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Comparing Housing Wealth and Stock Wealth Effects on Consumption

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Abstract
How strongly does consumption respond to changes in wealth? Is the response to housing wealth different than the response to stock market wealth? Policymakers are currently very interested in the magnitudes of such wealth effects, in light of the recent boom and crash in stock prices and the current strength in housing prices. We are trying to estimate the propensity to consume out of various types of wealth and are updating previous studies using time-series data at the national level.

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PROBLEM STATEMENT

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BACKGROUND

This topic is particularly interesting and relevant to policymakers. In the late 1990s we witnessed an economic expansion leading to a stock market bubble. Then in 2001, we saw the bubble burst and stock market crash but housing prices have remained strong to date. One view, apparently espoused by the Fed, is that the positive wealth effect from housing might have largely offset the negative wealth from stocks, helping to stabilize the economy. The housing market has also experienced dramatic changes in the past decades with second mortgages and home equity loans enhancing the ability of consumers to spend out of housing wealth.

We are trying to estimate the magnitudes of the marginal propensity to consume (MPC) out of stock market wealth and the MPC out of housing wealth, and to test whether they differ. If the MPC out of housing wealth is greater than that out of stock wealth, this will help confirm the Fed's view (and vice versa). We will measure these effects on total household consumption and break them down into durables, non-durables, and services as well as their respective sub-categories. In addition to the MPCs, we also examine the percentage changes in different categories of consumption as a function of the percentage changes in housing versus stock market wealth.

This research is important because consumption patterns are an important driver of the economy since consumption is approximately two-thirds of GDP in the United States. Also, the rise in housing prices has been a "hot" topic among economists and consumers since home equity makes up a substantial portion of household wealth for the majority of households. There is some concern that house prices may be experiencing a similar "bubble" as the stock market previously experienced. If house prices were to fall, it would be useful to have some way to quantify how such a change would impact consumer spending in a variety of areas. There are also important business implications of wealth effects. In addition to affecting aggregate demand for their output, wealth effects might disproportionately affect demand in certain sectors. Even small MPCs can have large effects, given the large potential size of the change in stock and housing wealth.

SUMMARY OF PREVIOUS RESEARCH

As a framework for our research, we analyzed some of the previous literature, especially work done by Karl E. Case, John M. Quigley, and Robert J. Shiller [CQS] who published a report entitled "Comparing Wealth Effects: The Stock Market Versus the Housing Market" in October 2001. The research they conducted looked at U.S. states on a quarterly basis from 1982-1999 and annual international data for 14 countries from 1975-1997. CQS chose to focus their U.S. data at the state level because the distribution of changes in housing values and stock market wealth has varied substantially across geographic regions. On the other hand, state level data is more limited than national data.

CQS ran several regressions using data on consumption, income, stock wealth, and housing wealth as well as other variables to control for fixed effects (by state and time). Their main model, which examined percentage changes in wealth, took the following form:

(1) $\ln C_{it} = \beta_0 + \beta_1 \ln Inc_t + \beta_2 \ln Stock_{it} + \beta_3 \ln House_{it} + \gamma FixedEffects_{it} + \varepsilon_{it}$

They concluded that the evidence of a stock market wealth effect was weak but there was strong evidence that variations in housing market wealth had important effects upon consumption. At the state level, they found a "highly significant effect of housing market wealth upon consumption, especially large relative to financial wealth" (CQS). They found similar results across countries.

METHODOLOGY

We are using the past research as a guide for our research but are making several important changes. First, unlike CQS, we conduct our research at the national level rather than the state or international level. This allows us to avoid the approximations that CQS must make to estimate stock market wealth by state. A second important difference is that we assess consumption rather than retail sales, which is just a subsection of consumption. The reason CQS focused on retail sales is that consumption data is unavailable at the state level. We believe this consumption data will be an especially valuable addition to the regression analysis because retail sales only account for about half of overall consumption.

We will also utilize a longer sample period than CQS. We are able to take our national data back as far as 1975 whereas the U.S. data in past studies only dates back to 1982. More importantly, the stock market trended upwards throughout the majority of CQS's sample period, which may bias their results. Our data will include seven important additional recent years (1998-2004) that capture the height of the stock market bubble, the subsequent burst and eventual upward recovery, as well as the boom in the housing market.

Another significant difference is that CQS used a combination of the OFHEO repeat sales price index and the Case-Shiller proprietary repeat sales house price index, which records market transactions but is available for only some states. We will instead use the Flow of Funds (FOF) as a consistent measure of household real estate wealth. Lastly, we will control for additional factors such as changes in stockownership rates and homeownership rates over time, as well as other variables such as consumer sentiment.

DATA COLLECTION

We have identified and collected what we believe are the key variables needed to analyze our hypothesis at the national level. Whenever possible, we use quarterly, seasonally adjusted time-series data taken as far back as possible. We focused on national data first because we believe it is of most interest to policymakers and this data is most readily available. We prioritize national data over international data because we believe the international data may be difficult to consistently measure across countries and recognize there are different laws governing taxation of wealth and capital gains, different consumption/saving patterns, and institutional differences in borrowing which may affect the data.

The main data we use and their sources is as follows:

- Consumption: We use nominal, seasonally adjusted, quarterly consumption data, (and the components of consumption, durables, non-durables, and services, and their subcomponents), which we found from Global Insight (DRI) dating back to as early as 1946. We deflated consumption using the CPI, and expressed it in per capita terms by dividing it by the population.

- Housing Wealth (Real Estate Household Assets), Stock Wealth (Corporate Equities): We use quarterly data since 1952 from the Federal Reserve Flow of Funds (FOF). We disaggregate household wealth into total assets, tangible assets, real estate assets, real estate household assets, and stock wealth for households (and nonprofit organizations). We use real estate household assets as our primary measure of housing wealth and corporate equities

holdings as our measure of stock wealth. Note this does not include indirect holdings of stock (via mutual funds, 401Ks, etc.).[1]

- Personal Income: We use quarterly, seasonally adjusted data from Global Insight (DRI) since 1947. We deflated total nominal personal income using the CPI, and expressed it in per capita terms by dividing it by the population.

- Homeownership Rate: Use annual data (which we interpolated to quarterly) from the U.S. Census Bureau in the *Current Population Survey* dating back to 1965.

- Stock Ownership Rate: We use the *Survey of Consumer Finances,* which has been published every three years since 1983, and interpolated the missing data gaps.

- Consumer Price Index: Use monthly data (which we convert to quarterly) from Global Insight (DRI) dating back to 1947. We normalized it at 100 in 1983.

- Number of Households: Use annual data (which we convert to quarterly) from the U.S. Census Bureau in the *Current Population Survey* dating back to 1947.

- Population: Use monthly data (which we convert to quarterly) from Global Insight (DRI), which is also based on U.S. Census data and dates back to as early as 1947.

- Consumer Sentiment: Use quarterly and monthly data from University of Michigan Survey of Consumer Sentiment from Global Insight (DRI) dating back to 1960 (1978 for monthly).

- OFHEO Weighted Repeat Sales Index: Looks at the repeat sales house price which provides information on how much one's house is worth adjusting for quality upgrades. This index is produced quarterly since 1975 by Fannie Mae and Freddie Mac and published by the Office of Federal Housing Enterprise Oversight (OFHEO). We use this index as a comparison to the FOF housing measure but chose not to include it in our regression results.

DATA ANALYSIS

Incorporating the aforementioned data variables, we ran regressions of the following form:

$$(2)\ \Delta C_t = \beta_0 + \beta_1 \Delta \text{Stock}_t + \beta_2 \Delta \text{House}_t + \beta_3 \Delta X_t + \varepsilon_t$$

$$(3)\ \Delta\%C_t = \beta_0 + \beta_1 \Delta\% \text{ Stock}_t + \beta_2 \Delta\% \text{House}_t + \beta_3 \Delta\% X_t + \varepsilon_t$$

[1] We also tested regressions using broader measures of stock wealth and found similar qualitative and quantitative effects. We speculate this is because the other measures of wealth such as from 401Ks are less liquid and thus less accessible.

where ΔC is the per capita change (or percent change) in some measure of real consumption, ΔStock and ΔHouse are the corresponding changes in stock market and housing wealth, and X includes other control variables (e.g. stock and homeownership rates, income, consumer sentiment, etc.) Essentially we are measuring the change in consumption resulting from the change in stock wealth versus the change in housing wealth while controlling for other variables.

RESULTS

We ran several regressions in STATA 8 to examine the national data. Before running the regressions, we examined the trends in the data and graphed several correlations. We ran scatter plots of the change in consumption on the changes in housing wealth and stock market wealth. For both the MPCs [Figures 1 and 2] and percentage changes [Figures 3 and 4], we found that even in a univariate sense, housing wealth [Figures 1 and 3] had a strong, positive correlation with consumption while stock wealth [Figures 2 and 4] had a slightly positive correlation with consumption.

For housing wealth, we initially considered both the Flow of Funds (FOF) household wealth data and OFHEO's Weighted Repeat Sales index. However, we decided the FOF index is more appropriate because it measures housing wealth net of mortgages and we think this is a better indicator of the wealth households can spend out of. While the results differed quantitatively, the qualitative conclusions were similar, especially for the percent changes.[2]

Tables 1 and 2 contain our primary results, using just stock and housing wealth in equations (2) and (3), (and with no other controls, x=0).

[2] For comparison's sake, we graphed the MPC and percentage changes in OFHEO housing wealth on consumption [Figures 5 and 6]. We further discuss the OFHEO index below.

In the first regression, we find the MPC out of housing wealth (dwh) is approximately $0.156 while the MPC out of stock wealth (dws) is a mere $0.018; both effects are statistically significant at the 95% confidence level. This means that for every $1.00 increase (decrease) in housing wealth, consumption increases (decreases) by $0.156 and for every $1.00 increase (decrease) in stock wealth, consumption increases (decreases) by $0.018. The magnitude of the highly significant housing wealth effect is much larger than the magnitude of the stock wealth effect for the MPCs. [Table 1]

In our second regression which looked at the percentage changes, we also found the housing wealth effect (dpwh) to be highly significant; the estimated elasticity is 0.251%. Accordingly, for every 1% increase (decrease) in housing wealth, consumption increases (decreases) by 0.251%, which is a very large elasticity. The magnitude of the stock wealth elasticity was much smaller at 0.008%, and is not statistically significant. [Table 2] While these results are broadly consistent with CQS, we will make more direct comparisons below.

Consumption Sub-Categories

The above results are for total consumption (GC). We also broke consumption down into its main subcomponents of durables (GCD), non-durables (GCN), and services (GCS), which account for 13%, 34%, and 52% of total consumption, respectively. [Figure 9] We then further broke down these components into: motor vehicles and parts (GCDA), furniture and household equipment (GCDF), food (GCNFO), and other durables; into clothing (GCNC), gasoline and oil (GCNG), fuel oil and coal (GCNF), and other non-durables; and into household operations (GCSHO), transportation (GCST), medical care (GCSM), and other services. To avoid

circularity, we excluded housing services (GCSH) and subtracted housing services from total services (GCS), because housing services is in part computed using house prices.

As reported in Table 3, we found a disproportionately large effect of housing wealth changes on durables consumption, considering that durables account for a relatively small part of consumption. Durables have a strong positive effect on the MPC ($0.054) and an even stronger effect for the percentage consumption change (0.70%) out of housing wealth. The effects were particularly strong for automobiles ($0.034 or 1.17%) and furniture ($0.012 or 0.33%). These findings suggest the new purchase of homes is linked to consumption of durables: when people purchase a home, they typically furnish it or make upgrades, and if people are moving from the city to a suburb, they may also choose to purchase an automobile.

Housing wealth also has a strong positive effect on non-durables, and the strongest positive elasticity was for clothing and shoes at 0.33% while the strongest positive MPC was for fuel, oil & coal at $0.023.[3]

Housing wealth has strong positive effect on consumption of select services (excluding housing services). The MPC and percent changes out of housing wealth for total services were $0.069 and 0.24% respectively. The categories of services that were significant include household operations, medical, and transportation.

The impact of stock wealth was far smaller in magnitude and significance for all categories of consumption. The elasticity and MPC of stock wealth had positive effects on consumption of furniture, clothing and shoes, and the MPCs were also significant and positive for fuel, oil and coal. However, the magnitude of these effects were substantially smaller than

[3] We are unsure why both the MPC and elasticity are negative and significant for gas and oil but positive and significant for fuel, oil, and coal. We speculate this may have to do with a tradeoff between energy sources as wealth changes.

the magnitude of the housing wealth effects. In addition, both percent and dollar changes in stock wealth were significant for consumption of total services.

Lagged Effects on Consumption

We also explored the lagged effects of changes in housing wealth and stock market wealth on consumption. We looked at three quarters of lags for both the MPCs and percentage changes.

In Tables 4 and 5, the lag effects for both housing wealth and stock wealth were strong, positive, and significant; this suggests that the magnitude of the effects on consumption are larger than our initial regression suggest and are not fully realized immediately in spending patterns.

For housing wealth, we found that the MPC was $0.13 and the percentage change was 0.17% in the contemporaneous quarter. However, in the following quarter, there was an additional MPC of $0.06 (dwhl) and an additional percentage increase of 0.10% (dpwhl). [Tables 4 and 5]

For stock market wealth, we found that MPC in the contemporaneous period to be approximately $0.02 and the percentage change to be under 0.01% and not highly significant. However, in the next quarter, we witnessed additional significant increases in consumption of $0.02 and 0.02% from stock wealth. However, the most notable effect is that the percentage consumption change out of stock wealth was an additional 0.02% in the second lagged quarter (dpwsl2). Thus, the stock market effect on consumption is strong and significant for 1 and 2

quarter lags and the magnitude of these effects are collectively stronger than our baseline regression suggests.[4]

Controlling for Income

We also decided to examine the income effect on consumption by adding changes in income and percent changes in income to equations (2) and (3). As reported in Tables 6 and 7, the effect of income is very strong. The income effect also reduced the housing wealth effect substantially and completely wiped out the stock market wealth effect in the contemporaneous period. This is because income has a large direct effect on house prices. To visualize its magnitude, we scattered both the MPC and percentage changes in Figures 7 and 8. The graphs show a very strong positive correlation. In a univariate setting, when we regressed changes in income on changes in housing wealth, we found that for every $1 increase in income, housing wealth increases $0.77 and for every 1% increase in income, housing wealth increases by 0.70%.

In the multivariate regressions in Tables 6 and 7, we found that the MPC out of income is $0.39 and the elasticity is 0.69%. These effects are very large and significant. The income effect reduced the stock wealth effect; controlling for income, the stock effect is less than $0.01 or less than 0.01% and not statistically significant. More interestingly, the income effect dramatically reduced the magnitude of the housing wealth effect for both the MPC and elasticity to $0.07 and 0.05%, respectively. This suggests that much of the housing wealth effect on consumption is ultimately due to changes in income. Nonetheless, for the goal to measure the average effect of housing wealth on consumption whatever the ultimate cause of changes in housing wealth, then we might not want to control for income.

[4] Perhaps the lagged effects are stronger for stock wealth because stock prices are visibly more volatile and consumers may wait to alter consumption patterns to make sure the change is permanent.

Comparison with CQS's Study

We also tried to mimic the CQS study by running regressions only for the dates they included in their sample and comparing the results. The relevant data they used was limited to the years 1975-1997, and we thought it would be interesting to see what would happen if we left out the data after 1998, excluding the stock market bust and the strength of the housing market in the past six years. We controlled for income effects and looked at the percentage changes following their study.

CQS found that changes in income had very large significant effects on consumption while changes in stock market wealth had a small insignificant effect. In Table 8, we also found a very large significant income effect of around 0.59% and an insignificant stock market wealth effect.

CQS calculated the elasticity of housing wealth changes on consumption to be in the .11-.17 range, and their effects were statistically significant. We found a slightly smaller elasticity of 0.08 which is not statistically significant at the 5% level. However, the 95% confidence intervals of these different results overlap. [Table 8]

We are not surprised that our housing wealth elasticity differed from CQS's because we calculated housing wealth in very different ways. CQS created a proprietary repeat sales index based on a limited number of U.S. states' housing markets and extrapolated house prices for the remaining states. This repeat sales price index is more similar to OFHEO than FOF. Our measure of housing wealth, using the FOF, is more consistently calculated and better suited for this regression analysis. Also, CQS just uses retail sales data to measure consumption at the state level.

While we ran a number of baseline regressions using the OFHEO price index, after careful thought, we decided that the weighted repeat sales price index was not the best measure of housing wealth for our study. The OFHEO index is calculated to reflect only changes in price for constant quality homes and essentially looks at the transaction price for how individual houses change in price over time. The OFHEO index does not track the increase in value of new houses or investment into existing houses (e.g. quality upgrades); OFHEO exclusively looks at transaction prices, and we care more about housing wealth. The FOF data shows much larger changes because it includes wealth due to investment in new houses. The OFHEO data shows smaller changes and fewer periods of declines in price, which we speculate is because when transaction prices are falling, people wait and do not sell their homes, truncating observations of declines in price. Also, the FOF seems to be a better measure because it nets out mortgage debt. On the other hand, the FOF includes not just consumer wealth but also wealth of not-for-profits, which we don't want to include.

Controlling for Homeownership Rate

Over the last decade, there has been a substantial increase in homeownership, which could change the magnitude of the housing wealth effect. For example, if poorer households that recently bought homes have larger MPCs than average, then the MPC would increase by the homeownership rate. To test this possibility, we interacted the homeownership rate with housing wealth as follows:

(4) $\Delta C_t = \beta_0 + \beta_1 \Delta Stock_t + \beta_2 \Delta House_t + \beta_3 \Delta Homeownership_t + \beta_4 \Delta House_t * \Delta Homeownership_t + \varepsilon_t$

(5) $\Delta\%C_t = \beta_0 + \beta_1\Delta\%Stock_t + \beta_2\Delta\%House_t + \beta_3\Delta\%Homeownership_t + \beta_4\Delta\%House_t*\Delta\%Homeownership_t + \varepsilon_t$

To ease interpretation, we normalize the homeownership rate at the average rate. As reported in Tables 9 and 10, we found a significant interaction term between the homeownership rate and housing wealth (dwh*homeownership). At the average homeownership rate, the wealth effect is .16, but as the homeownership rates increases by 1 standard deviation (1.2 points), the wealth effect rises to .16 + 1.2(.056) = .16 + .078 = .268. Thus, as the homeownership rate rose over time, the wealth effect got larger in magnitude, consistent with the hypothesis above. The interaction term tells us that housing wealth and homeownership together have a very strong effect on consumption. The interaction term was also highly significant using percentage changes; at the average homeownership rate, the wealth effect is 0.245%, but as the homeownership rates increased by 1 standard deviation (1.2 points), the wealth effect rises to .245 + 1.2 (.134) = 41%.

However, we must note that the interaction term is no longer significant when we extend our analysis over a longer sample period. We only have the homeownership rate data since 1965. However, when we extrapolated the homeownership rate data back to 1952 to match our other data, the interaction terms were no longer significant. But part of the reason this interaction effect disappears may be due to how we interpolated the homeownership rate.

Controlling for Stockownership Rate

We analogously interacted stock wealth with the stockownership rate, which has also increased over time. The interaction term for stockownership was only significant at the 6.7% level for MPCs and was not significant for the elasticity. Also, the magnitude of the interaction

term was so small it did not have any real effects on the MPC out of stock wealth. Therefore, as the stockownership rate increases, there is no appreciable additional effect on the MPC out of stock wealth. This finding was quite different from the interaction between housing wealth and the homeownership rate.

Controlling for Consumer Sentiment:

The response of consumption to wealth changes over time for additional reasons such as with consumers' expectations regarding the future. One way to measure such expectations is by the consumer sentiment index. We also extended our baseline regression to control for the level of consumer sentiment as well as changes in sentiment, sometimes interacting them out of the wealth effects (as in equations (4) and (5)).

In Table 13, we find that consumption does significantly increase with absolute changes in consumer sentiment. When consumers become more optimistic about the future, they spend more, which is consistent with the life cycle of consumption. However, controlling for sentiment had little effect on the MPCs out of housing and stock wealth. In Table 14, when we examine the percentage changes, the percent change in consumer sentiment reduces the magnitude of the housing wealth effect somewhat, from 0.25% to 0.19%.

Tables 15 and 16 instead control for the level of consumer sentiment, which is again significant. While the effects of stock wealth do not change much, the effects of housing wealth decline to around $0.12 and 0.15%.

We also tried interacting the level and change in confidence with housing wealth in Tables 17 and 18. We found the interaction to be negative; when consumer sentiment is

increasing, then the same dollar increase in housing wealth leads to a smaller increase in consumption.

In our first regression, we interacted the absolute change in housing wealth with the absolute change consumer sentiment. We found that a 1 standard deviation increase in sentiment is 5.1, so 5.1*(-.009) = -.046, so the total effect of housing wealth is .127 - .046 = .08, or $0.08, smaller than the average MPC of $0.13. Thus, controlling for the interaction between housing wealth and consumer sentiment reduces the effect of housing wealth on consumption. Interestingly, the effect controlling for sentiment is similar to the effects we found when controlling for income. However, if we are ultimately looking at the average response of consumption, we may choose not to control for this interaction.

Lastly, we interacted the percent change in housing wealth with the percent change in consumer sentiment and found that a 1 standard deviation increase (%) in sentiment is .065, so .065*(-.9) = -.06, so the total effect of housing wealth is .18 - .06 = .12, or 0.12%**.** [Exhibit 18]

CONCLUSION and DISCUSSION

Our results confirm the Fed's view that housing wealth has a greater impact on consumption than stock market wealth, in terms of the MPC and percent changes. We found both wealth effects to be positive and significant but the magnitude of the effects are far greater for the housing wealth. We found that the contemporaneous effects on consumption are $0.16 or 0.25% for housing wealth and $0.02 or 0.008% for stock wealth. While stock wealth has some effect on consumption, housing wealth has very large and significant effects on housing. Thus, if housing prices are in a "bubble" and fall, the effects on consumption could be detrimental.

In the past 6 years, household real estate wealth has risen by over 60% (about 10% per year). If property values fell by 10% next year, we could potentially experience a 2.5% decline in consumption based on our regression analysis. With aggregate consumption of around $16 trillion, this corresponds to a $390 billion decrease in consumption, a sizeable effect. A decline in consumption of this magnitude can create a huge shock to the economy.

Even if house prices are not in a "bubble," "fundamental" decreases in house price values can still depress consumption. If interest rates continue to rise, this can led to a drop in house price values and have a similar effect. A similar situation could result from a recession.

When the stock "dot-com" bubble burst, there was a shock to the economy, but it is likely that low interest rates contributing to higher house prices and thus greater housing wealth helped keep consumption strong and hedged the economy against a major recession. However, since the effects of housing wealth are substantially greater in magnitude, a drop in house prices could have more detrimental economic effects.

FUTURE EXPANSION OPPORTUNITIES

While we focused our research on national consumption data, if we had more time we would have liked to analyze data the state level (or possibly, the international level) following the same set of procedures as at the national level. While it is more difficult to measure consumption at the state level and most macroeconomic policies are set at the national level, it may be useful to extend this study to state-level data in the future. While national house prices have been increasing in real terms over the past six years, most of the increase has been driven by a small proportion of the states with more inelastic housing supply conditions. Therefore, it

would be interesting to extend our research to the state level to see how consumers in states experiencing different housing wealth changes responded in their consumption behavior.

It would also be interesting to control for interest rates, mortgage rates, or access to mortgages in future studies. These variables all affect consumption behavior and housing wealth. In the past few years, interest rates and mortgage rates have been unusually low while house prices have been steadily rising in real terms. In addition, with low interest rates and the predominant use of fixed rate pre-payable mortgages in the U.S., the amount of refinancing activity in the U.S. has been historically high. Many households have recently taken the opportunity to refinance their homes at lower interest rates. One could argue that by locking into lower rates, individuals have more disposable capital to spend and can literally spend money out of their housing wealth. Economists have argued that the refinancing boom helped get the U.S. out of an economic recession by fueling the economy and consumption.

APPENDIX

Figure 1: Change in Consumption vs. Change in Housing Wealth

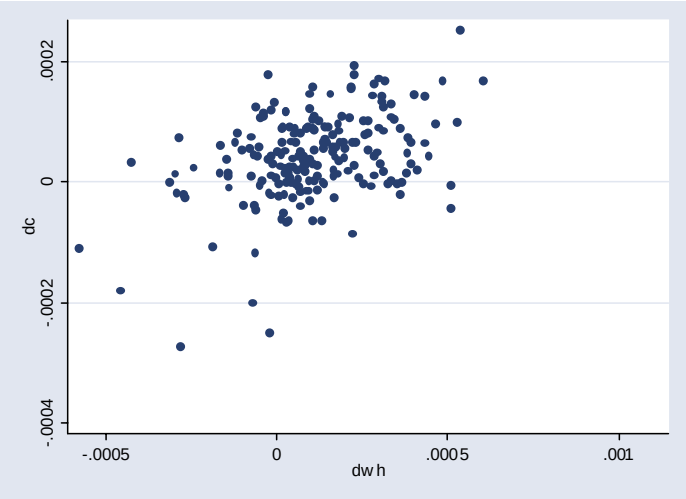

Figure 2: Change in Consumption vs. Change in Stock Wealth

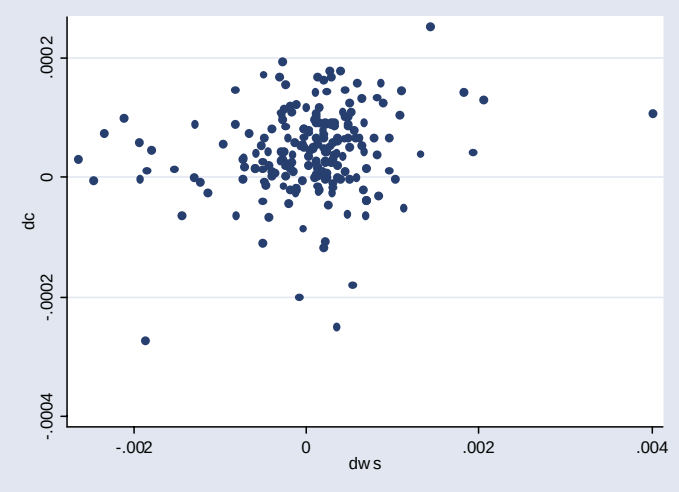

Figure 3: Percent Change in Consumption vs. Percent Change in Housing Wealth

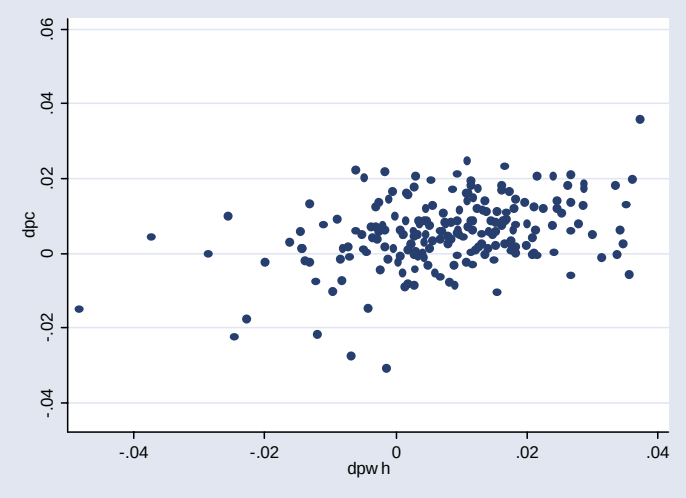

Figure 4: Percent Change in Consumption vs. Percent Change in Stock Wealth

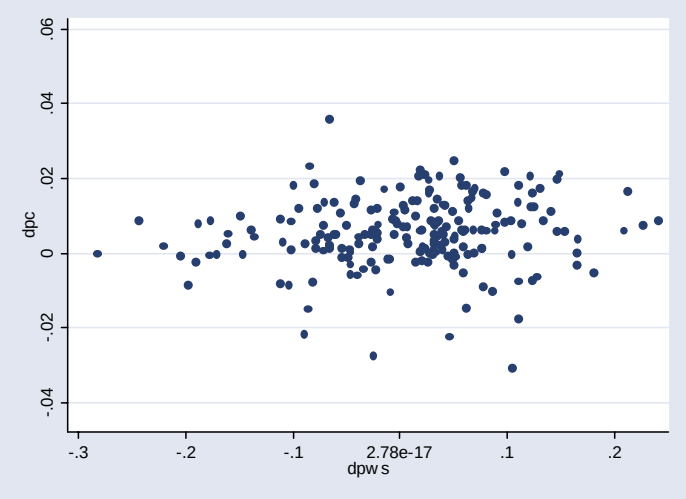

Figure 5: Change in Consumption vs. Change in OFHEO Housing Wealth

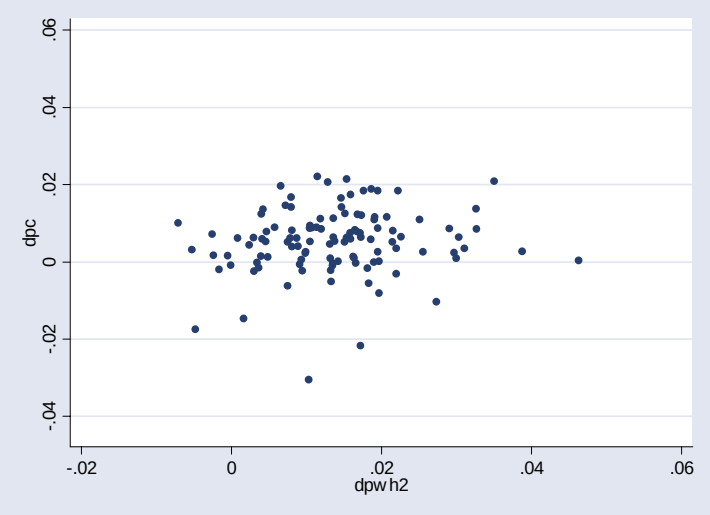

Figure 6: Percent Change in Consumption vs. Percent Change in OFHEO Housing Wealth

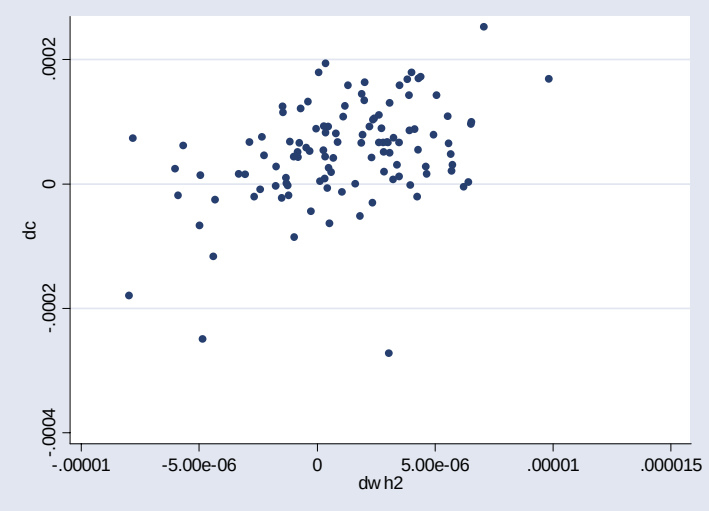

Figure 7: Change in Income vs. Change in Housing Wealth

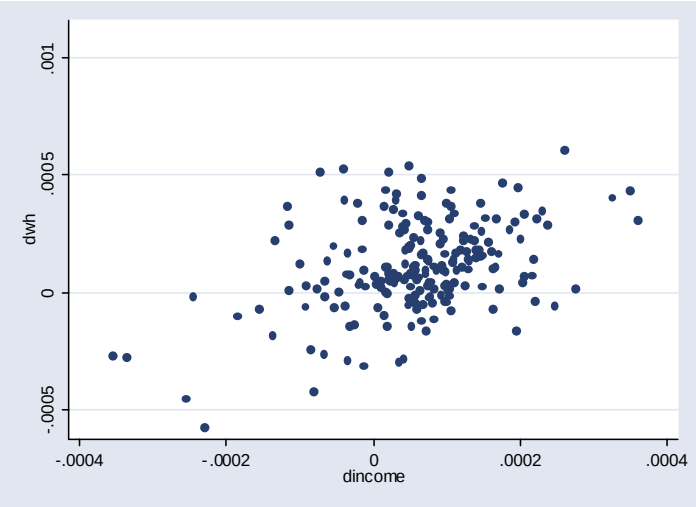

Figure 8: Percent Change in Income vs. Percent Change in Housing Wealth

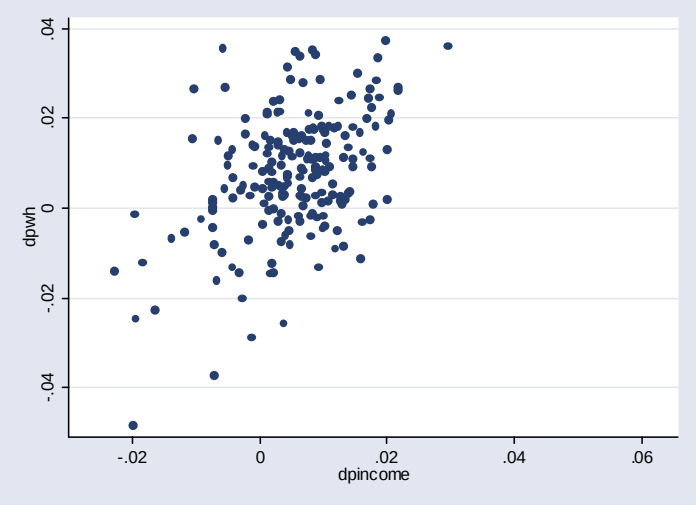

Figure 9: Consumption Breakdown
*Excludes housing services

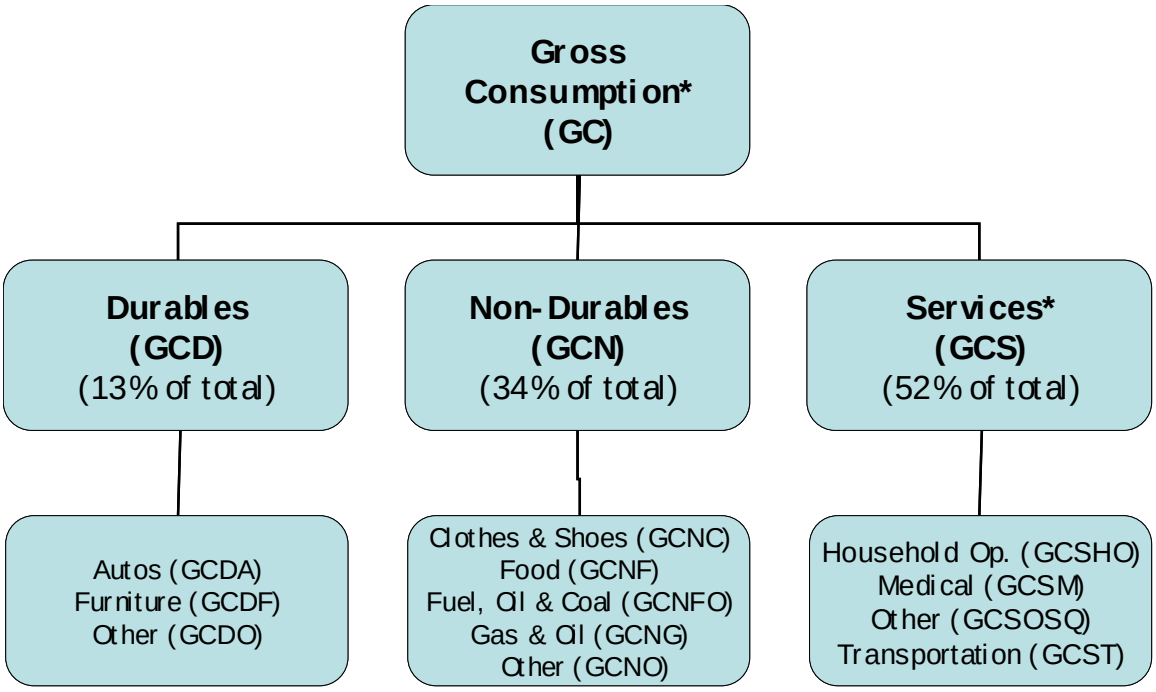

Table 1: Main Regression Results: MPCs

Number of obs = 204
Adj R-squared = 0.201

dc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dwh	.156	.024	6.54	0.000	.109	.203
dws	.018	.006	2.93	0.004	.006	.029
_cons	.000	.000	4.70	0.000	.000	.000

Table 2: Main Regression Results: Percentage Changes

Number of obs = 204
Adj R-squared = 0.1381

dpc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dpwh	.251	.045	5.58	0.000	.162	.339
dpws	.008	.007	1.20	0.230	-.005	.021
_cons	.003	.001	4.85	0.000	.002	.005

Table 3: Regression Analysis for Consumption Components
*Statistically significant

	Durables	Autos	Furniture	Other		
MPC						
housing wealth	0.054*	0.034*	0.012*	2008.57		
stock wealth	0.003	0.000	0.002*	198.48		
%						
housing wealth	0.699*	1.167*	0.329*	0.266*		
stock wealth	-0.017	-0.075	0.028*	0.011		
	Nondurables	**Clothes & Shoes**	**Food**	**Fuel, Oil, Coal**	**Gas & Oil**	**Other**
MPC						
housing wealth	0.033*	0.013*	0.000	0.023*	-0.019*	0.015*
stock wealth	0.006	0.002*	0.000	0.004*	-0.001	0.002*
%						
housing wealth	0.125*	0.328*	0.106	0.135*	-0.486*	0.224*
stock wealth	0.008	0.027*	-0.040	0.011	-0.048	0.011
	Services	**Household Op.**	**Medical**	**Transportation**	**Other**	
MPC						
housing wealth	0.069*	0.011*	0.019*	0.004*	0.067*	
stock wealth	0.009*	-0.001	0.001	0.001	0.014*	
%						
housing wealth	0.241*	0.348*	0.194*	0.225*	0.326*	
stock wealth	0.018*	0.002	0.010	0.015	0.045*	

Table 4: Regression Controlling for Lag Effects (MPCs)

Number of obs	201
Adj R-squared	0.25

dc	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
dws	0.017	.006	2.98	0.003	0.006	0.029
dwh	0.132	.028	4.79	0.000	0.078	0.187
dwsl	0.019	.006	3.18	0.002	0.007	0.030
dwhl	0.055	.029	1.88	0.061	-0.003	0.113
dwsl2	0.008	.006	1.31	0.193	-0.004	0.019
dwhl2	-0.044	.029	-1.53	0.127	-0.100	0.013
dwsl3	0.007	.006	1.14	0.257	-0.005	0.019
dwhl3	0.033	.028	1.18	0.239	-0.022	0.087
_cons	0.000	0.000	3.78	0.000	0.000	0.000

Table 5: Regression Controlling for Lag Effects (Percent Changes)

Number of obs	201
Adj R-squared	0.2228

dpc	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
dpws	0.010	.006	1.52	0.130	-0.003	0.022
dpwh	0.173	.047	3.68	0.000	0.080	0.265
dpwsl	0.024	.006	3.71	0.000	0.011	0.036
dpwhl	0.099	.048	2.06	0.040	0.004	0.193
dpwsl2	0.016	.006	2.47	0.014	0.003	0.028
dpwhl2	-0.078	.047	-1.67	0.097	-0.170	0.014
dpwsl3	0.006	.006	0.87	0.384	-0.007	0.018
dpwhl3	0.067	.045	1.50	0.135	-0.021	0.156
_cons	0.003	.001	3.69	0.000	0.001	0.004

Table 6: Regression Analysis Controlling for Income (MPC)

Number of obs	204
Adj R-squared	0.4639

dc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dwh	0.068	0.021	3.19	0.002	0.026	0.111
dws	0.009	0.005	1.8	0.074	-0.001	0.019
dincome	0.392	0.039	9.98	0	0.315	0.470
_cons	0.000	0.000	2.48	0.014	0.000	0.000

Table 7: Regression Analysis Controlling for Income (Percentage Changes)

Number of obs	204
Adj R-squared	0.4687

dpc	Coef.	Std. Err.	t	P>|t|	[95% Confnterval]	
dpwh	0.054	0.039	1.37	0.171	-0.024	0.132
dpws	0.007	0.005	1.33	0.185	-0.003	0.017
dpincome	0.691	0.062	11.23	0.000	0.570	0.813
_cons	0.001	0.001	2.11	0.036	0.000	0.002

Table 8: Regression Analysis Modeling Case Quigley and Shiller's Study

Number of obs	92
Adj R-squared	0.3666

dpc	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
dpws	0.006	0.008	0.66	0.509	-0.011	0.022
dpwh	0.075	0.057	1.3	0.196	-0.039	0.188
dpincome	0.585	0.091	6.43	0.000	0.404	0.765
_cons	0.002	0.001	2.06	0.042	0.000	0.004

Table 9: Regression Analysis Controlling for Homeownership Rate (MPCs)

Number of obs	153					
Adj R-squared	0.2362					
dc	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95% Conf.**	**Interval]**
dws	0.018	0.007	2.73	0.007	0.005	0.032
dwh	0.161	0.028	5.76	0.000	0.106	0.216
homeownership	0.000	0.000	-3.11	0.002	0.000	0.000
dwh*homeownership	0.056	0.023	2.42	0.017	0.010	0.102
_cons	0.000	0.000	3.28	0.001	0.000	0.000

Table 10: Regression Analysis Controlling for Homeownership Rate (%)

Number of obs	153					
Adj R-squared	0.1518					
dpc	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95% Conf.**	**Interval]**
dpws	0.009	0.007	1.23	0.221	-0.005	0.023
dpwh	0.245	0.051	4.84	0.000	0.145	0.345
homeownership	-0.003	-0.001	3.08	0.002	-0.005	-0.001
dpwh*homeownership	0.134	0.060	2.24	0.027	0.016	0.253
_cons	0.003	0.001	3.96	0.000	0.002	0.005

Table 11: Regression Analysis Controlling for Stockownership Rate (MPCs)

Number of obs	204					
Adj R-squared	0.2066					
dc	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95% Conf.**	**Interval]**
dws	0.008	0.008	1	0.319	-0.008	0.024
dwh	0.161	0.025	6.53	0.000	0.113	0.210
stockownership	0.000	0.000	0.180	0.859	0.000	0.000
dws*stockownership	0.001	0.000	1.840	0.067	0.000	0.002
_cons	0.000	0.000	4.660	0.000	0.000	0.000

Table 12: Regression Analysis Controlling for Stockownership Rate (%)

Number of obs	204					
Adj R-squared	0.1362					
dpc	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95% Conf.**	**Interval]**
dpws	0.009	0.007	1.3	0.196	-0.005	0.022
dpwh	0.255	0.045	5.64	0.000	0.166	0.344
stockownership	0.000	0.000	-0.72	0.475	0.000	0.000
dpws*stockownership	0.001	0.001	1	0.318	-0.001	0.002
_cons	0.003	0.001	4.8	0.000	0.002	0.005

Table 13: Regression Analysis Controlling for Change in Consumer Sentiment (MPC)

Number of obs	172					
Adj R-squared	0.2526					
dc	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95% Conf.**	**Interval]**
dws	0.014	0.006	2.21	0.028	0.001	0.026
dwh	0.140	0.025	5.68	0.000	0.091	0.188
dconsumers~t	0.000	0.000	3.78	0.000	0.000	0.000
_cons	0.000	0.000	5.13	0.000	0.000	0.000

Table 14: Regression Analysis Controlling for Change in Consumer Sentiment (%)

Number of obs	172					
Adj R-squared	0.1852					
dpc	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95% Conf.**	**Interval]**
dpws	0.004	0.007	0.61	0.544	-0.009	0.017
dpwh	0.186	0.046	4.01	0.000	0.095	0.278
dpconsumer~t	0.041	0.010	4.22	0.000	0.022	0.060
_cons	0.004	0.001	5.76	0.000	0.003	0.005

Table 15: Regression Analysis Controlling for Sentiment Level (MPC)

Number of obs	173
Adj R-squared	0.2634

dc	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
dws	0.017	0.006	2.76	0.006	0.005	0.029
dwh	0.117	0.025	4.62	0.000	0.067	0.167
consumersent	0.000	0.000	4.13	0.000	0.000	0.000
_cons	0.000	0.000	-3.35	0.001	0.000	0.000

Table 16: Regression Analysis Controlling for Sentiment Level (%)

Number of obs	173
Adj R-squared	0.2023

dpc	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
dpws	0.009	0.006	1.35	0.178	-0.004	0.021
dpwh	0.150	0.047	3.2	0.002	0.058	0.243
consumersent	0.000	0.000	4.7	0.000	0.000	0.000
_cons	-0.018	0.005	-3.81	0.000	-0.027	-0.008

Table 17: Regression Analysis: Interacting ΔHousing Wealth with ΔSentiment (MPC)

Number of obs	172
Adj R-squared	0.2746

dc	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
dws	0.015	0.006	2.52	0.013	0.003	0.028
dwh	0.127	0.025	5.11	0.000	0.078	0.176
dsentiment	0.000	0.000	4.15	0.000	0.000	0.000
dwh*dsentiment	-0.009	0.004	-2.47	0.014	-0.016	-0.002
_cons	0.000	0.000	5.53	0.000	0.000	0.000

Table 18: Regression Analysis: Interacting %ΔHousing Wealth with %ΔSentiment (%)

Number of obs	172					
Adj R-squared	0.1982					
dpc	**Coef.**	**Std. Err.**	**t**	**P>t**	**› Conf. Interval]**	
dws	0.005	0.007	0.7	0.485	-0.008	0.018
dwh	0.177	0.046	3.82	0	0.086	0.269
dpsentiment	0.043	0.010	4.47	0	0.024	0.062
dpwh*dpsentiment	-0.903	0.468	-1.93	0.055	-1.828	0.021
_cons	0.004	0.001	6	0	0.003	0.006

REFERENCES

Case, Karl E., Quigley, John M., & Shiller, Robert J. "Comparing Wealth Effects: The Stock Market Versus the Housing Market" October, 2001.