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# WEALTH ACCUMULATION AND HOUSEHOLD CONSUMPTION BY TYPE: U.S. EXPERIENCE

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This paper empirically examines the effect of various types of wealth on household consumption by type in the United States during period of 1990 to 2004. The basic analytical framework is the life-cycle permanent income hypothesis, though some other factors are also considered. The estimation results indicate that financial wealth is the most important component of wealth that stimulates consumption, especially in regard to durable goods. On the other hand, various types of cash extraction derived from housing assets are not always connected directly to consumption; instead, it is very likely that these extractions are tied to further accumulation of housing assets and financial wealth. The conclusion is that the effect of housing stock on consumption is not as prevalent as many economists believe, and the collateral of housing stock may have produced a warped flow of funds in the U.S. household sector.

## 1. Introduction

The remarkable rise in stock and housing prices during the recent economic expansion in the U.S. has led to research interest in the effects and mechanisms of wealth on consumption spending. From the perspective of the theoretical background of consumption, the life-cycle permanent income hypothesis is one of the most sophisticated theories.

This paper explores the U.S. household behavior that underlies the link between wealth and consumption. Here, there are three distinct analytical differences with earlier works. First, this work examines the effects of household wealth on consumption by taking the composition of wealth into consideration. The main focus of this hypothesis is that the total wealth is the key factor that affects household consumption, which is decided over one's lifetime. This characteristic implies that various types of wealth, such as equity, non-equity financial wealth, residential wealth, and other wealth should have effects of the same magnitude on consumption. Clearly, such an extreme effect is unrealistic and it is natural that different types of wealth have different effects on consumption. For example, in mid 2000, the financial wealth held by households fell dramatically due to the sudden drop in the U.S. stock market. In spite of worries that consumption would decrease due to the anti-wealth effect, consumption had held remarkably firm. Case, Quigley and Shiller (2001) rely on a panel of 14 countries and a panel of U.S. states. They distinguished the effects of financial and housing wealth on consumption and found a statistically significant and rather strong effect of housing wealth on household consumption. Boone *et al*. (1998) and, Ludvigson and Steindel (1999) also conducted recent studies on consumption in the U.S. in which they differentiate between stock market wealth and non-stock market wealth. Although these studies provided interesting

findings, the classifications of wealth in earlier works are of two types. The differential impact of various types of wealth, such as human wealth, financial wealth, and physical wealth should also be carefully investigated.

Second, the various types of consumption goods are considered. In general, spending on durable goods is more volatile than that on non-durable goods. Furthermore, durable-goods spending is sensitive to individual economic conditions in the future such as life-cycle income, future financial wealth, and uncertainty. The peculiarity of durable-goods consumption has already been pointed out by Mankiw (1982), Bernanke (1984), Grossman and Laroque (1990) and Chan *et al*. (1995). Yet, there has been little research about the wealth effect on consumption for more subdivided commodities. This paper investigates this point by estimating the consumption function of eight types of commodities.

Third, the mechanism of the effect of residential wealth on consumption is carefully examined. In the U.S., the rise of housing prices has boosted the equity extractions from existing homes such as capital gains on the sale of homes, home mortgage loans and cash withdrawals through refinancing. While these equity extractions may relax borrowing constraints and smooth consumption over the life cycle, little is known about the usage of all this cash in the U.S. household sector. Campbell and Cocco (2005) conducted a comprehensive survey on the relationship between housing prices and consumption, estimating the consumption functions using micro-level data from the U.K., and concluded that an increase in house price relaxes borrowing constraints. However, the following question arises: Do they really relax borrowing constraints and stimulate consumption in the U.S.? This paper empirically investigates this issue thoroughly using newly published real estate data from the Board of Governors of the Federal Reserve System.

The paper is organized as follows. Section 2 introduces the model and describes the data sources, and calculations, and Section 3 provides some basic results for our first empirical approach. Section 4 presents the second empirical research, which focuses on the role of housing stock in consumption. The conclusions of this paper are summarized in Section 5.

## 2. Model and Data

### 2.1 Model

The basic framework of the consumption function is expressed as

$$C_t = \alpha PY_t \qquad \alpha > 0 \tag{1}$$

$$PY_t = NHUW_t + HUW_t \tag{2}$$

$$NHUW_t = FW_t + KW_t \tag{3}$$

$$HUW_t = E_t \sum_{s=t}^{\infty} \beta^{s-t} YL_s \tag{4}$$

where $C_t$ is household consumption expenditure, $PY_t$ is permanent income, $NHUW_t$ is non-human wealth, $HUW_t$ is human wealth, $FW_t$ is financial wealth, $KW_t$ is real wealth, $YL_5$ is after-tax labor income, $\beta$ $(0 < \beta < 1)$ is the subjective discount rate, and $E_t$ is the mathematical expectation operator conditional upon the information available in period t. Eq. (4) shows the expected life-cycle income under the rational expectation hypothesis.

In this paper, the above model is extended in the following directions.When the household faces liquidity or borrowing constraints, the level of consumption is determined by the level of disposal income and consumer loans. Therefore, these factors are included in the consumption function. Aside from non-durable goods, since durable goods, such as automobiles, have a significant life span as stock, it is indispensable to include the user's cost of stock in estimating the consumption function for a durable commodity.

**2.2 Data**

The sample used in the estimation of this model comprises quarterly macroeconomic U.S. data from the first quarter of 1975 to the fourth quarter of 2004. The dependent variable, private consumption expenditure by type of good, is divided into three categories: durable goods, semi-durable goods, and non-durable goods. Durable goods have a significant life span, often defined as three years or more, and consumption is spread out over this span, some examples of which are automobiles and furniture. Non-durable goods are purchased for immediate or almost immediate consumption and have a life span ranging from minutes to three years. In this paper, the following commodities are selected as non-durable goods: (1) food, (2) gasoline, fuels oil, and other energy goods, and (3) other non-durables.[1)] All the data series of consumption expenditure by type of good are converted into real terms by the deflator for each type of good and divided by the population.[2)]

The main independent variable is permanent income, which is defined as the sum of initial non-human wealth and human wealth. Human wealth is the present discounted value of current and future labor income, which is unobservable. Therefore, to make a proxy variable, one has to know the stochastic structure underlying the labor income. An unobservable variable can be expressed as a linear function of the current and lagged variable. In this paper the ARCH process in the disturbance term is specifically expressed as,

$$\Delta YL_t = a_0 + \sum_{k=1}^{m} a_k \Delta YL_{t-k} + \varepsilon_t \tag{5}$$

1) There are more detailed types of consumption expenditure in *Personal Consumption Expenditures by Type of Product* (National Income and product Account (abbreviated as NIPA). Table 2.4.5). These series are, however, only annual time series and are not appropriate for this paper.

2) It is strongly recommended that the value of imputed services from consumer durables comprise the consumption expenditure on durable goods. Yet, Katz (1983) comments on the difficulties involved in calculating the imputed service of durable goods. For example, it is difficult to determine what the relevant nominal interest rate and relevant depreciation rate are for a given consumer durable.

$$E(\varepsilon_t^2|\Omega_{t-1}) = \gamma_0 + \sum_{i=1}^{n} \gamma_i \, \varepsilon^2_{t-i} + \nu_t$$

Substituting Eq. (5) into Eq. (4) yields the following:

$$HUW_t = \frac{YL_{t-1}}{1-\beta} + \frac{1}{1-\beta}(I - \beta M_1)^{-1} M_1 A_{t-1} + \frac{1}{(1-\beta)^2} c(I - \beta M_1)^{-1}\theta \tag{6}$$

$c = (1,0,.....,0)$
$A_t = (\Delta YL_t, \Delta YL_{t-1}, .....\Delta YL_{t-m+1})$
$\theta = (a_0, 0.....0)$

$$M_1 = \begin{bmatrix} a_1 & a_2 & ... & a_m \\ 1 & 0 & ... & 0 \\ . & . & ... & . \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

After-tax labor income ($YL_t$) is defined as wage and salary disbursements plus supplements to wages and salaries minus contributions for government social insurance minus personal current taxes minus personal current transfer payments. These data series are taken from *Personal Income and its Disposition* (NIPA, Table 2.1).[3)]

Non-human wealth consists of net financial and physical assets.[4)] Net financial assets (abbreviated as FA) are taken from the Flow of Fund Accounts of the United States, compiled by the Federal Board of Governors. Physical assets include housing structure and land. The stock of housing structure is calculated using the perpetual inventory method. The housing land data are taken from Davis and Heathcote (2005), which carefully constructs the price and quantity series of residential land in the United States over the first quarter of 1975 to the second quarter of 2005.[5)]

3) The lag of Eq. (5) is one selected by the SBIC criteria. The values of the estimated coefficients are 47.387 for $a_0$ and -0.172 for $a_1$. The specification of the disturbance term is decided with ARCH (1). The inclusion of the GARCH term was also examined, but it was found to exert an insignificant effect. The value of the subjective discount rate ($\beta$) is selected from Hamori (1998).
4) In this paper, the stock of durable consumption goods is not included in household wealth.
5) The Flow of Funds Account (abbreviated as FOF) publishes end-of-year vaulues of aggregate household real estate as well as the replacement cost of the aggregate structures. However, as pointed out by Davis and Heathcote (2005), the estimation technique in FOF is not a perpetual inventory system and it is not correctly calculated.

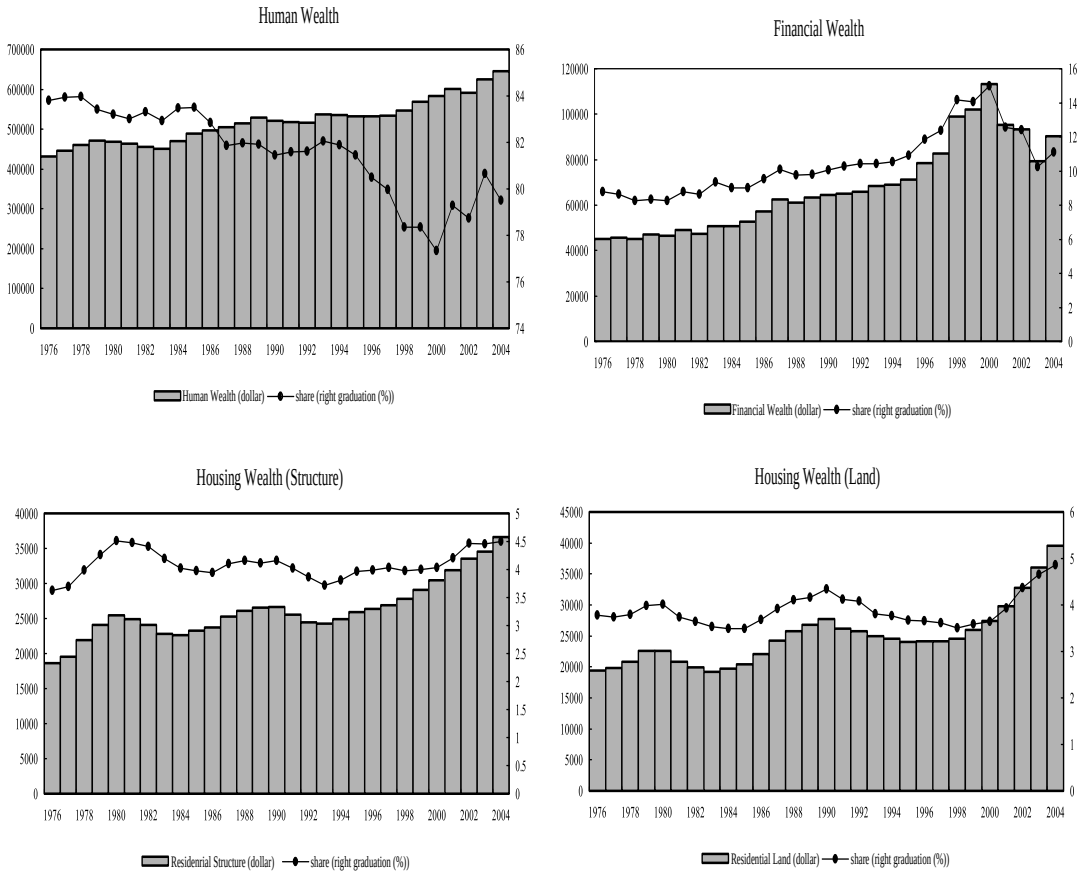


FIGURE 1. Contents of Permanent Income(Per capita)

Figure 1 plots the four series of permanent income, which are human wealth, net financial assets, housing structure, and residential land. The human wealth series shows slow growth over the sample period, with the average share of human wealth in permanent income being nearly 80%. However, this share decreases, especially through the late 1990s. The growth of financial assets is moderate until the 1990s, with an average share of approximately 10%. Thus, in terms of its relative size, financial wealth is one-eighth the size of human wealth. Examining the movements of financial assets reveals that most of the volatility can be traced to fluctuations in the market value of the equity. For example the 2001 stock market crash coincided with downturns in financial wealth. The stock of housing structure gradually grows over the sample period and gains about 4% on average. Residential land exhibits more growth than that of housing structure through the late 1990s, but the broad trends and the share in the two series are similar.

The rental price of durable goods and residential stock is calculated as follows:

$$UC_i = \frac{P_{it}}{PC_t}\{R_{it} + \delta_i - E[\pi_{it+1}|\Omega_t]\} \tag{7}$$

Where
i: automobiles, furniture, other durables, residential stock
$P_{it}$: Deflator of corresponding goods
$E[\pi_{it+1}|\Omega_t]$: Expected inflation rate of corresponding goods
$PC_t$: Deflator of consumption expenditure
$R_{it}$: Loan rate of corresponding goods
$\delta_i$: Depreciation rate of corresponding goods

The expected inflation rate of corresponding goods is calculated by specifying the stochastic process of the inflation rate for corresponding goods. The values for the depreciation rate are 0.07 for automobiles, 0.033 for furniture, 0.042 for other durables, and 0.042 for housing stock. These values are taken from Fraumeni (1997). The loan rate for durable goods is selected from Consumer Credit (FRB). For residential stock, the 30-year Mortgage Fixed Rate compiled by Freddie Mac is adopted.

**3. Estimation (1)**

This paper investigates the effects of household wealth on consumption by considering the composition of wealth introduced in the previous section. Measuring the extent of the wealth effect of various types of wealth encounters the problem that broad trends in these series are similar and that multicollinearity occurs. This problem is avoided by taking the growth rate from the previous year in the wealth series.

The dependent variable is the growth rate of consumption expenditure from the previous year. In this case, the disturbance term in the consumption function follows an autocorrelation of order four. Further more, human wealth and rental price are proxy variables and these regressors are thus subject to measurement error. Therefore two explanatory variables are correlated with disturbance term, and the least-squares estimator is inconsistent. To deal with these problems, the Generalized Method of Moments (abbreviated as GMM) is applied to estimate the consumption function. The GMM shows the regression with instrumental variables, and it is well known that GMM produces consistent estimates regardless of the disturbance structure. The choice of instrumental variables in this paper is summarized below the tables of estimation results.

TABLE 1. ESTIMATION RESULT (1)
1975Q1 - 2004Q4

| | Const | GHUW | GFW | GKW | DUC | GYD | Dcredit | J-Stat |
|---|---|---|---|---|---|---|---|---|
| Durable goods | | | | | | | | |
| Motor Vehicles | -6.299*** | -1.608 | 0.264* | -0.194 | -2.779*** | 6.034*** | 0.807 | 6.791 |
| | (-3.823) | (-1.268) | (1.729) | (-0.519) | (-5.046) | (6.775) | (0.825) | [0.340] |
| | -4.305*** | | 0.148* | | -0.805* | 2.391*** | 1.629** | 11.660 |
| | (-2.830) | | (1.741) | | (-1.933) | (3.561) | (2.393) | [0.473] |
| Furniture | 0.301 | 0.085 | 0.187*** | 0.047 | -1.408*** | 1.116*** | 2.670*** | 10.955 |
| | (0.413) | (0.438) | (3.874) | (0.325) | (-4.068) | (6.202) | (5.288) | [0.278] |
| Other | -1.799*** | 0.178 | 0.142* | 0.129 | -0.586* | 1.965*** | 2.616*** | 11.280 |
| | (-2.243) | (0.850) | (1.799) | (0.854) | (-1.713) | (5.708) | (4.383) | [0.186] |
| Nondurable goods | | | | | | | | |
| Food | -0.457 | 0.182** | 0.040 | 0.244*** | | 0.044 | -0.230 | 13.358 |
| | (-1.527) | (2.259) | (1.390) | (4.123) | | (0.367) | (-1.322) | [0.100] |
| Clothing | 2.854*** | 0.092 | 0.078* | -0.054 | | 0.482*** | -0.336 | 8.912 |
| | (6.066) | (0.597) | (1.668) | (-0.700) | | (3.256) | (-1.291) | [0.349] |
| Energy | -0.421 | -0.073 | 0.008** | 0.130* | | 0.336*** | 0.2365 | 5.286 |
| | (-1.104) | (-0.591) | (2.504) | (1.651) | | (3.047) | (0.817) | [0.625] |
| Other | 0.794*** | 0.077 | 0.044* | -0.011 | | 0.637*** | 0.255 | 6.168 |
| | (3.229) | (0.717) | (1.859) | (-0.169) | | (6.702) | (1.467) | [0.520] |
| Service | 0.873*** | 0.088 | 0.050** | 0.115** | | 0.378*** | -0.189 | 7.938 |
| | (5.876) | (1.161) | (2.516) | (2.125) | | (5.368) | (-1.163) | [0.439] |

Notes: GHUW, GFW, GKW, GYD are growth rate of human wealth, financial wealth, housing stock, and disposal income from the previous year. DUC, Dcredit are change of durable goods rental price and consumer loan (per disposal income). Const is the constant term. The value in the parentheses shows t statistics. The value in the brackets shows the p-value of J-statistics. ***, **, * indicate that t statistics is statistically significant at 1%, 5%, and 10% levels respectively. Instrumental variables in the GMM include a constant term, and the first and second lag of dependent and independent variables in each equation.

Table 1 summarizes the regression results for the entire sample. The table reveals that financial wealth plays an important role in consumption expenditure in the U.S. for almost all types of goods. The elasticity of financial wealth with respect to consumption is about 0.197 for durable goods and 0.044 for non-durable goods on average. This indicates that financial wealth exerts a strong influence on expenditure for durable goods. Ogawa (2003) points out that the increase of liquid wealth caused by stock price appreciation from the mid 1980s to the early 1990s in Japan is responsible for the high growth of expenditure on durables in that period. This point of view is also applicable to the U.S.

Total housing wealth, comprising structure and land, exerts influence on non-durable goods and services, but this effect is not less significant than that of financial wealth. It is often heard that the recent consumption boom is enhanced by the rapid increase in housing stock. However, looking from a long-term perspective, since the 1970s, such a prevalent connection is not necessarily observed. The effect of human wealth proves to have the wrong sign or be insignificant for all types of consumption. Rental prices for all durable goods, meanwhile, are significantly negative, while for all types of commodities, the effects of consumer loans and disposal income are significant.[6)]

6) In the case of automobiles, the elasticity of disposal income to consumption (about 6%) is rather high. The sign for human wealth is incorrect and the exclusion of this variable led to an improvement in elasticity to some degree. Minegishi and Ishizaki (2002) examined the consumption function of automobiles in the U.S. over the period of 1979Q1 to 2002Q2. Their report also pointed out the high elasticity of disposal income and the importance of sensitivity to automobile consumption in business booms and slumps.

In the next step, the estimation sample is divided into two sub-periods. The former is from the first quarter of 1975 to the fourth quarter of 1989, and the latter runs from the first quarter of 1990 to the fourth quarter of 2004.[7)]

TABLE 2. ESTIMATION RESULT (2)
1975Q1 - 1989Q4

| | Const | GHUW | GFW | GKW | DUC | GYD | Dcredit | J-Stat |
|---|---|---|---|---|---|---|---|---|
| Durable goods | | | | | | | | |
| Motor Vehicles | -0.907 | | 0.928*** | -0.108 | -1.364** | 2.373*** | -0.603 | 8.642 |
| | (-0.437) | | (3.284) | (-2.358) | (-2.394) | (2.733) | (-0.508) | [0.799] |
| Furniture | 6.583*** | -0.430 | 0.073 | -1.014 | -2.579*** | 0.630** | 1.788** | 3.255 |
| | (5.229) | (-1.113) | (0.334) | (-7.514) | (-6.913) | (2.274) | (2.572) | [0.953] |
| Other | -2.607*** | -0.481 | 0.388*** | 0.210 | -0.539 | 2.656*** | -0.212 | 4.361 |
| | (-2.927) | (-1.431) | (2.810) | (1.461) | (-1.484) | (12.072) | (-0.385) | [0.886] |
| Nondurable goods | | | | | | | | |
| Food | 0.227 | -0.041 | 0.183*** | -0.165 | | -0.014 | 1.217** | 6.051 |
| | (0.734) | (-0.249) | (3.983) | (-3.296) | | (-0.132) | (2.562) | [0.810] |
| Clothing | 0.981* | -0.213 | 0.479*** | -0.177 | | 1.010*** | 0.606 | 4.786 |
| | (1.730) | (-0.848) | (6.394) | (-1.271) | | (4.707) | (0.960) | [0.780] |
| Energy | -2.001** | -0.088 | 0.313*** | 0.167* | | 0.653*** | 0.450 | 5.667 |
| | (-2.037) | (-0.321) | (2.866) | (1.954) | | (3.675) | (0.765) | [0.684] |
| Other | 0.884 | 0.268 | 0.238*** | -0.121 | | 0.548*** | -0.136 | 5.347 |
| | (1.628) | (1.343) | (3.013) | (-2.619) | | (5.941) | (-0.311) | [0.719] |
| Service | 0.665 | 0.244 | 0.095 | 0.121* | | 0.366*** | -0.617 | 6.801 |
| | (1.338) | (1.280) | (1.326) | (1.868) | | (3.146) | (-1.326) | [0.558] |

TABLE 3. ESTIMATION RESULT (3)
1990Q1 - 2004Q4

| | Const | GHUW | GFW | GKW | DUC | GYD | Dcredit | J-Stat |
|---|---|---|---|---|---|---|---|---|
| Durable goods | | | | | | | | |
| Motor Vehicles | -6.263*** | -1.185 | 0.312** | 1.437*** | -2.190*** | 0.328 | 3.764*** | 6.280 |
| | (-5.222) | (-4.445) | (2.137) | (4.228) | (-5.211) | (0.292) | (4.266) | [0.901] |
| | -6.745*** | | 0.475*** | 0.915*** | -1.945*** | -0.106 | 2.252*** | 8.476 |
| | (-6.553) | | (3.485) | (3.022) | (-4.069) | (-0.105) | (3.702) | [0.811] |
| Furniture | 3.288*** | -0.525 | 0.244*** | 0.762 *** | 0.026 | 0.928* | 2.069*** | 6.229 |
| | (3.727) | (-1.845) | (3.192) | (3.823) | (0.071) | (1.689) | (5.600) | [0.716] |
| Other | 0.125 | 0.337 | 0.156** | 0.405 | 0.131 | 0.722 | 3.247*** | 6.318 |
| | (0.180) | (1.120) | (2.259) | (1.126) | (0.164) | (1.378) | (6.672) | [0.707] |
| Nondurable goods | | | | | | | | |
| Food | -0.190 | 0.226*** | 0.063*** | 0.389*** | | -0.308 | -0.624 | 7.761 |
| | (-1.427) | (4.616) | (3.335) | (10.764) | | (-3.004) | (-4.197) | [0.652] |
| Clothing | 1.470*** | 0.247** | 0.034 | 0.074 | | 0.693*** | 0.155 | 4.627 |
| | (5.371) | (2.294) | (0.906) | (0.789) | | (3.855) | (1.004) | [0.796] |
| Energy | -1.921*** | -0.218 | 0.124*** | 0.321*** | | 0.158 | 1.046*** | 5.005 |
| | (-4.230) | (-1.428) | (3.230) | (3.985) | | (0.620) | (3.737) | [0.757] |
| Other | 0.371** | 0.029 | 0.003 | -0.094* | | 0.985*** | 0.505*** | 5.376 |
| | (2.364) | (0.351) | (0.172) | (-1.736) | | (7.947) | (4.922) | [0.716] |
| Service | 0.601*** | 0.160*** | 0.027* | -0.088 | | 0.536*** | 0.231* | 7.610 |
| | (3.504) | (2.863) | (1.941) | (-2.540) | | (5.507) | (1.966) | [0.472] |

As shown in Tables 2 and 3, there are some remarkable similarities and differences between the former and latter periods. First, in both periods, financial wealth plays an important role in the consumption expenditure of all commodities. On the other hand, the effect of human wealth is insignificant or shows the wrong sign. Second, in the latter period the effect of housing stock wealth exerts a strong significant effect and the magnitude of the disposal income effect shrinks compared with the former period. Third, new consumer loans exert a positive

7) In dividing the sample period, it is preferable to conduct the test of structural change in U.S. consumption during the sample period. Gysels and Hall (1990a,b) explored the structural change test in the GMM framework. However, it is not applied in this paper because of the low power of rejecting the null hypothesis.

significant influence on durable goods during the latter period. Taking these results into consideration, the life-cycle permanent income hypothesis was valid during the period 1990-2004, with financial and residential wealth playing central roles to support this hypothesis. Consumer loans were also widely used to fuel high consumption of durable goods during the 1990s boom.

## 4. Estimation (2)

The estimation results above prove that financial assets and residential stock are the most important components of wealth to stimulate consumption spending in the U.S. Especially during the recent booms. However, little is known about the channels through which both types of wealth affect consumption. If consumers recognize the fluctuations of financial assets to be permanent, they acquire capital gains through the disposal of financial assets and increase consumption spending using such capital gains. This mechanism is regarded as a *direct* channel between consumption and financial wealth. On the other hand, if the fluctuations in asset values are transitory, one possibility is that changes in wealth *indirectly* cause changes in consumption through the latent assets effect.

Lettau and Ludvigson (2001,2004) reported that contrary to conventional wisdom, a variance-decomposition shows that the vast majority of quarterly fluctuations in U.S. asset values over the period from the fourth quarter of 1951 to the first quarter of 2003 are attributable to transitory innovations that display virtually no association with consumption. This finding indicates that indirect wealth in financial assets is an important determinant of consumption growth. Though this paper does not investigate thoroughly the distinction between the direct and indirect channels of the financial wealth effect, it is possible that indirect wealth in financial assets is indeed an important determinant of the consumption growth referred to in the studies mentioned above.

The dramatic increase in U.S. housing prices from the late 1990s has generated much discussion about whether wealth effects can explain the boom in consumption spending. Yet, relatively little is known about the mechanism of how all this residential wealth stimulates consumption spending. Several channels can be considered to link residential wealth and consumption. First, an increase in housing prices leads to increases in capital gains from the residential assets which stimulate consumption directly. Second, there are alternative explanations for the direct channel of housing stock and consumption.

Housing is an asset that can be used as collateral for a mortgage loan in the U.S., and as mentioned earlier, an increase in house prices relaxes borrowing constraints and smoothes out consumption over the life cycle. Although, this mechanism does not correspond strictly to the effects of wealth, rises in housing stock do play an important role in stimulating consumption by relaxing borrowing constraints. It is also possible that the purchase of housing stock leads to an increase in the consumption of housing-related goods, such as furniture, home electronics, and so on.

TABLE 4. ESTIMATION RESULT (4)
1992Q1 - 2004Q4

| | Const | GHUW | GFW | GKW | DUC | GYD | Dcredit | Dcash | Dcash × GKW | J-stat | Wald-Stat |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Durable goods | | | | | | | | | | | |
| Motor Vehicles | 2.430*** | | 0.132** | 0.282 | -0.936*** | -0.370 | -0.917 | -1.064 | -0.146 | 8.766 | 6.452 |
| | (2.790) | | (2.432) | (1.605) | (-2.745) | (-0.506) | (-2.230) | (-1.993) | (-1.226) | [0.643] | [0.039] |
| Furniture | 11.047*** | 0.242 | 0.257*** | 0.535*** | 1.287 | -0.973 | 1.696*** | 0.235 | -0.232 | 6.509 | 13.208 |
| | (6.322) | (1.130) | (3.656) | (3.316) | (2.543) | (-1.375) | (4.326) | (1.062) | (-3.138) | [0.770] | [0.001] |
| Other | 1.461* | 0.634*** | 0.108*** | -0.351 | -1.916*** | 0.730*** | 2.590*** | 0.181 | -0.063 | 9.307 | 0.878 |
| | (1.877) | (4.077) | (3.721) | (-2.579) | (-4.359) | (3.134) | (8.495) | (0.679) | (-0.837) | [0.676] | [0.644] |
| Nondurable goods | | | | | | | | | | | |
| Food | -0.553** | 0.034 | 0.084*** | 0.481*** | | -0.162 | -0.768 | 0.311** | -0.038 | 7.559 | 6.629 |
| | (-2.019) | (0.580) | (4.924) | (10.414) | | (-1.244) | (-5.599) | (2.518) | (-1.273) | [0.818] | [0.036] |
| Clothing | 2.394*** | 0.207*** | 0.039 | 0.014 | | 0.632*** | -0.260 | 0.043 | -0.028 | 5.070 | 1.016 |
| | (10.062) | (2.855) | (1.406) | (0.255) | | (5.173) | (-1.723) | (0.204) | (-0.962) | [0.886] | [0.601] |
| Energy | 1.331*** | 0.272 | 0.042** | -0.211 | | -0.158 | -0.371 | -0.399 | -0.015 | 5.476 | 8.673 |
| | (4.213) | (1.606) | (2.101) | (-3.352) | | (-0.751) | (-2.877) | (-2.737) | (-0.432) | [0.857] | [0.013] |
| Other | 1.119*** | 0.142 | -0.032 | -0.141 | | 0.852*** | 0.156 | 0.074 | -0.048 | 4.299 | 3.249 |
| | (4.198) | (1.457) | (-1.433) | (-3.745) | | (8.847) | (1.331) | (0.460) | (-1.682) | [0.932] | [0.197] |
| Service | 0.840*** | 0.291*** | 0.003 | -0.111 | | 0.429*** | 0.349*** | -0.118 | 0.048 | 6.118 | 3.350 |
| | (5.248) | (5.947) | (0.261) | (-4.123) | | (4.599) | (2.859) | (-1.072) | (1.803) | [0.633] | [0.187] |

Notes: Dcashs shows the change of cash withdrawals from home (per disposal income). Wald-stat is the Wald statistics under the null hypothesis that coefficients of equity extractions (Dcash) and cross-term (Dcash × GKW) are jointly zero (the value in the brackets shows p-value).

There has only been a small amount of study carried out on this topic in the U.S., but important examples are Brady, Canner, and Maki (2000), and Canner, Dynan and Passmoe (2002). They surveyed how funds liquefied through refinancing were used during the period of 1998 to 2002. The survey results are summarized in Table 4.

The most common use of refinancing funds was in home improvements, reported at 33% during the former period and 35% during latter period. Investments in financial assets or real estate were cited as totaling 20% on average, and repayment of other debts was cited as 26 % during latter period. On the other hand, consumers' expenditures on items, such as vehicles, vacations, education, and medical expenses were cited as 16% during 2001-2002. Furthermore, reinvestment in or repurchasing of real estate and financial assets comprised nearly 80% while the share of consumption spending was below 20% for the same period. Those two surveys were limited to the use of funds liquefied through refinancing and the use of other equity extractions, such as realized capital gains and home equity loans. Moreover, the sampling of the survey is two and no further information has been received since they were released. Still, considering such limitations, the above surveys do indicate that the extraction of equity on existing homes is linked to reinvestment in real estate and financial assets and does not remarkably stimulate consumption spending.

To test the validity of this mechanism, the following empirical investigations were conducted. First the consumption function was re-estimated by adding the value of equity extraction measured by Greenspan and Kennedy (2005). They estimated detailed time series data on equity extraction such as the realized capital gain on the sale of homes, home mortgage loans, and cash withdrawals obtained through refinancing, from the first quarter of 1991 to the first quarter of 2005. These series are shown in Figure 2.

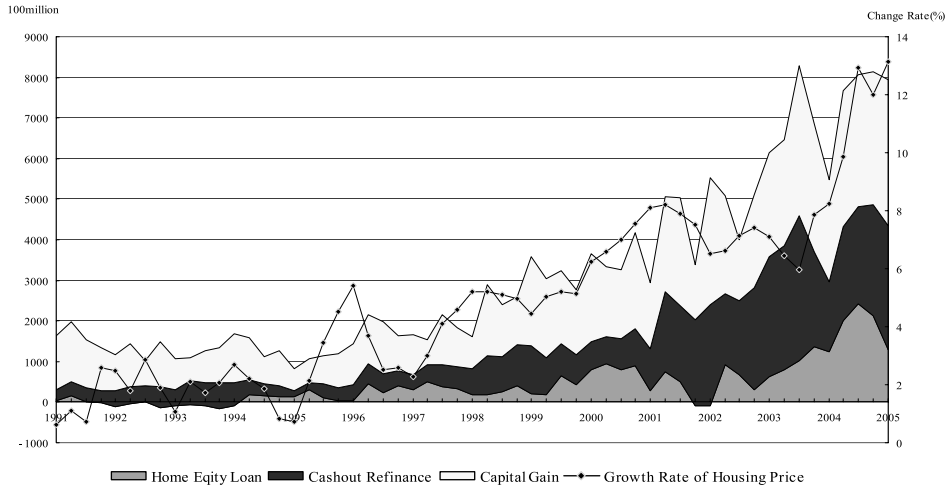


FIGURE 2. Equity Extractions from Home and Housing Price Movement
1991Q1 - 2005Q1

Table 5 shows the estimation results. Since equity extraction, especially home equity loans, is closely correlated with the value of existing residential stock, a cross-term for these variables is added as an explanatory variable. The remarkable feature here is that the equity extractions do not significantly affect consumption of all commodities. This result is confirmed by the testing of coefficient constraints under the null hypothesis that coefficients of equity extractions (Dcash) and cross-term (Dcash×GKW) are jointly zero. The coefficient of residential wealth (GKW) turns out to be less significant than the result in Table 3. The effect of financial wealth still, however, plays an important role in consumption. The results described above support the previous view that the extraction of equity in existing homes is linked to reinvestment in real estate and financial assets and does not stimulate consumption spending directly.[8] Greenspan (1999) was also skeptical that cash extractions from home refinancing stimulate consumption spending. Thus, the results of this work are supported empirically by Greenspan's keen perspective.

The next step considers how the equity extractions are utilized. To explore this issue, the simultaneous relationship among financial wealth, residential wealth and equity extractions from existing homes is characterized by a system equations as follows:

$$Dcash_t = a_1 + a_2 Dcash_{t-1} + a_3 GKW_{t-1} + \varepsilon_{1t} \quad (8)$$

$$GFAR_t = b_1 + b_2 GFAR_{t-1} + b_3 Dcash_t + b_4 UCH_t + \varepsilon_{2t} \quad (9)$$

$$GKW_t = c_1 + c_2 GFAR_{t-1} + c_3 Dcash_t + c_4 UCH_t + \varepsilon_{3t} \quad (10)$$

8) In the case of energy consumption, the effect of residential stock (GKW) and consumer loans (Dcredit) change dramatically compared with the results of Table 3. These results indicate that the consumption function for energy goods is unstable due to the dramatic rise in the oil price since the late1990s.

Eq. (8) implies that equity extractions (Dcash) are financed using lagged residential wealth (GKW(-1)) as collateral. This increased cash volume may be reinvested in financial assets or real estate and not used to purchase consumption commodities. This mechanism is specified in Equation (9). The accumulated residential wealth may increase equity extraction as formulized in Equation (10). Since the rental price of residential stock (UCH) may affect residential investment, it is also included in Eq. (10).[9)]

TABLE 5. ESTIMATION RESULT (5)
1992Q1 - 2004Q4

| | Dependent Variable | Const | GFW(-1) | Dcash | Dcash (-1) | UCH | GKW(-1) | S.E of Reg |
|---|---|---|---|---|---|---|---|---|
| Eq-(8) | Dcash | -0.021<br>(-0.162) | | | 0.021<br>(0.110) | | 0.138 ***<br>(3.634) | 1.285 |
| Eq-(9) | GFW | 29.060<br>(1.466) | 0.836 ***<br>(8.540) | 1.647 ***<br>(3.732) | | -2.825<br>(-1.464) | | 6.030 |
| Eq-(10) | GKW | 37.132 ***<br>(3.176) | -0.046<br>(-0.537) | 2.434 ***<br>(4.108) | | -3.327***<br>(-2.940) | | 4.597 |

Notes: S.E of Reg is the standard error of regression. UCH shows the rental price of residential investment. Instrumental variables in the GMM are as follows:
Eq- (8): constant term, GKW (-1), Dcash (-2), and Dcash (-3)
Eq- (9): constant term, GFW (-2), Dcash (-1), Dcash (-2), Dcash (-3), UCH (-2), and UCH (-3)
Eq- (10): constant term, GKW (-1) GFW (-1), Dcash (-1), Dcash (-2), UCH (-2), and UCH (-3)
J-statistics, which shows the overidentifying restriction in the system, is 11.191 and the p-value is 0.427.

The above simultaneous equations are estimated using the system GMM, and estimation results are summarized in Table 5. The signs of estimated coefficients are almost correct the chi-square test of the overidentifying restrictions (J-statistics), providing evidence in support of the model's specifications. The remarkable point is that the effects of equity extraction on financial and residential wealth prove to be strongly significant. These results suggest that the use of equity extractions from homes is not linked to spending on consumer goods; instead, it is strongly associated with financial and residential wealth accumulation. In sum, the dramatic rise in housing prices since the late 1990s has produced a warped flow of funds in the U.S. household sector.

## 5. Conclusions

This paper investigated the household behavior that underlies the link between various types of wealth and consumption. The main findings are summarized as follows: First, the most important type of wealth for consumption expenditure is financial wealth, and this also appears to be a significant explanatory variable in the consumption function of almost all commodities. In particular, it has affected, to a large extent, the spending on durable goods since the 1990s,

9) There are two possibilities regarding the link between the rental price of residential stock and financial assets. One possibility is that the fall in rental prices of residential stock may increase housing wealth and alternatively restrain the holding of financial assets. The other is that an increase in housing wealth induces cash extractions from homes and a reinvestment of financial assets. Therefore, it is difficult to determine the sign of $b_4$ a priori.

which corresponds to the business boom in the U.S. at the time. Though this paper did not thoroughly investigate the distinction between the direct and indirect channels of the financial wealth effect, the possibility remains that indirect wealth in the form of financial assets is an important determinant of the consumption growth referred to in previous studies. More careful investigations into this issue would be indispensable.

The second point is that the effect of the residential wealth effect on consumption spending is not as prevalent as many economists expect. The dramatic rise in housing prices during the recent economic expansion in the U.S. has led to an increase in equity extractions from existing residential stock. Yet, the remarkable point is that such equity extractions do not always lead to spending on consumer goods; instead, they are strongly associated with financial and residential wealth re-accumulation. This inference is illustrated in the scenario where the effect of housing wealth is actually prevalent thorough the financial wealth effect. This inference also contains policy implications that the effect of an ongoing policy to raise interest rates in the U.S. should be considered in regard to both financial and housing wealth.

Because the amount of available relevant data is limited, this paper did not carefully examine the wealth effect of consumption with respect to household-level data. Obviously, one area where more research is needed is applying micro-level data to investigate the channels of various wealth effects. These and other extensions, however, are left for further research.

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