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Decomposing Consumer Wealth Effects: Evidence on the Role of Real Estate Assets Following the Wealth Cycle of 1990–2002

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Abstract:
During the period from 1990 to 2002, U.S. households experienced a dramatic wealth cycle, induced by a 369-percent appreciation in the value of real per capita liquid stock-market assets, followed by a 55-percent decline. However, despite predictions at the time by some analysts relying on life-cycle models of consumption, consumer spending in real terms continued to rise throughout this period. Using data from 1990 to 2005, traditional approaches to estimating macroeconomic wealth effects on consumption confront two puzzles: (i) econometric evidence of a stable cointegrating relationship among consumption, income, and wealth is weak at best; and (ii) life-cycle models that rely on aggregate measures of wealth cannot explain why consumption did not collapse when the value of stock-market assets declined so dramatically. We address both puzzles by decomposing wealth according to the liquidity of household assets. In particular, we find that significant appreciation in the value of real estate assets that occurred after the peak of the wealth cycle helped to sustain consumer spending from 2000 to 2005.

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Introduction

Personal consumption expenditures account for 70 percent of real GDP in the United States. As a result, the ability of economists to understand the determinants of consumer spending has become increasingly important for identifying possible channels of influence on the macroeconomy in both the short and long run. In particular, in order to forecast future macroeconomic performance, policymakers pay attention to changes in the components of household wealth and the signals these changes provide.

From 1990 through 2002, households in the United States witnessed a dramatic boom-bust cycle in their accumulated net worth. In the third quarter of 1990, real household net worth stood at $97,363 per person (2000 dollars). By the end of the first quarter of 2000, the peak of the cycle, real per capita net worth had increased by more than 58 percent to $154,336. Over the next 10 quarters, a sharp reversal of fortune followed as the value of per capita household wealth declined by 18 percent in real terms. The macroeconomic effects of this wealth cycle present somewhat of a puzzle to economists. Some attribute the decline in personal saving rates to the run-up in stock-market wealth that occurred during this period. Yet, saving rates continued to decline following the peak of the cycle through 2005, falling below zero at the beginning of the second quarter of 2005.

During the 1990–2002 wealth cycle, former Federal Reserve Chairman Alan Greenspan spoke on a number of occasions about the difficulty in assessing the risks inherent in the rapid rise in the value of stock-market assets. As early as 1996, Chairman Greenspan posed the now-famous policy question facing the Board of Governors at that time: "…how do we know when irrational exuberance has unduly escalated asset values, which then become subject to unexpected and prolonged contractions?"[1] And in 1999, as concerns about a stock-market correction and the possibility of asymmetric responses to changes in wealth began to dominate the financial news, Greenspan noted that, "As model builders know, all economic channels of influence are not of equal power to engender growth or contraction. Of crucial importance, and still most elusive, is arguably the behavior of asset markets."[2] Similar concerns were being raised at the time among policymakers in the Clinton and Bush administrations as well.

In their attempts to model macroeconomic channels of influence arising from changes in wealth, economists have traditionally relied on approaches that focus on anticipated changes in income and wealth over the life cycle of consumers. The difficulty confronting policymakers during the wealth cycle of 1990–2002 was that traditional life-cycle models of consumption imply that wealth effects should be symmetric. However, the collapse of what has been referred to as the stock-market bubble of 2000 resulted in a 52-percent decrease in the real per capita value of stock-market assets, yet real consumer spending on a per capita basis increased by 4.2 percent from the peak to the trough of the wealth cycle. As a result, policymakers have begun to question the relevance of the traditional life-cycle model and its ability to reflect the importance of wealth cycles and their impact on the macroeconomy.

By the end of 2005, real per capita household net worth had surpassed its first-quarter of 2000 peak. However, stock-market assets stood at just 68 percent of their wealth-cycle peak, indicating that a change in the composition of household wealth—specifically, in the value of real estate—had occurred. From the peak of the wealth cycle in 2000 to the end of 2005, real per capita real estate wealth grew without interruption by 55 percent, largely because of lower mortgage rates associated with an

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[1] Federal Reserve Chairman Alan Greenspan on December 5, 1996, speaking before The American Enterprise Institute for Public Policy Research in Washington, DC.

[2] Federal Reserve Chairman Alan Greenspan on August 26, 1999, in his opening remarks at the Federal Reserve Bank of Kansas City Symposium in Jackson Hole, Wyoming.

accommodative monetary policy stance on the part of the Federal Reserve. This led some economists to suggest that the consistent increase in real per capita consumer spending and the continued decline in saving rates following the wealth cycle may be attributable to a coincident rise in the value of real estate assets.

There has been little published work to date on asymmetries in consumer wealth effects for the period following the peak of the stock-market bubble in 2000, arguably the most significant boom-bust wealth cycle in U.S. history despite the apparent lack of accompanying macroeconomic business cycle effects. Furthermore, few studies have decomposed wealth effects beyond the market value of direct equity holdings of households. What follows is our response to calls for additional econometric evidence on asymmetric wealth effects, including observations for the wealth cycle of 1990–2002 and subsequent recovery.

We begin with an overview of some of the existing literature and an outline of the traditional life-cycle, error-correction approach to modeling wealth effects. We then propose a decomposition of total wealth according to the liquidity of assets, focusing on the role of real estate wealth. In this fashion, we present new empirical evidence related to the presence of a cointegrating relationship between consumption, income, and wealth. We then provide updated estimates of wealth effects, using a traditional life-cycle model for three decompositions of household net worth. Finally, a search for short-run asymmetries in consumer spending is presented. We find that short-run asymmetries in the error-correction behavior of households do exist and that negative shocks to liquid stock-market assets matter more than positive changes in any of the other components of per capita net worth.

The Literature on Consumption Wealth Effects

The literature on wealth effects has at its core the life-cycle model of consumption developed by Albert Ando and Franco Modigliani (1963) and the introduction and examination of the Permanent Income Hypothesis by Robert Hall (1978). From these seminal papers, a standard approach to estimating the relationship between real consumption expenditures and measures of real income and wealth was developed through the work of Blinder and Deaton (1985), Campbell (1987), Campbell and Deaton (1989), and Galí (1990), among others.

The notion that stock-market assets affect consumer spending differently from other forms of wealth has received considerable attention in the literature. Bosworth (1975) and Mishkin (1976) provided early evidence of the existence of a stock-market wealth effect. Mishkin looked at the period of the Great Depression following the stock-market crash of 1929 and argued that the decline in financial asset values affected consumption through liquidity effects. The dramatic run-up in equity prices during the 1994 to 1999 period resulted in a resurgence of interest in the impact of the stock market on consumption, and several papers have attempted to decompose the wealth effect according to financial and non-financial wealth and also according to the liquidity of assets.

Ludvigson and Steindel (1999) updated previous econometric evidence in providing an estimate of the wealth effect on consumer spending, using data that include the run-up in stock-market values during the latter half of the 1990s, but stopped short of the wealth-cycle peak. While they found a significant relationship between consumption and stock-market wealth, they noted that the long-run relationship linking consumption, labor income, and wealth is unstable. Mehra (2001) also examined the experience of the 1990s and found a substantial effect of the stock-market boom on real consumer spending. According to Mehra, the wealth-induced consumption growth that occurred during this period may have contributed as much as two percentage points per year to the growth rate of real GDP during the second half of the 1990s.[3]

Byrne and Davis (2003) examined the effect of asset liquidity on consumer spending for a panel of G7 countries for the period 1972–1998. Using a life-cycle, error-correction framework, they found little evidence that liquid wealth affects consumption, despite their *a priori* expectations and the findings of previous studies of the impact of asset liquidity on consumer behavior. Their research also suggests that consumption functions relying on aggregate wealth exhibit instabilities and that illiquid wealth appears to be a more important determinant of long-run consumption.

The run-up in equity prices during the latter half of the 1990s and the possibility of asymmetric effects on consumption attracted considerable attention among policymakers during the period. In 1997, Alan Greenspan, in response to a question following his speech before the New York Economic Club, cited a need for additional econometric evidence on asymmetric wealth effects.[4] Poterba (2000), in an analysis of the empirical work on consumer wealth effects that included the sample period leading up to the peak of the wealth cycle, echoed Greenspan's concern over the lack of empirical work on asymmetric effects of rising stock-market wealth on consumption.

A number of recent studies have looked at the relationship between housing wealth and consumption, using micro data. Campbell and Cocco (2005) investigated the response of household consumption to house prices, using data for 1988 to 2000 from the United Kingdom, exploring differences due to age profiles and regional characteristics. They concluded that the effect of predictable changes in house prices on predictable changes in consumption is driven by national, rather than regional, factors and is significant for both renters and homeowners.

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[3] Mehra (2001, p. 66).

[4] Greenspan's remark is noted by Shirvani and Wilbratte (2000, p. 41).

Case, Quigley, and Shiller (2005) examined wealth effects, using data for a panel of 14 countries during 1975–1996. They compared their results using these data with a panel of state-level U.S. data for the period 1982–1999. They found that the evidence for a stock-market wealth effect on consumption is, at best, weak. They did, however, find strong evidence for a significant housing-market wealth effect on consumption. Case, Quigley, and Shiller concluded that, for their data, changes in housing prices have a more important impact than changes in stock-market prices in influencing consumption, both in the United States and across their panel of developed countries.

In another study using micro data, Juster et al. (2006) examined the decline in household saving rates, using data derived from three waves of the Panel Study on Income Dynamics (PSID) for the period from 1984 to 1994. The authors concluded that most of the decline in saving rates over this period can be attributed to significant capital gains in corporate equities; specifically, the effect of stock-market gains is larger than the effects from capital gains in housing or other assets. Contrary to the findings of Case, Quigley, and Shiller, Juster et al. found that, for the PSID households, the effect of changes in housing wealth on active saving was not statistically significant.

Returning to the literature on macroeconomic wealth effects on consumption, a few papers have provided econometric evidence of asymmetric effects of changing financial asset values on consumer spending. Shirvani and Wilbratte (2000) found short-run asymmetric wealth effects for Germany, Japan, and the U.S. for the period from the first quarter of 1970 through the second quarter of 1996, using OECD data on aggregate consumption. In particular, they found that consumption responded more strongly to stock-price decreases than to increases, and they suggest that such effects are important contributors to economic recessions, most notably in the case of the Japanese economy.

More recently, Stevans (2004) looked at real per capita consumption and aggregate wealth data in the United States, using a life-cycle error correction framework for the period from 1952 to 1999. He concludes that consumer spending responds quickly to changes in wealth during periods of appreciating equity values and finds little or no effect during periods of stock-market decline. Stevans' claim of asymmetric stock market wealth effects may be overstated, however, for two reasons. First, he used total household net worth as his measure of wealth, a measure that includes household durables and real estate as well as stock-market assets and other forms of financial wealth. Second, Stevans employed a momentum–threshold autoregressive model (MTAR) in an error-correction framework in which the threshold was defined in terms of direct equity holdings and total mutual fund assets. The following evidence suggests that there may be other reasons for asymmetric, short-run, error-correction behavior.

The Life-Cycle Model and Error-Correction Framework

Davis and Palumbo (2001) provide a summary of the traditional model of life-cycle consumption that has become a standard framework for empirical work on the measurement of wealth effects. Following their approach, we begin with the assumption that households behave in the aggregate according to a decision rule that becomes a target for spending behavior over their life cycle:[5]

$$C_t^T = m_Y \cdot \widetilde{Y}_t + m_W \cdot W_{t-1}, \tag{1}$$

where m_Y and m_W are marginal propensities to consume out of lifetime labor income and current household net worth, respectively. $\widetilde{Y}_t$ represents current and expected future earnings, and W_{t-1} is end-of-period household net worth used to help finance consumption in the current period. Operationalizing equation (1) for empirical work requires two analytical assumptions.

First, we recognize that households will not always behave according to the model of consumption implied by the life-cycle theory; that is, there will be periods in which actual consumption deviates from "the plan." Second, lifetime earnings are unobservable at time *t*. Here, we assume that lifetime earnings are proportional to current disposable labor income

[5] Deaton (1992, pp. 45-47) provides a more complete derivation of the aggregate life-cycle consumption function in this context.

(YD_t) and use this as a proxy for $\tilde{Y}_t$. Thus, for purposes of empirical estimation of long-run income and wealth effects, the life-cycle model of consumer spending becomes:

$$\begin{aligned} C_t &= C_t^T + \varepsilon_t \\ &= \left(m_{YD} \cdot YD_t + m_W \cdot W_{t-1}\right) + \varepsilon_t, \end{aligned} \tag{2}$$

where ε_t represents the deviation of actual consumption from the target.

As noted by Davidson et al. (1978), short-run consumer behavior may differ substantially from the life-cycle consumption function as households attempt to "correct" for deviations from planned levels in response to changes in their economic circumstances. Specifically, we assume some sort of short-run, error-correction behavior by households in which consumption growth occurs in response to unanticipated changes in income and wealth, as well as other factors, represented in equation (3) by the vector $\underline{x}_t$:

$$\begin{aligned} &C_t = C_{t-1} + \omega_0 + \omega_1 \cdot \varepsilon_{t-1} + \omega_2 \cdot \Delta YD_t + \omega_3 \cdot \Delta W_{t-1} + \omega_4' \cdot \underline{x}_t + \nu_t \\ &\text{or} \\ &\Delta C_t = \omega_0 + \omega_1 \cdot \varepsilon_{t-1} + \omega_2 \cdot \Delta YD_t + \omega_3 \cdot \Delta W_{t-1} + \omega_4' \cdot \underline{x}_t + \nu_t. \end{aligned} \tag{3}$$

The expected sign of the estimate of the "speed-of-adjustment" parameter, ω_1, in equation (3) is negative, since we expect consumers to slow down their consumption when they exceed the target and to speed up consumption when they fall short of their plan.

In searching for asymmetries, we expect wealth and income effects to be symmetric in the long run, as households anticipate the possibility of increases or decreases in income and wealth when they derive their consumption plan. On the other hand, it seems reasonable to expect to see asymmetries in the short run, in that households may respond differently to, say, a rapid increase in the value of their financial portfolio than they would to negative shocks in the value of those assets. Asymmetries of this sort may be manifested in the speed of adjustment or in one of the other exogenous determinants of short-run consumer behavior.

Wealth Decompositions

In the analysis that follows, we apply the conventional empirical methods for estimating wealth effects outlined above, using three decompositions of real per capita household net worth (defined in detail in the Data Appendix). Table 1 presents a historical view of the alternative measures of wealth we use in our analysis. As noted earlier, the peak of the wealth cycle occurred at the end of the first quarter of 2000, after a 58.5-percent increase in real per capita net worth that began in the third quarter of 1990. The subsequent trough in the wealth cycle occurred 10 quarters later, at the end of the third quarter of 2002, as real per capita household net worth declined by 18 percent.

Our first decomposition separates out stock-market assets, including an estimate of the value of corporate equities held by households in pensions and life insurance funds, from all other forms of wealth. Calculated this way, stock-market assets increased by 324 percent in the run-up to the peak in total wealth and suffered a 51.8-percent reversal over the next 10 quarters. By the end of 2005, the value of stock-market assets had increased by 40.3 percent. Interestingly, the value of non-stock-market wealth increased throughout the entire period, supporting the claim that the wealth cycle was indeed a stock-market-induced phenomenon. By the end of 2005, the value of non-stock-market wealth was 17.5 percent greater than it was at the trough of the wealth cycle.

In our second definition of wealth, we decompose per capita household net worth into liquid versus illiquid components. Here, liquid assets include currency, mutual funds, and direct equity holdings by households. Illiquid wealth includes all other forms of assets, such as pension and trust funds, real estate, and consumer durables. Looking at wealth in this fashion, we calculate a 128-percent increase in liquid assets during the run-up to the peak of the wealth cycle, fueled primarily by the increase in the value of direct equity holdings. These holdings also account in large measure for the 36-percent decline in the value of liquid assets that occurred during the collapse of the stock-market bubble. Illiquid wealth, which also includes some stock-market assets, increased by 31.6 percent during the run-up (through the first quarter of 2000) and suffered a somewhat less dramatic 6-percent decline during the subsequent correction. By the end of 2005, illiquid wealth was 23.4 percent greater than it had been at the trough of the wealth cycle.

To account for some of the increases in wealth that followed the wealth cycle of 1990–2002, our third decomposition of per capita household net worth separates out real estate assets and divides stock-market wealth into liquid and illiquid components to distinguish between direct equity holdings and holdings in pensions and other illiquid asset categories. One of the interesting stories revealed in Table 1 for this decomposition of wealth is the behavior of stock-market assets between 2002 and the end of 2005. Liquid and illiquid stock-market assets increased by 33.7 percent and 54.2 percent, respectively, after the trough of the wealth cycle, yet remained well below their peak values of the first quarter of 2000. In addition, the market value of real estate assets increased by 32.2 percent from the middle of 2002 to the end of 2005, almost doubling the rate of growth that occurred in this component of household net worth during the run-up to the peak of the wealth cycle. These decompositions illustrate quite clearly the shift in the composition of asset values in household portfolios, away from equity holding and toward real estate, following the peak of the wealth cycle. The decompositions also support the notion that housing capital gains fueled consumption growth during this period.

A Search for Cointegrating Relationships

One analytical hurdle remains before applying econometric methods to equations (2) and (3). Because of the trending nature of consumption, income, and wealth over our sample period, the error term in equation (2) will be non-stationary. Thus, it is necessary to test for the existence of a cointegrating relationship among these variables.

The notion that individually trending series may be cointegrated in this context can be derived from the budget constraint that defines the period-to-period accumulation of household wealth, which in turn provides an analytical link between consumption, disposable labor income, and wealth:[6]

$$W_t = (1 + r_t) \cdot W_{t-1} + (YD_t - C_t). \tag{4}$$

Equation (4) defines household net worth in the current period as the sum of the net value of assets in the previous period, any increase or decrease in the value of these assets between periods $(r_t \cdot W_{t-1})$, and current-period savings $(YD_t - C_t)$. The fact that each of these series is non-stationary is well established in the literature. We confirmed (via unit-root tests) that, for

[6] See Davis and Palumbo (2001, p. 4). Lettau and Ludvigson (2001, 2004) and Rudd and Whelan (2006) provide additional details on the theoretical underpinnings of this approach.

our sample period (1953–2005), the log of real per capita consumption, income, and each of the components of household wealth presented in Table 1 are indeed **I(1)** series.

Here again, a puzzle emerges when applying standard tests in estimating macroeconomic wealth effects. Ludvigson and Steindel (1999) concluded that a single cointegrating relationship exists for their measures of consumption, income, and wealth for the period 1954–1997. Similarly, Lettau and Ludvigson (2001, 2004) identified a cointegrating relationship between the log of consumption, wealth, and labor income for the period 1951–1995. However, Rudd and Whelan (2006) and Stevans (2004) point to problems with these test results and with the theoretical constructions of the cointegration framework used by by Lettau and Ludvigson; they conclude that, properly defined, the null hypothesis of no cointegration in fact cannot be rejected for their data. Rudd and Whelan suggested that the inability to find a cointegrating relationship among these variables may be attributable to structural economic and demographic shifts. Stevans (2004) suggested that asymmetries in the consumption-wealth relationship are responsible. Our findings indicate that asset liquidity may also play a role.

In Figure 1 we begin our search for cointegrating relationships in the data by applying the Augmented Dickey-Fuller (ADF) tests proposed by Engle and Granger (1987) to the residuals from recursive regressions of consumption on labor income and each of our four definitions of wealth. In this fashion, we seek to address Rudd and Whelan's concern for the stability of any cointegrating relationship among the variables, using the same ADF approach presented in their paper, but in a dynamic fashion. Figure 1 illustrates four time series of calculated t-statistics for the estimated parameter ψ_0 from recursive end-point regressions of equation (5), expanding the sample period from the second quarter of 1953 to the fourth quarter of 1984 through the fourth quarter of 2005:

$$\Delta\hat{\varepsilon}_t = \mu + \psi_0 \cdot \hat{\varepsilon}_{t-1} + \psi_1 \cdot \Delta\hat{\varepsilon}_{t-1} + \omega_t . \tag{5}$$

In equation (5) $\hat{\varepsilon}_t$ represents the residual from a regression over the corresponding sample period of consumption on labor income and one of our four measures of wealth.[7] Also shown in Figure 1 are the critical values for the 5- and 10-percent levels of significance for the null

[7] All variables are in log real per capita units. We used the AIC to choose a lag length of one for each of the regressions in Figure 1, as represented in equation (5).

hypothesis of no cointegration, calculated using the approach of MacKinnon (1991). From our results in Figure 1 we see that by using the ADF test procedure in this fashion, only in the case of our first decomposition of household net worth (stock-market assets versus non-stock-market wealth) can we reject the null hypothesis of no cointegration—and for this definition, only for the largest sample sizes and at the 10-percent level of significance.

There are, however, well-known problems with the single-equation approach to diagnosing cointegration, including the possibility of the existence of more than one cointegrating vector and a loss of efficiency when estimating just a single cointegrating equation for multiple variables.[8] Thus, in Table 2 we present results using the multivariate approach developed by Johansen (1988, 1991) and used by Rudd and Whelan (2006), which provides a more appropriate test for cointegration in this context.

Table 2 presents Johansen's trace statistics and the corresponding rank of the cointegrating coefficient matrix in a vector error-correction model (VECM) constructed for our measures of consumption, income, and wealth for observations through 2005. Looking at the first row of trace statistics in Table 2, we see that a cointegrating relationship does not appear to exist when we use total household net worth as our measure of wealth, confirming the results of Rudd and Whelan (2006) and Stevans (2004). However, when we apply our decompositions of net worth according to our alternative definitions of household wealth, one to four cointegrating relationships emerge, depending on the lag structure of the VECM and the chosen level of statistical significance. We conclude from these results that our decomposition of total wealth appears to be more appropriate than total wealth itself for estimating long-run consumption wealth effects.

Empirical Results: Life-Cycle Models

Table 3 presents the results of dynamic estimation of four versions of the life-cycle model of consumption. Each model in Table 3 is estimated using quarterly data for the period 1953–2005 and includes a correction for first-order serial correlation. Model 1, represented by equation (6),

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[8] Harris and Sollis (2003, Chapters 4 and 5) provided a good overview of tests for cointegration in single equations versus multivariate systems.

estimates income and wealth effects using total real per capita household net worth as the measure of wealth:

$$\ln(C_t) = \beta_0 + \beta_1 \cdot \ln(YD_t) + \beta_2 \cdot \ln(W_{t-1}) + \sum_{j=-2}^{+2} \gamma_j \cdot \Delta \ln(YD_{t+j}) + \sum_{j=-2}^{+2} \delta_j \cdot \Delta \ln(W_{t-1+j}) + u_t \,. \quad (6)$$

Note that in equation (6), as in all of the specifications of our life-cycle models in Table 3, we employ the dynamic OLS estimation procedure of Stock and Watson (1993) to control for the effects of regressor endogeneity in an equation with cointegrated variables.

Our results for model 1 match the most commonly reported value in the literature to date for the marginal propensity to consume out of total wealth: four cents per dollar.[9] We note, however, that despite the popularity of this specification in the literature, our inability to reject the null hypothesis of no cointegration among these variables casts doubt on the validity of this model as an appropriate long-run empirical specification. Furthermore, Figures 2 and 3 demonstrate that there exists a significant degree of parameter instability in the consumption-wealth relationship over time, confirming in part the conclusions of Ludvigson and Steindel (1999). The recursive regressions in Figure 3 for life-cycle model 1 illustrate a significant amount of parameter instability during and immediately following the stock-market bubble period, with a structural break in the relationship occurring sometime around 1996.[10] This structural break is also reflected in Figure 2, as the run-up to the peak of the wealth cycle in 2000 and the subsequent collapse would seem to indicate a marked difference in the dynamic relationship between consumption and wealth relative to the pre-1996 period.

The other models in Table 3 stand on somewhat firmer analytical foundations, given our ability to reject the null hypothesis of no cointegration among the relevant variables when we disaggregate wealth as described above. Model 2 decomposes the definition of wealth in equation (6) to include two variables: stock-market assets, represented by corporate equities held either directly or indirectly by households; and all other forms of wealth. Using data that include the entire 1990–2002 wealth cycle and subsequent recovery, we find a statistically significant effect on per capita consumption from both stock-market assets and non-stock-

[9] Average values of per capita consumption, income, and wealth over the sample period are used to calculate the marginal propensities to consume in Table 3.

[10] As indicated by a Chow break-point likelihood ratio test at the 5-percent level of significance.

market wealth. These results indicate that there exists a somewhat larger effect coming from non-stock-market wealth, with an estimated marginal propensity to consume of seven cents, versus a five-cent marginal propensity to consume out of changes in stock-market assets.

The third life-cycle model presented in Table 3 decomposes wealth into liquid assets and illiquid wealth components. Somewhat surprisingly, the estimated marginal propensity to consume out of liquid assets, at four cents, is slightly smaller than the estimated marginal propensity to consume resulting from a dollar change in illiquid wealth (five cents). The results here stand in contrast to those reported by Byrne and Davis (2003), who found no statistically significant effect of liquid financial wealth as they defined it.

The final life-cycle model in Table 3 decomposes wealth further to examine the impact of real estate wealth and to control for liquidity differences within a household's asset portfolio. Among the various components, only illiquid stock market assets (corporate equities held in personal trusts and pension and retirement funds) fail to have a statistically significant effect on consumption in the long run. Real estate wealth, according to our results, has a positive effect on long-run consumption, and the marginal propensity to consume associated with real estate wealth, at six cents, is larger than that of liquid stock-market assets. As we might expect, the marginal propensity to consume is greatest for the liquid non-stock-market wealth component (currency and deposits), at 14 cents per dollar change in these assets. Changes in the non-stock-market wealth component (which includes consumer durables and other non-financial assets) also have a statistically significant effect on per capita consumption, with an estimated marginal propensity to consume of five cents per dollar change in assets.

These results provide an answer to the puzzle of why per capita spending continued to grow despite the dramatic decline in stock-market wealth that occurred in 2000–2002. The rapid appreciation in the value of real estate holdings that occurred after the peak of the wealth cycle appears to have replaced stock-market wealth as the driving force behind continued increases in spending that occurred during 2000–2005.

We noted earlier that we would not expect, *a priori*, to observe asymmetric wealth effects in our life-cycle parameter estimates. To test for this, we separated our definitions of wealth for each of the models in Table 2 to control for both positive and negative changes and confirmed, with appropriate hypothesis tests, that the effects are indeed symmetric over the sample period, 1953 to 2005. in each of our four models.[11]

Error-Correction Models

There has been considerable debate in the literature on short-run, error-correcting behavior for macroeconomic data. Davis and Palumbo (2001) outlined a standard approach that corresponds to our equation (3) above, using a variety of indicators for the vector of "other" factors, $\underline{\mathrm{x}}_t$.[12] In a comment on the work of Davis and Palumbo, Lettau, Ludvigson, and Barczi (2001) take issue with the econometrics of their approach, demonstrating that the factors chosen by Davis and Palumbo prove not to be weakly exogenous and, in fact, are largely responsible for Davis and Palumbo's key result in favor of short-run, error-correcting behavior on the part of consumers. Omitting these factors, according to Lettau, Ludvigson, and Barczi, confirms earlier work by Lettau and Ludvigson (2001), showing that the coefficient on the cointegrating residual [ω_1 in equation (3)] is not statistically significant and that wealth is primarily responsible for any short-run adjustment in consumption necessary to correct for deviations from planned levels. In the results that follow, we chose to apply one of the econometric approaches favored by Lettau, Ludvigson, and Barczi to our updated data and alternative decompositions of wealth in order to investigate short-run, error-correcting behavior over our sample period.

Table 4 presents OLS estimates of the following equation, corresponding to model 1:

$$\begin{aligned}&\Delta \ln\left(C_t\right) = w_0 + w_1 \cdot \tilde{u}_{t-1} + \sum_{j=1}^{L} w_{2,j} \cdot \Delta \ln\left(C_{t-j}\right) + \sum_{j=1}^{L} w_{3,j} \cdot \Delta \ln\left(\widehat{YD}_{t-j}\right) + \sum_{j=1}^{L} w_{3,j} \cdot \Delta \ln\left(W_{t-j}\right) + v_t \\ &\text{where} \\ &\tilde{u}_{t-1} = \ln\left(C_{t-1}\right) - \left[\hat{\beta}_0 + \hat{\beta}_1 \cdot \ln\left(YD_{t-1}\right) + \hat{\beta}_2 \cdot \ln\left(W_{t-2}\right)\right].\end{aligned} \tag{7}$$

The underlying intuition to be tested in estimating equation (7) is how households adjust their consumption in the short run in response to deviations from their desired long-run path. These

[11] We do not present these results here, but they are available on request.

[12] Specifically, Davis and Palumbo use predicted values of labor income growth, changes in the unemployment rate, the real federal funds rate, and the University of Michigan Survey Research Center's index of unemployment expectations.

adjustments can be attributed to one of the following: the error-correcting adjustment parameter, w_1, short-run changes in consumption or labor income, or as a result of changes in wealth.

For three of the models in Table 4, the estimated coefficient on the life-cycle consumption error term, ω_1, is statistically significant and of the expected sign, although the significance is not as strong as that of some of the other coefficients in the model. Contrary to the findings of Lettau, Ludvigson, and Barczi, our results imply that, for this updated data set and for our decompositions of wealth, some evidence of short-run, error-correcting behavior appears to exist, although the magnitude of the so-called "speed of adjustment" parameter is much smaller than that reported in Davis and Palumbo. Like Lettau, Ludvigson, and Barczi, we also find statistically significant adjustments due to changes in household wealth, although the pattern of these effects is not uniform.

In terms of short-run wealth effects, our findings for model 1 indicate that changes in the rate of growth of total wealth contribute positively to consumption growth. In decomposing the short-run wealth effects, however, we see in model 2 that fluctuations in the value of stock-market assets have a much more significant short-run effect than changes in the growth of non-stock-market wealth. This result is not surprising, given the reduced liquidity of non-stock-market assets. This asset liquidity effect is confirmed in model 3, in which fluctuations in the rate of growth of illiquid wealth have little statistically significant effect on consumption growth in the short run. Finally, in model 4, as expected, the fully decomposed illiquid wealth effects have little short-run impact on consumption growth, while changes in liquid non-stock-market assets make the most significant marginal contribution to error-correction behavior in the short run.

An Investigation of Asymmetric Behavior

Turning now to the question of asymmetric wealth effects, Table 5 presents some interesting results. To investigate whether or not short-run differences in consumer behavior occur, we consider two types of asymmetries in our error-correction models. The first allows for differences in the speed of adjustment, in a fashion similar to the asymmetric effects investigated by Stevans, and the second allows for asymmetries with respect to positive versus negative changes in wealth. Specifically, model 1 in Table 5 is represented by equation (8):

$$\Delta \ln(C_t) = \gamma_0 + \gamma_1 \cdot \left(DU_t^+ \cdot \tilde{u}_{t-1}\right) + \gamma_2 \cdot \left(DU_t^- \cdot \tilde{u}_{t-1}\right) + \gamma_3 \cdot \Delta \ln(C_{t-1}) + \gamma_4 \cdot \Delta \ln\left(\hat{YD}_t\right) + \gamma_5 \cdot \left(DW_t^+ \cdot \Delta \ln(W_{t-1})\right) + \gamma_6 \cdot \left(DW_t^- \cdot \Delta \ln(W_{t-1})\right) + \kappa_t \tag{8}$$

where

$$DU_t^+ = \begin{cases} 1 \text{ if } \tilde{u}_{t-1} > 0 \\ 0 \text{ otherwise} \end{cases} \qquad DU_t^- = \begin{cases} 1 \text{ if } \tilde{u}_{t-1} < 0 \\ 0 \text{ otherwise} \end{cases};$$

$$DW_t^+ = \begin{cases} 1 \text{ if } \Delta \ln(W_{t-1}) > 0 \\ 0 \text{ otherwise} \end{cases} \qquad DW_t^- = \begin{cases} 1 \text{ if } \Delta \ln(W_{t-1}) < 0 \\ 0 \text{ otherwise} \end{cases}$$

Our approach differs from Stevans' MTAR application in that we control explicitly for asymmetric wealth effects and allow for general asymmetric speed-of-adjustment effects (rather than restricting the model to those defined only in terms of a stock-market and mutual fund adjustment threshold).

In Table 5 we see that for each of the models, the speed of adjustment is smaller and statistically less significant for negative life-cycle errors than for positive errors, indicating that consumers in the short run adjust their spending more quickly when actual spending exceeds the target, and are more cautious in adjusting behavior when actual spending falls short of the planned levels. According to our results for model 1, a positive one-percentage-point error this quarter will correspond to a decrease in consumer spending of 0.1 percentage points in the following quarter. A negative one-percentage-point error this quarter, however, is met by a statistically insignificant 0.037 percentage-point correction in the next period. As shown in Table 5, we find a similar pattern of asymmetric error-correction behavior for each of our models, although the magnitude of the error-correction parameter for model (4) varies considerably from that in the other models.

The evidence supporting short-run asymmetric wealth effects, however, is not very strong according to our results. For model 1, the results in Table 5 indicate that there are significant effects that correspond to both positive and negative changes in wealth, but the effects appear to be symmetric; that is, increases in wealth have an equal effect to that of decreases in wealth in the short run. Similarly, for model 2, there is no statistically significant difference between the effect of increases or decreases in stock-market assets, although both effects are individually statistically significant. Non-stock-market wealth effects remain statistically insignificant in model 2.

In model 3, however, we do find that increases in liquid assets have a statistically significant effect on short-run consumption, while negative shocks appear to have little statistically significant effect. This suggests that asymmetries are attributable to the liquidity of assets in a household's wealth portfolio. Households appear to adjust their spending behavior more quickly, and in a statistically significant fashion, when the value of directly held corporate equities, mutual fund holdings, and/or currency or deposits increase, raising short-run spending in response. Illiquid wealth appears to have virtually no statistically significant effect on per capita consumption in the short run.

From model 4 in Table 5, we see that any short-run, asset-liquidity effects appear to be confined to negative changes in liquid stock-market assets, as all other changes in the components of wealth are not statistically significant. Specifically, a 1-percentage-point decrease in the rate of growth of the value of direct equity holdings by households results in a .054-percentage-point decrease in consumption growth in the short run. However, according to our results, households do not appear to adjust their short-run spending in a statistically significant fashion in response to an unexpected increase in the value of stock-market assets, *ceteris paribus*. Changes in real estate asset values do not appear to have asymmetric effects on consumer behavior in the short run.

In summary, our results indicate that while consumers do appear to respond in an asymmetric fashion to deviations of short-run spending from their long-run plans, these asymmetries cannot be broadly interpreted as the result of aggregate wealth effects. Instead, we find support for asymmetric responses to changes in liquid stock-market assets. Specifically, we find that negative shocks to liquid stock-market assets lead to decreased consumption growth, while positive shocks have no statistically significant effect on consumption.

Conclusions

The boom-bust wealth cycle of 1990–2002 represented the greatest accumulation and collapse of household net worth in the United States since the Great Depression. Yet unlike the case of the Great Depression, aggregate demand appears to have been relatively unaffected throughout this more recent wealth cycle. This stylized fact presents a puzzle for policymakers viewing the experience through the lens of traditional life-cycle models of consumption, which predict a symmetric relationship between changes in household wealth and aggregate consumer spending.

The analysis presented here provides a look at the post–stock-market-bubble period through an investigation of asymmetries in the way households respond to short-run deviations in consumption from long-run target levels. We find that in the long run, wealth effects are symmetric, suggesting that consumers account for shocks when determining their desired consumption path over their life cycle. However, consumers appear to react differently in the short run, adjusting more rapidly to positive deviations from their consumption targets, while bringing spending back in line more slowly following negative shocks. Furthermore, we find that consumers react more strongly to negative shocks to the value of their liquid stock-market assets than they do to shocks to any other component of total wealth.

We also present evidence that supports recent concern over several published works on wealth effects. Specifically, it appears that a cointegrating relationship between per capita consumption, labor income, and total net worth does not exist in the data for our sample period of 1953 to 2005. This result raises the question of how best to apply the traditional life-cycle approach, and accompanying short-run error-correction models, to estimate wealth effects appropriately. However, policymakers care about the components of wealth, in addition to caring about aggregate wealth. We find that a decomposition of household net worth that includes liquid stock-market assets, as well as other liquid and illiquid components (such as the value of real estate assets), restores the cointegrating relationship among consumption, income, and wealth in a fashion that provides a more meaningful foundation for understanding the wealth effect on consumption in both the short and long run.

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Data Appendix

All consumption, wealth, and income variables are expressed in real (2000 dollars) per capita units, using the chained price index for personal consumption expenditures and the Bureau of Economic Analysis' (BEA) population measure used for reporting per capita income and consumption. All BEA data are current as of the March 30, 2006 release.

Consumption Expenditures (C): The data for real per capita personal consumption expenditures are taken directly from the National Income and Product Accounts as reported by the BEA.

Disposable Labor Income (YD): Defined as wage and salary disbursements, plus personal current transfer receipts, plus employer contributions for employee pension and insurance funds, minus contributions for government social insurance, minus labor taxes. Labor taxes are defined by imputing a share of personal tax payments to labor income, with the share calculated as the ratio of wage and salary disbursements to the sum of wage and salary disbursements, proprietors' income, rental income, and dividend and interest income.

Wealth (W): All wealth measures are constructed from the Flow-of-Funds Accounts of the Board of Governors of the Federal Reserve System (March 9, 2006 release) and are expressed on an end-of-period basis. Therefore, throughout the analysis in this paper the *t*-1 value of the Flow-of-Funds data is associated with period *t* wealth to obtain a start-of-period measure.

	Flow-of-Funds Table
Total Wealth	
Net Worth = Total Assets – Total Liabilities	B.100
Stock-Market Assets	
Liquid Stock-Market Assets	
Corporate Equities excluding Mutual Fund Shares	B.100
+ Corporate Equities Held in Mutual Fund Shares:	
Mutual Funds Shares ×	L.123
(Total Mutual Funds Assets Held in Corporate Equities ÷	L.123
Total Mutual Funds: Financial Assets)	L.123

Stock-Market Assets (continued)	Flow-of-Funds Table
Illiquid Stock-Market Assets	
Corporate Equities Held in Life Insurance Reserves =	
Life Insurance Reserves ×	B.100
(Total Life Insurance Companies Assets Held in Corporate Equities ÷	L.117
Total Life Insurance Companies Financial Assets)	L.117
+ Corporate Equities Held in Pension Fund Reserves =	
Pension Fund Reserves ×	B.100
((Private Pension Funds Assets Held in Corporate Equities +	L.118
State and Local Retirement Funds Held in Corporate Equities +	L.119
Federal Government Retirement Funds Held in Corporate Equities) ÷	L.120
(Total Private Pension Fund Assets +	L.118
Total State & Local Government Retirement Funds Assets +	L.119
Federal Govt. Retirement Funds Net Acquisition of Financial Assets))	L.120

Non-Stock-Market Wealth = Total Wealth – Stock-Market Assets

Liquid Assets	
Corporate Equities excluding Mutual Fund Shares	B.100
+ Mutual Funds Shares	B.100
+ Total Deposits & Currency	B.100
– Foreign Deposits	B.100

Illiquid Wealth = Total Wealth – Liquid Assets

Liquid Non-Stock-Market Assets (Checkable Deposits & Currency, Time & Savings Deposits, and Money Market Funds)

Total Deposits & Currency	B.100
– Foreign Deposits	B.100

Household Real Estate Assets	B.100

Other Illiquid Non-Stock-Market Wealth =
Total Wealth
– Stock Market Assets
– Liquid Non-Stock-Market Assets
– Real Estate Assets

Table 1: The Wealth Cycle of 1990–2002

Three Decompositions of Real Per Capita Household Net Worth

	1990q3	2000q1	2002q3	2005q4	1990q3 - 2000q1	2000q1 - 2002q3	2002q3 - 2005q4
Household Net Worth	97,363	154,336	126,525	155,370	58.5%	-18.0%	22.8%
Assets	115,359	179,055	154,413	190,900	55.2%	-13.8%	23.6%
– Liabilities	17,997	24,719	27,888	35,530	37.4%	12.8%	27.4%
(1) Stock-Market Assets	14,387	60,982	29,421	41,264	324%	-51.8%	40.3%
Non-Stock-Market Wealth	82,976	93,354	97,103	114,106	12.5%	4.0%	17.5%
(2) Liquid Assets	27,142	61,897	39,593	48,066	128%	-36.0%	21.4%
Illiquid Wealth	70,221	92,438	86,932	107,304	31.6%	-6.0%	23.4%
(3) Liquid Stock-Market Assets	9,447	44,336	20,052	26,818	369%	-54.8%	33.7%
Liquid Non-Stock-Market Assets	16,168	14,646	16,293	17,365	-9.4%	11.2%	6.6%
Illiquid Stock-Market Assets	4,940	16,646	9,369	14,446	237%	-43.7%	54.2%
Real Estate Assets	32,425	38,114	44,689	59,091	17.5%	17.3%	32.2%
Illiquid Other Non-Stock-Market Wealth	34,383	40,594	36,122	37,650	18.1%	-11.0%	4.2%

[1] Chained 2000 dollars. Source: Federal Reserve Board of Governors, available at http://www.federalreserve.gov/releases/z1/20060309/. See the Data Appendix for definitions.

Table 2

Johansen Cointegration Trace Tests

Sample Period: 1953q2–2005q2

Wealth Measures	Lag Interval 1: Trace Statistic	1: Rank	2: Trace Statistic	2: Rank	3: Trace Statistic	3: Rank	4: Trace Statistic	4: Rank
Total Wealth	20.16	0	19.43	0	20.58	0	22.39	0
Stock-Market Assets and Non-Stock-Market Wealth	49.89** 27.55*	1** 2*	43.97	0	45.60*	1*	46.92*	1*
Liquid Assets and Illiquid Wealth	59.51*** 31.74** 14.69*	1*** 2** 3*	58.21*** 33.29** 15.04*	1*** 2** 3*	60.80*** 33.84** 15.00*	1*** 2** 3*	65.62*** 36.59*** 16.61**	1*** 2*** 3**
5 Wealth Components	162.89*** 113.69*** 70.44**	1*** 2*** 3**	146.20*** 99.09** 66.11*	1*** 2** 3*	138.48*** 91.63*	1*** 2*	161.71*** 104.30** 74.25** 46.93*	1*** 2** 3** 4*

Variables: log real per capita consumption, labor income, and wealth measures. H_0: No cointegration; H_A: At least one cointegrating relationship. MacKinnon et al. (1999) significance levels: ***Reject H_0 at the 1% level; **Reject H_0 at the 5% level; *Reject H_0 at the 10% level. Rank equals the number of statistically significant cointegrating relations.

Table 3

Dynamic OLS Estimates of Four Life-Cycle Consumption Models

Sample Period: 1953q2–2005q2

	(1)		(2)		(3)		(4)	
	Elasticities	mpc	Elasticities	mpc	Elasticities	mpc	Elasticities	mpc
Disposable Labor Income	0.840*** (0.060)	1.07	0.702*** (0.073)	0.89	0.797*** (0.074)	1.01	0.729*** (0.096)	0.92
Total Wealth	0.222*** (0.046)	0.04						
Stock-Market Assets			0.050*** (0.010)	0.05				
Non-Stock-Market Wealth			0.303*** (0.063)	0.07				
Liquid Assets					0.067*** (0.021)	0.04		
Illiquid Wealth					0.191*** (0.059)	0.05		
Liquid Non-Stock-Market Assets							0.101** (0.059)	0.14
Liquid Stock-Market Assets							0.033* (0.023)	0.04
Illiquid Stock-Market Assets							0.014 (0.029)	0.11
Illiquid Non-Stock-Market Wealth: Durables & Equipment							0.096* (0.069)	0.05
Illiquid Non-Stock-Market Wealth: Real Estate Assets							0.091** (0.054)	0.06

One-tailed significance levels: *** p-value ≤ .01; ** p-value ≤ .05; * p-value ≤ .1. Standard errors in parentheses. All variables are in terms of real per capita values. Dependent variable is total consumer spending. Double logarithmic regressions include an intercept, contemporaneous plus two leading and two lagging values of each explanatory variable, and a correction for first-order serial correlation. 209 total observations.

Table 4: Error-Correction Models

	(1)		(2)		(3)		(4)		
	Coefficient	Stnd Error	Coefficient	Stnd Error	Coefficient	Stnd Error		Coefficient	Stnd Error
Life-Cycle Error	-0.038*	0.022	-0.050#	0.031	-0.059**	0.027	Life-Cycle Error	-0.029*	0.017
Δc_{t-1}	0.114#	0.080	0.114#	0.079	0.096	0.079	Δc_{t-1}	0.053	0.078
Δc_{t-2}	0.130#	0.080	0.141*	0.079	0.148*	0.079	Δc_{t-2}	0.080	0.079
Δc_{t-3}	0.124*	0.072	0.155**	0.072	0.174**	0.073	Δc_{t-3}	0.149**	0.071
Δy_{t-1}	0.108*	0.058	0.129**	0.057	0.132**	0.058	Δy_{t-1}	0.150**	0.059
Δy_{t-2}	-0.081#	0.059	-0.042	0.058	-0.073	0.058	Δy_{t-2}	-0.015	0.060
Δy_{t-3}	-0.055	0.057	-0.090#	0.056	-0.064	0.056	Δy_{t-3}	-0.091#	0.058
Δwealth$_{t-1}$	0.096***	0.022					Δliquid non-stock-mkt assets$_{t-1}$	0.086**	0.038
Δwealth$_{t-2}$	0.034#	0.023					Δliquid non-stock-mkt assets$_{t-2}$	-0.010	0.040
Δwealth$_{t-3}$	0.017	0.023					Δliquid non-stock-mkt assets$_{t-3}$	0.114***	0.038
Δnon-stock-mkt wealth$_{t-1}$			0.080	0.070			Δliquid stock-mkt assets$_{t-1}$	0.021#	0.013
Δnon-stock-mkt wealth$_{t-2}$			-0.172**	0.073			Δliquid stoc- mkt assets$_{t-2}$	0.003	0.012
Δnon-stock-mkt wealth$_{t-3}$			0.214***	0.071			Δliquid stock-mkt assets$_{t-3}$	0.024*	0.012
Δstock-market wealth$_{t-1}$			0.026***	0.005			Δilliquid non-stock-mkt wealth$_{t-1}$	0.043	0.054
Δstock-market wealth$_{t-2}$			0.012**	0.005			Δilliquid non-stock-mkt wealth$_{t-2}$	-0.078#	0.055
Δstock-market wealth$_{t-3}$			-0.001	0.005			Δilliquid non-stock-mkt wealth$_{t-3}$	0.080#	0.054
Δliquid assets$_{t-1}$					0.049***	0.012	Δother stock-mkt assets$_{t-1}$	0.004	0.014
Δliquid assets$_{t-2}$					0.033***	0.012	Δother stock-mkt assets$_{t-2}$	0.009	0.013
Δliquid assets$_{t-3}$					-0.003	0.012	Δother stock-mkt assets$_{t-3}$	-0.028**	0.014
Δilliquid wealth$_{t-1}$					-0.023	0.052	Δreal estate assets$_{t-1}$	-0.001	0.040
Δilliquid wealth$_{t-2}$					-0.085#	0.054	Δreal estate assets$_{t-2}$	-0.087**	0.041
Δilliquid wealth$_{t-3}$					0.077#	0.054	Δreal estate assets$_{t-3}$	0.048	0.039

Two-tailed levels of significance: *** p-value < .01; ** p-value < .05; * p-value < .1; # p-value < .2. Three-period lag minimizes the AIC.
Dependent variable: log(real per capita consumption); all variables are in terms of log real per capita values.

Table 5: Asymmetric Error-Correction Models

	(1)		(2)		(3)		(4)	
	Coefficient	Stnd Error	Coefficient	Stnd Error	Coefficient	Stnd Error	Coefficient	Stnd Error
Life-Cycle Error +	-0.100**	0.044	-0.085#	0.054	-0.108**	0.053	-0.046*	0.025
Life-Cycle Error –	0.037	0.044	0.003	0.056	0.025	0.048	0.009	0.053
Δc_{t-1}	0.158**	0.071	0.163**	0.072	0.164**	0.071	0.135*	0.073
Δy_{t-1}	0.122**	0.055	0.117**	0.056	0.140**	0.055	0.110*	0.057
Δwealth$_{t-1}$ +	0.106***	0.037						
Δwealth$_{t-1}$ –	0.097**	0.042						
Δnon-stock-mkt wealth$_{t-1}$ +			0.117#	0.087				
Δnon-stoc- mkt wealth$_{t-1}$ –			0.176	0.195				
Δstock-mkt wealth$_{t-1}$ +			0.020*	0.011				
Δstock-mkt wealth$_{t-1}$ –			0.029***	0.009				
Δliquid assets$_{t-1}$ +					0.071***	0.021		
Δliquid assets$_{t-1}$ –					0.029#	0.020		
Δilliquid wealth$_{t-1}$ +					-0.191#	0.126		
Δilliquid wealth$_{t-1}$ –					0.079	0.065		
Δliquid non-stoc- mkt assets$_{t-1}$ +							0.082#	0.059
Δliquid non-stock-mkt assets$_{t-1}$ ~–							0.076	0.087
Δliquid stock-mkt assets$_{t-1}$ +							-0.005	0.017
Δliquid stock-mkt assets$_{t-1}$ –							0.054**	0.021
Δilliquid non-stock-mkt wealth +							-0.022	0.081
Δilliquid non-stock-mkt wealth –							0.091	0.126
Δother stock-mkt assets$_{t-1}$ +							0.021	0.018
Δother stock-mkt assets$_{t-1}$ –							-0.033#	0.024
Δreal estate assets$_{t-1}$ +							0.046	0.053
Δreal estate assets$_{t-1}$ –							0.007	0.089

Two-tailed levels of significance: *** p-value < .01; ** p-value < .05; * p-value < .1; # p-value < .2.
One-period lag minimized the AIC. Dependent variable: log(real per capita consumption); all variables are in terms of log real per capita values. + denotes positive changes; – denotes negative changes.

Figure 1

t-Statistics for Augmented Dickey-Fuller Cointegration Tests and Rolling End-Point Regressions

Sample Period Beginning in 1952q2

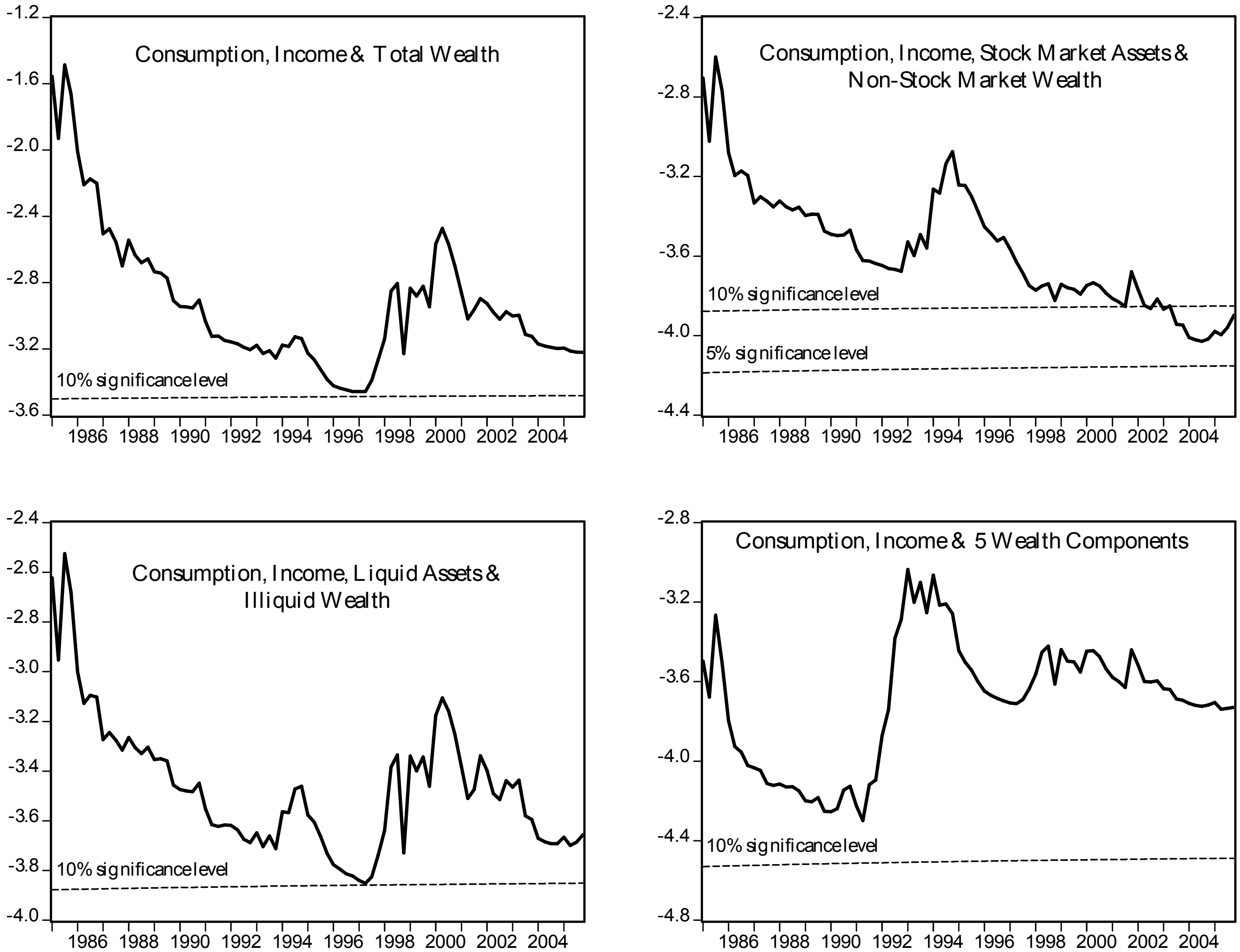

Figure 2

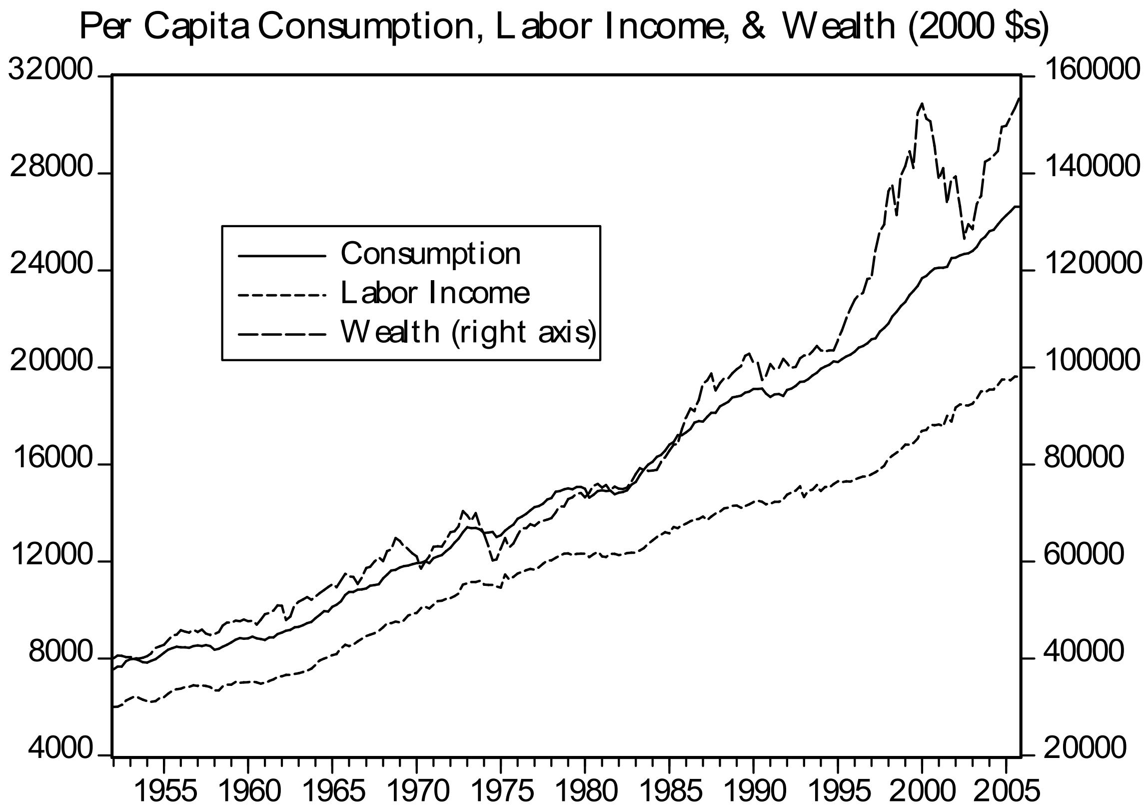

Figure 3