

**Wealth, Composition, Housing, Income, and Consumption**

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## **Wealth, Composition, Housing, Income, and Consumption**

### **Abstract**

The present research covering the latest residential boom and bust cycle highlights the lack of uniform or constant time invariant wealth, housing, and income relations. More important, wealth composition is shown to be a significant determinant of consumption. The marginal effects of housing equity, financial wealth, and income differ substantially based on the composition of household wealth. Households with the highest percentage of net worth in financial assets have much lower income effects, have substantially higher marginal effects associated with stock holdings, and have housing equity effects that differ noticeably from other households. Income effects for groups with the smallest amounts of relative financial wealth are dramatically higher than for households with greater financial wealth. Wealth and its composition affect consumption.

**Key words:** consumption, income, wealth composition, wealth effect, housing effect

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4 **1. Introduction**  
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7 The relations between housing wealth (home equity), financial wealth, income, and  
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9 consumption are of substantial interest to public policy analysts, economic forecasters, and  
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11 business managers since consumer spending is a dominant component of economic activity.  
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13 While it would be helpful if the relations between these factors were known with certainty,  
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15 the existing literature provides mixed and ambiguous results,<sup>1</sup> which may be related to  
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17 limitations in data utilized, temporal variability, the composition of individual household  
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19 wealth, and the permanence of unexpected income or wealth gains.  
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24 Acknowledgement of inequalities in the financial wealth of households is also necessary  
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26 since financial wealth impacts the composition of household net worth. Inequality in  
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28 financial wealth affects the marginal importance of housing wealth (home equity) and  
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30 income on consumption when households are segmented by total household wealth and  
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32 percentage of total wealth in financial assets. While housing wealth is a major component of  
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34 many households' net worth, it is less accessible than financial wealth and often has ongoing,  
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36 recurrent costs, even when unencumbered by debt, due to routine maintenance and property  
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38 taxes. Studies suggest that owner occupied residential real estate acts as a forced savings  
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40 plan since the asset generally increases in value in the long-term while debt secured by the  
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42 property is amortized. Financial wealth creation requires active allocation of income and  
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44 cash flow to investment. Few studies on consumption formally acknowledge the skewed  
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57 <sup>1</sup> Existing research has pegged marginal consumption from a housing wealth effect at anywhere from 2% to  
58 15% or more based on methodology and data studied (Benjamin, Chinloy and Jud (2004a), Case, Quigley,  
59 and Shiller (2005), Campbell and Cocco (2007), Kishor (2007), Carroll, Otsuka and Slacalek (2011) and  
60 others).  
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4 household wealth patterns found in the United States.<sup>2</sup> None investigate the *relative*  
5  
6 *composition* of wealth.  
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9 The data examined cover the pre-real estate boom period (1994-1999), the real estate  
10 boom market (2001-2005), and the post-boom (heading into bust) real estate market (2007).<sup>3</sup>  
11  
12 By inclusion of the real estate boom and decline periods, our analysis depicts a broader  
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14 picture of housing wealth effects on consumption than has generally been permitted. We  
15  
16 also segment the results by household wealth and link the relative magnitude of financial  
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18 versus housing wealth into the analysis. Assessment is provided using pooled data as well as  
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20 data disaggregated by sample year.  
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26 The focus on non-durable consumption differs from Bostic, Gabriel, and Painter (2009)  
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28 who examine total consumption and durable goods consumption.<sup>4</sup> Durable goods purchases  
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30 are discrete in timing, have non-negligible transaction costs, and consequently have different  
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32 consumption patterns than non-durables. Furthermore, Bostic et al (2009) find no significant  
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34 relations between house value or equity and durable goods consumption, although they find  
35  
36 a relation between house value and total consumption. The implication is that non-durable  
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38 consumption may be more dependent on house value or home equity. While this may at first  
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40 seem counterintuitive, the largest durable goods (automobiles, for example) acquired by  
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42 households are often financed with purchase loans or in the case of automobiles, leased.  
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44 Large scale financing operations related to their sale are the norm. Concentration on non-  
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46 durable consumption fills one of the voids in the literature while the introduction of  
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53 <sup>2</sup> Of note, many regulatory standards specifically exclude housing equity in determining the suitability of an  
54 investment. Also, the major wealth management firms exclude housing when determining investable wealth.  
55 While these firms earn fees from the management of financial assets, the distinction between the two types of  
56 wealth by financial professionals is prevalent and implies a difference in asset characteristics.

57 <sup>3</sup> Bostic Gabriel, and Painter (2009), Benjamin, Chinloy, and Jud (2004b), and Benjamin and Chinloy (2008)  
58 and others confine their analysis to the pre-real estate boom period.

59 <sup>4</sup> A major issue that has impacted the assessment of these effects is limited data on consumption. Like in prior  
60 studies this limitation is acknowledged.  
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4 household wealth composition further expands the scope of the existing literature. Research  
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6 by Benjamin, Chinloy, and Jud (2004b) and Benjamin and Chinloy (2008) positing that the  
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8 relations between consumption and housing wealth need not be positive is also extended.  
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11 Empirical results, including those related to the *relative composition* of wealth, provide  
12  
13 new insights. We show that wealth effects for stock and housing differ over time and that the  
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15 use of a measure derived from pooled data can be misleading. In prior research, the housing  
16  
17 wealth effect is normally significant and stronger than the stock holdings/financial assets  
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19 effect. In the present analysis, however, subsequent to the housing market peak, the relative  
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21 strength of the competing effects and their statistical significance switch. Next, we  
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23 investigate whether wealth level independently influences consumption elasticity and find  
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25 that more wealthy households enjoy higher elasticities of consumption on all components of  
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27 wealth, but not income. This suggests that even the more wealthy households (based on total  
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29 assets including residential housing net of debt and financial assets) are still partially  
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31 dependent on housing equity for consumption.  
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38 To further address the impact of wealth on consumption, we extend studies by Grossman  
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40 and Laroque (1990), Stokey (2009), Flavin and Nakagawa (2008), and Flavin and  
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42 Yamashita (2011), which highlight the role of housing-to-wealth ratios in determining  
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44 optimal portfolio choice and life-cycle consumption allocations. That is, the housing value  
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46 to wealth ratio is important and not just wealth level. While we use the housing value to net  
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48 worth or wealth ratio from the literature, we also use a cleaner measure of housing equity as  
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50 a percentage of wealth. The ratio of home equity to wealth is used to segment the aggregate  
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52 sample into several subsamples. For households whose home equity matters more in their  
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54 wealth position, the consumption elasticity corresponding to home equity is substantially  
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4 larger. For households whose stock holdings or financial assets matter more, the  
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6 consumption elasticity of the stock holdings is significant and larger. The importance of  
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8 household wealth composition is manifested. Consumption by households with the lowest  
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10 percentage of net worth in housing (highest percentage in stock holdings/financial assets) is  
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12 not impacted by housing wealth. Consumption by households with the greatest  
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14 concentration of net worth in financial assets/stock holdings is substantially affected by  
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16 financial wealth, but not home equity. In all cases, the magnitude of the differences in  
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18 marginal effects is large with practical implications.  
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24 The relations between housing wealth, financial wealth, income and consumption are  
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26 complex. Wealth alone, wealth composition associated with the percentage of net worth in  
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28 financial assets, and temporal effects associated with macro-economic conditions all impact  
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30 consumption. Differentiation of impacts based on wealth composition provides the  
31  
32 foundation for additional investigation of spending patterns using segmented consumer  
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34 groups. For the wealthiest, financial asset performance has a greater impact than home  
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36 equity. With regard to the average household, the importance of housing to consumption is  
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38 demonstrated as is the income to consumption relation.  
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## 45 **2. Literature**

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48 There is substantial interest in wealth effects and consumption. Research in several  
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50 related disciplines has concentrated on these relations as consumption is central to economic  
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52 activity, housing wealth is a major portion of total household wealth, and housing  
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54 construction and related activities are central to economic growth. Consumption cycles are  
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56 related to life cycles which impact wealth accumulation and dissipation which can be  
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58 affected by transient asset flows. The general wealth effect and real estate or housing  
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4 specific wealth effect are most germane to the present research. Prevailing empirical  
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6 assessments, while generally showing wealth effects impacting consumption, suffer from  
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8 substantive variation in coefficient magnitudes and changing measures of statistical  
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10 significance.  
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14 A number of studies investigate financial and housing wealth effects. Major studies  
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16 include early work by Elliot (1980), Goodman and Kawai (1982) and Bhatia (1987). More  
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18 recent studies by Belsky and Prakken (2004), Lettau and Ludvigson (2004), Case, Quigley,  
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20 and Shiller (2005) and Carrol, Otuska, and Slacalek (2011) focus on non-housing wealth  
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22 effects while controlling for housing effects. Added studies by Skinner (1989), Benjamin,  
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24 Chinloy, and Jud (2004b), Campbell and Cocco (2007), Kishor (2007), Benjamin and  
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26 Chinloy (2008), and Bostic, Gabriel, and Painter (2009) concentrate on the housing wealth  
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28 effect.  
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34 Using aggregate United States time series data, Elliot (1980) shows a large financial  
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36 wealth effect, but finds no real estate wealth effect. Goodman and Kawai (1982) investigate  
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38 permanent and non-permanent income gains and housing consumption and find that  
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40 permanent income gains are much more important for housing consumption. Bhatia (1987)  
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42 counters Elliot's use of construction costs as the measure of real estate wealth by employing  
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44 a market value measure and finds a substantial housing wealth effect (coefficient estimate  
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46 of .37) with no financial wealth effect. Bhatia's results suggest that the insignificant housing  
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48 wealth effect from the earlier period was due to data issues coming from the use of  
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50 aggregated data and the lack of a more liquid real estate market, including the ability to  
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52 refinance mortgage loans easily and access housing equity through lines of credit. Skinner  
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54 (1989) extends Elliot (1980) and Bhatia (1986) by showing a positive housing wealth effect.  
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4 Belsky and Prakken (2004) find that the housing wealth effect is about .05 to .07 which is  
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6 much lower than that of Bhatia. The general proposition is that the housing wealth effect is  
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8 meaningful and needs additional investigation.  
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11 Lettau and Ludvigson (2004) argue that the expected permanence of a wealth effect is  
12  
13 important. They posit that financial wealth with more volatility is likely to have a smaller  
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15 wealth effect than housing wealth which is postulated to have more permanence. Their  
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17 empirical assessment backs this claim, although one might not be willing to argue that  
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19 housing wealth is inherently more permanent after the latest real estate cycle. Case, Quigley,  
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21 and Shiller (2005) look at housing and financial wealth effects in the United States and  
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23 internationally and show a large housing wealth effect, but no or only a small financial  
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25 wealth effect in the United States. Data are for the year 1999 and prior. Variation in the  
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27 housing wealth effect at the state level is also shown. The implication is that the housing  
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29 effect is of more importance than other wealth effects. Carroll, Otsuka, and Slacalek (2011)  
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31 compare financial and housing wealth effects and postulate that the empirical specifications  
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33 of the housing and financial effects are similar at about 0.02 in the short run with additional  
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35 longer term impacts. Their estimate is at the lower range of existing studies.  
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43 Benjamin, Chinloy, and Jud (2004b) use aggregate data from the United States to  
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45 investigate the relation between housing wealth and consumption. A 0.08 marginal housing  
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47 wealth effect is shown along with a much smaller 0.02 financial wealth effect. Perhaps more  
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49 interesting, Benjamin and Chinloy (2008) argue that consumption need not be positively  
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51 correlated with net wealth. Wealth can either be accumulating or being used for  
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53 consumption and the relation is dependent on other economic factors and the smoothing of  
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55 consumption over time. This implies that marginal effects will change over time, without  
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4 changing model specifications, as aggregate assets and income change with macro level  
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6 factors.  
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9 Kishor (2007) finds marginal effects for housing of about 0.07 with financial wealth  
10 effects of about 0.03. Bostic, Gabriel, and Painter (2009) model total consumption prior to  
11 the real estate boom and bust cycle using partially matched micro level data and find that  
12 relations between housing wealth and consumption are large and much greater than financial  
13 effects. They find no relation between housing wealth and durable consumption, but do  
14 show a relation with total consumption. Again, the variability of marginal effects in prior  
15 studies is shown and highlighted. The coefficients of interest in existing studies are unstable,  
16 but do evidence directionally expected outcomes.  
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28 In almost all existing cases, interest is primarily associated with generating macro level  
29 financial and housing wealth effects using aggregate data. Our interest is in generating  
30 marginal effects from household level data, estimating time-varying differences, addressing  
31 the skewed wealth distribution in the United States and acknowledging that a household's  
32 level and *relative composition* of wealth impact consumption.  
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### 43 **3. Model and Empirical Specification**

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45 From the classical theory of consumption, a consumer bases his consumption decision  
46 on existing and expected resources. A additional conjecture is that consumers/households  
47 view the components of their wealth portfolio differently, depending upon the availability of  
48 each component, the ease of conversion to spendable cash, and the cash outlays associated  
49 with ownership of the asset. In comparing housing and stock/financial wealth, stock  
50 holdings are easier to liquidate and spend for consumption. Only a small percentage of the  
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4 U.S. population holds stocks at meaningful levels, especially outside of retirement accounts  
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6 that generally have high use costs associated with taxes. Historically, home equity is more  
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8 equitable across households, and borrowing against home equity has been cheaper than other  
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10 means of borrowing such as credit cards. The constraining side is the level of home equity  
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12 available to a household as well as the tightness of credit markets. Existing mortgage  
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14 indebtedness constrains the capability to tap home equity for consumption since a greater  
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16 outstanding balance of mortgage debt reduces the net equity in housing. The ability to  
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18 refinance mortgage debt, however, implies that mortgage debt can increase aggregate  
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20 consumption. Current income is a cash equivalent, while the ability and desire for using  
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22 other assets is determined by the level and composition of other wealth components.  
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### 31 *3.1 The Model*

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33 In the economy there is one composite, liquid risky market asset, which we call stocks.  
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35 There are many households in the economy. Concurrently, a household can choose the  
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37 amount of housing (in market value relative to consumption goods) used for a personal  
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39 residence. We assume a household, indexed by  $i$ , manages its balance sheet according to  
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41 cash equivalent units. We define  $\lambda_{i,S}$  and  $\lambda_{i,H}$ , whose values are between 0 and 1, as the  
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43 cash equivalent coefficients for stock holdings and house equity, respectively. Following  
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45 Benjamin and Chinloy (2008), the cash-equivalent wealth equality for this household is:  
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$$53 \quad W_{i,t} = \lambda_{i,S}S_{i,t} + \lambda_{i,H}(H_{i,t} - D_{i,t}) + D_{i,t} = \lambda_{i,S}S_{i,t} + \lambda_{i,H}H_{i,t} + (1 - \lambda_{i,H})D_{i,t},$$

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4 where  $S$ ,  $H$ ,  $D$  stand for stock holdings, house value, and debt, respectively. The use of a  
5 mortgage provides a cash equivalent in two ways. First, the greater the use of debt in the  
6 property acquisition the smaller the homeowner's cash outlay for acquisition. And second,  
7 with more debt, the ability to actually refinance and extract cash through the refinancing  
8 procedure declines.<sup>5</sup> Equation 1, by itself, is without any restriction of having to pay off debt.  
9 Thus, more debt is associated with more cash-equivalents for use. An additional equality in  
10 the above equation is illuminating: a higher cash-equivalent coefficient for housing assets,  
11  $\lambda_{i,H}$ , leads to a higher level of wealth perceived by the household, due to the convertibility of  
12 house value (or equity) to cash. However, the cash equivalent of existing debt decreases due  
13 to the higher opportunity cost of the current debt balance.  
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29 In the equation that relates consumption to wealth by the marginal propensity to  
30 consume (MPC) or  $\alpha_i$  for a household  $i$ ,  
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$$\begin{aligned}
 C_{i,t} &= \alpha_i W_{i,t} = \alpha_i \lambda_{i,S} S_{i,t} + \alpha_i \lambda_{i,H} H_{i,t} + \alpha_i (1 - \lambda_{i,H}) D_{i,t} \\
 &= \beta_{i,S} S_{i,t} + \beta_{i,H} H_{i,t} + \beta_{i,D} D_{i,t}.
 \end{aligned}
 \tag{2}$$

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41 The overall coefficients ( $\beta_i$ ) before each component of wealth are the product of MPC and  
42 corresponding cash equivalent coefficients.  
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46 Moving forward, to simplify the notation, the individual index is suppressed in the  
47 following. The objective of the model sketched below is the determination of the optimal  
48 value of  $\alpha$  to evaluate how it is related to the  $\lambda$ 's and other parameters.  
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53 Stock and housing prices follow the Brownian process (subscripts  $S$ ,  $H$ ,  $m$  indicate the  
54 return process for stocks, housing assets, and mortgage debt, respectively)  
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59 <sup>5</sup> Muellbauer (2007) makes a related argument that higher loan-to-value ratios increase consumption. Again,  
60 higher debt allows retention of cash for consumption.  
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$$\frac{dP_{j,t}}{P_{j,t}} = \mu_j dt + \sigma_j dZ_{j,t} \quad (j = S, H, m) \quad 3$$

for which we assume the instantaneous variance-covariance matrix between  $Z_{j,t}$  is

$$\mathbf{\Omega} = \begin{pmatrix} \sigma_S^2 & \sigma_{SH} & \sigma_{Sm} \\ \sigma_{SH} & \sigma_H^2 & \sigma_{Hm} \\ \sigma_{Sm} & \sigma_{Hm} & \sigma_m^2 \end{pmatrix}.$$

While the mathematical specification of the model assumes the covariance terms in  $\mathbf{\Omega}$  are generally non-zero, available empirical evidence points to little or zero covariance between housing market and stock market returns (see Englund et al. (2002) for the case of Sweden, Flavin and Yamashita (2002) for the U.S., and Iacoviello and Ortalo-Magne (2003) for the U.K). The covariance between housing and mortgage returns and between stock and mortgage returns, is also near zero for the case of U.S. (Flavin and Yamashita, 2002).

We start with the basic model. Specific implications related to income are introduced later. Hence, the formula for the dynamics of this cash-equivalent wealth is

$$dW_t = (\lambda_s S_t \mu_s + \lambda_h H_t \mu_h + (1 - \lambda_h) D_t) dt - C_t dt - \mu_m D_t dt \\ + \lambda_s \mathbf{S}_t \boldsymbol{\sigma}_s d\mathbf{Z}_{s,t} + \lambda_h \mathbf{H}_t \boldsymbol{\sigma}_H d\mathbf{Z}_{H,t} - \boldsymbol{\sigma}_m \mathbf{D}_t d\mathbf{Z}_{m,t}. \quad 4$$

There is a limit for mortgage borrowing, however. Otherwise people will withdraw as much cash as they want. We model this limit as the house value at each point of time, that is, the mortgage debt cannot go above a certain percentage of the house value

$$\mathbf{D}_t \leq \mathbf{LH}_t. \quad 5$$

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7 where  $L$  ( $0 < L < 1$ ) is the maximum loan-to-value ratio.  
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9 We assume the household is maximizing its expected lifetime utility which includes  
10 housing services and non-durable consumption goods  
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$$E \int_0^T e^{-\beta t} U(H_t, C_t) dt. \quad 6$$

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21 While it is easy to propose a frictionless model, it has been correctly noted in the  
22 literature that housing assets do not adjust frictionlessly (Grossman and Laroque, 1990).  
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24 Typically, a household pays transaction costs when buying and selling houses and when  
25 refinancing. Assuming the proportion of transaction costs to the value of a house is  $\theta$ , the  
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27 Bellman equation that characterizes a household's optimization problem is (without loss of  
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29 generality, suppose the decision time is at time 0):  
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$$J(W_0, H_0) = \text{Sup}_{\tau, C_t, H'_t, S'_t, D'_t} E \left[ \int_0^\tau e^{-\beta t} U(H_t, C_t) dt + e^{-\beta \tau} J(W_\tau - \theta H_\tau, H'_\tau) \right]. \quad 7$$

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43 where  $H_\tau \neq H'_\tau$  indicates the selling of an old house before purchasing a new one. This is an  
44 optimal stopping problem since the household has to decide when to sell a house (the value  
45 of  $\tau$ ) along with other variables.  
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51 Between stopping times, however, the household's decisions only involve adjusting  
52 the liquid financial assets and liabilities, including mortgage debts, and non-durable  
53 consumption goods, while the value of its housing assets is exogenously changed by market  
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4 conditions. During a short time interval  $(0, s)$  within which stopping does not occur, the  
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6 Bellman equation is:

$$7 \quad J(W_0, H_0) = \text{Sup}_{C_t, S_t, D_t} E \left[ \int_0^s e^{-\beta t} U(H_t, C_t) dt + e^{-\beta s} J(W_s, H_s) \right]. \quad 8$$

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16 As shown by Flavin and Nakagawa (2008), taking  $s \rightarrow 0$ , the solution is similar to the  
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18 familiar HJB equation

$$19 \quad \beta J(W, H) = \max_{C, S, D} [D^c J(W, H) + U(H, C)] \quad 9$$

20 where

$$21 \quad D^c J(W, H) = [\mu_S \lambda_S S + \mu_H \lambda_H H + (1 - \lambda_H - \mu_m) D - C] J_W(W, H) \\ 22 \quad + \frac{1}{2} [\lambda_S^2 S^2 \sigma_S^2 + \lambda_H^2 H^2 \sigma_H^2 + \sigma_m^2 D^2 + 2\lambda_S \lambda_H S H \sigma_{SH} + 2\lambda_S S D \sigma_{Sm} + \\ 23 \quad 2\lambda_H H D \sigma_{Hm}] J_{WW}(W, H) \quad 10$$

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40 And subject to constraints in Equations 4 and 5.

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42 The solution of this optimization problem, given in its current format, is now standard.  
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44 Solving for the optimal amounts of stocks and debts, we obtain the explicit solution as  
45  
46 follows

$$47 \quad \left\{ \begin{array}{l} 48 \quad S^* = \frac{1}{\lambda_S \sigma_S^2 \sigma_m^2 (1 - \rho_{Sm}^2)} \left[ -\frac{\mu_S J_W}{J_{WW}} \sigma_m^2 - \lambda_H H (\sigma_{SH} \sigma_m^2 - \sigma_{Hm} \sigma_{Sm}) + (1 - \lambda_H - \mu_m) \sigma_{Sm} \frac{J_W}{J_{WW}} \right] \\ 49 \quad D^* = \min \left\{ \frac{1}{\sigma_S^2 \sigma_m^2 (1 - \rho_{Sm}^2)} \left[ \frac{\mu_S J_W}{J_{WW}} \sigma_{Sm} + \lambda_H H (\sigma_{SH} \sigma_{Sm} - \sigma_{Hm} \sigma_S^2) - (1 - \lambda_H - \mu_m) \sigma_S^2 \frac{J_W}{J_{WW}} \right], LH \right\} \end{array} \right.$$

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4 where  $\rho_{sm}$  ( $0 \leq \rho_{sm} \leq 1$ ) is the correlation coefficient between the Brownian processes of  
5  
6 stock price and mortgage interest rate.  
7

8  
9 When  $\sigma_{Hm}$  and  $\sigma_{Sm}$  are both close to zero, the equation for  $D^*$  in Equation 11 says that  
10  
11 when a household is not faced with borrowing constraints and the liquidity from converting  
12  
13 home equity ( $\lambda_H$ ) increases, all else equal, cashed out home equity in the form of mortgage  
14  
15 borrowing, in relation to the overall cashable wealth, should decrease. This is due to the  
16  
17 increased opportunity cost of cashing out. In fact, this conclusion still holds when  $\sigma_{SH}\sigma_{Sm} <$   
18  
19  $\sigma_{Hm}\sigma_S^2$ , as can be seen from the equation. If, however,  $\sigma_{SH}\sigma_{Sm}$  is sufficiently large  
20  
21 ( $\sigma_{SH}\sigma_{Sm} \gg \sigma_{Hm}\sigma_S^2$ ), which could occur if the covariances between the stock market and the  
22  
23 housing and mortgage markets are much stronger than the covariance between the housing  
24  
25 and mortgage markets themselves, all with low volatility for the stock market, then  
26  
27 increased liquidity from home equity would actually spur mortgage borrowing against home  
28  
29 equity, even though the opportunity cost of doing so has increased.  
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36 Given the empirical evidence previously cited, however, we proceed by assuming all  
37  
38 covariance terms equal to zero to simplify the presentation without sacrificing empirical  
39  
40 relevance. By doing so,  $\rho_{sm} = 0$ , and the last three terms in each of the equations in (11)  
41  
42 drop out of the analysis.<sup>6</sup>  
43  
44  
45

46 In this case, if a household is not borrowing constrained, the ratio between stocks and  
47  
48 debt is  
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$$\frac{S^*}{D^*} = \frac{\mu_S \sigma_m^2}{\lambda_S (1 - \lambda_H - \mu_m) \sigma_S^2}. \quad 12$$

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58 <sup>6</sup> Bostic, Gabriel, and Painter (2009) following Goodman and Kawai (1982) use an abbreviated model that  
59  
60 posits that consumption is a function of current income, asset values, debt and a vector of household  
61  
62 characteristics.  
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4 The equation for  $\frac{S^*}{D^*}$  in Equation 12 says the ratio of stock to debt level is higher  
5  
6  
7 corresponding to a higher liquidity of home equity. That is, holding house stock constant, a  
8  
9 higher degree of liquidity of home equity would lead to a higher ratio of stocks to home  
10  
11 equity.  
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14 Further characterization of portfolio rules and consumption plan requires specification of  
15  
16 the utility function. We stipulate the housing is complementary to non-durable consumption  
17  
18 in a multiplicative way:  
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23

$$24 \quad U(H, C) = g(H) \frac{C^{1-\gamma}}{1-\gamma} \quad 13$$

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29 where  $g(H)$  is some unspecified function of  $H$ . We conjecture that the functional form of  
30  
31 value function  $J(W, H)$  and its first and second derivatives with respect to  $W$  are  
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$$38 \quad J(W, H) = Kg(H) \frac{W^{1-\gamma}}{1-\gamma}, J_W = Kg(H)W^{-\gamma}, J_{WW} = Kg(H)(-\gamma)W^{-\gamma-1} \quad 14$$

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42  
43 and  $h = \frac{H}{W}$ . When a household is not borrowing constrained,  $D^* = \frac{(1-\lambda_H-\mu_m)W}{\sigma_m^2 \gamma} < LH$ ,  
44  
45  
46 which implies a threshold value  $\bar{\lambda}_H = 1 - \mu_m - Lh\sigma_m^2\gamma$  in that if  $\lambda_H > \bar{\lambda}_H$ , then the  
47  
48 household is not constrained. The optimal consumption plan is  $C^* = \alpha_{UC}W = \alpha_{UC}[\lambda_S S_t +$   
49  
50  
51  $\lambda_H(H_t - D_t) + D_t]$ , where  
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$$57 \quad \alpha_{UC} = \frac{\beta}{\gamma} + \left(1 - \frac{1}{\gamma}\right) \left[\mu_H \lambda_H h - \frac{1}{2} \gamma \lambda_H^2 h^2 \sigma_H^2\right] + \frac{1}{2} \left(1 - \frac{1}{\gamma}\right) \left[\frac{\mu_S^2}{\sigma_S^2 \gamma} + \frac{(1-\lambda_H-\mu_m)^2}{\sigma_m^2 \gamma}\right]$$

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7 The sign of the change of  $\alpha_{UC}$  in response to an increase in  $\lambda_H$  is ambiguous. Consider  
8  
9  $\gamma > 1$ , as has been confirmed by the macro finance literature. The first square bracket term  
10  
11 in Equation 15 captures the effect on consumption through amplifying housing asset returns  
12  
13 and volatility by increasing  $\lambda_H$ , the net effect of which is undetermined without inputs from  
14  
15 calibration values. The last square bracket term captures the negative effect on consumption  
16  
17 by reduced cash-equivalent of existing cash-out debt due to higher opportunity cost. The  
18  
19 total effect is thus ambiguous.  
20  
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22

23  
24 When  $\lambda_H \leq \bar{\lambda}_H$ , a household is borrowing constrained,  $D^* = LH$ . The optimal  
25  
26 consumption plan is  $C^* = \alpha_C W = \alpha_C [\lambda_S S_t + \lambda_H (1 - L) H_t + D_t]$ , where  
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$$31 \quad \alpha_C = \frac{\beta}{\gamma} - \frac{1-\gamma}{2} \left[ \frac{\mu_S^2}{\sigma_S^2 \gamma^2} \right] + \frac{1-\gamma}{2} (\lambda_H^2 \sigma_H^2 + L^2 \sigma_m^2) h^2 + \left( 1 - \frac{1}{\gamma} \right) (\mu_H \lambda_H + L(1 - \lambda_H - \mu_m)) h.$$

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40 Once again, the change of  $\alpha_C$  in response to  $\lambda_H$  is ambiguous without further inputs of other  
41  
42 parameter values. Thus, how consumption responds to different components of wealth in  
43  
44 response to the liquidity of home equity is an empirical question.  
45  
46

47 So far we have not incorporated labor income into the model. Introducing labor income  
48  
49 into the model above makes the analytical solution for  $\alpha_{UC}$  and  $\alpha_C$  considerably more  
50  
51 complicated. Empirically, however, the solution simply implies labor income as an  
52  
53 additional control variable. Kraft and Munk (2011) show the closed-form solution when the  
54  
55 labor income ( $Y$ ) is spanned by other assets (i.e., the stochastic part of the dynamic process  
56  
57 of labor income can be replicated by a portfolio of market assets, including housing):  
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$$dY_t = Y_t[\mu_Y dt + \sigma_Y(\rho_{YS}dZ_{S,t} + \rho_{YH}dZ_{H,t} + \rho_{Ym}dZ_{m,t})]. \quad 17$$

where  $\rho_{YS}$  is the standardized correlation between income growth and stock returns, and likewise for  $\rho_{YH}$  and  $\rho_{Ym}$ . The optimal consumption policy in this case is a linear function of cash-equivalent non-human wealth and discounted human capital. For borrowing unconstrained households, the solution is:

$$C^* = \tilde{\alpha}_{UC}\tilde{W} = \tilde{\alpha}_{UC}[\lambda_S S_t + \lambda_H(1-L)H_t + D_t + \lambda_{Y,UC}Y_t] \quad 18$$

where  $\lambda_{Y,UC}$  is the discount factor for calculating the present discounted human capital based on information on current income. A parallel solution exists for borrowing constrained households:

$$C^* = \tilde{\alpha}_C\tilde{W} = \tilde{\alpha}_C[\lambda_S S_t + \lambda_H(1-L)H_t + D_t + \lambda_{Y,C}Y_t] \quad 19$$

When the risk in income cannot be completely hedged away by other assets (i.e., uninsurable income), Koo (1998) shows that the consumption policy still takes the format of (18) and (19), except now  $\tilde{\alpha}$  and  $\lambda_Y$  are non-linear functions of the ratio of total non-human assets to income. These non-linear functions are determined by the underlying preference parameters of a household. In either case, our empirical specification will not be affected, as we do not seek recovering values of  $\tilde{\alpha}$  and  $\lambda_Y$  for each household, and their average value will be incorporated in the regression coefficients on a cross-section sample data.

Intuitively, given a consumer's desire for consumption, besides income, he can draw down his available liquid financial assets, or if that is not available, choose to borrow. The ability to borrow depends on current credit market conditions. If the ability to borrow is constrained, this consumer has to rely on income sources more heavily.

### 3.2 *The Empirical Specification*

The difference in  $\lambda_H$ , i.e., convertibility of home equity in the equations above, may be determined by two aspects of a household's wealth portfolio: first, the size of home equity itself; and second, by how much else is available in liquid wealth that can support borrowing, as sizable liquid assets can help obtain favorable borrowing terms. To account for the influence of both, we proceed with home equity as a regressor in our regressions. We also segment the data using various measures of home equity and financial assets as a percentage of total wealth. The empirical questions are investigated in several ways. First, differences in cross-sectional regressions over various years, when presumably the liquidity of home equity differs, are assessed. The question of interest is the stability of the relations between stock/financial wealth, housing equity, income and non-durable consumption. Second, differences in consumption patterns for individuals who presumably differ in their access to and need for credit in the mortgage markets based on total and decomposed wealth are analyzed. Total household wealth and the composition of this wealth are posited to impact consumption patterns.

If adequate time series data were available for each household  $i$ 's stock holdings, home price, and mortgage balance, we could identify the corresponding parameters in Equation 3 at the household level. A sufficient representative longitudinal data sample with wealth variables at the household level, however, is usually unavailable. This is recognized in the literature and is again acknowledged. The objective in this research is to show that wealth composition matters for consumption propensity, as shown by Equation 15 and 16. We expect such a wealth composition effect to show up in cross-section data.

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4 Since it is well-known that many wealth measures are right-skewed, an OLS estimation  
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6 would be overwhelmingly influenced by the observations at the right tails of distributions.  
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8 Hence, the median regression methodology is used instead which is also noticeably different  
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10 from predominant estimation methods employed in the literature.  
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#### 15 16 **4. Data and Results** 17

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19 Cross-sectional samples from the Panel Study of Income Dynamics (PSID henceforth)  
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21 database spanning the years from 1994 to 2007 are drawn in order to address these  
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23 questions.<sup>7</sup> The PSID database has been used in related studies by Engelhardt (1996),  
24  
25 Skinner (1996) and Lehnart (2003). In particular, we concentrate on those households that  
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27 own a home, have non-negligible holdings of stocks (greater than or equal to \$500), non-  
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29 durable consumption that is not too extreme (between \$500 and \$350,000), and have  
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31 positive mortgage balances outstanding. Home equity is the house value net of existing  
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33 mortgage balances, and is therefore a potential source of funding when positive. The  
34  
35 literature has not focused on this subset of households in prior studies. Mortgage balances  
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37 reflect cash that has already been obtained or conserved, even though debt has to be repaid.  
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43 The data is summarized in Table 1 which segments data based on observation year. The  
44  
45 data are in constant 1982-84 dollars. The median age moves upward slightly. Family size  
46  
47 and marital status are consistent across years. Median stock holdings remain below \$15,000  
48  
49 in constant dollars across all periods. Average stock holdings increase by less than 100%  
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51 while the standard deviation in stock holdings increases dramatically over the period  
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57 <sup>7</sup> PSID is a nationally representative sample of U.S. households starting from 1968 with over 18,000  
58 individuals living in 5000 families. It is of longitudinal nature in design, but cross-sectionally also  
59 representative. Since 1999, PSID has switched from annual surveys to biennial ones. Furthermore, prior to  
60 1999, wealth information is only solicited once every five years.  
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4 indicating that a small number of households have outsized gains in financial assets. Home  
5 equity increases (about doubling) over the period. Households show increases in real income  
6 for the period on average, but median income is only up slightly. The data imply a  
7 concentration of financial assets and income in the highest tier.  
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14 The first column of Table 2 presents the median regression results of the log of  
15 consumption for all observations in the sample. For the overall sample, the consumption  
16 elasticity of home equity is 0.02, more than doubling that of stock/financial holdings (with  
17 both being statistically significant at the 1% level). These results are in line with some  
18 existing research showing that the home equity or value impact is larger than the stock  
19 wealth effect. The results, however, are at the lower end of existing estimates. The elasticity  
20 of mortgage borrowing is larger than these two estimates (statistically significant at the 1%  
21 level) as might be expected from Benjamin and Chinloy (2008). Utilization of additional  
22 debt supported by house value is more important than prospective use as measured by actual  
23 equity. In short, additional debt is used systemically to support consumption. This is  
24 affirmative of the data in Table 1 where mortgage debt in real terms increases over the  
25 period. Coefficients of the additional control variables in the model are as expected.  
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43 The subsequent columns of Table 2 examine the relative effects of these three  
44 components separately for each data year between 1994 and 2007. During the years 2001-  
45 2005, when home credit is widely available and people can easily cash out available home  
46 equity, the consumption elasticity of mortgage balances approaches 0.10. The same is true  
47 for available home equity during 2001-2003: in 2001 its coefficient is .04; in 2003 it is 0.06,  
48 larger than any other year and implying that prospective equity cash outs supported  
49 consumption. In 2005, arguably close to the peak of the housing market boom and because  
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4 households had cashed out almost all of available equity, there is little room for further cash-  
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7 outs to support consumption. Correspondingly, this estimate declines to virtually zero.  
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9 Credit constraints are also likely during 2005 and 2007 as lenders started to reduce exposure  
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11 to the residential real estate sector. There is substantial variation in this coefficient of interest  
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13 indicating that the estimated quantitative effects are not stable even if the qualitative  
14  
15 relations are maintained.  
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19 The stock holdings and income coefficients provide interesting stories as well.  
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21 While stock holdings are statistically significant in the aggregate sample model, the stock  
22  
23 holdings coefficients are not significant in the first four years of data and are only  
24  
25 marginally significant in years 2005 and 2007. With growth and use of household wealth  
26  
27 from residential real estate holdings, the minimal holdings of stock by the typical household  
28  
29 matter less unless they are the only assets available. The coefficient of the income variable  
30  
31 increases from the 1994 model coefficient and is largest in 2007 when income is the primary  
32  
33 source of consumption due to reduced housing equity and limited other assets. The lack of  
34  
35 consistent statistical significance in the stock and home equity factors implies that while  
36  
37 general relations exist, no standard effect coefficients associated with these factors are  
38  
39 evident since these metrics are all influenced by temporal conditions. Financial, housing,  
40  
41 and income effects change over time. The magnitude and importance of these relations  
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43 change as evidenced by the notable changes in the factor coefficients when disaggregated  
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45 over time.  
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53 The second area of interest addressed is related to the skewed distribution of wealth  
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55 in the United States. Wealthier households ostensibly possess more in each of the net worth  
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57 components: greater house equity and value, higher income, and larger stock holdings. We  
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4 also know that these factors are not normally distributed across the United States population.  
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6 In an initial assessment, the total sample is divided into groups based on net worth. Median  
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8 regressions are then run with these subsamples. Table 3 displays the estimation for the  
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10 wealthier groups versus the rest, when we define the wealthier group as the top 1/3 of  
11  
12 households, top 1/5 of households, or top 1/10 of households based upon net worth. For all  
13  
14 high wealth classifications, the elasticities of consumption from home equity, stock holdings,  
15  
16 and mortgage are higher than the less wealthy households. This is most notable for the  
17  
18 housing equity factor as the highest wealth cohort (the Top 1/10 of households) evidences a  
19  
20 housing equity coefficient at least 200% greater than the coefficient from the 9/10 of  
21  
22 households with less wealth. Also, it is the higher cohorts of wealth that show a stock wealth  
23  
24 effect. The top 1/5 and 1/3 household wealth cohorts show significant impacts. The  
25  
26 coefficient on the highest wealth cohort is the largest, but is not statistically significant (due  
27  
28 in part to a much lower sample size). The wealthy households are much less dependent on  
29  
30 income. Depending on wealth classification, the elasticities of income for the highest wealth  
31  
32 cohorts range from 0.076 to 0.05. These coefficients are 25% to 50% lower than for the  
33  
34 lower wealth groups. Households in the higher wealth groups simply have different  
35  
36 consumption patterns than the typical household and are more likely to use financing options  
37  
38 related to mortgages and housing equity. These households have the greatest tax benefits  
39  
40 associated with mortgage debt and are more creditworthy given higher incomes and greater  
41  
42 amounts of non-house equity wealth.  
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53 Concurrently, if a household decides between funding sources of consumption as  
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55 theory posits, wealth effects related to wealth composition should also exist. That is, not  
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57 only does net worth itself matter for estimating consumption elasticities, so also does the  
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4 composition of net worth. The overall assessment recognizes that a change in the  
5  
6 composition of net worth will impact consumption. For example, the marginal consumption  
7  
8 of a household with a net worth of \$800,000 composed of \$200,000 in home equity and  
9  
10 \$600,000 in financial assets would not be the same as one which has \$600,000 in home  
11  
12 equity and \$200,000 in financial assets. Financial assets are more liquid and less costly to  
13  
14 access and housing equity has a carrying cost associated with ownership (property taxes and  
15  
16 insurance, for example). Consistent with our model, the following three ratios are used to  
17  
18 evaluate the importance of net worth composition in household consumption: stock holdings  
19  
20 to net worth, home equity to net worth, and house value to net worth. Analysis based on the  
21  
22 ratio of mortgage debt to net worth is omitted since home equity is computed as the house  
23  
24 value net of outstanding mortgage debt.  
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31 Preliminary results are presented in Table 4. The top panel of Table 4 presents the  
32  
33 results based on the ratio of stock/financial holdings to net worth. The middle panel uses a  
34  
35 classification based on the ratio of house equity to net worth.<sup>8</sup> The larger the ratio of  
36  
37 stock/financial holdings to net worth, the larger a household's percentage of net worth in  
38  
39 financial assets. Cohorts are created based on the decile cohort with the highest percentage  
40  
41 of financial assets to net worth (90 – 100%), followed by the cohort composed of  
42  
43 households in the top 20% and 30% of households ranked by percentage of net worth from  
44  
45 financial assets (the 80 – 100% and the 70 – 100% cohorts). The base comparison cohort is  
46  
47 composed of households in the bottom 70% of households based on percentage of net worth  
48  
49 in stock/financial assets. The comparison cohorts are generated to reflect the skewed  
50  
51 distribution of financial wealth in the United States. The impact of housing equity is  
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58 <sup>8</sup> In our model and data, we have not considered the fractions in riskless savings deposits, thus observations  
59 are not exactly switched off in classification tiers based on the ratio of stock holdings versus that of housing  
60 equity.  
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4 minimal for the top cohorts. The housing wealth effect is not significant for the top cohorts,  
5  
6 but is for the cohort with the lowest concentration of wealth in financial assets (highest  
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8 concentration of wealth in housing assets). The magnitude of the housing equity factor  
9  
10 coefficients move from small and insignificant (0.00) to statistically significant, positive and  
11  
12 greater than zero as the cohorts' percentage of wealth in financial assets declines.  
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16 The stock wealth effect is more evident with larger coefficients for the cohorts with  
17  
18 the highest percentages of net worth in stock holdings. All coefficients are statistically  
19  
20 significant at the 1% level. The coefficients decline monotonically as the cohorts'  
21  
22 percentage of net worth in financial assets declines. Of additional interest, with the  
23  
24 exception of the group with the highest stock holdings in net worth, the mortgage  
25  
26 coefficients are all statistically significant suggesting that mortgage debt impacts  
27  
28 consumption even for those households with a greater percentage of stock holdings in net  
29  
30 worth. The income coefficients are all significant (at the 1% level) and above 0.10 which  
31  
32 implies that income remains a major determinant of consumption. A major takeaway is the  
33  
34 lack of importance of housing equity in consumption for the households with the greatest  
35  
36 proportion of wealth in stock holdings. These households' consumption is more related to  
37  
38 stock holdings and income.  
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46 In the second panel of Table 4, households are segmented based on the home equity  
47  
48 to net worth ratio. This adds robustness to the analysis. Since home equity is a potential  
49  
50 source of funding net of cash withdrawals from existing mortgage indebtedness, this ratio is  
51  
52 also relevant to the present thesis. It implicitly acknowledges that assets other than stock  
53  
54 holdings exist, although the ratio is, when operationalized, close to the reciprocal of the  
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56 stock holdings to net worth ratio. Existing equity is the component of housing value that can  
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4 be leveraged when the market condition is favorable. A lower ratio indicates a higher  
5  
6 cushion of more liquid financial wealth and a lower percentage of net worth in housing  
7  
8 wealth. A higher ratio indicates a higher percentage of net worth in housing equity.  
9

10  
11 The home equity to total wealth or net worth relation is evaluated by segmenting  
12  
13 groups based on the ratio of home equity to net worth. Four comparisons are presented: the  
14  
15 bottom 10%, bottom 20%, and bottom 30% of households based on housing equity as a  
16  
17 portion of net worth with concurrent comparison with the 70% of households with highest  
18  
19 percentage of net worth in housing equity. The results support the top panel results and show  
20  
21 that the coefficients on the home equity variable increase monotonically as we move from  
22  
23 the household cohorts with the smallest percentage of net worth in home equity (from the  
24  
25 bottom 10% to the top 70% of households) to the cohorts with the largest percentage. The  
26  
27 housing wealth effect increases from a statistically insignificant 0.0065 for the group with  
28  
29 the lowest percentage of net worth in housing equity to a statistically significant 0.0683 (at  
30  
31 the 1% level) for the group with highest percentage of net worth in housing equity.  
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38 Concurrently, the coefficients of the stock holdings factor steadily decline from a  
39  
40 statistically significant (at the 1%) 0.0436 to a statistically insignificant 0.0020. Stock  
41  
42 holdings have little impact on the consumption of the vast majority of households, but are  
43  
44 important to the subgroup of households where they are more heavily weighted as a  
45  
46 percentage of net worth. The impact of mortgage debt changes little for the cohorts while the  
47  
48 coefficients remain statistically significant for each household segment. With regard to  
49  
50 income, the households with a higher percentage of wealth in housing equity have marginal  
51  
52 income effects that are about 100% greater than the incomes effects of those with more  
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4 financial assets (the bottom 10% to top 70% comparison). The results again support the idea  
5  
6 that wealth composition matters for consumption.  
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9 The bottom panel of Table 4 presents results based on the ratio of house value to net  
10 worth which is again used to segment the overall sample. This is a less precise measure than  
11 the prior two measures, but has been used in prior studies and is thus included here. The  
12 weakness is that the ratio used to segment the sample is directly related to variables used in  
13 the previous assessments (home value less mortgage debt is housing equity). Nonetheless,  
14 the results while slightly less robust, support the prior results. Households with the lowest  
15 proportion of value to total wealth show no housing equity wealth effect. The stock variable  
16 is less robust. The magnitude of stock holdings increases when moving to the top tier, but  
17 the coefficients of stock holdings are not statistically significant. The other relations are  
18 similar. Mortgage debt is statistically significant in all cases. The coefficients on income are  
19 similar to the middle panel. For the households with the highest house value relative to  
20 wealth, the income marginal effect is the highest.  
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38 Additional robustness checks are provided in Table 5 and Table 6. Median regressions  
39 using subsamples based on a minimum net worth of \$50,000 are presented in Table 5 with  
40 Table 6 containing results from subsamples with a minimum net worth of \$100,000. This is  
41 to address the concern that low wealth level itself will artificially inflate the ratios with  
42 wealth as the denominator. In the first panel the cohorts again are segmented based on the  
43 stock to net worth ratio. For the higher net worth cohorts with a greater proportion of wealth  
44 in stocks, the housing equity coefficients show a weak relation. There is some support for  
45 the importance, at least at some level, of housing equity and consumption at all levels. When  
46 compared to the results in Table 4, both the 70 – 100 and 0 – 70 percentile samples have  
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4 larger home equity coefficients (statistically significant at the 1% level). The stock holdings  
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6 results show a larger and broader impact with all coefficients being statistically significant at  
7  
8 the 1% level. The 90 – 100 and 80 – 100 cohorts (the cohorts with greatest percentage of  
9  
10 financial assets) have much larger stock holding coefficient than in Table 4. The relation  
11  
12 between mortgage debt and consumption is similar to that in the top panel of Table 4. Again,  
13  
14 the households with highest percentage of wealth in stocks post no statistically significant  
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16 relation of mortgage balance with consumption. The income relations are similar although  
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18 the coefficients on income are lower for all household groups.  
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24 The middle panel of Table 5 shows a slight change from Table 4 with the home equity  
25  
26 and stock holdings effects being more pronounced. There are no statistically significant  
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28 relations for the two cohorts with the lowest percentage of wealth in home equity. The 30 –  
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30 100 cohort group, however, has a statistically significant coefficient (at the 1% level) that is  
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32 about 37 percent greater than the coefficient shown in Table 4. The stock holding relations  
33  
34 are similar. So too are the relations for mortgage debt and income.  
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39 The results in the bottom panel of Table 5 are qualitatively similar to those in the bottom  
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41 panel of Table 4. The only difference that stands out is related to the home equity to  
42  
43 consumption relation. The home equity coefficient for the 0 – 30 group is more significant  
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45 (at the 1%) and double the coefficient shown in Table 4. In addition, the home equity  
46  
47 coefficient for the 30 – 100 group is significant (at the 1%) and more than double the  
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49 coefficient shown in Table 4. In both situations, the housing wealth effect is much larger for  
50  
51 those households where wealth is more concentrated in housing.  
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55 The results from Table 6, which restrict the analysis to households with a net worth  
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57 greater than or equal to \$100,000 in 1982-84 dollars, highlight the prior results, especially  
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4 with regard to the housing equity and stock holdings. In the top panel the juxtaposition of  
5  
6 the housing equity and stock holdings relations is pronounced. Households in the 70 – 100  
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8 of stocking holdings as a percentage of net worth group do not post a significant housing  
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10 equity coefficient, but do post a statistically significant (at the 1% level) stock holdings  
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12 coefficient. Concurrently, households in the 0 – 70 of stocking holdings as a percentage of  
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14 net worth group post a statistically significant and large housing equity coefficient (at the  
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16 1%), but do not post a statistically significant stock holdings coefficient. The other  
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18 coefficients in the top panel of Table 6 follow previous results, although the coefficients are  
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20 slightly lower.  
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26 The middle panel again extends the top panel findings. The home equity and stock  
27  
28 holdings coefficients remain consistent with the basic hypotheses. The stock holdings effect  
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30 is limited to the group with the least amount of net worth from housing equity. The pattern  
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32 in the bottom panel is similar to the middle panel of Table 6 and prior Tables 4 and 5.<sup>9</sup>  
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36 The empirical analysis highlights three substantial points. First, while wealth, housing,  
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38 income, and consumption relations are evident over time and in aggregate, their statistical  
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40 significance and magnitude have substantial variability. There are no generic marginal  
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42 effects. Second, in a country with skewed wealth distribution like the United States,  
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44 marginal effects differ across the distribution of wealth. Households with the highest level of  
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46 wealth evidence different wealth, income and consumption relations and are more likely to  
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52 <sup>9</sup> Direct comparisons of the 90 to 100%, 80 to 90%, 70 to 80%, and 0 to 70% stock holdings as a  
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54 percentage of net worth household groups as well as comparisons of the households segmented based on  
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56 ratio of home equity to net worth from 0 to 10%, 10 to 20%, 20 to 30%, and 30 to 100% provide  
57  
58 complementary and confirmatory results as well. The households with the largest portion of net worth in  
59  
60 financial assets (the 90 to 100% group in the first measure and 0 to 10% group in the second measure) have  
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62 statistically significant and large coefficients indicative of a greater impact of stocks on consumption. For  
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64 example, the coefficient of the stock holdings variable for the 0 to 10% home equity to net worth group is  
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-0.0436 (and significant at the 1% level), while the coefficients for the other three groups in order are 0.0068,  
-0.0187, and 0.0020, respectively and are not statistically significant.

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4 be involved with debt markets that facilitate consumption. Third, composition of wealth  
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6 matters. Households with greater net worth in financial assets relative to real estate equity  
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8 evidence marked differences in consumption patterns. Consumption by high net worth  
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10 households with a greater percentage of net worth in financial assets is primarily related to  
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12 financial assets and not housing wealth.  
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## 15 16 17 18 19 5. Conclusions 20

21 A basic understanding of the relations between financial wealth, housing wealth, income  
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23 and consumption provides a foundation for evaluating economic policies and assessing  
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25 prospective economic activity. While the underlying theoretical underpinnings of these  
26  
27 relations are well-established, empirical assessment has produced ambiguous results.  
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29 Empirical application of theory is extended through the latest real estate boom and bust  
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31 cycle, use of controls for skewed wealth levels in the United States, and by investigating the  
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33 *relative composition* of household net worth.  
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38 The statistical significance and magnitude of the relations between financial wealth,  
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40 housing wealth, income, and consumption change over time. The influence of these factors  
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42 is subject to large fluctuations. This implies needed care in assessing wealth and housing  
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44 effects. There are no out of the box marginal effects that are accurate for all economic cycles.  
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46 The marginal impacts are best understood within the context of concurrent economic market  
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48 conditions. In addition, we also show that level of household wealth influences marginal  
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50 consumption patterns including the magnitude and appearance of financial wealth, housing  
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52 wealth, and income effects. The differences in magnitude and statistical significance are  
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54 large with practical implications.  
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More important, by acknowledging that the holdings of financial assets are skewed and that the *relative composition* of wealth matters, the literature is further extended. Households with greater net worth and those with more financial assets relative to housing equity exhibit different consumption patterns than other households. Consumption by high net worth households with a greater percentage of net worth tied to financial assets is more related to financial assets and not housing wealth. The magnitude of the stock holdings effect is meaningful for the subset of households with the majority of their assets in financial assets.

A need for additional assessment of consumption patterns is evident. The movement of retirement benefits to defined contribution plans, the reduction in the percentage of workers covered by defined benefit retirement plans, the aging of the boomer generation, and a requirement to be more active in one's own retirement planning will likely change consumption patterns. This suggests continued debate.

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7 6. References  
8

- 9 Belsky, E., & Prakken, J. (2004) Housing wealth effects: housings impact on wealth  
10 accumulation, wealth distribution, and consumer spending. National Center for Real  
11 Estate Report W04-13. Harvard University, Boston. [http://www.jchs.harvard.edu/  
12 publications/finance/w04-13.pdf](http://www.jchs.harvard.edu/publications/finance/w04-13.pdf).  
13  
14  
15 Benjamin, J. D., Chinloy, P., & Jud, G. D. (2004a). Real estate versus financial wealth in  
16 consumption. *Journal of Real Estate Finance and Economics*, 29, 341-354.  
17  
18 Benjamin, J. D., Chinloy, P., & Jud, G. D. (2004b). Why do households concentrate their  
19 wealth in housing? *Journal of Real Estate Research*, 26, 329-343.  
20  
21 Benjamin, J. D., & Chinloy, P. (2008). Home equity, household savings and consumption.  
22 *Journal of Real Estate Finance and Economics*, 37, 21-32.  
23  
24  
25 Bhatia, K. B. (1987). Real estate assets and consumer spending. *Quarterly Journal of  
26 Economics*, 102, 437-444.  
27  
28  
29 Bostic, R., Gabriel, S., & Painter, G. (2009). Housing wealth, financial wealth, and  
30 consumption: new evidence from micro data. *Regional Science and Urban  
31 Economics*, 39, 79-89.  
32  
33  
34 Campbell, J. Y., & Cocco, J. (2007). How do house prices affect consumption? Evidence  
35 from Micro data. *Journal of Monetary Economics*, 54, 591-621.  
36  
37  
38 Carroll, C. D. , Otsuka, M., & Slacalek, J. (2011). How large is the housing wealth effect?: a  
39 new approach. *Journal of Money, Credit, and Banking*, 43,  
40  
41  
42 Case, K., Quigley, J., & Shiller, R. J. (2005). Comparing wealth effects: the stock market  
43 versus the housing market. *Advances in Macroeconomics*, 5, Article 1.  
44  
45  
46 Disney, R., Gathergood, P., & Henley, A. (2010). House price shocks, negative equity and  
47 household consumption in the United Kindgom. *Journal of the European Economic  
48 Association*, 8, 1179–1207.  
49  
50  
51 Elliot, J. W. (1980). Wealth and wealth proxies in a permanent income model. *Quarterly  
52 Journal of Economics*, 95, 509-535.  
53  
54  
55 Engelhardt, G. V. (1996). House prices and home owner saving behavior. *Regional Science  
56 and Urban Economics*, 26, 313–36.  
57  
58 Englund, P., Hwang, M. & Quigley, J. M. 2002. Hedging housing risk. *Journal of Real  
59 Estate Finance and Economics*, 24, 167-200.  
60  
61  
62  
63  
64  
65



- 1  
2  
3  
4  
5  
6 Flavin, M., & Yamashita, T. (2002). Owner-occupied housing and the composition of the  
7 household portfolio. *American Economic Review*, 92, 345-62.  
8  
9  
10 Flavin, M., & Nakagawa, S. (2008). A Model of Housing in the Presence of Adjustment  
11 Costs: A Structural Interpretation of Habit Persistence. *American Economic Review*,  
12 98(1), 474-495.  
13  
14  
15 Flavin, M., & Yamashita, T. (2011). Owner-occupied housing: life-cycle implications for  
16 the household portfolio. *American Economic Review: Papers & Proceedings*, 609-  
17 614.  
18  
19  
20 Goodman, A. C., & Kawai, M. (1982). Permanent income, hedonic prices, and demand for  
21 housing: New evidence, *Journal of Urban Economics*, 12, 214 – 237.  
22  
23  
24 Greenspan, A. & Kennedy, J. (2005). Sources and uses of equity extracted from homes.  
25 *Oxford Review of Economic Policy*, 24, 120-144.  
26  
27  
28 Grossman, S. J., & Laroque, G. (1990). Asset pricing and optimal portfolio choice in the  
29 presence of illiquid durable consumption goods, *Econometrica*, 58, 25-51.  
30  
31  
32 Kishor, N. K. (2007). Does consumption respond more to housing wealth than to financial  
33 market wealth? If so, why? *Journal of Real Estate Finance and Economics*, 35, 427-  
34 448.  
35  
36  
37 Koo, H. K. (1998). Consumption and portfolio selection with labor income: a continuous  
38 time approach. *Mathematical Finance*, 8, 49-65.  
39  
40  
41 Kraft, H., & Munk, C. (2011). Optimal housing, consumption, and investment decisions  
42 over the life cycle. *Management Science*, 57, 1025-1041.  
43  
44  
45 Iacoviello, M., & Ortalo-Magne, F. (2003). Hedging housing risk in London. *Journal of Real*  
46 *Estate Finance and Economics*, 27, 191-209.  
47  
48  
49 Lehnart, A. (2003). Housing, consumption, and credit constraints. Board of Governors of the  
50 Federal Reserve System.  
51  
52  
53 Lettau, M., & Ludvigson, S. (2004). Understanding trend and cycle in asset values:  
54 reevaluating the wealth effect on consumption. *American Economic Review*, 94,  
55 276–29.  
56  
57  
58 Muellbauer, J. N. (2007), Housing, credit, and consumer expenditure. *Housing, Housing*  
59 *Finance, and Monetary Policy*, Conference Proceedings, Federal Reserve Bank of  
60 Kansas City.  
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Piazzesi, M., Schneider, M., & Tuzel, S. (2007). Housing, consumption and asset pricing. *Journal of Financial Economics*, 83, 531-569.

Skinner, J. (1989). Housing wealth and aggregate saving. *Regional Science and Urban Economics*, 19, 305-324.

Skinner, J. S. (1996). Is housing wealth a sideshow? Advances in the economics of aging, National Bureau of Economic Research Report. University of Chicago Press, Chicago, Il, 241–268.

Slacalek, J. (2009). What drives personal consumption? The role of housing and financial wealth. *B. E. Journal of Macroeconomics*, 9, article 37.

Stokey, N. L. (2009). Moving costs, nondurable consumption and portfolio choice. *Journal of Economic Theory*, 144, 2419-2439.

Table 1. Summary statistics

	1994 (obs. 965)			1999 (obs. 583)			2001 (obs. 637)		
	Median	Mean	Std. Dev	Median	Mean	Std. Dev	Median	Mean	Std. Dev
Age	43	43.3	9.3	45	45.0	9.3	46	45.6	9.3
Family size	3	3.2	1.3	3	3.1	1.3	3	3.2	1.4
Marital status		0.84	0.37		0.86	0.35		0.84	0.37
Income	41,835	49,327	45,173	48,019	60,276	65,181	46,584	58,836	58,708
Mortgage balance	43,522	52,443	41,433	49,220	60,693	45,009	50,819	60,510	51,599
Home equity	33,063	47,615	51,549	42,017	56,112	53,697	47,995	67,868	84,890
Stockholdings	13,495	39,025	87,370	15,006	52,498	120,837	12,422	46,352	100,188
Net worth	90,486	180,159	370,919	128,752	269,667	778,659	143,987	255,438	781,377

  

	2003 (obs. 965)			2005 (obs. 583)			2007 (obs. 637)		
	Median	Mean	Std. Dev	Median	Mean	Std. Dev	Median	Mean	Std. Dev
Age	47	46.8	10.0	47	47.4	10.2	48	48.2	10.3
Family size	3	3.0	1.3	3	3.0	1.2	3	2.9	1.3
Marital status		0.84	0.37		0.85	0.36		0.85	0.36
Income	43,478	56,983	89,456	46,250	62,180	111,530	46,551	60,477	60,520
Mortgage balance	55,163	69,992	65,846	62,274	78,182	71,311	62,711	79,834	75,679
Home equity	58,424	82,497	99,432	67,076	103,037	137,651	75,216	114,246	162,206
Stockholdings	13,587	50,891	119,265	12,801	55,131	152,673	14,469	75,326	246,506
Net worth	148,370	271,708	479,053	173,451	353,996	1,049,661	194,487	395,802	988,101

All values are in constant 1982-84 dollars.

Table 2. Median regressions of consumption for all observations and across years

Independent Variables	All years	1994	1999	2001	2003	2005	2007
Log of home equity	0.0244***	0.0275***	0.0188	0.0424***	0.0603***	0.0060	0.0092
Log of stock holdings	0.0112***	0.0089	0.0120	-0.0043	0.0028	0.0159*	0.0193*
Log of mortgage balance	0.0451***	0.0451***	0.0329	0.0834***	0.0804***	0.0987***	0.0374*
Log of income	0.1119***	0.0503***	0.1316***	0.1149***	0.1034***	0.1123***	0.1564***
Age	0.0144***	0.0180**	0.0277*	0.0127	0.0176	0.0283**	0.0009
Age squared	-0.0001	-0.0002	-0.0001	-0.0001	-0.0002	-0.0002*	0.0001
Family size	0.0948***	0.1048***	0.0879***	0.0795***	0.1133***	0.0877***	0.1016***
Marital Status	0.1653***	0.1489***	0.1601**	0.1834***	0.1282	0.1795***	0.1146*
Dummy: year 1999	-0.9682***						
Dummy: year 2001	-0.9069***						
Dummy: year 2003	-0.8438***						
Dummy: year 2005	-0.7946***						
Dummy: year 2007	-0.0128						
Constant	6.6016***	7.2601***	5.4108***	5.4012***	5.1522***	5.1709***	6.6731***
Observations	3948	965	583	637	604	584	575
Pseudo r <sup>2</sup>	0.4242	0.1699	0.1717	0.1565	0.1950	0.1538	0.1860

Results are from median regressions. The dependent variable is the logarithm of total non-durable consumption. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5% and 10% levels, respectively. For year dummy variables, the default year is 1994. The other variables are self-defined.

Table 3: Median regressions of consumption for segmented by net worth percentile groups

Independent Variables	Classification based on terciles of net worth					
	Top 1/3	Bottom 2/3	Top 1/5	Bottom 4/5	Top 1/10	Bottom 9/10
Log of home equity	0.0485***	0.0167***	0.0501***	0.0184***	0.0671**	0.0223***
Log of stock holdings	0.0171**	0.0002	0.0219*	0.0037	0.0322	0.0059
Log of mortgage balance	0.0694***	0.0536***	0.0799***	0.0516***	0.1079***	0.0523***
Log of income	0.0768***	0.1157***	0.0725***	0.1101***	0.0500*	0.1147***
Observations	1315	2633	788	3160	393	3555
Pseudo r <sup>2</sup>	0.3729	0.4427	0.3659	0.4343	0.3500	0.4298

Results are from median regressions. The dependent variable is the logarithm of total non-durable consumption. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5% and 10% levels, respectively. For year dummy variables, the default year is 1994. Control variables include household head age, family size, and marital status. The control variable results not presented are as expected. The table focus is the variables of interest.

Table 4. Median regressions of consumption by composition of net worth by percentile

Percentiles groups based on stock holding to net worth ratio				
Independent Variables	90 – 100 Percentile	80 – 100 Percentile	70 – 100 Percentile	0 – 70 Percentile
Log of home equity	0.0066	0.0063	0.0141*	0.0249***
Log of stock holdings	0.0545***	0.0516***	0.0411***	0.0155***
Log of mortgage balance	0.0336	0.0807***	0.0786***	0.0511***
Log of income	0.1294***	0.1180***	0.1059***	0.1046***
Observations	395	792	1,183	2,761
Pseudo R <sup>2</sup>	0.5016	0.4572	0.4519	0.4145
Percentiles groups based on home equity to net worth ratio				
Independent Variables	0 – 10 Percentile	0 – 20 Percentile	0 – 30 Percentile	30 – 100 Percentile
Log of home equity	0.0065	0.0130*	0.0154***	0.0683***
Log of stock holdings	0.0436***	0.0220**	0.0137**	0.0020
Log of mortgage balance	0.0701**	0.0636***	0.0714***	0.0548**
Log of income	0.0520**	0.0625***	0.0769***	0.1089***
Observations	394	789	1,184	2,761
Pseudo R <sup>2</sup>	0.3790	0.3874	0.3929	0.4401
Percentiles groups based on home value to net worth ratio				
Independent Variables	0 – 10 Percentile	0 – 20 Percentile	0 – 30 Percentile	30 – 100 Percentile
Log of home equity	0.0118	0.0147	0.0169*	0.0241***
Log of stock holdings	0.0272	0.0100	0.0109	0.0066
Log of mortgage balance	0.0598*	0.0673***	0.0696***	0.0602***
Log of income	0.0496	0.0762***	0.0738***	0.1432***
Observations	394	789	1,184	2,761
Pseudo R <sup>2</sup>	0.3506	0.3651	0.3907	0.4398

Results are from median regressions. The dependent variable is the logarithm of total non-durable consumption. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5% and 10% levels, respectively. For year dummy variables, the default year is 1994. Control variables include household head age, family size, and marital status. The control variable results not presented are as expected. The table focus is on the variables of interest. The top panel measures stock holdings as a percentage of net worth. The middle panel measures housing equity as a percentage of net worth with final panel measuring housing value as a percentage of net worth. The results are presented so that the table is consistent in the presentation of the importance of net worth composition inclusive of the percentage of net worth in financial assets.

Table 5. Median regressions of consumption for households with net worth at or above \$50,000

Percentiles groups based on stock holding to net worth ratio				
Independent Variables	90 – 100 Percentile	80 – 100 Percentile	70 – 100 Percentile	0 – 70 Percentile
Log of home equity	0.0341*	0.0136	0.0366***	0.0373***
Log of stock holdings	0.0971***	0.0655***	0.0425**	0.0107*
Log of mortgage balance	0.0258	0.0719***	0.0825***	0.0570***
Log of income	0.0861**	0.1048***	0.0891***	0.0776***
Observations	321	640	961	2,241
Pseudo R <sup>2</sup>	0.4840	0.4443	0.4437	0.3960
Percentiles groups based on home equity to net worth ratio				
Independent Variables	0 – 10 Percentile	0 – 20 Percentile	0 – 30 Percentile	30 – 100 Percentile
Log of home equity	0.0049	0.0149	0.0148*	0.0940***
Log of stock holdings	0.0395***	0.0237*	0.0131	0.0002
Log of mortgage balance	0.0854***	0.0629**	0.0769***	0.0548**
Log of income	0.0412*	0.0604**	0.0720***	0.1089***
Observations	320	640	961	2,241
Pseudo R <sup>2</sup>	0.3579	0.3758	0.3852	0.4220
Percentiles groups based on home value to net worth ratio				
Independent Variables	0 – 10 Percentile	0 – 20 Percentile	0 – 30 Percentile	30 – 100 Percentile
Log of home equity	0.0124	0.0137	0.0324***	0.0527***
Log of stock holdings	0.0221	0.0182*	0.0109	0.0030
Log of mortgage balance	0.0728*	0.0719***	0.0768***	0.0635***
Log of income	0.0200	0.0736***	0.0724***	0.1009***
Observations	319	640	961	2,242
Pseudo R <sup>2</sup>	0.3644	0.3542	0.3823	0.4202

Results are from median regressions. The dependent variable is the logarithm of total non-durable consumption. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5% and 10% levels, respectively. For year dummy variables, the default year is 1994. Control variables include household head age, family size, and marital status. The control variable results not presented are as expected. The table focus is on the variables of interest. The top panel measures stock holdings as a percentage of net worth. The middle panel measures housing equity as a percentage of net worth with final panel measuring housing value as a percentage of net worth. The results are presented so that the table is consistent in the presentation of the importance of net worth composition inclusive of the percentage of net worth in financial assets.

Table 6. Median regressions of consumption for households with net worth at or above \$100,000.

Percentiles groups based on stock holding to net worth ratio				
Independent Variables	90 – 100 Percentile	80 – 100 Percentile	70 – 100 Percentile	0 – 70 Percentile
Log of home equity	0.0470***	-0.0051	0.0206	0.0376***
Log of stock holdings	0.1074***	0.0949***	0.0764***	0.0064
Log of mortgage balance	0.0416*	0.0634***	0.0778***	0.0582***
Log of income	0.0895***	0.0991***	0.0813***	0.0797***
Observations	237	475	713	1,667
Pseudo R <sup>2</sup>	0.4842	0.4547	0.4443	0.3770
Percentiles groups based on home equity to net worth ratio				
Independent Variables	0 – 10 Percentile	0 – 20 Percentile	0 – 30 Percentile	30 – 100 Percentile
Log of home equity	0.0018	0.0133	0.0185*	0.0683***
Log of stock holdings	0.0367**	0.0255*	0.0121	-0.0050
Log of mortgage balance	0.0949**	0.0873***	0.0734***	0.0575***
Log of income	0.0310	0.0655***	0.0754***	0.0909***
Observations	237	475	713	1,667
Pseudo R <sup>2</sup>	0.3710	0.3609	0.3748	0.4509
Percentiles groups based on home value to net worth ratio				
Independent Variables	0 – 10 Percentile	0 – 20 Percentile	0 – 30 Percentile	30 – 100 Percentile
Log of home equity	0.0059	0.0045	0.0195	0.0525***
Log of stock holdings	0.0368**	0.0187	0.0106	-0.0029
Log of mortgage balance	0.0772***	0.0377	0.0718***	0.0658***
Log of income	0.0127	0.0661***	0.0742***	0.0991***
Observations	238	476	714	1,668
Pseudo R <sup>2</sup>	0.3892	0.3724	0.3581	0.4101

Results are from median regressions. The dependent variable is the logarithm of total non-durable consumption. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5% and 10% levels, respectively. For year dummy variables, the default year is 1994. Control variables include household head age, family size, and marital status. The control variable results not presented are as expected. The table focus is the variables of interest. The top panel measures stock holdings as a percentage of net worth. The middle panel measures housing equity as a percentage of net worth with final panel measuring housing value as a percentage of net worth. The results are presented so that the table is consistent in the presentation of the importance of net worth composition inclusive of the percentage of net worth in financial assets.