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Revisiting the relationship between financial wealth, housing wealth and consumption: a panel analysis for the US

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Abstract: Based on the seminal paper of Case, Quigley and Shiller (2013), we investigate the effects of financial and housing wealth on consumption. Using quarterly data from 1975 to 2016, for all States of U.S. economy, and a different methodology in measuring wealth, we report relatively greater financial effects than housing effects on consumption. Specifically, in our basic utilized model, the calculated elasticity for financial wealth is 0.060, while for housing is 0.045. The results are not in agreement with the ones obtained by Case, Quigley and Shiller. In an attempt to investigate the disparity we proceed by incorporating the introduction of the Tax Reform Act in 1986, which increased incentives for owner-occupied housing investments. Finally, due to distributional factors at work, and taking into account the pronounced uneven distribution of wealth we investigate the effects of wealth for 8 states that include the Metropolitan areas comprising of the well known Case-Shiller 10-City Composite Index. Now the housing effect on consumption is much stronger and larger than the financial effect. Additionally, we forecast the consumption changes at the time of the high rise and large drops in house prices for these states. Forecasts showed a recession from the fall of Lehman Brothers until the fourth quarter of 2011. These forecasts were not verified. Probably, the new techniques used by politics played an important role. We also find that extreme behaviors cannot be predicted.

JEL codes. E21; E44; R31.

Keywords. Consumption; Financial Wealth; Housing Wealth; Wealth effects.

1. Introduction

The pronounced volatility in the prices of financial assets, and in the housing prices, during the period from 2002 to 2009 and, consequently the effects of the Great Recession in the economy, has led to renewed political and scientific interest in the effect of wealth on aggregate consumption. The enormous swings in wealth, either from financial wealth or property wealth have grown in importance and raised a number of questions about the macroeconomic implications on consumer spending, aggregate demand and consequently on economic activity. Declines in stock prices accelerate the slowdown of households consumption and thus of the economic activity, a process which, eventually could lead to a recession. The same importance yields the changes in housing wealth upon household behavior, since recent developments in the housing markets give the opportunity to the homeowner to extract cash from housing and use it for consumption.

Against this backdrop, it is not surprisingly that some researchers state that housing equity is essentially similar to the act of selling shares. But in contrast to that, other researchers point out that the impact of stock market wealth accumulation may be quite different from that of real estate, because people may be less aware of the short - term changes in real estate market, since they do not receive relevant updates on its value. As for the financial wealth, people have immediate information on changes in the stock market through the news, online, or from newspapers.

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While in the last couple of decades the impact of wealth on consumption has been studied extensively, still, there is no clear consensus of whether housing wealth effects are greater than financial wealth effects. Equally, the theoretical underpinnings of the housing wealth effect remain controversial. Buiter (2010) suggests that housing wealth is not really wealth, and even if it is the effects are not of primary importance. Under a standard life-cycle permanent income consumption model, he argues that housing wealth is considered at the same time an asset and consumption good, and housing consumption costs offset any housing wealth effect on consumption, leaving thus overall consumption unchanged. Most efforts support the notion that housing wealth is a reliable indicator of business cycle and therefore an instrument for monetary policy. Consequently, a number of monetary authorities make regularly public statements in support of the importance of the housing market wealth[1].

Case, Quigley and Shiller in a series of papers investigated the effects of wealth on consumption for USA and reported that housing wealth is greater than financial wealth. Supporting this finding, Mishkin (2007) concludes that although there might be a mis-measurement issue, housing wealth effect is greater than the estimated stock wealth effect. But Levin (1998) found that consumption is more likely to respond to changes in financial (liquid) assets and not so much to changes in housing.

In this paper, we follow Case, Quigley and Shiller (CQS thereafter) and with the use of state-level panel data, we provide some new empirical evidence on the effects of housing and financial wealth on consumption. By expanding the data from the first quarter of 1975 to the first quarter of 2016 and by constructing the stock market and housing variables in a different way, than CQS, we repeat the regressions by using a richer specification and a range of econometric techniques for robust purposes. Then, we proceed by using a shorter sample, beginning from1986, where the Tax Reform Act (TRA) introduced, until 2016[2]. Lastly, we investigate the 8 States where their 10 Metropolitan areas comprising the well known Case-Shiller Composite 10 Index. For these states we predict consumption from 2005 until the end of the sample and compare it with the actual data. We attempt to see mainly how the economy behaved and how politics influenced actual consumption.

The paper is organized as follows: In the second section we discuss the results of previous studies on consumption. In the third section we describe the data and how was constructed and our empirical methodology. Section four discusses the statistical results and forecasts the consumption change in USA and the 7 States mentioned above (we omit DC). Section 5 concludes.

2. Literature Review

Early academic work (Modigliani 1963) suggested that an increase in wealth by $1 increases consumption by about five cents. Since then, the wealth effect on consumption has generated a longstanding interest to economists. Hence researchers gave emphasis on the estimated marginal propensity to consume (MPC) out of wealth. Various studies show that for the case of the U.S., the MPC from housing is between 0.03 and 0.07 while from financial wealth is from 0.03 to 0.075. As previously pointed, CQS in a series of papers have compared the wealth effects, coming from housing and financial, on consumption. In their first attempt (2005) by using state and country-level data, from 1980 to 1990, they reported large housing wealth effects on household consumption. In their second attempt (2011) they extended the data set from 1978 to 2009 and arrived at the result where the effect of housing is permanently higher than the effect of the stock wealth on consumption.

Finally, in their third paper (2012), the sample size extended until 2012 and the results were in line with the previous findings, although now the housing wealth appears to be much stronger than the financial effect. In addition they have found strong evidence that fluctuations in the housing

[1] Among the authorities were, the Fed Governors, Greenspan and Ben Bernanke.

[2] We could've included the effect of TRA 1986 in the whole sample with the use of dummy variables, but we wanted to explore further in terms of the error correction model the significance of that particular act.

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market wealth have a significant impact on consumption. This key finding was robust to various techniques used. Benjamin et al. (2003), with the use of U.S. state-level data, reports sizable housing wealth effects, a result that is in line with the ones obtained by CQS. They also reported that the marginal propensity to consume from housing wealth is significant and higher than that of financial wealth. In the same vein, Bostic, Gabriel, and Painter (2009) utilizing data from the Survey of Consumer Finances and the Consumer Expenditure Survey, for the period of 1989 to 2001 argue for relatively larger housing wealth effects (with an estimated elasticity of 0.06) in comparison with financial wealth (estimated elasticity 0.02).

On the other side, Elliot (1980) conducted an early study of the impact of non-financial and financial wealth on consumption spending using aggregate data, and concluded that non-financial wealth had no impact on consumption. Dvornak and Kohler (2003) obtained opposite results in application of the CQS methodology to the Australian economy, with larger and significant financial wealth effects, than the effects of housing wealth. Attanasio et al. (2009) employing micro-level data for England concluded that there was no housing wealth effect on consumption.

Calomiris et al. (2009), re-examine the impact of housing wealth, by employing the CQS data. Following a method suggested by Hall (1978), Auerbach and Hassett (1989) and Campbell and Mankiw (1990), they find that the estimated housing wealth has much smaller magnitude and less significant effect on consumption, compared with the financial wealth effect. This comes in direct contrast with the results obtained by CQS. In fact, the coefficient of the financial wealth ranges between 0.149–0.230, while the coefficient of housing wealth is between 0.024–0.065. Moreover the income coefficient fall within the 0.3–0.7 range, in agreement with the ones found by Campbell and Mankiw (1990). However, Calomiris et al. (2013) extend their previous model by considering the role of age composition and wealth distribution. By constructing new panel data they find that the effect of housing wealth on consumer spending depends crucially on age composition, poverty rates, and the housing wealth share. They support that consumers with different age and wealth characteristics have different housing wealth effects especially due to credit constraints. Generally, housing wealth effects are higher in state-years with higher housing wealth shares.

De Bonis and Silvestrini (2012), by using panel data for a number of OECD countries also found greater impact on financial asset than the actual effects of housing wealth on consumption. Recently, since special attention was paid to the role of lending collateral real estate Cooper (forthcoming) finds slightly greater effect of financial wealth from the effects of real estate. Sierminska and Takhtamanova (2012) showed that the relative magnitude of the effect of financial wealth against the effect of real estate depends on the country to be studied and that differences within countries can be guided by certain age groups. Phang (2004) supports this argument by showing that an increase in housing price has no significant effect on aggregate consumption in Singapore.

In terms of long-run relationship and applying an error correction framework, Belsky and Prakken (2004) find that the estimated consumption effects of real estate and corporate equity are sizable and similar in magnitude (about $5^{1/2}$ cents on the dollar), but different in immediacy of impact. As follows, Bampinas et al. (2017) examine the role of inequality and demographics. Based on the same model specification and data from CQS, and employing quantile regression techniques, they find first, that at the lower end of the conditional distribution of consumption the two types of wealth are statistically significant and of similar size (0.053-0.088).

Demographics are not significant, while the effect of income inequality as measured by the Gini coefficient at the state level is negative and significant. As they move to higher quantiles, the effect of income and housing wealth is increasing and the effect of financial wealth is decreasing. At higher quantiles the coefficient of housing wealth is at least two times that of financial. They also find that a larger percentage of people over 65 years of age and a higher degree of income inequality also lead to lower consumption in the long-run.

Furthermore, since private consumption historically represents about 70 percent of US-GDP, Schmidt and Vosen (2011) in an attempt to forecast private consumption, introduce a new indicator

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based on search query time series provided by Google Trends. The results suggest that Google Trends may be a new source of data to forecast private consumption.

Lahiri et al. (2015) introduce consumer confidence to forecast consumption and employ real-time data. The consumer confidence was based on a survey, which tracked many different aspects of consumer attitudes and expectations about economy. The results show that consumer confidence has a notable and positive contribution in forecasting personal consumption expenditure. Dees and Soares Brinca (2011) investigate the role of confidence for forecasting consumption change in USA and Europe. They found that it brings additional information beyond to income, wealth, interest rates etc. Generally, expectations can be in certain circumstances a good predictor of consumption, additionally to income and wealth.

3. Data and Methodology

3.1. Data

This section provides a summary description of the data used in our analysis. A more detailed description can be found in the Appendix A. The data are quarterly in frequency and span from 1975 (1st quarter) to 2016. All variables are in chained 2005 dollars, measured per capita in logarithms, and seasonally adjusted by census X12.

We use state-level panel data in order to get more accurate estimates especially for the two wealth variables, and, at the same time, to allow us in getting significance and probably differences in magnitude. The employed variables are consumption, personal income, financial wealth and housing wealth. We use retail sales as proxy for consumption. In order to obtain retail sales for each State, unlike CQS who got the data from Moody's Economy.com, we get from Bureau of Economic Analysis (BEA) national quarterly retail sales data as well as state-level retail trade data. Next, the percentage share of the retail trade data for each State is allocated to the national retail sales data in order to obtain the State-level retail sales. For personal income data are taken from Bureau of Economic Analysis converted in to real per capita personal income. For total financial wealth we obtained the data from the Federal Reserve Flow of Funds calculated as the sum of corporate equities, mutual fund shares and pension fund. Then, on a state-level data, from BEA we subtract the "Private nonfarm earnings Real estate" from "Private nonfarm earnings finance, insurance and real estate" in order to get net earnings finance and insurance.

We finally, allocate that measure of National aggregate financial wealth among states based on the share of Private nonfarm earnings, Finance and Insurance.

Lastly, we obtain date from Census of Population and Housing in order to calculate the housing wealth for each state. For the construction of this variable the CQS procedure was utilized, but the number of households per state and the weighted repeat sales price index were calculated differently. Detailed description of constructing the variables is provided in the Appendix.

Before we begin with the methodology it is important to depict the performance of the housing and the financial wealth for the time period under investigation. Fig. 1 reports the two national measures of house and financial wealth from 1975 to 2016. It seems that the housing wealth never declines from 1975 to 2007. Even for the period where the DotCom crisis greatly impacted the financial wealth and consequently the Economy (March 2000), the housing wealth continues to rise across States.

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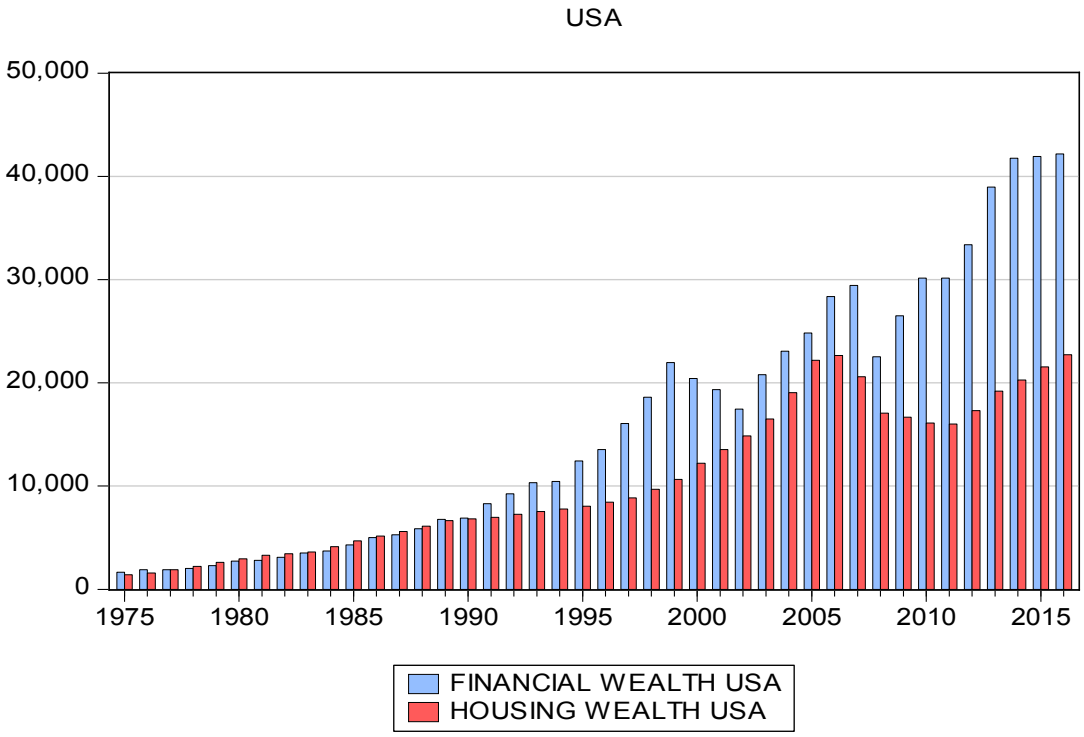

Figure 1. Financial and housing wealth in USA, during the period 1975-2016, (in billion of US dollars).

3.2. *Methodology*

In this section we start our analysis by investigating if the variables are stationary. Based on two different methods namely a) the Im, Pesaran and Shin W-stat, and, (b) PP- Fisher chi-square we estimate the unit root hypothesis for consumption, income, financial wealth and housing wealth. Tests assume a null hypothesis of joint stationarity against the null that all series are non-stationary. Under cross-sectional independence, each of these statistics is distributed as standard normal as both *N (states)* and *T (time)* increasing. **Table 1** presents the results of the panel unit root tests with intercept and intercept and trend. The analysis shows that all variables are stationary at the 5% significance level of the first difference, meaning that all variables are I (1) processes. Although the next step is to test for the long run relationship and possible cointegration, we follow the CQS method; regressing the difference of consumption on the differences of income, financial and housing wealth. While this specification addresses the nonstationarity issue, we understand that it does not take into account possible cointegration relationship. But we proceed in order to compare our results with the ones obtained by CQS, Calomiris et al. (2009, 2013) and Bampinas et al. (2017).

Table 1. Results for panel unit root tests.

	IPS		**PP – Fisher Chi-square**	
Variable	Constant	Constant trend	Constant	Constant trend
lnConsumption	-0.78[0.2179]	-6.42 [0.0000]	138.05[0.0101]	202.79[0.0000]
lnIncome	0.29[0.6157]	2.67[0.9962]	82.73[0.9188]	59.72[0.9999]
lnFinancialWealth	8.65[1.0000]	-1.63[0.0511]	17.030[1.0000]	112.96[0.2154]
lnHousingWeatlh	2.46[0.9931]	-5.43[0.0000]	66.24[0.9977]	274.82[0.0000]
ΔlnConsumption	-24.26[0.0000]	-81.68[0.0000]	4194.05[0.0000]	5107.04[0.0000]
ΔlnIncome	-74.89[0.0000]	-77.48[0.0000]	4258.40[0.0000]	4089.47[0.0000]
ΔlnFinancialWealth	-88.25[0.0000]	-91.69[0.0000]	4748.11[0.0000]	4558.27[0.0000]
ΔlnHousingWeatlh	-83.54[0.0000]	-86.34[0.0000]	4527.15[0.0000]	4344.54[0.0000]

Ln is the natural log and Δ is the first difference operator. Numbers in brackets are p-values. The maximum lag length is set to 6, determined by the Schwarz Bayesian Criterion.

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The estimated equation is given as:

$$\Delta C_{it} = \beta_1 \Delta Y_{it} + \beta\ \Delta FW_{it} + \beta_3 \Delta HW_{it} + FEffects + e_t \quad (1)$$

The equation shows the relationship between consumption (*C*), personal income (*Y*), stock (*FW*) and housing wealth (*HW*). We test three different specification models with the variables to be in first differences. Model I, II and III are the basic specifications representing the effects of changes in both housing and stock-market wealth upon consumption. Model II explores further the nature of estimated wealth effects and their robustness by including state-specific time trends, while model III includes time fixed effects. Please note that the above model specifications, as articulated by Calomiris et al. (2009), lead to inconsistent results, since the residual contains changes in permanent and current income and these will likely be highly correlated with changes in housing and stock wealth. In order to correct for any correlation issues, we proceed with the estimation of three other models IV, V and VI with the use of two-stage least squares and instrumental variables[3]. As instruments we use lagged variables of income changes, housing wealth changes and stock market changes. The hypothesis that the housing market wealth parameter is equal to the stock market wealth parameter is tested by the Wald test coefficient restriction.

As a next step we use the following error correction model (ECM)[4,5] utilized by CQS. We understand that the basic format given by Brooks (2008), as given by eq. 2 differs from the one presented by CQS, eq. 3 in a number of ways:

$$\Delta y_t = \beta_1 \Delta x_t + \beta_2 \left(y_{t-1} - \gamma x_{t-1} \right) + error \quad (2)$$

$$\Delta C_t = \alpha \Delta C_{t-1} + \beta_1 \Delta Inc_t + \beta_2 \Delta FW_t + \beta_3 \Delta HW_t + \gamma [C_{t-1} - Inc_{t-1}] + \varepsilon_t \quad (3)$$

Firstly, CQS estimates eq. 3 by including lags of consumption, in order to correct for autocorrelation. Secondly, for the parameter γ, in eq. 2, which measures the speed of adjustment back to equilibrium and the long-term relationship between income and consumption, CQS impose-without estimation – a cointegrating vector with a parameter of one.

Finally, given the original model (1), we are building the model for predicting consumption as follows. We construct our model in time series for USA and the 8 States except District of Columbia in order to use it for forecasting the consumption change. We forecast the consumption of Massachusetts, Illinois, Colorado, Nevada, California, Florida, New York and USA. The equation specification consists of the dependent variable of consumption (in logs) followed by the list of regressors, we used in this paper (the income and the two types of wealth). We include consumption with one lag as independent variable for forecasting purposes (because the dependent variable is an auto-series). The estimated equation is:

$$\log C_t = \alpha \log C_{t-1} + \beta_1 \log Inc_t + \beta_2 \log FW_t + \beta_3 \log HW_t + \varepsilon_t \quad (4)$$

[3] The instrumental variables version takes account of possible endogeneity problems

[4] Carrol et al. (2011) argue that cointegration methods are problematic for estimating wealth effects, for at least two reasons. First, basic consumption theory does not imply the existence of a stable cointegrating vector; in particular, a change in the long-run growth rate or the long-run interest rate should change the relationship between consumption, income, and wealth. Second, even if changes to the cointegrating vector are ruled out by assumption, changes in any other feature of the economy relevant for the consumption/saving decision can generate such long-lasting dynamics that hundreds or thousands of years of data should be required to obtain reliable estimates of that vector.

[5] Instead of ECM estimation the literature suggests fixed-effect estimator procedure, dynamic OLS, mean group estimator, panel quantile regression etc.

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We use the model to forecast future values of consumption which we have already estimated. In fact we know the real values of consumption. Initially, we determime whether the forecast is accurate or not, which would then be compared with the actual values, and the difference between them. Therefore, we use the same set of data that was used to estimate the model's parameters (in-sample forecasts) to see how well our model performs out-of-sample.

We first estimate the model using data from 1986 fourth quarter to 2016 first quarter. Then we conduct in-sample forecasts from the first quarter of 2005 until the first quarter of 2016, using a lagged dependent variable according the information criteria. We construct dynamic forecast to calculate multi-step forecasts starting from the first period in the forecast sample.

3.3. The Tax Reform Act of 1986

Following we take in consideration the Tax Reform Act enacted in October 1986 (TRA, 86). The TRA (86) among other encourages certain types of investments. It was a tax-simplification Act and chopped the top individual income tax rate from 50% to 28% while curbing special deductions, exclusions and breaks, such as tax expenditures (Novack 2011). The Act also increased incentives favoring investment in owner-occupied housing, by increasing the home mortgage interest deduction. We proceed with re-estimating the model over the time period from 1986 to 2016. We understand that the two classes of wealth may have differences in terms of liquidity, with the housing to be less liquid since it is impossible to liquidate just a part of it. Furthermore one should take into account the high processed fees for doing that. But since the end of 1986, home owners had the ability for home equity loans, refinancing with better terms and thus have more spending income for consumption.

3.4. The Case-Shiller Metropolitan areas Index

As a last step we perform the same analysis for the 10 metropolitan areas given by the Case Shiller composite 10 index[6]. We first depict in **fig. 2** the index from 1974 until the end of 2016, to see the evolution of the house prices through time. One could easily notice the positive trend displayed from 1974 until 2007. But the prevalent increase of the index occurred between 2002 and 2007, where ample market liquidity and lax credit conditions drove the house prices much higher, across the United States. From 2007 until the end of the 3th quarter of 2011, the house prices decrease significantly before start increasing again.

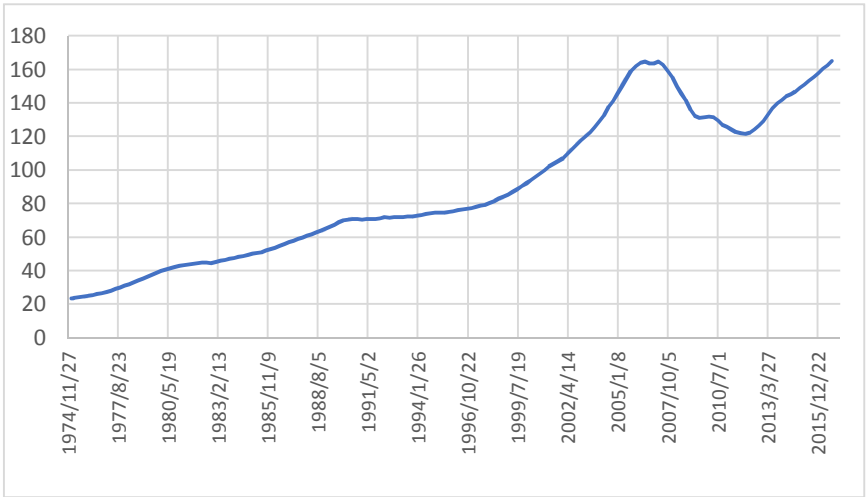

Figure 2. House price Index for 10 U.S. Metropolitan areas (Case-Shiller Composite 10) (2000=100).

[6] The metropolitan areas are: Greater Boston, Chicago metropolitan area, Denver-Aurora Metropolitan Area, Las Vegas metropolitan area, Greater Los Angeles, South Florida metropolitan area, New York metropolitan area, San Diego County, San Francisco and Washington Metropolitan Area.

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Testing the specific metropolitan areas comes from the notion that there might be distributional factors at work (Dvornak and Kohler 2007). In other words, uneven distribution of wealth is very pronounced, and, although housing is held by a great majority of households, regardless of income classes, stock market wealth is held largely by the higher-income class. Indeed, this is more evident in other developed countries, but there is a notion that high-income class propensity to consume out of income and stock wealth is lower, pertaining that changes in housing wealth might have a larger effect on consumption. As Carroll (2012) reports the 20% of U.S. households hold most of the country's overall net worth. Also, a good reason for testing the wealth effect on the particular metropolitan areas, as CQS pointed out, is the fact that home prices have evolved very differently in different parts of the country, and therefore can be substantial differences in the elasticity of land supply, the performance of State economies, and their changing demographics.

Since there is no data available for the U.S. 10 metropolitan areas, we utilize the associated State-based data. For that reason, we test the wealth effect on consumption of the 8 States where the metropolitan areas are part of them. In particular the States are Massachusetts, Illinois, Colorado, Nevada, California, Florida, New York and District of Columbia.

4. Results and Discussion

Table 2 depicts the results of all six models. The first observation is that consumption changes are significantly dependent on changes in income and in both forms of wealth. But in all specifications, stock market wealth has a positive and greater effect on consumption compared to the housing wealth effect. For models I and II, the stock market effect is 0.058 while for the housing effect the parameter is equal to 0.045. Both parameters appear to be statistically significant at 1% level. Interesting enough, the sum of the financial and housing estimated parameters is almost equal to the sum obtained by CQS. Also, the estimated income effect on consumption is equal to around 0.49, which is within the 0.3-0.7 range found by Campbell and Mankiw (1990).

Table 2. Consumption Models in first differences. Panel data from 1975 to 2016.

Dependent variable: Change in Consumption per capita

	Ordinary Least Squares			Instrumental Variables		
	I	II	III	IV	V	VI
Income	0.494*** (19.271)	0.489*** (19.034)	0.233*** (14.478)	0.209 (1.571)	0.156 (1.149)	0.378*** (4.513)
Stock Market Wealth	0.058*** (9.364)	0.058*** (9.413)	0.029*** (5.662)	0.085*** (3.716)	0.081*** (3.553)	-0.010 (0.227)
Housing Market Wealth	0.045*** (7.670)	0.045*** (7.624)	0.011*** (3.381)	0.070*** (3.177)	0.068*** (3.048)	0.018 (1.603)
State Specific Time Trends	No	Yes	No	No	Yes	No
Quarterly Time Fixed Effects	No	No	Yes	No	No	Yes
R^2	0.069	0.069	0.782	-	-	-
t-statistic	1.379	1.444	2.957	0.427	0.391	0.605

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p-value for Ho	0.168	0.149	0.003	0.669	0.696	0.545

Note: Ho is the test of the hypothesis that the coefficient on housing market is equal to that of stock market; t-statistics are in parentheses and ***, **,* are estimated value significant at the 1%, 5% and 10% level respectively.

The importance of the stock market wealth on consumption is reinforced by the results derived from model III which includes fixed effects, and by models IV and V, where changes in stock market wealth have still greater impact, than the housing effect on changes in consumption. The results are in direct contrast to the findings of CQS, but in an agreement with Calomiris et al. (2009). Also, table 2 reports the t statistics for the hypothesis that the coefficient of stock market wealth is equal to the coefficient of the housing-market wealth. The results suggest that we could not reject the hypothesis that that financial wealth could be equal in importance to the housing wealth. Only in model III, the financial wealth is greater and more important than the housing wealth.

Table 3 presents the results of the error correction model and support the highly significant immediate effect of financial wealth on consumption, as well as the housing effect. But the financial wealth coefficient is larger in magnitude than the housing coefficient. For I and II models the financial coefficient takes a value of around 0.062, while for the housing parameter is 0.047. In the third model when fixed effects are included the estimated parameters decrease in magnitude but still the financial wealth appears to be greater and more significant than the housing wealth effect. Furthermore, the results obtained by ECM are consistent with the results found by the first difference model specification. As for the lagged ratio of consumption to income, the coefficient is negative and significant in both cases, reviling an immediate correction of the potential shocks. It also suggests that transitory shocks, arising from changes in other variables in the model or in the error term, will have an immediate effect on consumption. This effect will eventually be offset, unless the shock is ultimately confirmed by income changes (CQS 2012).

Table 3. Error Correction Consumption Models. Panel data from 1975 to 2016.

Dependent variable: Change in Consumption per capita

	I	II	III
Change in Income	0.499***	0.495***	0.264***
	(23.729)	(23.647)	(15.710)
Change in Stock Market Wealth	0.060***	0.059***	0.024***
	(12.370)	(12.354)	(4.775)
Change in Housing Market Wealth	0.047***	0.047***	0.012***
	(10.175)	(10.092)	(3.592)
Lagged Change in Consumption (1 to 8)	0.215***	0.216***	0.076***
	(20.783)	(20.953)	(6.766)
Lagged Ratio of Consumption to Income	-0.015***	-0.031***	-0.017***
	(8.191)	(11.472)	(9.969)
State Specific Time Trends	No	Yes	No
Quarterly Time Fixed Effects	No	No	Yes
R^2	0.455	0.459	0.791
t-statistic	1.802	1.846	2.071
p-value for Ho	0.071*	0.065*	0.038**

Note: Ho is the test of the hypothesis that the coefficient on housing market is equal to that of stock market; **t-statistics are in parentheses and ***, **, * are estimated value significant at the 1%, 5% and 10% level respectively.**

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In **Table 4** we repeat the same methodology and present only the estimates of the error correction models, with the sample data spanning from end 1986 until 2016. The results support again the highly significant immediate effect of financial wealth on consumption, which is more than 2 cents higher than the effect of housing wealth. Surprisingly, we find that the housing effect is lower than before, irrespective of the estimation method chosen. The opposite is reported for the financial wealth where the effect on consumption is now 0.066 to 0.068 instead of 0.060. It is worth pointing out the increase, in absolute terms, of the estimated parameter measuring the lagged ratio of consumption to income, reviling again a very immediate correction of the any potential shocks. In concluding, based on the error correction estimates the 1986 Act seems not to change people preferences and still the financial wealth effect is greater and significantly more important, based on the Wald test, than the housing wealth effect on consumption.

Table 4. Error Correction Consumption Models for the period 1987-2016, after the introduction of the Tax Reform Act in 1986.

Dependent variable: Change in Consumption per capita

	I	II	III
Change in Income	0.532*** (19.093)	0.528*** (19.025)	0.425*** (17.376)
Change in Stock Market Wealth	0.068*** (13.257)	0.066*** (12.952)	0.010** (1.748)
Change in Housing Market Wealth	0.042*** (8.331)	0.042*** (8.361)	0.009*** (2.857)
Lagged Change in Consumption (1 to 8)	0.208*** (17.249)	0.211*** (17.562)	0.042*** (3.219)
Lagged Ratio of Consumption to Income	-0.035*** (11.362)	-0.057*** (13.753)	-0.037*** (12.754)
State Specific Time Trends	No	Yes	No
Quarterly Time Fixed Effects	No	No	Yes
R^2	0.313	0.321	0.713
t-statistics	15.768	15.798	6.156
p-value for Ho	0.000	0.000	0.000

Note: Ho is the test of the hypothesis that the coefficient on housing market is equal to that of stock market; t-statistics are in parentheses and ***, **, * are estimated value significant at the 1%, 5% and 10% level respectively.

Table 5 presents the results of the first three specification models, where the variables are in first differences, along with the error correction models, in an attempt to test the consistency of the estimated parameters. The results are surprisingly different now and in direct contrast to the findings of the previous sections of the paper. Now, the estimated housing effect is larger in magnitude and more significant than the financial wealth effect. The MPC out of housing wealth is in the region of 0.052 while the MPC for stock wealth is around 0.021. In most of the cases, the stock wealth estimate is not even statistically significant. In addition the estimated income coefficient is much greater in magnitude and steadily in the area of 0.59 compared with only 0.49 before, and still within the 0.3–0.7 range estimated by Cambell and Mankiw (1990). The results from the first three models are supported by the error correction estimates depicted by the models IV, V and VI in table 5. The estimates of the housing wealth parameter are more than double in magnitude than the estimates of the stock market wealth. The coefficient of lagged ratio of consumption to income is

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once more very small, indicating the immediate restoration of consumption after a shock in the residuals in the short run.

Table 5. OLS Model for Consumption and Error Correction for the period 1987-2016, for the 8 States, after the introduction of the Tax Reform Act in 1986.

Dependent variable: Change in Consumption per capita

	Ordinary Least Squares			Error Correction Model		
	I	II	III	IV	V	VI
Change in Income	0.583*** (6.131)	0.589*** (6.189)	0.549*** (5.832)	0.599*** (6.565)	0.594*** (6.517)	0.605*** (6.062)
Change in Stock Market Wealth	0.021 (1.225)	0.022 (1.278)	0.004 (0.272)	0.030* (1.862)	0.029* (1.820)	0.002 (0.132)
Change in Housing Market Wealth	0.052*** (3.203)	0.051*** (3.183)	0.022* (1.873)	0.055*** (3.748)	0.055*** (3.747)	0.024** (2.018)
Lagged Change in Consumption **(1to8 lags)**	-	-	-	0.205*** (6.525)	0.207*** (6.613)	0.103*** (2.884)
Lagged Ratio of Consumption to Income	-	-	-	-0.032*** (4.888)	-0.044*** (5.051)	-0.029*** (4.410)
State Specific Time Trends	No	Yes	No	No	Yes	No
Quarterly Time Fixed Effects	No	No	Yes	No	No	Yes
R^2	0.061	0.063	0.681	0.269	0.272	0.688
t-statistic	1.261	1.210	0.873	1.122	1.151	1.063
p-value for Ho	0.208	0.227	0.383	0.262	0.250	0.288

Note: Ho is the test of the hypothesis that the coefficient on housing market is equal to that of stock market; t-statistics are in parentheses and *, **, * are estimated value significant at the 1%, 5% and 10% level respectively.**

4.1. Forecasting the consumption change

Table 6 compares the forecasted (predicted) values from the model (over the period 2005q1 to 2016q1) to the actual data and computes the forecast evaluation table (6).

Table 6. Forecast evaluation table

The forecast statistics for the 7 States comprised the Case-Shiller Index and US.

States	RMSE	MAE	Theil Inequality Coefficient	Bias Variance	Variance Proportion
Massachusetts	0.0344	0.0233	0.0018	0.3492	0.1775
Ilinois	0.0366	0.0277	0.0019	0.0234	0.1433
Colorado	0.0321	0.0261	0.0017	0.4354	0.0724
Nevada	0.0751	0.0558	0.0039	0.0193	0.5268
California	0.0339	0.0268	0.0017	0.2390	0.0000
Florida	0.0473	0.0419	0.0025	0.0656	0.2353
New York	0.0452	0.0344	0.0023	0.0235	0.3121

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USA	0.0262	0.0213	0.0014	0.0011	0.0132

The root mean squared error is about 0.02-0.07 and the mean absolute error ranges from 0.02-0.04. Bias proportion is about 0.00-0.43, while the variance proportion is about 0.01-0.31.

The reported forecast statistics indicate that our forecasting model perform well out-of-sample. Figures 2-10 display the results of forecasting consumption change in Massachusetts, Illinois, Colorado, Nevada, California, Florida, New York and USA.

Figure 2-10. Consumption in predicted and actual values

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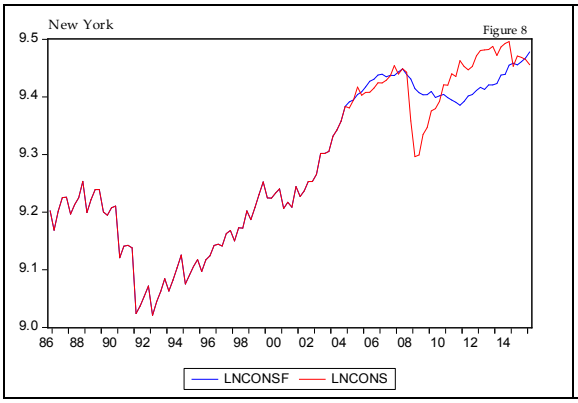

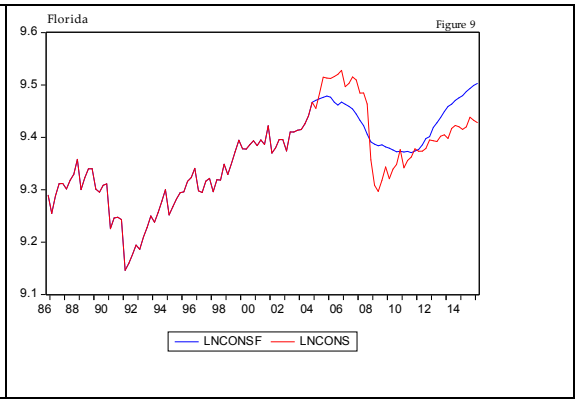

We conclude that the big dip in consumption in 2008 was not predicted in any state, as well as the large rise in consumption for 2005. Generally, extreme consumption behaviors were not predictable. Our panel results show that the effect of housing wealth is larger on consumption compared to financial wealth. Simultaneously, literature evidence (Attanasio O. et.al, 2009) finds that the relationship between house prices and consumption is stronger for younger than older households. The young are more vulnerable in irrational behaviors and more likely to be credit-constrained and thus willing to borrow against any increase in housing equity.

Furthermore, while the forecast showed a recession from 2008 to the last quarter of 2011, in fact from the first quarter of 2009 the economy in America began to recover in all States, probably due to quantitative easing, which was started in November 2008. The Fed increased the amount of money by going to the financial markets to buy assets and generating new money to pay for it. Specially, in N. York and Nevada the real consumption exceeds forecasts.

5. Conclusion

We have followed Case et al. (2012) in an attempt to estimate the effect of changes in financial and housing wealth on change in household consumption for the time period of 1975 to 2016. Constructing the housing and finance data differently from the method used Case et al. (2012) we find first that both financial and housing wealth are significant determinants of household consumption and secondly the effect of the financial wealth is larger in magnitude from the housing wealth effect. For most of model specifications a 1 $ change in stock market wealth will change consumption by 5.8 – 6 cents, whereas in terms of housing wealth consumption will increase by only 4.5 – 4.7 cents. Our panel results are in contrast to CQS studies and in line with the ones obtained by Calomiris et al. (2009). But when we test the top 10 metropolitan areas due to the fact that distributional factors could be at work and the that home prices have evolved very differently in different parts of the country, meaning substantial differences in the elasticity of land supply, we find that the estimate housing wealth has greater and robust effect on consumption than the stock market wealth. The difference with the CQS results could be explained because we use mainly an alternative methodology for measuring of stock market and housing wealth. Therefore, we could agree with Calomiris et al. (2013) that the results are very sensitive with the choice of housing wealth measure.

Finally, we forecast consumption change in the 7 states that include the 10 (richer) Metropolitan areas comprising of the well known Case-Shiller 10-City Composite Index and the USA. We conclude that our model is a good predictor and extreme behaviors in consumption were not predictable. Additionally, while the forecast showed a recession from 2008 to the last quarter of 2011, in fact from the first quarter of 2009 the economy in America began to recover. The main reason may be the aggressive monetary policy followed and the quantitative easing that has spurred consumption. However, expectations for greater consumption were not verified for most areas.

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Data Appendix.

Consumption

There are no direct measurements of U.S. consumption for each state separately, thus, CQS used a panel of retail sales (as a proxy), which has been constructed by Moody's Economy.com (Formerly Regional Financial Associates, RFA. See Zandi, 1997). "The RFA estimates were constructed from county level sales tax data, the Census of Retail Trade published by the U.S. Census Bureau, and the Census Bureau's monthly national retail sales estimates. For states with no retail sales tax or where data were insufficient to support imputations, RFA based its estimates on the historical relationship between retail sales and retail employment.

We followed a different way in obtaining retail sales. We obtain the aggregate quarterly retail sales for the whole economy and the retail trade of the 51 states from http://www2.census.gov/retail/releases/ and www.bea.gov. Then the aggregate retail sales are allocated across states based on the distribution of retail trade across states. Our data were consistent without any empty intervals.

Financial Wealth

Estimates of the accumulated financial wealth in U.S. per quarter have been obtained according to the detailed instructions of CQS (2005, 2013) from the Federal Reserve Flow of Funds (FOF) accounts for every quarter. We computed (from FOF) the sum of mutual funds, corporate equities and pension fund reserves that are held by the household sector.

The allocation of the aggregate financial wealth across states was done the data taken from The Bureau of Economic Analysis (BEA) and namely the two categories, a) "Private nonfarm earnings real estate" and b) "Private nonfarm earnings, finance, insurance and real estate". By subtracting a) from b) we got the private nonfarm earnings, finance and insurance. Then the distribution of this outcome used to allocate the aggregate financial wealth across states.

On the other hand CQS allocated aggregate financial wealth based on data furnished by the Investment Company Institute (ICI) which were available only for 1986, 1987, 1989, 1991 and1993. For the interval 1993 to 2009, CQS interpolated the share of holdings in each state, linearly, mapping the 1993 figures to the 2008 figures.

Housing wealth

CQS constructed the panel of aggregate housing wealth data for each state through the following equation:

$$V_{it} = R_{it} N_{it} I_{it} V_{io}$$

where,

1. V_{it}: aggregate of owner occupied housing in state i in quarter t,
2. R_{it}: homeownership rate in state i in quarter t,
3. N_{it}: number of households in state i in quarter t,
4. I_{it}: weighted repeat sales price index, for state i in quarter t, and,
5. V_{io}: mean home price for state i in the base year, 2000.

Our differences with the data used by CQS are in the third and fourth dataset. For the number of households in state i in quarter t, we used the data from CENSUS https://www.census.gov/hhes/families/files/hh4.csv https://www.census.gov/popest/research/p25-1123.pdf and in particular the proportion of the population for each state which was used as a proxy for the number of households per state. We compare the outcome of this procedure with the data provided by Statistical Abstract of USA, (we did not use the Statistical Abstract of USA in the first place since the figures where different from issue to issue). Regarding the fourth category, about the house prices, we used the Median Sales Price of Houses Sold for each region and applied the percentage change in median home value in 1970 which we had at our disposal for each state.

As for the index of repeat sales (price index), we used data from Freddie May Housing Price Index (FMHPI), https://www.quandl.com/data/FMAC/HPI-House-Price-Index-All-States-and-US-National. The series are available at a state-level, and the and begin in January 1975. The FMHPI is based on an ever-expanding database of loans purchased by either Freddie Mac or Fannie Mae.

Personal income

The quarterly data are from the Bureau of Economic Analysis (2016Q4 release).

References

1. Ando, A.; Modigliani, F. The Life Cycle Hypothesis of Saving: Aggregate Implications and Tests. *The American Economic Review* 1963, 53, 55-84, URL: 1817129.
2. Attanasio, P.O.; Blow, L., Hamilton, R.; Leicester, A. Booms and Busts: Consumption, House Prices and Expectations. *Economica* 2009, 76, 20-50, doi:10.1111/14680335.
3. Auerbach, J. A.; Hassett, K. Corporate Savings and Shareholder Consumption 1989, NBER Working Paper No. 2994.
4. Bampinas, G.; Konstantinou, P.; Panagiotidis, T. Inequality, Demographics and the Housing Wealth Effect: Panel Quantile Regression Evidence for the US. *Finance Research Letters* 2017, 23, 19-22, Doi:10.1016/j.frl.2017.01.001.
5. Belsky E.; Prakken, J. Housing Wealth Effects: Housing's Impact on Wealth Accumulation, Wealth Distribution and Consumer Spending. 2004,National Center for Real Estate Research 2004, Joint Center for Housing Studies of Harvard University.
6. Benjamin, J.; Chinloy, P.; and Jud, D. Why do Households Concentrate Their Wealth in Housing? *Journal of Real Estate Research* 2004, 26(4), 329-344.
7. Bonis, De R.; Silvestrini, A. The effects of financial and real wealth on consumption: new evidence from OECD countries. *Applied Financial Economics* 2012, 22(5), 409-425.
8. Bostic, R.; Stuart, G.; Gary, P. Housing wealth, financial wealth, and consumption: New evidence from micro data. *Regional Science and Urban Economics* 2009, 39(1).
9. Brooks, C. Introductory Econometrics for Finance, 2nd Ed. Cambridge University Press: New York, NY, USA, 2008, ISBN-13 978-0-511-39848-3.
10. Buiter, H. W. Housing Wealth Isn't Wealth. Economics: The Open-Access. *Open Assessment E-Journal* 2010, 4, 2010-22.
11. Calomiris, C.; Longhofer, S. D.; Miles, W. The (Mythical?) Housing Wealth Effect 2009. NBER Working Paper No 15075.
12. Calomiris, C.; Longhofer, S. D.; Miles, W. The housing wealth effect: the crucial roles of demographics, wealth distribution and wealth shares. *Crit. Finance Rev.* 2013, 2, 49-99, Doi:10.1561/104.00000008.
13. Campbell, J.; Mankiw, G. The Response of Consumption to Income. *European Economic Review* 1991, 35, 723-767.
14. Carroll, D.C.; Otsuka, M.; Slacalek, J. How Large are Housing and Financial Wealth Effects? A New Approach. *Journal of Money, Credit and Banking* 2011, 43, 55-79.
15. Case, K. E.; Quigley, J. M.; Shiller, J. R. Comparing Wealth Effects: The Stock Market versus the Housing Market. *Advances in Macroeconomics* 2005, 5, 1-34.

16. Case, K. E.; Quigley, J. M.; Shiller, J. R. Wealth Effects Revisited 1978-2009. COWLES FOUNDATION Discussion Paper No. 1784, 2011, Yale University, New Haven, Connecticut 06520-8281.
17. Case, K. E.; Quigley, J. M.; Shiller, J. R. Wealth Effects Revisited 1975-2012. *Critical Finance review* 2012, 2, 101-128, Doi:10.1561/104.00000009.
18. Dees, S.; Soares Brinca, P. Consumer confidence as a predictor of consumption spending: evidence for the United States and the euro area. ECB Working Paper 2011, No 1349, European Central Bank, Frankfurt a. M., Germany.
19. Dvornak, N.; Kohler M. Housing Wealth, Stock Market Wealth and Consumption: A Panel Analysis for Australia. Research Discussion Paper 2003-07, Reserve Bank of Australia.
20. Elliott, J. W. Wealth and wealth proxies in a permanent income model. *Quarterly Journal of Economics* 1980, 95, 509–535.
21. Hall, E. R. The Long Slump. *American Economic Review* 2011, 101, 431-469, Doi:10.1257/aer.101.2.431.
22. Lahiri, K.; Monokroussos, G.; Zhao, Y. Forecasting Consumption: the Role of Consumer Confidence in Real Time with many Predictors. *Journal of Applied Econometrics* 2015, 31, 1254-1275, Doi:10.1002/jae.2494.
23. Levin, L. Are assets fungible? Testing the behavioral theory of life-cycle savings. *Journal of Economic Behavior & Organization* 1998, 36, 59-83, Doi:10.1.1.639.4471.
24. Mishkin, S. F. Housing and the Monetary Transmission Mechanism. NBER Working Paper Series No.13518/2007, National Bureau of Economic Research, Inc.
25. Novack, J. Special Report: 25 Years after Tax Reform, What Comes Next?" Personal Finance, Forbes. https://www.forbes.com/sites/janetnovack/2011/10/21/. Accessed 10 November 2016.
26. Phang, Y. S. House Prices and Aggregate Consumption: Do they move together? Evidence from Singapore. *Journal of Housing Economics* 2004, 13, 101-119, Doi:10.1016/2004.04.003.
27. Siermisnka, E.; Takhtamanova, Y. Financial and Housing Wealth and Consumption Spending: Cross-Country and Age Group Comparison. *Journal Housing Studies* 2012, 27, 685-719, Doi:10.1080/02673037.2012.697550.
28. Vosen, S.; Schmidt, T. Forecasting private consumption: survey-based indicators vs. Google trends. *Journal of Forecasting* 2011, 30, 565-578, Doi:10.1002/for.1213.