the broadening of the population owning stocks and the way in which stocks are held, particularly given recent evidence that the response of 401(k) holders to returns on their portfolios may not conform to the predictions of conventional theory. More work needs to be done to explore these explanations and to understand the implications of the results for macroeconomic dynamics.

My housing wealth analysis turned up scant evidence of a direct link between state home price growth and homeowners' consumption of non-housing nondurables and services. The findings thus add to the already mixed evidence regarding the underpinnings of the correlation between consumption and housing wealth that is observed at the aggregate level. Future work will explore whether housing wealth directly spurs types of spending not captured by the measure of consumption used here; it will also consider ways to strengthen the identification, perhaps by further restricting the sample to those households for whom changes in housing wealth should be most relevant. While the housing results thus far raise more questions than they answer, at the very least, they increase the uncertainty surrounding the degree to which past declines in home prices should be expected to restrain economic activity as the recovery proceeds.

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Table 1
Estimation Results from Regressions of Consumption Growth on Contemporaneous Stock Price Growth by Stockownership 1983-1998

	Full Sample	Stockholders defined as households with securities > $0		Stockholders defined as households with securities > $1000		Stockholders defined as households with securities > $10,000	
		SH	Other HHs	SH	Other HHs	SH	Other HHs
%ΔWilshire	-.023	.080	-.052	.110	-.051	.110	-.040
	(.027)	(.063)	(.029)	(.069)	(.028)	(.081)	(.028)
%Δ Income	.019	.001	.023	-.002	.023	-.004	.021
	(.003)	(.007)	(.004)	(.008)	(.004)	(.010)	(.004)
Age	-.143	.043	-.212	.206	-.219	.279	-.221
	(.098)	(.237)	(.100)	(.264)	(.100)	(.350)	(.099)
Age^2 /1000	1.611	-.570	2.270	-2.157	2.349	-2.84	2.306
	(.945)	(2.222)	(.997)	(2.494)	(.984)	(3.163)	(.963)
High School	-.871	1.641	-1.309	2.508	-1.154	2.675	-1.102
	(.740)	(2.069)	(.809)	(2.256)	(.815)	(2.593)	(.775)
College	1.295	1.530	1.297	2.726	1.207	3.734	.861
	(.959)	(2.135)	(1.042)	(2.279)	(1.051)	(2.659)	(1.020)
Income/1000	-.004	.012	-.034	.021	-.031	.013	-.025
	(.010)	(.016)	(.013)	(.018)	(.013)	(.021)	(.012)
p-value for month dummies	.000	.000	.000	.000	.000	.000	.000
p-value for year dummies	.000	.000	.000	.000	.000	.000	.000
R^2	.010	.012	.012	.013	.012	.013	.011
N	32749	7592	25157	6138	26611	4167	28582

Note. Standard errors (corrected for the clustering of the asset price growth rates) in parentheses. Dependent variable is the log difference of nondurables and services consumption excluding housing and medical expenditures. Regressions also include family size and an indicator for race of head.

Table 2
Estimation Results from Regressions of Consumption Growth on Contemporaneous and Lagged Stock Price Growth by Stockownership 1983-1998

	Full Sample	Stockholders defined as households with securities > $0		Stockholders defined as households with securities > $1000		Stockholders defined as households with securities > $10,000	
		SH	Other HHs	SH	Other HHs	SH	Other HHs
%ΔWilshire	.041	.269	-.034	.344	-.032	.377	-.01
	(.037)	(.084)	(.044)	(.087)	(.041)	(.106)	(.040)
Lag 1	.139	.38	.062	.39	.075	.429	.091
	(.045)	(.109)	(.056)	(.116)	(.053)	(.145)	(.051)
Lag 2	.099	.22	.053	.235	.059	.302	.062
	(.042)	(.100)	(.049)	(.107)	(.047)	(.130)	(.045)
Lag 3	.065	.099	.055	.053	.064	.074	.06
	(.035)	(.073)	(.038)	(.083)	(.038)	(.100)	(.036)
%Δ Income	.019	.001	.023	-.002	.022	-.003	.021
	(.003)	(.007)	(.004)	(.008)	(.004)	(.010)	(.004)
sum of Wilshire terms	.344	.968	.136	1.022	.167	1.182	.203
p-value for Wilshire terms	.018	.004	.178	.001	.092	.011	.107
R^2	.010	.014	.012	.015	.012	.015	.012
N	32749	7592	25157	6138	26611	4167	28582

Note. Standard errors (corrected for the clustering of the asset price growth rates) in parentheses. Dependent variable is the log difference of nondurables and services consumption excluding housing and medical expenditures. Regressions also include age, age-squared, family size, level of income, and indicators for race and education of head.

Table 3
Estimation Results from Regressions of Consumption Growth on Contemporaneous and Lagged Stock Price Growth by Stockownership and Age
1983-1998

	Younger than 35		35-64		Older than 65	
	SH	Other HHs	SH	Other HHs	SH	Other HHs
%ΔWilshire	-.129	-.074	.420	.070	.072	-.222
	(.229)	(.080)	(.110)	(.065)	(.179)	(.100)
Lag 1	.037	-.16	.406	.146	.564	.143
	(.221)	(.092)	(.138)	(.073)	(.211)	(.111)
Lag 2	.031	-.059	.176	.110	.412	.076
	(.192)	(.080)	(.121)	(.061)	(.200)	(.102)
Lag 3	.075	-.028	.046	.059	.263	.155
	(.136)	(.056)	(.091)	(.045)	(.135)	(.081)
%Δ Income	.021	.039	-.001	.019	-.004	.003
	(.023)	(.007)	(.008)	(.005)	(.021)	(.013)
sum of Wilshire terms	.013	-.322	1.048	.384	1.311	.152
p-value for Wilshire terms	.782	.392	.000	.348	.018	.001
R^2	.043	.026	.024	.015	.019	.014
N	1299	6479	4633	12843	1660	5835

Note. Standard errors (corrected for the clustering of the asset price growth rates) in parentheses. Dependent variable is the log difference of nondurables and services consumption excluding housing and medical expenditures. Regressions also include age, age-squared, family size, level of income, and indicators for race and education of head. Stockholders defined as those households reporting positive securities holdings.

Table 4
Estimation Results from Regressions of Consumption Growth on Contemporaneous and Lagged Stock Price Growth by Stockownership 1983-2008

	Full Sample	Stockholders defined as households with securities > $0		Stockholders defined as households with securities > $1000		Stockholders defined as households with securities > $10,000	
		SH	Other HHs	SH	Other HHs	SH	Other HHs
%ΔWilshire	-.034	.034	-.052	.069	-.056	.056	-.047
	(.027)	(.050)	(.030)	(.053)	(.030)	(.063)	(.028)
Lag 1	.030	.102	.009	.111	.009	.120	.013
	(.029)	(.056)	(.031)	(.058)	(.032)	(.070)	(.031)
Lag 2	.010	-.012	.012	-.001	.007	.024	.003
	(.030)	(.062)	(.033)	(.062)	(.033)	(.071)	(.033)
Lag 3	.027	.029	.024	.013	.027	.021	.025
	(.026)	(.055)	(.028)	(.058)	(.029)	(.067)	(.028)
%Δ Income	.020	.002	.024	-.002	.024	-.003	.023
	(.002)	(.005)	(.003)	(.005)	(.003)	(.007)	(.003)
sum of Wilshire terms	.032	.152	-.007	.193	-.013	.221	-.006
p-value for Wilshire terms	.100	.177	.200	.241	.122	.502	.148
R^2	.009	.010	.010	.011	.010	.009	.010
N	61909	13605	48304	11793	50116	8608	53301

Note. Standard errors (corrected for the clustering of the asset price growth rates) in parentheses. Dependent variable is the log difference of nondurables and services consumption excluding housing and medical expenditures. Regressions also include age, age-squared, family size, level of income, and indicators for race and education of head.

Table 5
Estimation Results from Regressions of Consumption Growth on Contemporaneous and Lagged Stock Price Growth by Stockownership and Age
1983-2008

	Younger than 35		35-64		Older than 65	
	SH	Other HHs	SH	Other HHs	SH	Other HHs
%ΔWilshire	-0.171	-0.094	0.103	-0.037	-0.064	-0.05
	(0.123)	(0.056)	(0.060)	(0.035)	(0.117)	(0.053)
Lag 1	-0.052	-0.068	0.103	-0.004	0.192	0.111
	(0.130)	(0.066)	(0.068)	(0.040)	(0.112)	(0.063)
Lag 2	-0.094	-0.074	-0.066	0.018	0.154	0.104
	(0.124)	(0.061)	(0.072)	(0.042)	(0.123)	(0.064)
Lag 3	-0.005	-0.01	0.014	0.03	0.091	0.061
	(0.113)	(0.048)	(0.065)	(0.036)	(0.105)	(0.060)
%Δ Income	0.017	0.034	0.003	0.022	-0.017	0.011
	(0.019)	(0.006)	(0.006)	(0.003)	(0.015)	(0.009)
sum of Wilshire terms	-0.321	-0.247	0.154	0.008	0.373	0.226
p-value for Wilshire terms	0.608	0.495	0.06	0.752	0.204	0.067
R^2	0.04	0.024	0.016	0.011	0.017	0.007
N	2033	11218	8660	26123	2912	10963

Note. Standard errors (corrected for the clustering of the asset price growth rates) in parentheses. Dependent variable is the log difference of nondurables and services consumption excluding housing and medical expenditures. Regressions also include age, age-squared, family size, level of income, and indicators for race and education of head. Stockholders defined as those households reporting positive securities holdings.

Table 6
Estimation Results from Regressions of Consumption Growth on Contemporaneous House Price Growth by Homeownership Status and Age
1994-2008

	Younger than 35		35-64		Older than 65	
	Owners	Renters	Owners	Renters	Owners	Renters
%ΔHPI	-.114	-.381	-.024	.071	-.030	.426
	(.188)	(.226)	(.082)	(.153)	(.144)	(.294)
%ΔIncome	.029	.019	.021	.024	.009	-.047
	(.012)	(.011)	(.005)	(.009)	(.011)	(.042)
Age	-.946	-10.286	-.310	-1.827	2.086	-2.073
	(2.969)	(3.026)	(.576)	(1.190)	(2.542)	(3.538)
Age^2 /1000	16.198	180.147	3.421	22.093	-13.593	13.976
	(51.247)	(54.673)	(5.917)	(12.395)	(16.805)	(23.101)
High School	3.502	6.202	1.949	1.822	-1.036	.594
	(3.386)	(2.766)	(1.400)	(1.969)	(1.575)	(2.849)
College	5.422	9.696	3.664	.607	.036	-2.089
	(3.818)	(3.593)	(1.572)	(2.683)	(2.437)	(4.688)
Income/1000	.034	-.016	.000	-.002	-.005	-.038
	(.026)	(.039)	(.007)	(.030)	(.022)	(.065)
p-value for month dummies	.000	.011	.000	.026	.667	.019
p-value for year dummies	.000	.001	.043	.391	.078	.989
p-value for state dummies	.000	.226	.001	.000	.015	.006
R^2	.038	.036	.015	.025	.012	.037
N	3146	2822	13918	4142	5150	1562

Note. Standard errors (corrected for the clustering of the asset price growth rates) in parentheses. Dependent variable is the log difference of nondurables and services consumption excluding housing and medical expenditures. Regressions also include family size and an indicator for race of head. HPI is the First American CoreLogic house price index for the state in which the respondent resides.

Figure 1

Timing of Consumption Changes and Wealth Changes

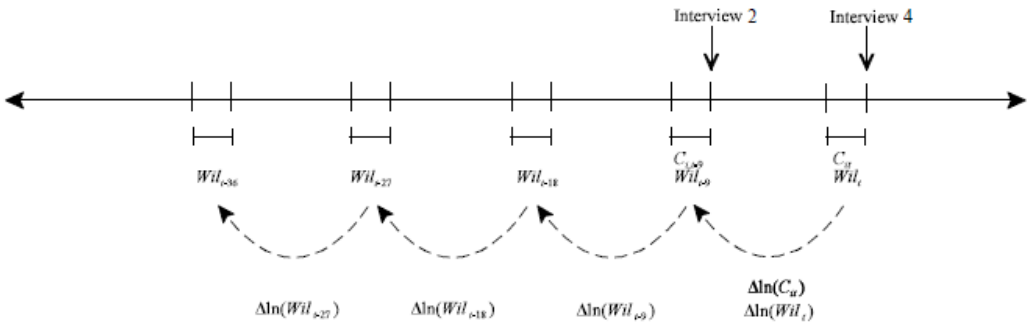

Figure 2

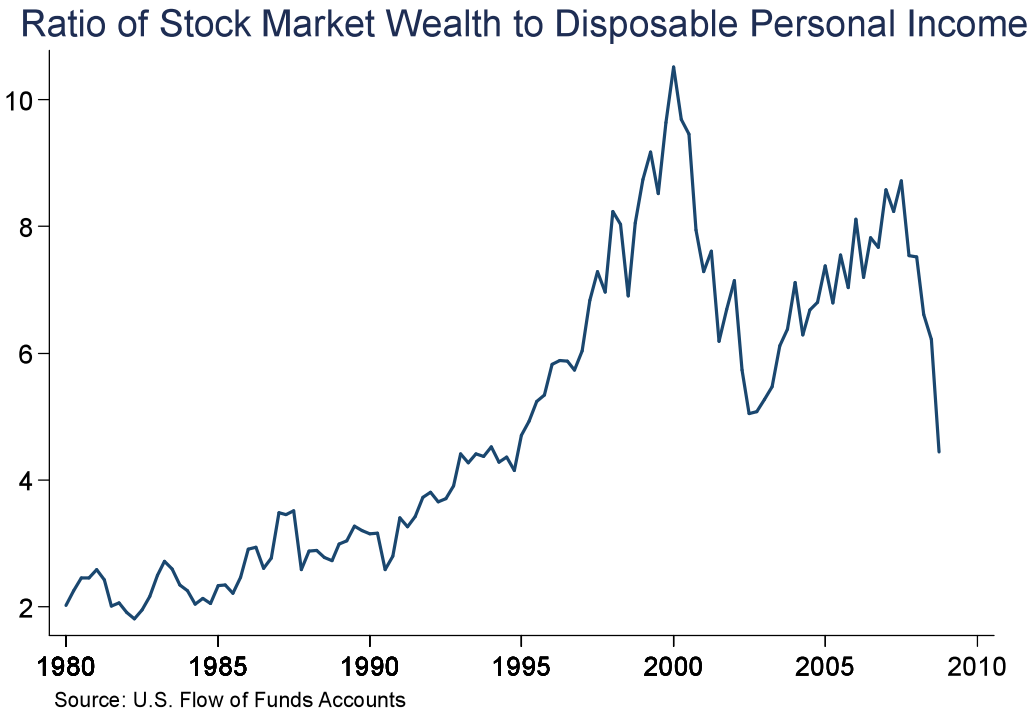
Ratio of Stock Market Wealth to Disposable Personal Income
10
8
6
4
2
1980
1985
1990
1995
2000
2005
2010
Source: U.S. Flow of Funds Accounts

Figure 3

Graphs include all states except Mississippi, Montana, New Mexico, North/South Dakota, and Wyoming, which never appear in the CEX.
Source: First American CoreLogic.