Three Essays on Home Equity, Mortgage Distress, Consumption, and Assets Management during the Financial Crisis

by

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To the Memory of My Grandmother

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Abstract

There are three independent essays in my dissertation with the analysis of Home Equity, Mortgage Distress, Consumption, and Assets Management during the Financial Crisis. The financial crisis began in middle 2008 and affected households in many aspects. My dissertation can let us have a better understanding of the effect of financial crisis on households and some of their responses to the crisis.

The first essay analyzes the effect of financial crisis on household consumption. The results indicate that the financial crisis affected household consumption behavior not only through decreasing income and wealth but also through changing the household's consumption responses to changes of home equity and other financial status.

The second essay studies borrowing decisions and other factors related to the run-up in housing prices in 1999-2007, their precipitous decline in 2007-2009, and how they contributed to mortgage distress and foreclosures as of 2009-2011. Often expecting further price appreciation or responding to a positive family labor market and income circumstance, homeowners, supported by their lenders, allocated too much of their family income to support house payments and put themselves in a risky position.

The third essay explores the financial behavior of households with respect to stock market participation, both in a time of rising equity values and then a substantial overall decline. The repeated panels show some decline in new entrants to the stock market and also some rise in exits from the stock market when comparing 2007-09 to 2005-07. In terms of life cycle effects,

families headed by a person age 65 or older were less likely to exit in good times (2005-07) and were more likely to become stock owners in both 2005-07 and 2007-09. Families experiencing home mortgage payment difficulties are shown to have been more likely to sell equities and to not become new participants. In this way the adverse changes in one asset category (owner occupied housing) connect to a change in the demand for another asset category (stocks). This is a financial channel implying related co-movements in two major asset categories.

Chapter 1: The Effects of Home Equity and Other Financial Assets on Household Consumption of Food Expenditures and Vehicle Acquisition During the Financial Crisis

1. Introduction

The largest single, non-pension asset in the asset portfolio of many households is housing equity, which accounts for more than 35% of the median overall household's wealth (Hurst, Luoh, and Stafford 1998). Wolff (2010) shows that 33% of a household's total assets were composed of owner-occupied housing in 2007. Numerous studies show that consumption and housing equity or wealth are highly correlated (Lambertini, Mendicino, and Punzi 2010 and Iacoviello 2011). In addition, Bostic, Gabriel, and Painter (2009) and Dvornak and Kohler (2003) show the effect of housing wealth on consumption.

The co-movements between housing wealth and consumption may be different across different consumption categories. Bostic, Gabriel, and Painter (2009) show that non-durable consumption is more sensitive to changing housing wealth, while durable consumptions are more sensitive to the change in financial wealth. Through analyzing Health and Retirement Study data, Sun (2010) finds that non-durable consumption for the elderly is greatly affected by changes in housing wealth. The information about the differing co-movements between housing wealth and various consumption categories is important for firms and government policy makers. They can take more effective action based on this knowledge.

There are three main explanations for the co-movements between housing wealth and consumption in the literature. Firstly, households determine consumption levels based on their life-cycle overall wealth. The change of housing wealth results in the change of life-cycle overall wealth, and then results in the change of consumption. This explanation is supported by Case, Quigley, and Shiller (2005), Campbell and Cocco (2007), Bostic, Gabriel, and Painter (2009), and Carroll, Otsuka, and Slacalek (2011).

Secondly, there are some common factors that drive both housing wealth and consumption. The movement of those common drivers, while not the causal relationship between housing wealth and consumption, produces the co-movements of housing wealth and consumption. King (1990) and Pagano (1990) argue that expected future income increases may drive both the housing wealth and consumption. Attanasio and Weber (1994) and Attanasio, Blow, Hamilton, and Leicester (2008) also support this argument.

Thirdly, increased housing wealth can act as collateral to relax the borrowing constraint of households, and then they can change current consumption levels to smooth life-cycle consumption (Bernanke and Gertler 1989, Hurst and Stafford 2004, and Cooper 2009).

Besides these factors, the 2005-2009 period was characterized by the onset of a pronounced decline in the labor market. Unemployment rose dramatically from 4.6% in June 2007 to more than 9.0% in the summer of 2009. How did these co-occurring factors shape consumption expenditures? I also include the employment status of the household head in the empirical analysis.

This paper focuses on the time period of 2007-2009 to estimate the effect of change in home equity, while also including other independent variables, such as income, wealth without

home equity, and employment status of head, on consumption of food and vehicle expenditures. The Panel Study of Income Dynamics (PSID) main family data are used in this paper. PSID main family data have more than 8,000 observations with over 5,000 variables in the areas of housing, utilities, employment status, income, wealth, pension, and the consumption categories of childcare, food, vehicles, and other transportation.

Before the empirical analysis, I constructed a theoretical model and implemented computer simulations to capture the effect of home equity on household consumption expenditures. Home equity works as a buffer stock to smooth future household consumption. A household with a substantial negative home equity ("underwater") will default on mortgage payments in the context of utility maximization over time. This result is supported by the empirical analysis in this paper.

There are four main features in this paper compared with the previous literature:

(1) The theoretical model not only captures the role of home equity and household income but also includes the possibility of mortgage foreclosure for a household with a deep "underwater" home equity position.

(2) The new opportunity to focus on a period with major housing price slump in numerous major housing markets. The effect of home equity change on consumption during this kind of period may be different from the effect during more stable periods because of the speed and extent of the decrease in home equity.

(3) PSID has more detailed measures in home equity, other wealth without home equity, income, employment status, and consumption, and all those measures are at the household level. This micro data structure allows us to work with more flexible models. Some existing literature

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also uses household level micro data, such as data from Family Expenditure Survey (FES) and Consumer Expenditure Survey (CE). Some studies separate consumption into durable and nondurable categories, but only a very limited amount of recent literature focuses on the analysis of more detailed consumption categories, such as food eaten at home expenditures and food eaten out expenditures (Hofferth and Curtin (2005)). Hall and Mishkin (1982) and Skinner (1987) used the PSID food consumption expenditure data several decades ago. In addition, the detailed measures of household wealth and employment status in the PSID data can allow a more comprehensive analysis. For example, if government policy makers and U.S. auto producers have more specific information about the household's vehicle consumption in response to a financial crisis, they can take more effective action to deal with financial disturbances.

(4) Both home owners and renters are analyzed in this paper, and significantly different consumption behaviors are found between those two groups. The differences may result from other factors besides home equity, such as overall wealth.

Empirical analysis shows that the change of food eaten at home expenditure is not significantly affected by the change of household financial status, while both the change of expenditure for food eaten out and the vehicle acquisition decision are significantly affected in response to the change of household financial status, and the responses differ across the two sub-periods of 2005-2007 and 2007-2009. Whether the head of household ("head") has a job is more crucial to the vehicle acquisition decision for renters than for home owners.

Blinder-Oaxaca Decomposition is a method that allows one to characterize households' different consumption responses to changes in financial status before and during the financial

crisis based on a changing regression structure. Specifically, there is a significant "coefficients effect" for the change in food eaten out expenditures and vehicle acquisition. Households changed their consumption attitudes toward food eaten out and vehicles during the financial crisis, a result consistent with expectations as measured by declining consumer confidence as the recession was setting in. Further, the Blinder-Oaxaca Decomposition result shows that, in response to the financial crisis, home owners adjusted vehicle consumption at a more significant level than did renters.

In addition, mortgage foreclosure is analyzed in this paper. Households with deep "underwater" mortgages are more likely to foreclose their mortgages.

One application of the above results is that the government should build household confidence for the future by implementing and explaining policies to control the business cycle because household confidence can significantly affect the current period consumption. To stimulate the economy, the government needs to increase the confidence of both investors and households.

The rest of this paper is organized as follows: section 2 discusses the theoretical model; section 3 presents the numerical simulation; section 4 presents the empirical analysis, including the empirical analysis for food expenditure, the empirical analysis for vehicle acquisition, the Blinder-Oaxaca Decomposition analysis, and the foreclosure analysis; and section 5 is the conclusion.

2. Theoretical Model

The S-Branch utility function is introduced by Brown and Heien (1972). It permits more flexibility in estimates of the elasticity of demand as well as complements and substitutes than the Constant Elasticity of Substitution function. The following is the S-Branch utility function:

$$U = \left\{ \sum_{s=1}^{S} \alpha_s \left[\sum_{i \in s}^{n_s} \beta_{si}(c_{si} - \gamma_{si})^{\rho_s} \right]^{\rho/\rho_s} \right\}^{1/\rho}$$

There are n consumption goods, and they are separated into S groups. For group s, there are n_s kinds of goods. c_{si} is the consumption of good i in group s. γ_{si} is the minimum consumption of good i in group s. α_s is the utility weight of the consumption of goods in group s. $\rho = 1 - \frac{1}{\sigma} < 1$ and $\rho_s = 1 - \frac{1}{\sigma_s}$, σ and σ_s are parameters related to the partial elasticity of substitution ($\sigma_{si,mj}$) between the additional consumption of $c_{si} - \gamma_{si}$ and the additional consumption of $c_{mj} - \gamma_{mj}$. $\sigma_{si,mj} = \sigma$ if $s \neq m$ and $\sigma_{si,mj} = \sigma + \frac{1}{w_s}(\sigma_s - \sigma)$ if $s = m$, where $w_s = \sum_{j \in s}^{n_s} p_{sj}(c_{sj} - \gamma_{sj}) / (m - \sum_{s=1}^{S} \sum_{i \in s}^{n_s} p_{si}\gamma_{si})$, and m is the available money for consumption.

Given the available amount of money to consume (m_t) in any period t, the household's one period optimal consumption is solved by Brown and Heien (1972).

$$c_{sit} = \gamma_{si} + \left(\frac{\beta_{si}}{p_{sit}} \right)^{\sigma_s} \left[\alpha_s^\sigma X_{st}^{((\sigma-1)/(\sigma_s-1))-1} \right] \left[\sum_{r=1}^{S} \alpha_r^\sigma X_{rt}^{((\sigma-1)/(\sigma_r-1))} \right]^{-1} \left(m_t - \sum_{r=1}^{S} \sum_{j \in r}^{n_r} p_{rj}\gamma_{rj} \right) \quad (1)$$

where p_{sit} is the price of goods i in group s at time t, and $X_{st} = \sum_{j \in s}^{n_s} \left(\frac{\beta_{sj}}{p_{sjt}} \right)^{\sigma_s} p_{sjt}$.

Under the framework of the S-Branch utility function, the household first needs to buy the minimal amount of consumption of each good (γ_{si}). If there is available money left after buying the required minimal consumption, the household will allocate the remaining money to goods with different weights, and there can be both substitutability and complementarity. If the household cannot afford the minimum consumption in one period because of low income and negative asset value, the government will pay the uncovered cost of minimum consumption to meet needs for survival.

In a dynamic model, the partial utility in terms of c_{sit} can be expressed as

$$\frac{\partial U}{\partial c_{sit}} = p_{sit}\lambda_{sit}$$

λ_{sit} is a nominal dollar's dynamic companion value related to both the current and future cash flows. When a household is pessimistic about the future, the value of λ_{sit} will increase, resulting in a decrease in current consumption, and the adjustment will be greater for the price elastic consumption components.

I apply the S-Branch utility function in this paper to analyze some major consumption categories, and within each category there are several components of consumption. The model is built on the framework of the Deaton Buffer-Stock Model (Deaton 1991). I include more elements to consider the mortgage default case. A household enters each period with a home equity of HE_t, an outstanding mortgage of Mor_t and a current income y_t. The home equity in this model can be extended to denote all household financial assets. These assets function as a buffer stock for a household's smooth consumption over time. The household can tap into home equity by re-financing the home mortgage. The household can choose to default in each period. Under default, the household will consume whatever is available in the current period and have zero home equity and outstanding mortgage in the next period. The household needs to pay a

penalty of N if it plans to borrow again in the future.[1] If the household does not default, it needs

to pay the mortgage interest and can use its home equity as a resource to smooth consumption on

better terms. There is an upper limit of outstanding mortgage, $Mor_t < \overline{Mor}$, in each period.

To simplify the model, I will not analyze the effect of prices in this paper. This is in part

because, during the financial crisis, there were no major changes in relative prices or price levels

for consumption goods,[2] except that the relative cost of housing changed significantly. I assume

that all the prices in the model are 1. There are two possible income levels in each period, low

level income y_l and high level income y_h. The evolution of income level follows a Markov

Chain process. The transition matrix is given by:

$$\begin{bmatrix} P_{ll} & P_{lh} \\ P_{hl} & P_{hh} \end{bmatrix}$$

$P_{ij} = P(y_{t+1} = y_j | y_t = y_i)$. I assume that $P_{ll} = P_{hh} = P$ in the model. Thus, the transition

matrix is:

$$\begin{bmatrix} P & 1-P \\ 1-P & P \end{bmatrix}$$

The household's problem at current period t is:

$$U(HE_t, Mor_t, y_t) = \max\{D(y_t), P(HE_t, Mor_t, y_t)\} \qquad (2)$$

where $D(y_t)$ is the valuation function of default and $P(HE_t, Mor_t, y_t)$ is the valuation function

of non-default.

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[1] In the case of default, the resulting credit score would lead to higher costs for a whole range of products, ranging from credit costs to insurance premiums on autos.
[2] http://seekingalpha.com/article/91714-the-economic-consequences-of-falling-oil-prices

$$D(y_t) = \max_{c_{sit}} \left\{ \left\{ \sum_{s=1}^{S} \alpha_s \left[\sum_{i \in s}^{n_s} \beta_{si}(c_{sit} - \gamma_{si})^{\rho_s} \right]^{\frac{\rho}{\rho_s}} \right\}^{\frac{1}{\rho}} \right\} + \beta max E\{D(y_{t+1}), P(0,0,y_{t+1}) - N\} \quad (3)$$

subject to

$$y_t = \sum_{s=1}^{S} \sum_{i \in s}^{n_s} p_{sit} c_{sit} \quad (4)$$

$P(HE_t, Mor_t, y_t)$

$$= \max_{c_{sit}} \left\{ \left\{ \sum_{s=1}^{S} \alpha_s \left[\sum_{i \in s}^{n_s} \beta_{si}(c_{sit} - \gamma_{si})^{\rho_s} \right]^{\frac{\rho}{\rho_s}} \right\}^{\frac{1}{\rho}} \right\}$$

$$+ \beta \max E\{D(y_{t+1}), P(HE_{t+1}, Mor_{t+1}, y_{t+1})\} \quad (5)$$

subject to

$$HE_{t+1} = HE_t + y_t - M_t r - \sum_{s=1}^{S} \sum_{i \in s}^{n_s} p_{sit} c_{sit} \quad (6)$$

$$Mor_{t+1} = Mor_t + (HE_t - HE_{t+1}) \quad (7)$$

$$Mor_{t+1} < \overline{Mor} \quad (8)$$

Theorem 1: $P(HE'_t, Mor_t, y_t) > P(HE_t, Mor_t, y_t)$ if $HE'_t > HE_t$

$$P(HE_t, Mor_t, y_t) > P(HE_t, Mor'_t, y_t) \text{ if } Mor'_t > Mor_t$$

Proof: Suppose c_{sit}^*, HE_{t+1}^*, and Mor_{t+1}^* are the optimal current consumption and next period home equity and outstanding mortgage if the current home equity, outstanding mortgage, and income level are HE_t, Mor_t, and y_t. Since $HE_t' > HE_t$, c_{sit}^*, HE_{t+1}^*, and Mor_{t+1}^* are affordable if the current home equity is HE_t' and current outstanding mortgage and income level are Mor_t and y_t respectively.

$$P(HE_t, Mor_t, y_t)$$

$$= \left\{ \sum_{s=1}^{S} \alpha_s \left[\sum_{i \in s}^{n_s} \beta_{si} (c_{sit}^* - \gamma_{si})^{\rho_s} \right]^{\frac{\rho}{\rho_s}} \right\}^{\frac{1}{\rho}}$$

$$+ \beta \max E\{D(y_{t+1}), P(HE_{t+1}^*, Mor_{t+1}^*, y_{t+1})\}$$

$$P(HE_t', Mor_t, y_t)$$

$$\geq \left\{ \sum_{s=1}^{S} \alpha_s \left[\sum_{i \in s}^{n_s} \beta_{si} (c_{sit}^{**} - \gamma_{si})^{\rho_s} \right]^{\frac{\rho}{\rho_s}} \right\}^{\frac{1}{\rho}}$$

$$+ \beta \max E\{D(y_{t+1}), P(HE_{t+1}^*, Mor_{t+1}^*, y_{t+1})\}$$

If the household choose HE_{t+1}^* and Mor_{t+1}^* as the next period home equity and mortgage, c_{sit}^{**} is larger than c_{sit}^* in the above equations because $HE_t' > HE_t$. In addition, the distribution of $\{y_{t+1}|y_t\}$ is the same for both cases because they have the same y_t.

Thus, $P(HE_t', Mor_t, y_t) > P(HE_t, Mor_t, y_t)$.

The second argument can be proved in the same way.■

Theorem 2: Given the current income level of y_t and current outstanding mortgage level of Mor_t, if the household defaults with the current home equity of HE_t, it will default if the current home equity is smaller than HE_t.

Given the current income level of y_t and current home equity of HE_t, if the household defaults with the current outstanding mortgage level of Mor_t, it will default if the current outstanding mortgage level is larger than Mor_t.

Proof: Given the current income level of y_t and current outstanding mortgage level of Mor_t, if the household defaults with the current home equity of HE_t, then $D(y_t) > P(HE_t, Mor_t, y_t)$. According to Theorem 1, $P(HE_t', Mor_t, y_t) < P(HE_t, Mor_t, y_t)$ for any home equity level of $HE_t' < HE_t$. Thus, $D(y_t) > P(HE_t', Mor_t, y_t)$, and the household will default for any home equity level of $HE_t' < HE_t$.

The second argument can be proved in the same way.∎

3. Numerical Simulation

A review of some simulation results is presented in this section. For the simulation, I assume that there are three consumption categories, and there is one kind of good in category 1, two kinds of goods in category 2, and three kinds of goods in category 3. Table 1 includes the parameter values in the model.

Figure 1 is the plot of $P(HE_t, Mor_t, y_t)$ and $D(y_t)$ given $Mor_t = 18$. According to the results in Figure 1, we can see that $P(HE_t, Mor_t, y_t)$ is an increasing function of HE_t and y_t. The household will default if the home equity is deeply underwater. But, the household will not default if the home equity is just slightly underwater. In this case, the household would likely pay

the mortgage by cutting back on current consumption and keep the house as a buffer asset to smooth future consumptions. The extent to which they can intentionally cut back is shaped by the needs parameters in the S-Branch utility function.

Figure 2 and Figure 3 are the consumption plots in cases of current low income level and high income level when $Mor_t = 18$. The household will consume more in the current period if the home equity is greater, given the current income level and outstanding mortgage. And, the household will consume more if the current income level is higher, given other factors unchanged.

Will the "needs" as minimum consumption levels, γ_{si}, affect current consumption? Figure 4 and Figure 5 are the consumption plots in cases of current low income level and high income level with different minimum consumption. "High min." signifies the high minimum consumption levels, and "Low min.' indicates the low minimum consumption levels, which are 60% of the original values. The change of the minimum consumption levels will affect current consumption. The consumption of some goods increase, while the consumption of other goods decrease. This fact can be explained by equation (1). For lower minimum consumption, the required costs for minimum consumptions decrease, giving the household more flexibility to reallocate wealth across different periods and different kinds of goods.

Overall, it is optimal for households with deep "underwater" home equities to foreclose their mortgages. And, the change of minimum consumption levels can affect the overall consumptions of each good in the current period.

4. **Empirical Analysis**

The empirical analysis focuses on households' consumption expenditures on food, including food eaten at home and food eaten out, and vehicle because food is the most important and necessary household consumption and vehicle is a typical and popular durable goods in households. PSID main family data from 2005 to 2009 are used for the empirical analysis[3]. I divide the data into two sub-periods, 2005-2007 and 2007-2009. After estimating a regression for each sub-period, I contrast the household's different consumption responses to changes in home equity and other financial status before and during the financial crisis. The Blinder-Oaxaca Decomposition is exploited with regard to the two groups to test the "Characteristics Effect" (changing in X's) and "Coefficients Effect" (changing in β 's). The Blinder-Oaxaca Decomposition captures the effects on household consumption caused by the change in the values of independent variables, such as employment status and wealth level, versus the shift of consumption function. The "Coefficients Effect" captures the effect caused by the change of λ, which is a measure of people's expectations for the future.

4.1. Food Expenditures

There are three categories of food consumption in the PSID family data: food eaten at home (F22), delivered food (F24), and food eaten out (F25)[4]. For each household, the reference period of food consumption expenditure can be weekly, bi-weekly, monthly, or yearly. All the reference periods are transformed to per week for estimation. Because some reported food eaten at home expenditures may include delivered food expenditures given the design of the PSID questionnaire, these two categories are combined as the food eaten at home expenditure category.

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[3] In this paper, only the households who are interviewed in both of two sequential interviews are included in the sample, and the same household is defined by having the same individual head in the two sequential interviews.

[4] F22, F24, and F25 are PSID question numbers for the survey questions of food expenditures.

The food eaten out expenditure is the other broad category. Households who used food stamps are excluded from the sample.

OLS regression is used for the food expenditure analysis.[5] For the sub-period of 2007-2009, the dependent variable is the change of food expenditure in a household per week between 2007 and 2009, and the independent variables include the change in the number of persons in a household between 2007 and 2009, whether a household refinanced either mortgage 1 or mortgage 2 at the time of 2009 interview, the change of head's employment status between 2007 and 2009 (define head's employment status=1 if the head has a job at the time of interview; otherwise, head's employment status=0. The change of head's employment status between 2007 and 2009 is the difference between head's employment status in 2007 and in 2009), the change of total family income between 2006 and 2008, the change of total wealth without home equity between 2007 and 2009, and the change of home equity between 2007 and 2009.

To study the likely different consumption structures, all households are divided into two groups: households who owned their houses in both 2007 and 2009 (all owner) and households who rented their houses in both 2007 and 2009 (all renter). This excludes the observations of those changing their occupation status. Since home owners and renters suffered different losses in the financial crisis, they are expected to respond to the financial crisis differently. For renters, the "HE" in the model can denote the overall wealth without home equity. Home owners experienced a larger decrease in "HE" during the financial crisis than renters did.

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[5] The PSID Core/Immigrant Family Weight in 2009 (ER47012) is used for the regression of 2007-2009 data, and the same weight in 2007 (ER41069) is used for the regression of 2005-2007 data. All the other regressions in this paper are adjusted by the corresponding PSID Core/Immigrant Family Weights.

Households within different age groups may have different consumption behaviors. Those differences are captured by the different parameter values in the model. To capture those differences, I further divide the household groups.

All owners are divided into two sub-groups according to the age of head:

Owner, age ≤ 45: home owner households in which the age of head is less than or equal to 45 in 2009;

Owner, age > 45: home owner households in which the age of head is greater than 45 in 2009;

All renters are divided into two sub-groups according to the age of head:

Renter, age ≤ 45: home renter households in which the age of head is less than or equal to 45 in 2009;

Renter, age > 45: home renter households in which the age of head is greater than 45 in 2009;

To capture the possible effect of retirement, I include one more dummy variable of "whether head retired in 2007" for the groups of (Owner, age > 45) and (Renter, age > 45). Table 2 is the regression analysis of the change in food eaten at home expenditure from 2007 to 2009, and table 3 is the regression analysis of the change in food eaten out expenditure from 2007 to 2009.[6] For the change in food eaten at home expenditure, the change in household wealth status and the change in employment status of head do not have significant effects, except for the group

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[6] Some outliers are deleted. ($|\Delta\ food\ eaten\ at\ home\ expenditures| \geq 350$, or
$|\Delta\ food\ eaten\ out\ expenditure| \geq 270$, or $|\Delta\ number\ of\ persons| \geq 5$, or $|\Delta\ total\ family\ income| \geq 500K$, or $|\Delta\ wealth\ without\ home\ equity| \geq 10M$, or $|\Delta\ home\ equity| \geq 800K$. In addition, observations with invalid variable values are also excluded.

(Renter, age $\leq$ 45), in which the change in total family income and the change in wealth without home equity significantly affect the change of food consumption. This result indicates that the underlying elasticities of food eaten at home expenditure with respect to the financial status and employment status of head are either low or imprecisely estimated. The change in number of persons in a household significantly affects the change of food eaten at home expenditure. This result is intuitive. The more people in a household, the higher the necessary food expenditure needed at home, as suggested by the consumption change of goods c_{11} in Figure 4 and Figure 5 for different needs parameter (γ_{si}) values. The native estimated coefficient of the change in total family income for the group (Renter, age> 45) does not make sense, but it is only slightly significant (P-value=0.0921).

In contrast with the change in food eaten at home expenditure, the change in food eaten out expenditure is very responsive to the financial status of the home owners. The increase (decrease) in home equity, wealth without home equity, and total family income all significantly increase (decrease) the food eaten out expenditure for home owners. For home owners with young heads, the change in head's employment status significantly affects the change in food eaten out expenditure. If we compare the estimated coefficients in the group (Owner, age $\leq$ 45) to the group (Owner, age > 45), we can see that the households with young heads are more sensitive to the change in financial and employment status of head with respect to food eaten out expenditure than are the households with older heads. For renters, the change in employment status of head and the change in total family income do not significantly affect the change in food eaten out expenditure. The estimated coefficient on the change in total family income is significant only at the 10% level for renters with young heads.

The negative estimated coefficients of the change of wealth without home equity in the group of (all renter) and group of (Renter, age > 45) are difficult to evaluate. But, the P-value of the estimated coefficient of -6.1950 in the group of (All Renter) is 0.0497, which is very close to the boundary of being significant at the 5% level. One possible reason for this result is that there is heterogeneity among renters in their response to the change in wealth during the financial crisis. The large estimated standard errors for the change of wealth without home equity in group of (all renter), group of (Renter, age ≤ 45), and group of (Renter, age > 45) are possible indicators of this reason.

All the estimated coefficients of "whether head retired in 2007" are negative but insignificant. Overall, the retired people cut more food expenditures during the financial crisis, even though this effect is not significant. For those people who retired between the 2007 interview date and 2009 interview date, part of the retirement effect is captured by the change in head's employment status.

To compare the possible different food expenditure responses of households to the change in financial status, I go back in time by 2 years and the same regression is estimated using the 2005-2007 PSID main family data. Table 4 presents the result of the change of food eaten at home expenditure from 2005 to 2007, and table 5 presents the result of the change in food eaten out expenditure from 2005 to 2007.[7]

For the change in food eaten at home expenditure, the 2005-2007 regression result is similar to the 2007-2009 result. The financial status and employment status of head do not

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[7] Some outliers are deleted. ($|\Delta\ food\ eaten\ at\ home\ expenditures| \geq 350$, or $|\Delta\ food\ eaten\ out\ expenditure| \geq 250$, or $|\Delta\ number\ of\ persons| \geq 5$, or $|\Delta\ total\ family\ income| \geq 500K$, or $|\Delta\ wealth\ without\ home\ equity| \geq 6M$, or $|\Delta\ home\ equity| \geq 600K$. In addition, observations with invalid variable values are also excluded.

significantly affect the change in food eaten at home expenditure. But, for the food eaten out expenditure, there are two different patterns between the 2005-2007 result and the 2007-2009 result. First, the estimated coefficients on the change in total family income and the change in wealth without home equity are not significant, and the estimated coefficient of the change of home equity is only statistically significant at the 10% level for the home owners in table 5. But, those corresponding estimated coefficients in table 3 are statistically significant at the 1% level or 5% level. In addition, the estimated coefficients of financial status for home owners in the sample of 2005-2007 are smaller than those in the sample of 2007-2009. This finding indicates that home owners significantly adjusted their food eaten out expenditures according to the changes of their financial status in the time interval of 2007-2009 during the financial crisis. However, they did not do so in the time interval of 2005-2007 (All t-statistics>5). An interpretation is that, at the interview time of 2007, the economy was performing well and home owners were not particularly worried about their wealth levels decreasing because the outlook for the overall economy and their families were optimistic. Conversely, home owners were not that optimistic about the future economy and their future family incomes in 2009 during the financial crisis, and with these concerns they significantly adjusted their food eaten out expenditures as a way to deal with either or both current and expected difficulties. This result is consistent with the theoretical effect of λ discussed in section 2. When people are pessimistic about the future, the value of λ will increase and the current consumptions will decrease. Secondly, the change of employment status of head significantly affects the change of food eaten out expenditure for both home owners and renters in the 2005-2007 result, while it is insignificant in the 2007-2009 result, except for young home owners in table 3. One possible reason is that many household heads lost their jobs during the financial crisis, but some

households adjusted their food eaten out expenditures correspondingly at the time of 2009 interview, while others did not nor had just started to adjust their food eaten out expenditures at the time of 2009 interview.

Table 5 also indicates that the change of food eaten out expenditure is more sensitive to the change of employment status of head in households headed by young persons than in households headed by old persons. In addition, the change of food eaten out expenditure is more sensitive to the change of employment status of head in renters than in home owners.

4.2.   Vehicle Acquisition

Vehicle consumption is another important household consumption category, but it is quite different from food consumption. First, it is more discretionary in terms of level and timing of expenditure for each household than food consumption. Second, there is a substantial inventory dimension to vehicle consumption. Third, a household cannot adjust vehicle expenditure by continuous amount in term of whether acquiring a vehicle, while, for food expenditure, we assume the household can.

For the sub-period of 2007-2009, in contrast to the age and ownership analysis, I separate the households into four separate categories: households who neither bought nor leased a vehicle, households who bought a used vehicle, households who bought a new vehicle, and households who leased a vehicle (either new or used) in 2008 or 2009. Multinomial logistic regression is used for the analysis of vehicle consumption. The dependent variable is the above categorical variable indicating vehicle acquisition activity in 2008 or 2009, and the independent variables include the number of adults in a household in 2009, (which is calculated by the difference between the number of persons and the number of children (under 18 years old) in a household),

whether a household had more than 2 vehicles at the time of the 2007 interview, whether a household was interviewed between June and August in 2009, whether a household was interviewed after August in 2009 (those two variables indicate the time of exposure to the contraction), whether a household refinanced either mortgage 1 or mortgage 2 at the time of 2009 interview, head's employment status in 2009 (head's employment status=1 if the head has a job at the time of interview; otherwise, head's employment status=0), the unemployment weeks of the head in 2008, the household total family income in 2008, the household total wealth without home equity in 2009, and the household home equity in 2009.

In the context of an inventory adjustment model, households that had just acquired a vehicle recently have reduced incentives to acquire another vehicle in the short run. To mitigate this effect, I exclude the households who acquired the latest vehicle in 2005, 2006, or 2007. I do not split the sample by head age for the vehicles analysis because the sample size of households that acquired vehicles is relatively small compared with the sample size of food expenditure regressions, and too few observations may cause regression distortion.

Table 6 is the multinomial logistic regression analysis of the vehicle acquisition decision from 2007 to 2009.[8] The number of adults in a household significantly affects the acquisition of vehicles. The more adult people in a household, the more likely a household will acquire a vehicle in the two years. The households with more than 2 vehicles in 2007 are more likely to acquire a used vehicle. Even though it is insignificant, the estimated coefficient of "whether # of vehicle>2 in 07" is positive for the buy new category for home owners. This result is

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[8] Some outliers are deleted. (number of adults in 2009>6, or $|total\ family\ income\ in\ 2006\ or\ 2008| > 600K$, or $|wealth\ without\ home\ equity\ in\ 2007\ or\ 2009| > 6M$, or $|\ home\ equity\ in\ 2007\ or\ 2009| \geq 900K$, or $wealth\ without\ home\ equity\ in\ 2009 < -0.5M$). Since some observations with extreme 2007 variable values are influential points for the regression, I also excluded them. In addition, observations with invalid variable values are also excluded.

contradictory to results in the durable inventory literature several decades ago. With increasing household wealth level and decreasing vehicle prices, more and more households can afford to have multiple vehicles now. Another possible reason for this result is that people in households with more than two vehicles have consumption preference to vehicles. The 2009 interview date also plays a significant role for home owners. The later the 2009 interview date, the more likely a household will acquire a vehicle. Compared with a household interviewed in January 2009, a household interviewed at December 2009 has more time to acquire a vehicle in 2009. On the other side, the 2009 interview date indicates the time exposure to the financial crisis. Here the time exposure to the recession is more than offset by a wider time window in which to report vehicle acquisition activity. The employment status of head at the date of the 2009 interview plays a slightly significant role for home owners but plays a strong and significant role for renters. In addition, the magnitudes of estimated coefficients of "whether head has a job in 09" for renters who acquired used or new vehicles are much larger than the magnitudes of corresponding estimated coefficients for home owners. This means that "whether head has a job" is more crucial for renters in acquiring vehicles than for home owners.

Total family income in 2008 significantly affects vehicle acquisition for both home owners and renters. Households with more total family income in 2008 are more likely to acquire vehicles. Wealth without home equity plays a significant positive role for home owners who acquired new vehicles. A surprising result is that "Home Equity in 09" plays a significant negative role for home owners in acquiring used vehicles. A similar result also appears for renters: the "wealth without home equity" also plays a significant negative role for renters in acquiring used vehicles. An interpretation for this result is that, despite their poor financial

status, households acquired used vehicles as a less-expensive way to meet their "real" need for transportation.

Similar to the analysis of food expenditure, I go back in time by 2 years and re-estimate the model. The 2005-2007 PSID main family data are used. This allows the comparison of the possible different vehicle acquisition responses of households to changing of financial status. Table 7 is the multinomial logistic regression analysis of the vehicle acquisition decision from 2005 to 2007.[9] Compared with the number of renters (1401) in the sample of 2007-2009, the number of renters (1232) in the sample of 2005-2007 is much smaller. One partial reason is that people are more likely to own houses in the period of 2005-2007 because it was easier to get mortgages at that time. In terms of which factors significantly affect the vehicle consumption, the 2005-2007 result is very similar to the 2007-2009 result, except for two main differences. Firstly, the interview time in the 2005-2007 result does not play a significant role for home owners. Secondly, "whether head has a job" plays a greater and more significant role for home owners in the 2005-2007 data than in the 2007-2009 data. Conversely, for renters who acquired used or new vehicles, it plays a smaller role in the 2005-2007 data than in the 2007-2009 data.

Since the variable of total family income in 2009 is not available in the 2009 PSID main family data[10] and family income plays a significant role in vehicle acquirement, the above models may have a distortion for households who acquired vehicles in 2009. To avoid this kind of distortion, a similar regression model with the dependent variable being the categorical variable indicating what kind of vehicle the household acquired only in 2008 is estimated. To provide a better temporal alignment with income, households who acquired their latest vehicles

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[9] The same outlier deletion rules as the ones in footnote 8 after moving the time backward by 2 years.

[10] PSID collects annual total family income in each of the two precious calendar years.

in 2005, 2006, 2007, or 2009 are excluded. The independent variables include the number of adults in a household in 2007, whether a household had more than 2 vehicles at the 2007 interview time, head's employment status in 2007 (head's employment status=1 if the head has a job at the time of interview; otherwise, head's employment status=0), the unemployment weeks of the head in 2008, the household total family income in 2008, the household total wealth without home equity in 2007, and the household home equity in 2007. Since we have fewer cases in the "buy new vehicle" and "lease vehicle" categories, I combine them together as a "buy new or lease" category. Table 8 is the multinomial logistic regression analysis of the vehicle acquisition decision in 2008.[11] Again, I go back by 2 years and estimate another similar regression for vehicle expenditure in 2006. Table 9 is the multinomial logistic regression analysis of the vehicle acquisition decision in 2006.[12] Overall, most of our previous conclusions still hold in Table 8 and Table 9, but the latter can be argued as preferable and are used in the analysis to follow.

4.3.   Blinder-Oaxaca Decomposition

In the previous analysis, we have four pairs of regressions before and during the financial crisis (two for the food expenditure and two for the vehicle expenditure). For some certain pairs, even though we identify similar significant factors, there are notable differences in the estimated

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[11] Some outliers are deleted. (number of adults in 2009>6, or $|total\ family\ income\ in\ 2008| > 600K$, or $|wealth\ without\ home\ equity\ in\ 2007| > 6M$, or $|\ home\ equity\ in\ 2007| \geq 900K$, or $wealth\ without\ home\ equity\ in\ 2007 < -0.5M$). In addition, observations with invalid variable values are also excluded.

[12] Some outliers are deleted. (number of adults in 2005>6, or $|total\ family\ income\ in\ 2006| > 600K$, or $|wealth\ without\ home\ equity\ in\ 2005| > 6M$, or $|\ home\ equity\ in\ 2005| \geq 900K$, or $wealth\ without\ home\ equity\ in\ 2005 < -0.5M$, or $home\ equity\ in\ 2005 < -30K$, or $total\ family\ income\ in\ 2006 < -3K$). In addition, observations with invalid variable values are also excluded.

coefficients, including the estimated intercepts. Those differences indicate the different household consumption behavioral responses before and during the financial crisis. In this section, I will use Blinder-Oaxaca Decomposition to investigate the relative roles of changing responses (the coefficients) versus changing values of the means.

Blinder-Oaxaca Decomposition was first developed by Blinder (1973) and Oaxaca (1973) and then extended by Gomulka and Stern (1990) and Fairlie (1999 and 2005) for binary dependent variable models and by Bauer and Sinning (2008) for nonlinear models.

For the linear regression models in group 1(time period 1) and group 2 (time period 2),

$$Y_{Group\ 1} = X'_{Group\ 1}\beta_{Group\ 1} + \varepsilon_{Group\ 1}$$

$$Y_{Group\ 2} = X'_{Group\ 2}\beta_{Group\ 2} + \varepsilon_{Group\ 2}$$

The mean difference between the dependent variables in group 1 and group 2 can be decomposed by:

$$MD = E(Y_{Group\ 1}) - E(Y_{Group\ 2}) = E(X'_{Group\ 1})\beta_{Group\ 1} - E(X'_{Group\ 2})\beta_{Group\ 2}$$

$$= [E(X_{Group\ 1}) - E(X_{Group\ 2})]'\beta_{Group\ 2} + E(X'_{Group\ 2})(\beta_{Group\ 1} - \beta_{Group\ 2}) +$$

$$[E(X_{Group\ 1}) - E(X_{Group\ 2})]'(\beta_{Group\ 1} - \beta_{Group\ 2})$$

The first term captures the difference caused by the difference of the independent variable values in group 1 and group 2 (Characteristics Effect), the second term captures the difference caused by the difference of estimated coefficients (Coefficients Effect), and the third term captures the difference caused by the interaction of characteristics and coefficients (Interaction Effect).

I apply the Blinder-Oaxaca Decomposition for food expenditure and vehicle expenditure to estimate the above three effects. For each effect, the standard error is estimated by bootstrapping (reps=200).

Table 10 presents the Blinder-Oaxaca Decomposition result of food expenditure between the sub-period of 2005-2007 and the sub-period of 2007-2009. There are no significant "characteristics effect", "coefficients effect", and "interaction effect" for food eaten at home expenditure, except for the weak "coefficients effect" for home owners. The low financial status elasticity of food eaten at home expenditure causes the insignificant "characteristics effect", even though the financial status of households deteriorated during the financial crisis. The insignificant "coefficients effect" indicates that households did not significantly change their consumption behaviors toward food eaten at home, given objective measured income, wealth, and labor market status, under conditions of the wider financial crisis. For food eaten out expenditure, there is a significant "characteristics effect" for home owners but not for renters. Home owners suffered a bigger loss than renters both because they have more overall wealth than renters and specifically because house price slumped during the financial crisis, inducing wealth and/or collateral effects. And thus, there is a significant "characteristics effect" for home owners. There is a significant "coefficients effect" for both home owners and renters for food away from home. Both home owners and renters changed their consumption attitudes toward food eaten out. People became more careful in food eaten out expenditures during the financial crisis.

For vehicle acquisition decisions, a non-linear technique is used for Blinder-Oaxaca Decomposition. Only the households that are "neither buy nor lease" or "buy new" are included in the sample for the decomposition. Table 11 is the Blinder-Oaxaca Decomposition result for

the vehicle acquisition decision between the sub-period of 2005-2007 and the sub-period of 2007-2009. The "characteristics effect" is insignificant. One main reason for this fact is that the mean value of "total family income in 2008" actually is bigger than the mean value of "total family income in 2006" and that total family income is an important factor for vehicle acquisition decision. The financial crisis started from the September of 2008. Even if a person lost his/her job at the end of 2008, the total family income in 2008 would often not be affected much because of unemployment compensation. In addition, for some households interviewed early 2009, their financial status had not fallen to a substantially worse condition. There is a significant "coefficients effect" for both home owners and renters. They greatly changed their consumption attitudes toward vehicles in light of the financial crisis. This result is consistent with the Consumer Sentiment Index released by the University of Michigan and Thomson Reuters. Figure 6 is the monthly Consumer Sentiment Index from 2005 to 2009.[13] The Consumer Sentiment Index was relatively stable and high in the sub-period of 2005-2007 and plummeted in the sub-period of 2007-2009. Both the magnitude and significant level of "coefficients effect" for home owners are bigger than those for renters. Home owners changed their attitudes toward vehicle consumption on a greater level than renters did during the financial crisis.

Table 12 is the Blinder-Oaxaca Decomposition result of vehicle acquisition between the sub-period of 2006 and the sub-period of 2008. Comparing with the results in table 11, we can find that there is no "coefficients effect" for renters. Renters did not really feel the painful impact of the financial crisis in 2008, and then they did not significantly change their attitudes toward vehicle consumption, given their characteristics. In contrast, home owners already felt the pinch of the financial crisis by 2008 because of the huge decrease in home equity and pessimism over

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[13] The data come from the Federal Reserve Bank of St. Louis.
http://research.stlouisfed.org/fred2/series/UMCSENT/

the future of housing market. Subsequently, they significantly changed their attitudes toward vehicle consumption.

4.4.   Foreclosure

PSID 2009 main family data and 2011 early data are used for the foreclosure analysis. I generate a dummy dependent variable (Foreclosure) indicating whether a household foreclosed a mortgage during 2009 and 2011. This dummy variable is generated as follows:

Foreclosure=1 if a bank or lender has started the foreclosure process on a household's home at the time of 2011 interview, or, since 2009, anyone in the household has ever owned a main residence on which a foreclosure was commenced; otherwise, Foreclosure=0.

Logistic regression is used, and the independent variables include head's employment status in 2009 (head's employment status=1 if the head has a job at the time of interview; otherwise, head's employment status=0), the household total family income in 2008, the household total wealth without home equity in 2009, and whether the household home equity in 2009 is less than 0, less than -10K, less than -50K, or less than -100K.

Table 13 is the logistic regression analysis of foreclosure. All estimated coefficients of home equity dummy variables are positive and strongly significant. In addition, the magnitudes of estimated coefficients increase from 1.8439 for "wtr home equity in 09<0" to 2.8031 for "wtr home equity in 09<-100K". These results indicate that negative home equity has a significant effect on the foreclosure, and that the effect increases with the extent of deep "underwater" home equities.

5. Conclusion

I set out a theoretical model and implemented computer simulations to capture the effect of home equity on household consumption expenditure. It is optimal for households with deep underwater home equity positions to default in their mortgages. In the default case, households would save money for current period consumptions if they expect poor future incomes. The empirical result shows the significant effect of negative home equity on mortgage foreclosures.

Empirical analysis shows that the financial status elasticity of food eaten at home is very small, while the change of food eaten out expenditure and the vehicle acquisition are significantly affected by the financial status of households.

Blinder-Oaxaca Decomposition is exploited to measure the household's different consumption responses to changes of financial status before and during the financial crisis. I find significant "coefficients effect" for the change of food eaten out expenditure and vehicle acquisition. This result indicates that households changed their consumption attitudes toward food eaten out and vehicles during the financial crisis. In addition, home owners adjusted their attitudes toward new vehicle acquisition to a deeper level than renters. These results indicate that the decreases in food eaten out expenditure and in vehicle acquisition in 2009 were mainly caused by the change of household's expectation for the future.

More analysis can be done after the 2011 full data are released, such as the effect of total family income in 2009 on vehicle acquisition decisions. Future work includes the further analysis of vehicle acquisition, using an advanced statistics tool of classification-Random Forest. It can help identify the importance levels of independent variables in predicting the dependent variable.

References:

Attanasio, Orazio P., Laura Blow, Robert Hamilton, and Andrew Leicester (2008), "Booms and Busts: Consumption, House Prices and Expectations," Economica, 76(301), p.20-50.

Attanasio, Orazio P. and Guglielmo Weber (1994), "The UK Consumption Boom of the Late 1980s: Aggregate Implications of Microeconomic Evidence," Economic Journal, 104(427), p.1269-1302.

Bauer, Thomas K. and Mathias Sinning (2008), "An Extension of the Blinder-Oaxaca Decomposition to Nonlinear Models," Advances in Statistical Analysis, 92 (2), p.197-206.

Blinder, Alan S. (1973), "Wage Discrimination: Reduced Form and Structural Estimates," Journal of Human Resources, 8(4), p.436-455.

Bostic, Raphael, Stuart Gabriel, and Gary Painter (2009), "Housing Wealth, Financial Wealth, and Consumption: New Evidence from Micro Data," Regional Science and Urban Economics, 39 (1), p. 79-89.

Bernanke, Ben and Mark Gertler (1989), "Agency Costs, Net Worth, and Business Fluctuations," American Economic Review, 79(1), p.14-31.

Brown, Murray and Dale Heien (1972), "The S-Branch Utility Tree: A Generalization of the Linear Expenditure System," Econometrica, 40(4), p. 737-747.

Campbell, John Y. and João F. Cocco (2007), "How Do House Prices Affect Consumption? Evidence from Micro Data," Journal of Monetary Economics, 54(3), p. 591-621.

Carroll, Christopher D., Misuzu Otsuka, and Jiri Slacalek (2011), "How Large Are Housing and Financial Wealth Effects? A New Approach," Journal of Money, Credit and Banking, 43(1), p.55-79.

Case, Karl E., John M. Quigley, and Robert J. Shiller (2005), "Comparing Wealth Effects: The Stock Market versus the Housing Market," Advances in Macroeconomics, 5(1), Article 1.

Cooper, Daniel (2009), Essays on Housing Wealth and Consumer Behavior, Ph.D. dissertation, University of Michigan, Department of Economics.

Deaton, Angus (1991), "Saving and Liquidity Constraints," Econometrica, 59 (5), p.1221-1248.

Dvornak, Nikola and Marion Kohler (2003), "Housing Wealth, Stock Market Wealth and Consumption: A Panel Analysis for Australia," RBA Research Discussion Papers, Number rdp2003-07, Reserve Bank of Australia.

Fairlie, Robert W. (1999), "The Absence of the African-American Owned Business: An Analysis of the Dynamics of Self-Employment," Journal of Labor Economics, 17(1), p.80-108.

Fairlie, Robert W. (2005), "An Extension of the Blinder-Oaxaca Decomposition Technique to Logit and Probit Models," Journal of Economic and Social Measurement, 30(4), p.305-316.

Gomulka, Joanna, and Nicholas Stern (1990), "The Employment of Married Women in the United Kingdom, 1970-83," Economica, 57(226), p.171-199.

Hall, Robert E. and Frederic S. Mishkin (1982), "The Sensitivity of Consumption to Transitory Income: Estimates from Panel Data on Households," Econometrica, 50 (2), p.461-481.

Hofferth, Sandra L. and Sally Curtin (2005), "Poverty, Food Programs, and Childhood Obesity," Journal of Policy Analysis and Management, 24 (4), p.703-726.

Hurst, Eric, Ming Ching Luoh, and Frank P. Stafford (1998), "Wealth Dynamics of American Families, 1984-1994," Brooking Papers on Economic Activity, 98 (1), 267-338.

Hurst, Eric and Frank P. Stafford (2004), "Home is Where the Equity Is: Mortgage Refinancing and Household Consumption," Journal of Money, Credit and Banking, 36(6), p.985-1014.

Iacoviello, Matteo (2011), "Housing Wealth and Consumption," International Finance Discussion Papers, Number 1027, The Federal Reserve Board.

King, M. (1990), "Discussion," Economic Policy 11, p.383-387.

Lambertini, Luisa, Caterina Mendicino and Maria Teresa Punzi (2010), "Expectations-Driven Cycles in the Housing Market," Center for Fiscal Policy Working Paper Series, Number 201001.

Li, Geng, Robert F. Schoeni, Sheldon H. Danziger, and Kerwin Charles (2010), "New Expenditure Data in the Panel Study of Income Dynamics: Comparisons with the Consumer Expenditure Survey Data," <u>Monthly Labor Review</u>, 133(2), p.29-39.

Oaxaca, Ronald (1973), "Male-Female Wage Differentials in Urban Labor Markets," <u>International Economic Review</u>, 14(3), p.693-709.

Pagano, M. (1990), "Discussion," <u>Economic Policy</u> 11, p.387-390.

Skinner Jonathan (1987), "A Superior Measure of Consumption from the Panel Study of Income Dynamics," <u>Economics Letters</u>, 23 (2), p.213-216.

Sun, Wei (2010), <u>Three Essays on the Economic Decisions Faced by Elderly Households</u>, Ph.D. dissertation, Boston College, Department of Economics.

Wolff, Edward N. (2010), "Recent Trends in Household Wealth in the United States: Rising Debt and the Middle-Class Squeeze-An Update to 2007," <u>Working Paper No. 589</u>, Levy Economics Institute of Bard College.

Parameter Values			
α1	0.80	ρ	-1.10
α2	0.10	ρ1	-0.90
α3	0.05	ρ2	-0.80
β11	0.60	ρ3	-0.70
β21	0.30	$\overline{Mor}$	30
β22	0.20	yl	20
β31	0.56	yh	35
β32	0.78	r	0.10
β33	0.09	β	0.95
γ11	1.00	p	0.85
γ21	2.00	N	5
γ22	3.00		
γ31	4.00		
γ32	3.00		
γ33	2.00		

Table 1.1: Parameter Values
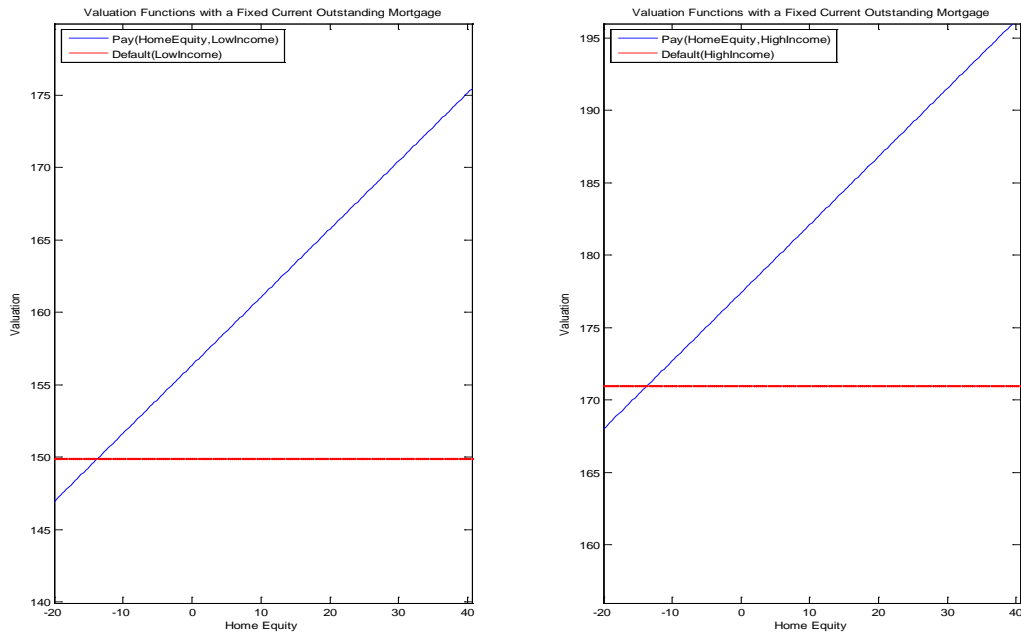
Figure 1.1: Valuation Functions for Current Low and High Income Given Mor=18
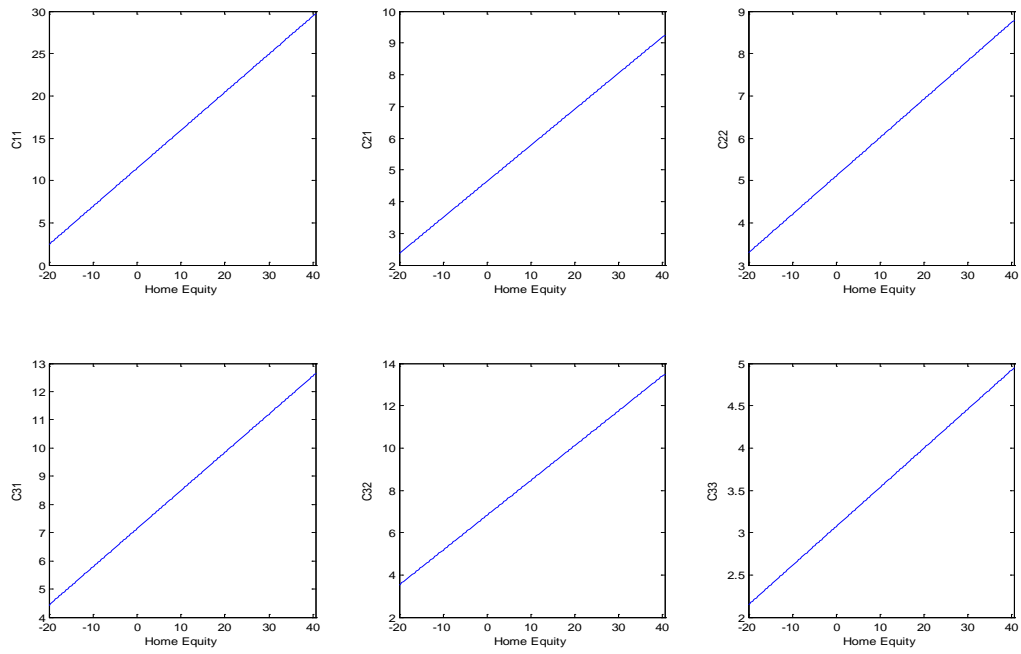
Figure 1.2: Consumptions with Current Low Income when Mor=18
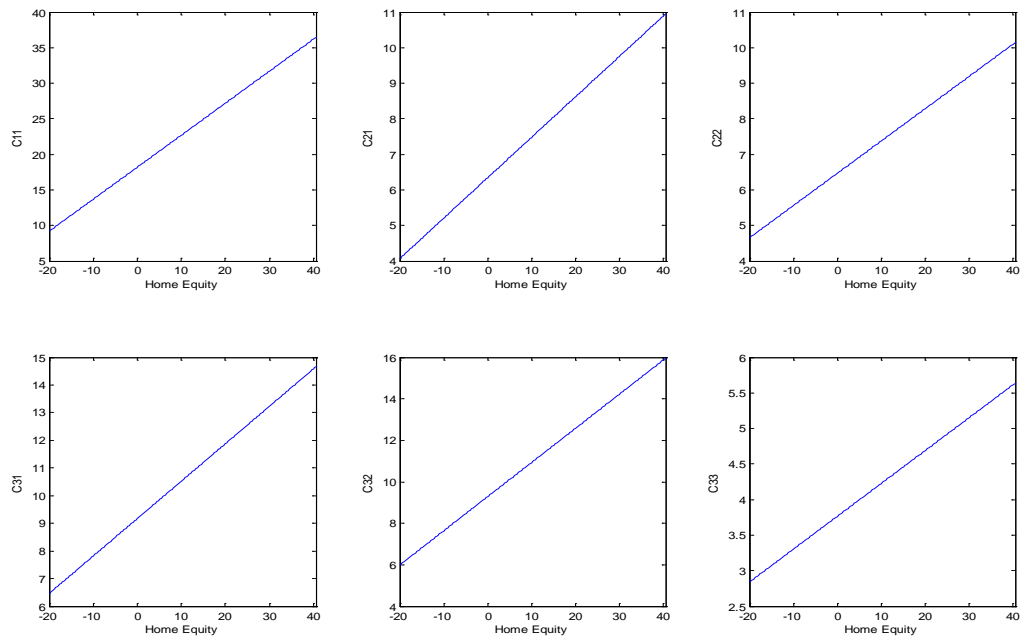
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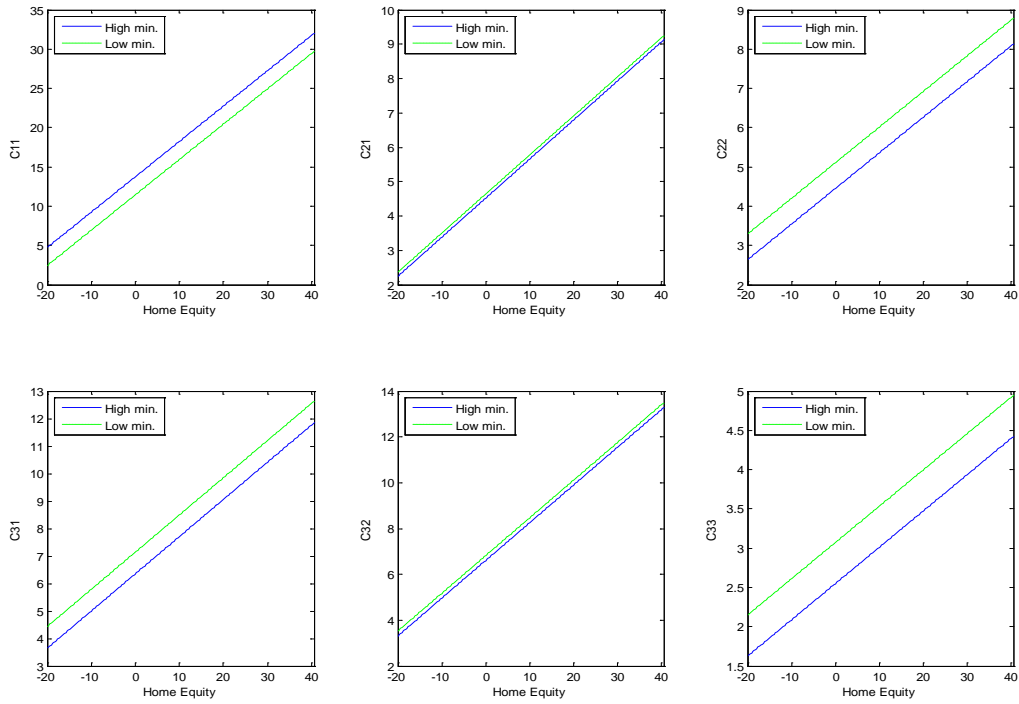
Figure 1.4: Consumptions with Current Low Income for Different Minimum Consumptions
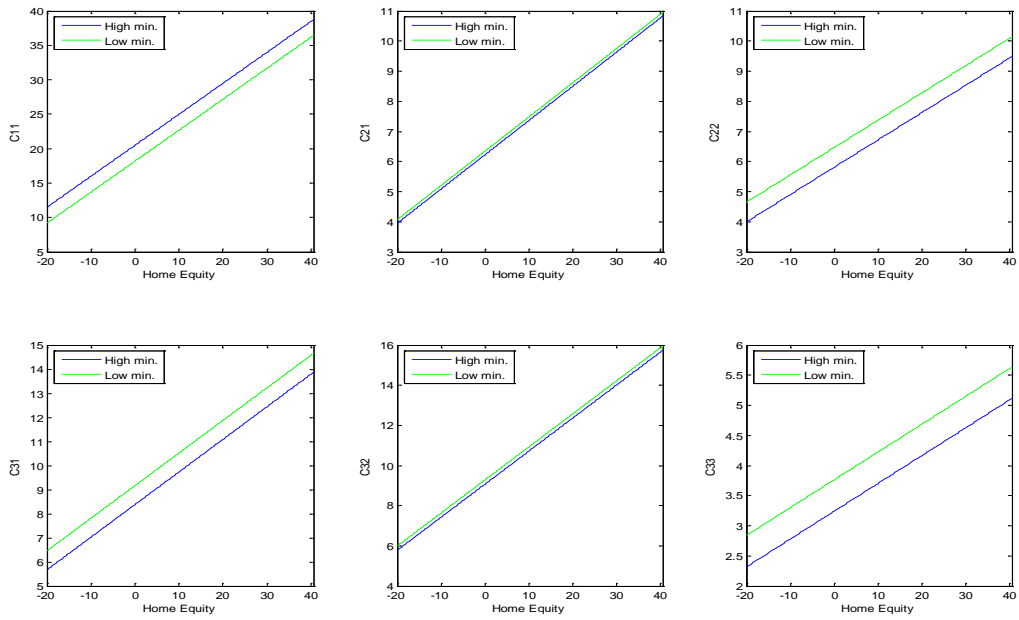
Figure 1.5: Consumptions with Current High Income for Different Minimum Consumptions
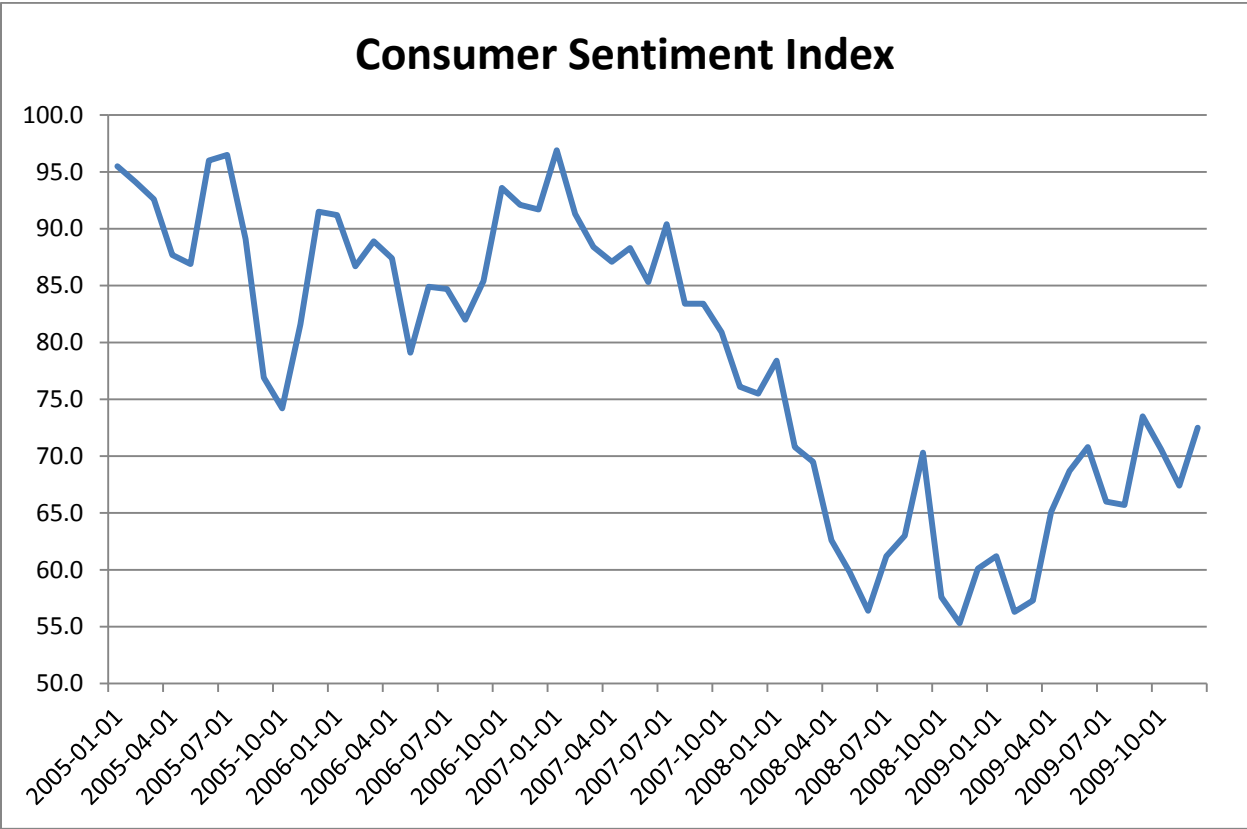
Figure 1.6: Consumer Sentiment Index from 2005 to 2009

	Δ Food Eaten at Home Expenditure ($)					
	All Owner	Owner age ≤ 45	Owner age > 45	All Renter	Renter age ≤ 45	Renter age > 45
Intercept	4.4609***	3.9891	4.7973**	2.3939	2.1608	2.6782
	(1.2934)	(2.7331)	(1.8836)	(1.7475)	(2.2168)	(2.8146)
Δ Number of Persons	20.0768***	20.3618***	19.1012***	11.8060***	16.8911***	3.1982
	(2.2543)	(3.7625)	(2.9173)	(3.3162)	(2.6399)	(6.5287)
Wtr Refinance Mortgage	-0.9329	1.0826	-2.3370			
	(2.2376)	(4.0171)	(2.9353)			
Δ Wtr Head Has a Job	0.2239	0.3158	0.3496	-1.7630	3.0441	-6.6546)
	(2.8813)	(7.4614)	(3.1999)	(3.5056)	(4.3465)	(5.7636)
Δ Total Family Income (K)	0.0043	0.0206	-0.0048	0.0187	0.1718*	-0.1165*
	(0.0282)	(0.0719)	(0.0278)	(0.0754)	(0.1026)	(0.0690)
Δ Wealth W/O Home Equity (M)	0.5223	10.5239	-1.2219	2.0023	37.8505**	1.4861
	(2.2220)	(7.2488)	(2.3672)	(5.3159)	(18.5936)	(4.3613)
Δ Home Equity (K)	-0.0120	-0.0354	-0.0042			
	(0.0120)	(0.0242)	(0.0144)			
Wtr Head Retired in 2007			-0.9941			-9.7734
			(3.0765)			(7.8585)
Number of observations	3680	1303	2377	1349	893	456

*, ** ,and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 1.2: Regression Analysis of the Change of Food Eaten at Home Expenditure from 2007 to 2009

	Δ Food Eaten out Expenditure ($)					
	All Owner	Owner age ≤ 45	Owner age > 45	All Renter	Renter age ≤ 45	Renter age > 45
Intercept	-2.4136***	1.7185	-2.9723**	-3.6372***	-3.2066*	-4.6660***
	(0.9287)	(2.2329)	(1.3146)	(1.2622)	(1.7750)	(1.7092)
Δ Number of Persons	4.2524***	3.1992	4.0153**	-0.9111	0.5110	-4.7185
	(1.5209)	(2.6253)	(1.8966)	(1.8148)	(2.0208)	(3.4658)
Wtr Refinance Mortgage	0.5958	-1.0669	0.3076			
	(1.7286)	(3.1640)	(2.1009)			
Δ Wtr Head Has a Job	1.4826	11.5471**	-0.1510	3.9983	5.1993	2.4117
	(2.0382)	(5.1996)	(2.2494)	(2.9494)	(3.5474)	(4.8392)
Δ Total Family Income (K)	0.0600***	0.1363**	0.0318	0.0571	0.1466*	-0.0169
	(0.0215)	(0.0544)	(0.0207)	(0.0394)	(0.0755)	(0.0283)
Δ Wealth W/O Home Equity (M)	3.9977**	4.4893	3.9476***	-6.1950**	-21.1778	-4.2671*
	(1.5978)	(6.3017)	(1.4526)	(3.1543)	(21.7704)	(2.5441)
Δ Home Equity (K)	0.0340***	0.0733***	0.0243**			
	(0.0111)	(0.0229)	(0.0123)			
Wtr Head Retired in 2007			-2.5236			-3.4071
			(1.7748)			(4.7338)
Number of observations	3680	1303	2377	1349	893	456

*, ** ,and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 1.3: Regression Analysis of the Change of Food Eaten out Expenditure from 2007 to 2009

	Δ Food Eaten at Home Expenditure ($)					
	All Owner	Owner age ≤ 45	Owner age > 45	All Renter	Renter age ≤ 45	Renter age > 45
Intercept	6.5871***	11.8200***	5.9903***	5.0407***	7.2654***	1.3630
	(1.1687)	(2.2415)	(1.7643)	(1.6247)	(2.2906)	(2.6263)
Δ Number of Persons	16.7908***	11.0206***	19.4023***	5.7790**	9.6769***	-1.5696
	(1.8911)	(2.8939)	(2.5609)	(2.7130)	(2.9524)	(4.4193)
Wtr Refinance Mortgage	0.8982	-1.3137	0.8104			
	(2.0300)	(3.3447)	(2.6710)			
Δ Wtr Head Has a Job	2.6531	11.0219*	0.5875	5.8266	8.1272	2.8148
	(3.1013)	(6.3043)	(3.6904)	(5.2568)	(7.0182)	(6.9998)
Δ Total Family Income (K)	0.0027	-0.0217	0.0117	0.0781	0.0529	0.0978
	(0.0231)	(0.0324)	(0.0286)	(0.0632)	(0.0950)	(0.0766)
Δ Wealth W/O Home Equity (M)	-2.1160	-7.4804*	-0.9160	4.2510	33.0704	0.9726
	(1.9881)	(4.3095)	(2.1320)	(9.9290)	(32.3017)	(10.1358)
Δ Home Equity (K)	0.0086	0.0415*	0.0010			
	(0.0139)	(0.0242)	(0.0165)			
Wtr Head Retired in 2005			-2.4178			3.3633
			(2.6832)			(5.9050)
Number of observations	3638	1352	2286	1191	762	429

*, ** ,and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 1.4: Regression Analysis of the Change of Food Eaten at Home Expenditure from 2005 to 2007

	Δ Food Eaten out Expenditure ($)					
	All Owner	Owner age ≤ 45	Owner age > 45	All Renter	Renter age ≤ 45	Renter age > 45
Intercept	1.1752	1.8778	0.7755	2.9219**	4.5551**	1.6792
	(0.8505)	(1.7450)	(1.2770)	(1.2191)	(1.8986)	(1.7016)
Δ Number of Persons	4.1056***	1.1206	6.3553***	0.6906	-1.4912	3.6658
	(1.2963)	(1.6555)	(1.8543)	(2.2031)	(2.0933)	(4.7091)
Wtr Refinance Mortgage	-0.0118	-1.7337	1.4576			
	(1.4664)	(2.4662)	(1.8750)			
Δ Wtr Head Has a Job	5.9047***	6.6894	5.3150**	14.0332***	15.3740***	11.9586***
	(2.1101)	(4.9085)	(2.3710)	(3.3980)	(4.7166)	(3.8360)
Δ Total Family Income (K)	0.0354	0.0107	0.0465	-0.0114	-0.0180	-0.0052
	(0.0249)	(0.0370)	(0.0299)	(0.0673)	(0.1016)	(0.0554)
Δ Wealth W/O Home Equity (M)	1.9819	-3.8897	3.0427	7.7833	14.0845	6.9214
	(2.1879)	(2.6471)	(2.4671)	(6.5053)	(24.2271)	(6.3478)
Δ Home Equity (K)	0.0193*	0.0278	0.0168			
	(0.0112)	(0.0242)	(0.0125)			
Wtr Head Retired in 2005			1.1298			-2.6020
			(1.8644)			(3.1139)
Number of observations	3638	1352	2286	1191	762	429

*, ** ,and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 1.5: Regression Analysis of the Change of Food Eaten out Expenditure from 2005 to 2007

	Vehicle Acquisition Decision					
	Home Owners			Renters		
	Buy used	Buy new	Lease	Buy used	Buy new	Lease
Intercept	-2.4648***	-2.9898***	-5.5138***	-2.7256***	-5.9323***	-3.7192***
	(0.2606)	(0.2325)	(0.4649)	(0.2432)	(0.6391)	(0.6938)
Number of Adults in 09	0.6354***	0.5022***	0.6436***	0.5673***	0.6030***	-0.0230
	(0.1001)	(0.1128)	(0.1457)	(0.1187)	(0.2317)	(0.3894)
Whether # of Vehicle > 2 in 07	0.2977**	0.1098	-0.3049	0.8896**	-0.3156	-0.5735
	(0.1502)	(0.1702)	(0.3105)	(0.4001)	(0.8633)	(0.9369)
Interview between Jun. and Aug.	0.4028***	0.0804	0.5652*	-0.1427	0.5694	-0.1476
	(0.1559)	(0.1760)	(0.2987)	(0.2156)	(0.4366)	(0.5238)
Interview between Sep. and Dec.	0.6417*	0.4183	1.3331**	0.2962	0.3596	-0.2475
	(0.3628)	(0.3603)	(0.5634)	(0.4179)	(0.5294)	(0.9973)
Wtr Refinance Mortgage	-0.1308	0.0245	0.5361**			
	(0.1474)	(0.1575)	(0.2665)			
Wtr Head Has a Job in 09	0.2965*	0.3644*	0.0756	1.3527***	2.5250***	-0.0077
	(0.1671)	(0.1896)	(0.3569)	(0.2084)	(0.5824)	(0.5225)
Unemployed Weeks of Head in 08	-0.0075	-0.0167	0.0058	0.0101	-0.0865*	-0.0160
	(0.0112)	(0.0144)	(0.0236)	(0.0074)	(0.0457)	(0.0223)
Total Family Income in 08 (K)	0.0031**	0.0061***	0.0114***	-0.0028	0.0054*	0.0112**
	(0.0013)	(0.0013)	(0.0017)	(0.0031)	(0.0030)	(0.0044)
Wealth W/O Home Equity in 09(M)	0.0179	0.3282**	-0.6206	-2.8190**	0.4761	0.1480
	(0.1995)	(0.1502)	(0.4883)	(1.3226)	(0.3492)	(0.3694)
Home Equity in 09 (K)	-0.0032***	-0.0003	-0.0002			
	(0.0006)	(0.0006)	(0.0011)			
Number of observations	541	386	77	396	57	45
Number in Reference Group (neither buy nor lease)			1214			903

*, ** ,and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 1.6: Multinomial Logistic Regression Analysis of the Vehicle Acquisition Decision from 2007 to 2009

	Vehicle Acquisition Decision					
	Home Owners			Renters		
	Buy used	Buy new	Lease	Buy used	Buy new	Lease
Intercept	-2.1079***	-2.8743***	-4.3819***	-2.4079***	-4.7217***	-6.7135***
	(0.2491)	(0.2340)	(0.3867)	(0.3089)	(0.5815)	(0.8638)
Number of Adults in 07	0.4750***	0.5741***	0.4147**	0.6571***	0.6547***	0.4529
	(0.1175)	(0.1118)	(0.1674)	(0.1643)	(0.2385)	(0.3495)
Whether # of Vehicle > 2 in 05	0.3394**	0.1383	0.0663	1.8705***	0.9189	2.1818***
	(0.1646)	(0.1681)	(0.2630)	(0.5525)	(0.7694)	(0.8330)
Interview between Jun. and Aug.	0.0290	0.1444	0.0200	-0.1467	-0.1550	1.5309***
	(0.1543)	(0.1539)	(0.2549)	(0.2168)	(0.3701)	(0.5044)
Interview between Sep. and Dec.	0.3860	-0.0772	-0.4036	0.0154	-0.0912	1.2718
	(0.3598)	(0.3671)	(0.6003)	(0.3652)	(0.5058)	(0.8018)
Wtr Refinance Mortgage	-0.0968	-0.2750*	0.1711			
	(0.1469)	(0.1494)	(0.2302)			
Wtr Head Has a Job in 07	0.5034***	0.4027**	0.4129	1.1852***	1.9608***	1.9854***
	(0.1763)	(0.1734)	(0.3179)	(0.2405)	(0.5627)	(0.6903)
Unemployed Weeks of Head in 06	-0.0015	-0.0240	0.0211	0.0064	0.0047	-0.0154
	(0.0152)	(0.0164)	(0.0207)	(0.0114)	(0.0216)	(0.0241)
Total Family Income in 06 (K)	0.0052***	0.0089***	0.0110***	-0.0048	0.0045	0.0107**
	(0.0015)	(0.0015)	(0.0018)	(0.0036)	(0.0042)	(0.0047)
Wealth W/O Home Equity in 07(M)	0.0463	-0.0726	0.0390	-0.8145	0.2491	-5.0090*
	(0.1316)	(0.1305)	(0.2020)	(0.8122)	(0.8307)	(2.8960)
Home Equity in 07 (K)	-0.0033***	-0.0002	0.0003			
	(0.0006)	(0.0005)	(0.0008)			
Number of observations	579	512	123	370	81	51
Number in Reference Group (neither buy nor lease)			1042			730

*, ** ,and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 1.7: Multinomial Logistic Regression Analysis of the Vehicle Acquisition Decision from 2005 to 2007

	Vehicle Acquisition Decision			
	Home Owners		Renters	
	Buy used	Buy new or lease	Buy used	Buy new or lease
Intercept	-2.9430***	-3.2651***	-2.9219***	-4.0120***
	(0.3153)	(0.2743)	(0.3303)	(0.5516)
Number of Adults in 07	0.6362***	0.5076***	0.2669*	0.3102
	(0.1153)	(0.1138)	(0.1457)	(0.2180)
Whether # of Vehicle > 2 in 07	0.2360	0.0128	0.9312**	-0.7622
	(0.1743)	(0.1748)	(0.4137)	(0.8537)
Wtr Head Have a Job in 07	0.5258**	0.4436**	1.3816***	1.3482***
	(0.2147)	(0.2152)	(0.2856)	(0.5053)
Unemployed Weeks of Head in 08	-0.0012	-0.0071	-0.0028	-0.1070**
	(0.0115)	(0.0131)	(0.0086)	(0.0470)
Total Family Income in 08 (K)	0.0030**	0.0074***	0.0001	0.0054*
	(0.0014)	(0.0013)	(0.0031)	(0.0033)
Wealth W/O Home Equity in 07(M)	-0.2530	0.1515	-3.5766**	0.3387
	(0.2512)	(0.1476)	(1.6881)	(0.8022)
Home Equity in 07 (K)	-0.0024***	0.0001		
	(0.0007)	(0.0005)		
Number of observations	371	367	243	78
Number in Reference Group (neither buy nor lease)		1223		904

*, ** ,and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 1.8: Multinomial Logistic Regression Analysis of the Vehicle Acquisition Decision in 2008

	Vehicle Acquisition Decision			
	Home Owners		Renters	
	Buy used	Buy new or lease	Buy used	Buy new or lease
Intercept	-1.9870***	-2.7200***	-2.6236***	-4.4401***
	(0.2636)	(0.2273)	(0.3302)	(0.5111)
Number of Adults in 05	0.3909***	0.3842***	0.4628***	0.6485***
	(0.1148)	(0.1093)	(0.1791)	(0.2488)
Whether # of Vehicle > 2 in 05	0.2867	-0.0573	1.5406*	1.1471
	(0.1845)	(0.1818)	(0.7895)	(0.8670)
Wtr Head Have a Job in 05	0.1597	0.4533**	1.2053***	1.3471***
	(0.1981)	(0.1838)	(0.2754)	(0.5171)
Unemployed Weeks of Head in 06	-0.0201	-0.0372	-0.0024	-0.0482
	(0.0163)	(0.0250)	(0.0138)	(0.0455)
Total Family Income in 06 (K)	0.0060***	0.0084***	-0.0028	0.0069*
	(0.0016)	(0.0014)	(0.0036)	(0.0042)
Wealth W/O Home Equity in 05(M)	-0.1163	-0.0368	-1.6207	-2.8432
	(0.2026)	(0.1626)	(1.3059)	(2.6041)
Home Equity in 05 (K)	-0.0049***	0.0003		
	(0.0009)	(0.0005)		
Number of observations	404	457	234	79
Number in Reference Group (neither buy nor lease)		1052		730

*, ** ,and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 1.9: Multinomial Logistic Regression Analysis of the Vehicle Acquisition Decision in 2006

The decomposition for the "Δ Food Eaten at Home Expenditure" case

	Home Owner			Renter		
	Coefficient	Std. Err.	P>|z|	Coefficient	Std. Err.	P>|z|
Omega=1[14]						
Char.	-0.7353	0.7338	0.316	0.3292	0.3148	0.296
Coef.	2.1229	1.4242	0.136	2.5054	2.4785	0.312
Interaction	1.0287	1.1264	0.361	-0.0604	0.4300	0.888
Omega=0						
Char.	0.2934	0.8277	0.723	0.2688	0.3290	0.414
Coef.	3.1516**	1.4323	0.028	2.4450	2.4730	0.323
Interaction	-1.0287	1.1264	0.361	0.0604	0.4300	0.888

The decomposition for the "Δ Food Eaten out Expenditure" case

	Home Owner			Renter		
	Coefficient	Std. Err.	P>|z|	Coefficient	Std. Err.	P>|z|
Omega=1						
Char.	2.7229***	0.7074	0.000	0.1379	0.2065	0.504
Coef.	3.4652***	1.0290	0.001	5.9315***	1.6009	0.000
Interaction	-0.9276	0.9723	0.340	0.1025	0.3692	0.781
Omega=0						
Char.	1.7954***	0.7282	0.014	0.2404	0.3389	0.478
Coef.	2.5376***	1.1752	0.031	6.0340***	1.5558	0.000
Interaction	0.9276	0.9723	0.340	-0.1025	0.3692	0.781

Table 1.10: Blinder-Oaxaca Decomposition for Food Expenditure

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[14] Different Omega values indicate different weighting matrixes which are used in the decomposition process.

	Home Owner			Renter		
	Coefficient	Std. Err.	P>|z|	Coefficient	Std. Err.	P>|z|
Omega=1						
Char.	0.0020	0.0080	0.805	0.0048	0.0059	0.413
Coef.	0.0578***	0.0169	0.001	0.0397**	0.0176	0.024
Interaction	-0.0036	0.0075	0.635	-0.0032	0.0060	0.593
Omega=0						
Char.	-0.0016	0.0090	0.860	0.0016	0.0078	0.835
Coef.	0.0542***	0.0168	0.001	0.0365**	0.0178	0.040
Interaction	0.0036	0.0075	0.635	0.0032	0.0060	0.593

Table 1.11: Blinder-Oaxaca Decomposition for Vehicle Acquisition Decision between the Group of 2005-2007 and the Group of 2007-2009

	Home Owner			Renter		
	Coefficient	Std. Err.	P>|z|	Coefficient	Std. Err.	P>|z|
Omega=1						
Char.	-0.0060	0.0069	0.384	-0.0014	0.0048	0.763
Coef.	0.0585***	0.0171	0.001	0.0119	0.0188	0.528
Interaction	0.0002	0.0045	0.959	-0.0039	0.0058	0.508
Omega=0						
Char.	-0.0058	0.0079	0.464	-0.0053	0.0071	0.458
Coef.	0.0587***	0.0167	0.000	0.0080	0.0177	0.649
Interaction	-0.0002	0.0045	0.959	0.0039	0.0058	0.508

Table 1.12: Blinder-Oaxaca Decomposition for Vehicle Acquisition Decision between the Group of 2006 and the Group of 2008

	Foreclosure			
	Model 1	Model 2	Model 3	Model 4
Intercept	-2.5401***	-2.5145***	-2.3233***	-2.2324***
	(0.2512)	(0.2458)	(0.2400)	(0.2470)
Wtr Head Have a Job in 09	-0.2647	-0.2703	-0.2342	-0.2303
	(0.2661)	(0.2656)	(0.2890)	(0.2869)
Total Family Income in 08 (K)	-0.0089***	-0.0094***	-0.0098***	-0.0097***
	(0.0027)	(0.0028)	(0.0031)	(0.0031)
Wealth W/O Home Equity in 09 (M)	-0.1800	-0.2057	-0.2776	-0.3486
	(0.8037)	(0.7498)	(1.1872)	(1.2380)
WTR Home Equity<0 in 09	1.8439***			
	(0.2678)			
WTR Home Equity<-10K in 09		2.2735***		
		(0.2674)		
WTR Home Equity<-50K in 09			2.7465***	
			(0.3212)	
WTR Home Equity<-100K in 09				2.8031***
				(0.4361)
Number of Observations	3083	3083	3083	3083

Table 1.13: Regression Analysis of Foreclosure

2005-2007	Owner		Renter	
	Mean	Std Error of Mean	Mean	Std Error of Mean
Δ Food Eaten at Home Expenditure	6.244532	0.951177	5.476761	1.613807
Δ Food Eaten out Expenditure	1.778569	0.694432	2.488948	1.180811
Δ Number of Persons	-0.040058	0.01009	0.041802	0.017481
Wtr Refinance Mortgage	0.343514	0.009174		
Δ Wtr Head Has a Job	-0.027083	0.006156	-0.030349	0.012704
Δ Total Family Income (K)	8.266846	0.942544	4.636695	1.182416
Δ Wealth W/O Home Equity (M)	0.071337	0.010691	0.002154	0.008082
Δ Home Equity (K)	25.834242	1.496283		

2007-2009	Owner		Renter	
	Mean	Std Error of Mean	Mean	Std Error of Mean
Δ Food Eaten at Home Expenditure	3.828226	1.053546	2.702564	1.627183
Δ Food Eaten out Expenditure	-3.482011	0.778876	-3.683016	1.263092
Δ Number of Persons	-0.031809	0.008988	0.008341	0.015291
Wtr Refinance Mortgage	0.353142	0.009277		
Δ Wtr Head Has a Job	-0.082787	0.006971	-0.052925	0.014169
Δ Total Family Income (K)	1.702945	1.122726	4.65789	1.053387
Δ Wealth W/O Home Equity (M)	-0.025376	0.013124	0.014967	0.010909
Δ Home Equity (K)	-30.026083	2.022982		

Appendix 1.1: Weighted Statistics for Food Expenditure

2005-2007	Owner		Renter	
	Mean	Std Error of Mean	Mean	Std Error of

	Mean			Mean
Buy Used	0.213186	0.009877	0.270012	0.01741
Buy New	0.213469	0.009991	0.073553	0.010358
Lease	0.058935	0.00596	0.023807	0.005016
Number of Adults in 07	1.88076	0.018572	1.407644	0.024223
Whether # of Vehicle > 2 in 05	0.228284	0.010099	0.032376	0.006576
Interview between Jun. and Aug.	0.235495	0.010537	0.280842	0.018162
Interview between Sep. and Dec.	0.03786	0.004591	0.074859	0.010998
Wtr Refinance Mortgage	0.332992	0.011729		
Wtr Head Have a Job in 07	0.667753	0.012588	0.622043	0.020345
Unemployed Weeks of Head in 06	0.669608	0.136698	2.505691	0.3932
Total Family Income in 06 (K)	80.983056	1.726123	34.917341	1.457565
Wealth W/O Home Equity in 07 (M)	0.283756	0.015363	0.03565	0.005872
Home Equity in 07 (K)	163.549398	4.365901		

2007-2009	Owner		Renter	
	Mean	Std Error of Mean	Mean	Std Error of Mean
Buy Used	0.207149	0.009782	0.229588	0.015053
Buy New	0.180216	0.009665	0.046842	0.00843
Lease	0.032727	0.004112	0.024395	0.005802
Number of Adults in 09	1.890696	0.019079	1.414362	0.024807
Whether # of Vehicle > 2 in 07	0.251551	0.010524	0.040895	0.00639
Interview between Jun. and Aug.	0.202412	0.010159	0.267241	0.01727
Interview between Sep. and Dec.	0.028967	0.003783	0.048078	0.007973
Wtr Refinance Mortgage	0.331274	0.011897		
Wtr Head Have a Job in 09	0.631141	0.012773	0.588945	0.019478
Unemployed Weeks of Head in 08	1.082211	0.159377	2.99611	0.340217
Total Family Income in 08 (K)	83.699254	1.633437	37.02679	1.228909
Wealth W/O Home Equity in 09(M)	0.245059	0.013354	0.047481	0.011531
Home Equity in 09 (K)	132.048537	3.946947		

Appendix 1.2: Weighted Statistics for Vehicle Acquisition

Chapter 2: Diminishing Margins: Housing Market Declines and Family Financial Responses

1. Introduction and Literature

In this paper, we study the factors related to family level mortgage distress and foreclosure in the U.S. economy, 2007-2011. Somewhat ironically, many homeowners with poor family financial and labor market circumstances during the boom were less likely to have trouble. This is because they were less likely to have access to a risky financial position in housing. On this basis lending in the boom can be said to have been prudent. Yet, as is well known, a family's labor market and economic conditions can and do change – so many that had greater access to home ownership and financing in the boom were those with the greatest mortgage distress and became a central part of the process of contraction when housing and labor markets deteriorated. The implication is that mortgage credit should be based on a set of longer term measures of ability to pay.

Rapid appreciation in home prices has been observed in many advanced economies. In Japan the housing markets for condominiums experienced a sharp rise in prices, 1987-1991, with Tokyo prices leading the way up quickly followed by Osaka prices. Then Tokyo prices led the way, precipitously downward, followed closely by those in Osaka, 1992-1995. The path of the rising prices and then sharply declining prices in Osaka and Tokyo, 1987-1995, has essentially the same shape as the Case-Shiller average of 10 major urban markets in the U.S., 1999-2009. A housing price boom occurred in Scandinavia: in Sweden, housing prices tripled after the mid 1990s, with similar patterns observed in other Northern European countries. In Sweden, a boom

developed during 1985-1990. Subsequently, a bust occurred, 1990-1993, with a severe impact on the wider Swedish economy (Jaffé, 1994).[15]

Various factors explaining the presence of a housing bubble include the difficulty of holding a short position in a heterogeneous commodity. Another strand in the literature is that of unfounded optimism in the value of a particular class of investment, including railroads or real estate. This was the premise behind the concepts set out by Irving Fisher (1933) in his effort to understand the Great Depression, and is more commonly recognized in the notion of Keynes' 'animal spirits' or expectation contagion (Akerloff and Shiller, 2009)[16]

In Fisher's assessment:

"The public psychology of going into debt for gain passes through several more or less distinct phases: (a) the lure of big prospective dividends or gains in income in the remote future; (b) the hope of selling at a profit, and realizing a capital gain in the immediate future; (c) the vogue of reckless promotions, taking advantage of the habituation of the public to great expectations; (d) the development of downright fraud, imposing on a public which had grown credulous and gullible."

Our empirical results are consistent with housing holding a favored position as an investment in many U.S. markets. In particular, the resulting downturn in housing prices and associated delinquencies on mortgages are generally considered to be the major cause of the crisis in credit markets that subsequently spilled into the other sectors of the U.S. economy in the

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[15] There was a shift to more favorable tax deductions of mortgage interest, and a dramatic increase in the financing and construction of multi-unit housing ensued. The cycle in commercial real estate was even more acute.

[16] Work in neuroscience establishes the presence of a mirror neuron center in the brain which gives rise to human propensities to behave in a pattern 'mirroring' that of others (Iacoboni, 2009).

form of a Fisherian debt-deflation (Fisher, 1933). In our study, the most substantial predictor of mortgage distress and foreclosure is the family's allocation of a high share of annual family income going to housing payments for interest, taxes, and utilities. Higher values of housing payments to family income -- HPI were more common in markets with strong appreciation during the housing boom. Our analysis suggests that lenders placed substantial reliance on current income rather than the longer run income needed to support repayments.

With the belief in a high probability of realizing future capital gains, households found themselves in what has been referred to as the 'double trigger' condition (Fishback, Rose and Snowden, 2013). Namely, for a home financed with a substantial mortgage a fall in price need not create a crisis if there is sufficient income to maintain the payments. And if income falls substantially but the house price remains stable the house can be sold to pay the mortgage. A crisis arises when there is both a fall in home value below the mortgage balance and income falls to the extent of preventing continued payments. An addition to the double trigger condition is the absence of substantial net worth in other accessible categories. So perhaps it is better to think of a 'triple trigger'.

Owner-occupied housing matters for the whole economy since it is the major asset in many households' portfolios and across a wide span of the life cycle (Hurst, Luoh, and Stafford, 1998; Wolff, 2010). Housing wealth is an important determinant of consumption and saving behavior of households and is often correlated with savings and better overall financial management. For example, Bostic, Gabriel, and Painter (2009) find that housing wealth has substantial effects on household consumption and the U. S. economy. Dvornak and Kohler (2003), analyzing the data of a panel of Australian states, show that a one dollar permanent increase in housing wealth can cause a three cent increase in long-run annual consumption. As

shown by Jaffe (2004), disruptions in the housing market can have widespread and long lasting effects via the connection to other spending and economic activity.

Housing services are the consumption dimension, but on the financial side, recent research (Hurst and Stafford, 2004; Cooper, 2009) supports home ownership as playing a central collateral or liquidity role (Bernanke and Gertler, 1989) – in contrast to the wealth effects found for non-pension holdings of stocks (Juster, Lupton, Smith and Stafford, 2006) and the 'wealth' interpretation offered by Bostic, Gabriel and Painter. In the Hurst-Stafford framework there are two motivations for exercising the option to refinance a mortgage. There is a traditional 'financial option' allowing the homeowner to realize a net worth gain and possibly an asset reallocation when an existing mortgage can be refinanced at a lower interest rate. A second motivation for exercising the refinancing option is to tap into equity and 'borrow up' to support consumption.

Exercising this 'consumption option' can lead to refinancing to both a higher loan balance and a higher rate of interest. This perspective has been given added support in the analysis of aggregate data (Greenspan and Kennedy, 2008). A substantial share of equity withdrawals was found to support personal consumption expenditures. Since the different balance sheet components are fungible, this consumption allocation is consistent with equity withdrawal as a supplement to cash flow to spend beyond current cash flow from income sources.

Connected to the 'consumption option' is a third motivation to refinance: borrowing to cover cash flow requirements from home ownership that are induced by rising interest, tax and utility costs. This refinancing can otherwise be thought of as a 'speculation-based liquidity option'. That is, refinancing for a position in housing which embodies a wider set of and higher

level of costs. These are costs beyond those related to normal predicted consumption, based on income and family composition. Rather the funds support speculative financing, based on expected appreciation. This appears to have played a major role in the housing market turbulence, 2001-2009. Tapping into perceived equity gains from rising home prices can clearly be risky as changes in the family balance sheet are mixing with expense flows. In short, during the boom, families and their lenders more often took on a jointly speculative position, leading to increased cash flow demands to cover housing costs – and reducing liquidity other than from *future* borrowing on equity gains. In effect, the borrowing collateral was often based on expected future appreciation.[17]

The decisions to invest in housing and hold a substantial mortgage are usually associated with younger households (Flavin and Yamashita, 2002), as part of a life-cycle approach to consumption and asset management (Campbell and Viciera, 2002; Deaton, 1991). But the housing boom of 1999-2005 induced many of those, even 60 years or older, to depart from the prior norm and to hold more housing and have greater mortgage debt than earlier cohorts. In data from the PSID for 1986, 20.4 percent of owners age 65-79 held a mortgage on their home. By 2005, this had increased to 35.8 percent. A study by Apgar and Di (2006) reports that mortgage debt owed by older households nearly quadrupled between 1989 and 2001. In 2001, after accounting for inflation, the typical household headed by someone 65 or older had $44,000 in mortgage debt, compared with $12,000 in 1989 (Apgar and Di, 2006). This may reflect a desire to hold a more leveraged housing investment or it may indicate access to home equity to support retirement.

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[17] In part, higher marginal debt service costs were offset by interest deductibility on home mortgages, which should have induced families to hold a larger share of debt in the form of mortgages, even prior to 2005 bankruptcy reforms.

Even at the lower mortgage rates, by 2007 mortgage debt payments as well as other fixed expenses for insurance and taxes had become a rising share of family income compared to earlier periods.[18] This was most pronounced in specific urban markets. With rising home expenses and a greater cost of home debt servicing, even elderly homeowners were in a financially constrained situation should there be a reversal in home prices. As can be seen in Table 1, the 1999-2005 period was characterized by both a higher rate of home ownership and greater persistence in ownership than 1989-1995. When housing prices are on the rise, new demand can maintain the upward trend. Yet in many markets, most families that could afford the new housing and the related costs had already become owners, leaving a smaller pool of new potential entrants to further boost demand, at which point the price rise began to stall out.

Before the 2005 U. S. bankruptcy reform, households with financial distress could transfer more money to pay their mortgage and could then file for bankruptcy to discharge other debts. After the bankruptcy reform, the cost for filing for bankruptcy increased and there were greater limitations on what could be discharged. Thus, households with financial problems had more incentive to foreclose on their mortgages. For this reason Bernstein (2008) has argued that the 2005 reform of U.S. bankruptcy law resulted in, or at least precipitated, the increase of mortgage defaults. Morgan, Iverson and Botsch (2011), using 1/1998-3/2007 state-level aggregate data, show that subprime foreclosures increased more in states where home equity exemptions are high after 2005 bankruptcy reform. Li, White, and Zhu (2011), using large samples of individual level mortgage data also show that the 2005 reform of U.S. bankruptcy law led to an increase of mortgage defaults. Possibly these early foreclosure sales were enough to precipitate the downward price path for housing in numerous markets.

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[18] This is parallel to the concept of the aggregate Debt Service Ratio. At lower borrowing rates the amounts borrowed can increase to the point that overall interest costs rise (Greenspan, 2004)

In line with the Fisherian perspective, Crouhy, Jarrow, and Turnbull (2008) argue that banks implemented some risky actions before the real estate bubble burst. Demyanyk and Hemert (2009) show that the quality of loans decreased greatly during the dramatic expansion of the subprime (securitized) mortgage market. On the other side of the mortgage market, households also may take risky positions before the burst of the real estate bubble. Campbell (2003) shows that people with low risk aversion would be more likely to take Adjustable Rate Mortgages (ARM). Some other papers (Mayer, Pence, and Sherlund 2009, Coulibaly and Li 2009, and Immerqluck 2009) also discuss the risky position of lenders and borrowers in the mortgage market. Since ARM rates are normally below fixed rates, the popularity of ARM mortgages can also be explained as a way to participate in greater housing leverage.

Here we explore some of the themes outlined above by using the data in the longstanding, nationally representative Panel Study of Income Dynamics (PSID) of approximately 8,600 families and 24,000 individuals living within these families. For our analysis we use a balanced panel of families, who had home mortgages, 2007-2009. PSID data includes housing and wealth holdings and basic geospatial measures. New measures include data on foreclosure and mortgage distress added in 2009 – 2011. Our results show that specific ex ante positions in 2007 do matter for future mortgage payment problems in 2009 and subsequent foreclosure. Race and education level of head, number of people in household, year of taking the original mortgage, the rate of decrease in the markets included in the Case-Shiller home price index, the ratio of housing payments to family income, employment status in 2009, and wealth level without equity are all highly related to 2009 mortgage distress and subsequent foreclosure.

2. Net Worth, Emerging Patterns of Assets and Home Mortgage

We review selected basic patterns of household net worth for those headed by a person age 65 and older and of those at midlife, age 40-49, along with age profiles of participation on the home mortgage market over time. In Table 2 it can be seen that over the period, 2001-2007, those age 65 and older experienced a substantial rise in the constant dollar value of their net worth. The median value of net worth rose modestly but was generally quite stable. The rise in net worth of families age 65-79 has been documented elsewhere.[19] The younger or midlife group age 40-49, which could be thought of as including the 'younger generation,' and likely to receive help from the elders[20] in times of need also had substantially more net worth as of 2007 compared to 2001. On the other hand, financial net worth, cash or that which can be readily converted into cash to meet contingencies that could jeopardize mortgage payments, shows no growth at the mean or median, 2001-2007, for those 65 or older, and, in fact, declined modestly.

For those of age 40-49 the mean financial wealth shows no clear improvement, 2001-2007, and the median financial wealth shows a low and declining real value, 2001-2007. Of some concern is that moving toward 2007 the liquid financial net worth was declining, especially relative to overall net worth, and is persistently low and declining, especially at the median. The median for this age group was persistently under $10,000 ($2007). The debt growth was fully observed at that time (Dynan and Kohn, 2007). As financial vicissitudes arise, these midlife course families had limited net liquid reserves with which to deal with negative financial

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[19] The average net worth of those age 65-79 more than doubled in constant dollars from 1984-2001 and the income relative to Census Needs also rose strongly for this group, especially for those in better health. See Grafova, McGonagle and Stafford, 2005 "Functioning and Well-Being in the Third Age, 1986-2001," in The Crown of Life: Dynamics of the Early Post-Retirement Years (Jacquelyn B. James and Paul Wink, eds.) , 2006.

[20] See McGarry and Schoeni, 2007.

shocks [21] . The rise of net worth, substantially driven by home price appreciation, was characterized by a constant or slightly declining financial net worth.

Age profiles of home mortgage holding among homeowners, based on the full weighted sample of the PSID, 1979 to 2007, are in Figure 1. The top line is for those headed by a family age 25-34, and just below are the families age 35-49. Both show the persistently high rates for those families headed by a 25-49 year old. The middle line is for families headed by a 50-64 year old. About half of these families held a mortgage from 1979 to the early 1990s and then the share of these homeowners with a mortgage rose to about 70 percent after 1999. The lowest line is for families headed by an individual age 65 or older. Over the period we can see a rise for older families from under 20% with a mortgage to about 30 % by 2007. Another reference point is the dip in mortgage holding in the early 1990s, a period with high mortgage rates, followed by a rebound in mortgage holding as rates came down in the mid and later 1990s.

One related measure of housing and mortgage contract position is a micro level version of the Debt Service Ratio (DSR) maintained by the Federal Reserve Board. This aggregate index shows an upward movement in cash flow burden of mortgages up through 2007.[22] At the micro level, the PSID data show both a rising and dispersed ratio of mortgage debt to family income (DSR). Holding a high mortgage-based DSR is one measure of a family's housing risk. The expectation of additional future increases in home prices and continued employment can be the motivation for enduring a higher current cash flow burden. Expanding this to include all other

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[21] The 2007 value of non-collateralized debt, especially burdensome in a cash flow crisis, shows that of the families who hold any had a total balance averaging $21,500. See 'Trends in Household Wealth Dynamics, 2005-2007.' Technical paper Working Paper Series, September, 2009. http://psidonline.isr.umich.edu/Publications/Papers/tsp/2009-03_Trends_in_Household_Wealth.pdf

[22] As noted by Alan Greenspan (2004), even with lower mortgage rates, the added mortgage value outstanding can lead to a higher debt service ratio for home mortgages. http://www.federalreserve.gov/boarddocs/speeches/2004/20041019/default.htm

housing related payments relative to family income, housing payments to income (HPI) provides another measure of housing service cost burden.

Included in HPI are payments for interest on the first and second mortgage, and with rising house prices come rising real estate taxes, and along with utilities, the cash flow going into owner occupied housing was on the rise, 1990-2007. Retrospectively, we may want to conclude that these were evident patterns of 'excess' in the housing and mortgage market and related to the various mortgage quality measures reported from industry data. At the time of the upswing, observers could refer to stable and falling ex post loan-to-value ratios, but these were often driven by home price appreciation that did not persist, mostly in the markets with rapidly rising home prices. Edward Gramlich (2007) noted that one aspect of the 1995-2005 U.S. housing pattern was higher ownership rates with a wider demographic distribution. This can be seen in Table 1. Some families persisted as renters and others, in addition to being new or continuing owners took on very risky positions with non-traditional mortgages (NTM's). Specifically, they (and their lenders) often chose variable rate mortgages or a balloon repayment and a short horizon, or a reborn use of second mortgages. The PSID panel data show these and other aspects of housing and mortgage decisions.

3. The Spatial and Household Distribution of NTM's and the Cash Flow Position

What measures are clear indicators of a risky housing position prior to the declines in the market? The existing PSID data show that 2005 loan to value ratios as a measure of the homeowner's leverage position are problematic. Even mortgages with a high LTV, well above a 'safe' level of 80% or more in home equity at the point of mortgage settlement,[23] were often

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[23] Data in the Financial Crisis Inquiry Report, The Financial Crisis Inquiry Commission, U.S. Government Printing Office, January, 2011 indicate that high LTV's at the point of loan origination were a rising share of new mortgages..

driven downward by rapid home price increases, producing an ex post 'safe' mortgage. By 2007, the normal strong relationship between permanent income and the house value (not shown here) became much weaker. Going forward to 2009, some of the ex ante 'safe' mortgages sunk 'under water' with rapidly declining home values, 2007-2009. By 2009, most of the acute declines had ended, and the net equity position ex post can be observed as an outcome. Which families are these? Who are those experiencing this 'collateral damage'? How strongly does the 2007 housing payments to income (HPI) ratio, likely a better *ex ante* risk measure, relate to such an outcome?

The share of the 2007 mortgages which were non-traditional mortgages (NTM's) included variable rate mortgages (ARM's). The ARM share was rising from 1997 to 2007, as shown in Figure 2.[24] The rise is even stronger, given the reports were from a March to December field period in 2007, and that given the 2001-2004 and 1997-2001 periods are for 4 year intervals.

There was a general rise in the share of income going to support homeowner expenses for all age groups. Given the position of families with respect to housing in 2007, how important are 2007 HPI (housing payments relative to family income) and other 2007 mortgage measures in predicting the various outcomes in 2009 – falling behind in payments, mortgage modification, expecting to fall behind in the next 12 months, and foreclosure?

4. Distress Indices and Analysis

Here we show how these ex ante risk positions played out as the housing market and the wider economy deteriorated, 2007-2009. For this we have used the PSID family files in 2009 which measure a set of mortgage distress indicators, or adverse outcomes. These range from no

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[24] The percent of ARM mortgages taken out varies with the expected inflation rate. After the 1982 inflation a very high share of new mortgages was adjustable as the banks sought protection from inflation risk.

observed problems to modest reported risk of payment problems in the next 12 months, to having fallen behind substantially in making payments, the need to modify the mortgage because of payment problems (not normal refinancing), negative home equity, and then actual foreclosure. Specifically, we have explored the following outcomes:

1   **Falling behind.** This is based on the variable **(A27F1)** 1= yes, 5 = no from the questionnaire. Here the measure =1 if the answer is 1, and otherwise the measure=0.

2   **Next 12 Months (A27F6)** fall behind? 1=very likely, 3 = somewhat likely, 5= not at all likely. We define the value of this measure is 1 for the "very likely" case, 0.5 for the "somewhat likely" case, and 0 for the "not at all likely" case.

3   **Mortgage Modification (A27F5)** (1=yes; 5=no) Here the measure =1 if the answer is 1, and the measure=0 otherwise.

4   **Under water 1.** Here we have the cases where a dollar value of the home was reported. The unfolding bracket cases[25] are likely to create classification problems. The ratio is (for valid dollar value of home value on the market – excluding bracket range values s and 'don't know') the sum of **(A24MOR1 + A24 MOR2)** divided by **A20** = sum of mortgage balances / house value (value of house if sold today). This was converted into 1-0 under water dummy variable= sum of mortgages/hv > 1.00 or not.

5   **Under water 2.** This measure is based on the difference between the wealth with home equity **(WEALTH2)** and the wealth without home equity **(WEALTH1)**. We define under water 2 equal to 1 if WEALTH2-WEALTH1<0 and equal to 0 if WEALTH2-WEALTH1>0.[26]

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[25] Unfolding brackets refers to the use of respondent value ranges when the respondent does not offer a dollar value answer.(Hurd, McFadden, Chand, Gan, Merrill, and Roberts, 1998)

[26] Measure 4 and Measure 5 differ as a function of the way in which 'bracket' values were treated in data processing. Measures 4 and 5 are used as multiple indicators of being under water – each receiving a weight of .5.

6   **Foreclosure,** 2009-2011. This is a measure of foreclosure from 2009-2011 on a mortgage for the main residence.

Each of the above six measures only partly captures mortgage distress. We constructed a set of mortgage distress indices based on measures (1-5) to capture the overall mortgage distress of households, including a distress index by principal component analysis partly as a robustness check. Since foreclosure has relatively few cases (74 recently completed foreclosure cases, or 4% out of 1827 panel observations) and is quite distinct from pre-foreclosure distress, a separate estimation was implemented.

5. The Best of Times, The Worst of Times: Outcomes and Discussion

The PSID had major data collections in both 2007 and 2009 (primarily over the April to October field period of each year). Many of the measures are as of the survey date (labor market status), but other important measures are for the prior calendar year (such as weeks of unemployment). Economic activity was falling through much of 2008, and particularly so in the latter part of the year and into 2009. As a result there is quite a complete capture of the deterioration occurring in the recession. In contrast the 2007 data refer to the calendar year 2006 and better conditions at the date of the survey in 2007. In addition PSID has a valuable measure of the overall labor income of the husband and wife for two calendar years back (Yeung, Stafford and Andreski, 2008). From the 2009 wave, this is Income of the head 2007 and Income of the wife 2007. This and other 2007 wave measures allow us to explore the role of favorable conditions as of 2006-2007 as factors leading to a strong commitment to housing in good times and then the 'triple trigger' factors operating in bad times of 2008-2009.

The key dependent variables are mortgage distress indices. Index 1 for Table 3 Column 1 was constructed by summing up measure 1 through measure 5. It has 9 possible values and

ranges from 0 to 4. We estimated the OLS regression of this and three other variants of the

mortgage distress index on baseline regressors and those specifically for our housing, financial

and labor market variables. The models include several family and demographic variables known

to predict mortgage problems (Webb, Friedberg and Dushi, 2010): age, race, marital status and

education level of head, and the number of people in household at a given income level. We only

include the households with male head in 2007 in the sample, and some observations with

extreme value are excluded.

Of direct interest are the mortgage and financial variables: the 2009 interview date (with

after August 2009 indicating more time exposure to financial risk), whether the mortgage was

the original mortgage, the year of taking the original mortgage, the (7/2007 – 7/2009) rate of

decrease in the Case Shiller home price index,[27] the ratio of housing payments to family income

(HPI) in 2007[28]. The estimated coefficient of 'year of original mortgage' is significantly positive

at the 1% level. Households with more recent original mortgages as of 2007 interview were more

likely to have mortgage payment troubles in 2009. The U.S. real estate bubble achieved its peak

in early 2006 and then the price of real estate started to decrease from later in 2006 until 2011.

Even controlling for HPI and other covariates, the closer to 2007 is the time of taking the original

mortgage, the more likely does the loan reflect a risky mortgage position for both households and

lenders because, as we now know, the anticipated future increases were not to be. This supports

the thought that there was a build-up in overoptimistic home price expectations.

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[27] The models also included region and urbanicity, which evidenced limited correlation [to other variables] except for the very largest cites, for Index 1 and Index 2. The Case Shiller Index with the sharpest declines were generally the cities with the most rapid appreciation.
[28] Given the importance of HPI in the risk of mortgage distress, Appendix B presents a descriptive regression of HPI predictors as of 2007.

The second group of variables includes the income and balance sheet measures. The income of the husband and wife has been collected in summary form for two calendar years prior to the year of the interview. This provides an approximate measure of family income for 2007. Higher income of the head and wife in calendar year 2008 is strongly predictive of less mortgage distress. On the other hand, income as of 2007 has a modest *positive* relationship to mortgage distress as of 2009. One conjecture is that having a good income flow in 2007 was often conducive to the families and their lenders agreeing to mortgages by 2007 which could not be easily supported in 2008 and 2009, unless they had sufficient current income In contrast then, 2008 income of the husband and wife is strongly related to *reduced* mortgage distress. Measures of the family's net worth and liquidity indicate that those who with thin reserves of liquid assets (as shown in Table 2) were often those with payment problems as the recession set in.

Labor market status in 2007 and 2009 has an interesting relationship to mortgage distress in 2009. In a fashion somewhat parallel to income, and in line with the Fisher thesis, many of the measures of poor labor market status as of 2007 appear to be factors that prevented families from getting into a risky mortgage position. While the head being unemployed as of 2007 is a positive predictor of later distress, as reported in PSID, 'keeping house' (which is another term for being out of the labor force and often being a discouraged worker) in 2007 by the head or wife is a negative predictor of distress in 2009. An interpretation is that, just as low income as of 2007 may have prohibited lenders from letting a family become overcommitted to housing, so too did the husband and wife being out of the labor force in 2007. In a parallel fashion, the husband or wife being disabled in 2007 is a predictor of less mortgage distress, while either being disabled as of 2009 is a strong positive predictor of mortgage distress.

For households in the cities where the Case Shiller home index declined more than 35% from 2007 to 2009, the values of distress index are significantly higher at the 1% level. This result may at least be the consequence of our distress index, which includes a partly mechanical link between a falling local housing market prices and being 'under water'. To rule out this effect, we created a new index, Index 2, only using measures 1 - 3. The regression results of Index 2 are shown in regression (2) in Table 3. Even though the estimated coefficient of "Case-Shiller index decline (07-09)>=35" is not significant, it is still positive and close to being significant. (Similar results are found for another index built by Principal Component Analysis). This finding is interesting because the rate of home price declines in city is presumably independent of the financial situation of the individual household and its ability to pay the mortgage as reflected in the family-specific financial and income measures.

Unemployment, income level, balance sheet measures, the household being in a city with 35% or more home price decline predict likely payment troubles. Rapidly decreasing house prices in a city can be a signal of poor current and anticipated labor market and income levels. This poor prospect gives households more anticipated difficulties and greater incentives to consider foreclosure on their own mortgages, a type of financial contagion. Further, a large price decrease may cause anxiety for the household, and this by itself can shape expectations about ability to pay in the next 12 months.[29]

The other significant predictor of mortgage payment trouble is the HPI in 2007. A high value of HPI is an indicator of a risky cash flow position, and is an alternative to the traditional index of a 'safe mortgage', the loan-to-value ratio (LTV) of .80 or less. While LTV can be

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[29] The correlation of the mortgage distress measures and reported life satisfaction was significantly negative.

shaped by rapid house price appreciation, if the value of HPI is high[30], the ability of the household to pay the mortgage can be compromised with a deterioration of employment status or other negative financial shocks, including a decline in the market value of the home. To assess the role of 2007 income and HPI, a reason *both* seem to matter is as follows. A high HPI implies a cash flow risk in its own right, but if, besides, the family was at a high level of *current* income, they are at still greater risk of moving to a lower future level and that will additionally precipitate repayment difficulties.

To check the robustness of our results, we constructed two additional indices (Index 3 and Index 4) and estimated a regression structure similar to Index 1 and Index 2. For Index 3, we first estimated the OLS regression of each mortgage distress measure on all the other mortgage distress measures and kept the fitted values of each regression. Then, applying a principal component analysis for the fitted values, we defined the first dimension of the PCA as Index 3. Index 4, built up in the same way as Index 3, except that we did not include the measure 4 and measure 5 to rule out the effect of house value declines on the index. The regression results of Index 3 and Index 4 are shown as III and IV. Most conclusions from Index 1 and 2 hold for Index 3 and Index 4. Overall, the results about the number of people in the household, year of taking the original mortgage, the rate of decrease of Case Shiller index>=35%, HPI, the head 'keeping house' as of 2009, income of wife in 2008, and net worth excluding home equity are relatively stable across different models.

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[30] "People [in Bakersfield, California] didn't seem to have enough income to pay for what they had bought." Financial Crisis Inquiry Report, p. 43.

6. Analysis of Foreclosure 2009-2011

The process of foreclosure unfolds over time. By 2009 there was substantial mortgage distress while the number of actual foreclosures observed by the date of the interview was rather small and may have been part of the normal incidence of foreclosure rather than in the context of the financial crisis. By adding in the foreclosures reported looking back from the date of interview in 2011 we were able to obtain a better measure of the eventual foreclosure outcome. For 2009-2011 (date of interview) a total of 74 foreclosures (of 1,827 panel observations) were reported as having at least been started. Similar to the model of Index 1, a model with Index 5, Foreclosure, 2009-2011, is estimated. We have the results for the main variables of interest in Table 4.

The date of interview as of 2009 becomes less important, given the wider time window to observe the adverse outcome. For Case-Shiller index and housing payments to income (HPI), the predictive power for a foreclosure is comparable to the results for Indices 1-4, and the recent (as of 2007) mortgages are those most likely to end up in foreclosure. The relationship with income in the different years is of interest. Greater income of the head and wife as of 2008 predicts a lower foreclosure probability. In contrast, greater income by the head and wife in 2007 before the recession predicts a *greater* risk of foreclosure, 2009-2011. It seems as if ample current income as of 2007 led the families and their banks to commit to more housing, while more income as of 2008 when the recession was coming in provided the cash flow to reduce the subsequent foreclosure risk.

For African American families a high *current* income is likely to have larger transitory component than for a white family (Friedman, 1957). Specifically, for those African-American mortgage holders with total family income in the 75-79th percentile as of 2006 (2007 survey), 55%

had income less than the 75th percentile in 2008 (2009 survey), and 27 percent had moved up.[31] In comparison, while 46 percent of white and Asian families had moved down below the 75th percentile 42 percent had moved up. While downward income mobility across the two years was common, this was more the case for African-American families. As such, lending based on current income will lead to more repayment problems for any group with a greater risk of downward income mobility.

Adverse labor market measures for the husband as of 2007 show a positive relation to foreclosure as of 2008-2011. For the wife, however, a weak labor market connection as of 2007 is somewhat parallel to the income measure for the year 2007. That is, a wife being unemployed, retired, disabled or keeping house (out of the labor force) as of 2007 has a *negative* relation to the later foreclosure outcome. This suggests that a weak labor market connection of the wife as of 2007 led families and lenders to be more cautious about mortgage commitments. Then, as of 2008-09, most negative labor market indicators for both the husband and wife are positive predictors of foreclosure. The exception is the modest positive relation between foreclosure and weeks worked of the head as of 2008, possibly a labor supply response to foreclosure risk.[32]

7. Conclusion

A main reason for mortgage payment troubles of households in 2009 can be found in the prior mortgage decisions. Often expecting further price appreciation or responding to a positive family labor market and income circumstance, ex ante, homeowners allocated too much of their family income to support house payments and put themselves in a risky position. From our

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[31] A similar argument could apply to wealth – a high value for an African-American family may include a larger transitory component.

[32] The relation between foreclosure and the demographic variables are similar to those for Indices 1-4. Net of the reported covariates region, city size, age of head had little relationship to foreclosure.

perspective, the strong connection of the high cash flow service burden on housing, from debt service and other housing costs, can inform future assessments of rising risk in residential housing. Committing a high share of current family income to housing, or substantial mortgage borrowing relative to current family income is an indication that the family expects a price rise to reward their current payment burden or that they simply have housing which is likely beyond their means. Continued appreciation was often not borne out in 2007-2009, nor was the income needed to support the housing commitment, and both of these may re-occur in the future.

In the Dodd-Frank bill the "ratios of total monthly debt to monthly income or alternate measures of ability" to pay should be considered when determining whether a mortgage is a "qualified mortgage" or not.[33] At a minimum, to develop market measures to assess the quality of existing mortgages, a measure of cash flow commitments to housing should be monitored along with the traditional index of loan to value (LTV). Given the heterogeneity across housing markets, the HPI ratio should be measured for individual urban housing markets such as those in the Case-Shiller index, using micro data such as the PSID, the Survey of Consumer Expenditures or the Survey of Income and Program Participation. An even more readily available measure is the price of homes relative to income. This ratio doubled during the recent price cycle in United Kingdom housing. Such a measure could serve as an early warning indicator and lead to a disaggregated geospatial assessment, looking at both the income of families and the cash flow for debt service and other costs to support their housing position.

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[33] 15 USC 1639c(b)

References

Akerlof, George A. and Robert J. Shiller, <u>Animal Spirits: How Psychology Drives the Economy</u> <u>and Why it Matters for Global Capitalism</u>, Princeton University Press, 2009.

Apgar W. C. and Zhu Xiao Di (2006),"Housing Wealth and Retirement Savings: Enhancing Financial Security for Older Americans," in the <u>Oxford Handbook of Pensions and</u> <u>Retirement Income</u>, edited by Gordon L Clark et al., Oxford University Press.

Bernanke, Ben and Mark Gertler, "Agency Costs, Net Worth, and Business Fluctuations," <u>American Economic Review</u>, March, 1989, p.14-31.

Bernstein, David P., "Bankruptcy Reform and Foreclosures", <u>SSRN working paper</u>, July 2008.

Bostic, Raphael, Stuart Gabriel, and Gary Painter, "Housing Wealth, Financial Wealth, and Consumption: New Evidence from Micro Data," <u>Regional Science and Urban</u> <u>Economics</u>, 2009 (39), p. 79-89.

Campbell, John Y. and João F. Cocco, "Household Risk Management and Optimal Mortgage Choice," <u>The Quarterly Journal of Economics</u>, November, 2003, p. 1449-1494.

Campbell, John Y. and Luis Viceira, <u>Strategic Asset Allocation: Portfolio Choice for Long-Term</u> <u>Investments</u>, Clarendon Press, Oxford, 2002.

Cooper, Daniel, <u>Essays on Housing Wealth and Consumer Behavior</u>, Ph.D. dissertation, University of Michigan, Department of Economics, 2009.

Coulibaly, Brahima and Geng Li, "Choice of Mortgage Contracts: Evidence from the Survey of Consumer Finances," <u>Real Estate Economics</u>, Winter 2009, p.659-673.

Crouhy, Michel G., Robert A. Jarrow, and Stuart M. Turnbull, "The Subprime Credit Crisis of 07," <u>The Journal of Derivatives</u>, Fall 2008, p. 81-110.

Deaton, Angus, <u>Understanding Consumption</u>, Clarendon Press, Oxford, 1991.

Demyanyk, Yuliya and Otto Van Hemert, "Understanding the Subprime Mortgage Crisis," <u>The Review of Financial Studies</u>, May 4, 2009, p. 1-33.

Dvornak, Nikola and Marion Kohler, "Housing Wealth, Stock Market Wealth and Consumption: A Panel Analysis for Australia," <u>Research Discussion Paper</u>, Reserve Bank of Australia, 2003.

Dynan, Karen E. and David L. Kohn, "The Rise in U.S. Household Indebtedness: causes and Consequences," FEDS Working Paper No. 2067., August, 2007.

Fishback, Price, Jonathan Rose and Kenneth Snowden, <u>The Home Owner's Loan Corporation, Safeguarding Home Ownership During the Great Depression</u>, forthcoming, 2013.

Fisher, Irving, "The Debt-Deflation Theory of Great Depressions," <u>Econometrica</u>, Vol. 1 No. 4, p. 337-357, 1933.

Flavin, Marjorie and Takishi Yamashita, "Owner-Occupied Housing and the Composition of the Portfolio," <u>American Economic Review,</u> March, 2002, p. 345-362.

Gramlich, Edward M., <u>The Subprime Crisis: America's Latest Boom and Bust</u>, Urban Institute, Washington, D.C., 2007.

Greenspan, Alan, "Understanding household debt obligations," Federal Reserve Board, February 23, 2004.

Greenspan, Alan and James Kennedy, "Sources and Uses of Equity Extracted from Homes," <u>Oxford Review of Economic Policy</u>, Vol. 24, No. 1, 2008, p. 120-144.

Hurd, Michael D., Daniel McFadden, Harish Chand, Li Gan, Angela Merrill, and Michael Roberts, "Consumption and Savings Balances of the Elderly: Experimental Evidence on Survey Response Bias," in <u>Frontiers in the Economics of Aging</u>, University of Chicago Press (David A. Wise, editor), 1998.

Hurst, Erik, Ming Ching Luoh, and Frank P. Stafford , "Wealth Dynamics of American Families, 1984-1994", <u>Brooking Papers on Economic Activity</u>, 1998 (1), p. 267-338.

_____, and Frank P. Stafford, "Home is Where the Equity Is: Mortgage Refinancing and Household Consumption, <u>Journal of Money Credit and Banking</u>, December 2004, p.985-1014.

Iocoboni, Marco. <u>Mirroring People: The Science of Empathy and How We Connect with Others</u>. Picador . 2009.

Immerqluck, Daniel, <u>Foreclosed: High-Risk Lending, Deregulation, and the Undermining of America's Mortgage Market</u>, Cornell University Press, June, 2009.

Jaffé, Dwight, "The Swedish Real Estate Crisis," <u>A Report Prepared for the Studieförbundet Näringsliv och Samhälle</u>, Center for Business and Policy Studies, SNS, Stockholm, Sweden, October, 1994

Juster, F. Thomas, Joseph Lupton, James P. Smith and Frank P. Stafford, "The Decline in Household Savings and the Wealth Effect," <u>Review of Economics and Statistics</u>, 2006.

Li, Wenli, White, Michelle J., and Zhu, Ning, " Did Bankruptcy Reform Cause Mortgage Defaults to Rise?", <u>NBER working paper 15968</u>, 2011

Mayer, Christopher, Karen Pence, and Shane M. Sherlund, "The Rise in Mortgage Defaults," <u>Journal of Economic Perspectives</u>, Winter 2009, p. 27-50.

McGarry, Kathleen, and Robert F. Schoeni, "Transfer Behavior in the Health and Retirement Study: Measurement and the Redistribution of Resources within the Family<u>," Journal of Human Resources</u>, Vol. 30, 1995, p. S184-S226.

Morgan, Donald P., Benjamin Iverson, and Matthew Botsch, "Did the 2005 Bankruptcy Reform Increase Subprime Foreclosures?" <u>Federal Reserve Bank of New York Economic Policy Review</u>, 2011, forthcoming

Yeung W. Jean Frank P. Stafford and Patricia Andreski, "Assessing the Quality of Income Data Collected on A Two-Year Periodicity: Experience from the Panel Study of Income Dynamics," Manuscript prepared for the 2008 International Conference on Survey Research Methodology, September 11-12, Center for Survey Research, RCHSS, Academia Sinica, Taiwan. <u>Survey Research—Method and Application</u>, Vol. 23, p. 33-80.

Webb, Anthony, Leora Friedberg and Irene Dushi, "What is the Impact of Foreclosures on Retirement Security?" Center for Retirement Research, Boston College, Paper 2101-20, 2010.

Wolff, Edward N., "Recent Trends in Household Wealth in the United States: Rising Debt and the Middle-Class Squeeze-An Update to 2007," <u>Working Paper No. 589</u>, Levy Economics Institute of Bard College, 2010.

1989 - 1995 -- All Respondents Ages 30-60			
	Don't Own 1989	Own 1989	Total
Don't Own 1995	25.66%	4.74%	30.40%
Own 1995	10.74%	58.86%	69.60%
Total	36.40%	63.60%	100%

1999 - 2005 -- All Respondents Ages 30-60			
	Don't Own 1999	Own 1999	Total
Don't Own 2005	22.39%	5.07%	27.47%
Own 2005	10.81%	61.72%	72.53%
Total	33.20%	66.80%	100%

Table 2.1: The Rise of Persistent Home Ownership, 1989-2005

AGE	2001	2003	2005	2007
65+				
NW Mean	463.5	486.4	488.5	575.5
NW Median	218.5	204.3	208.1	237.1
FNW Mean	238.8	255.0	222.8	237.7
FNW Median	48.7	48.4	42.5	42.0
40-49				
NW Mean	267.8	257.4	306.5	367.2
NW Median	82.3	73.8	81.7	90.0
FNW Mean	123.5	103.5	121.7	100.1
FNW Medn	9.7	8.0	8.2	8.0

Table 2.2: Household Net Worth (NW) and Financial Net Worth (FNW), 2001-2007 ($2007)

NW: These are the same definitions as used in "Wealth Dynamics of American Families, 1984-1994," (Erik Hurst, Ming Ching Luoh and Frank P. Stafford), *Brookings Papers on Economic Activity*, 1998: 1, p. 276-337. However, as of 1999 the value of IRAs in the PSID was obtained in a separate question sequence.

	Index 1	Index 2	Index 3	Index 4
	(1)	(2)	(3)	(4)
Interviewed after August 2009	0.1669**	0.1744***	0.0128	0.0551***
	(0.0749)	(0.0605)	(0.0409)	(0.0175)

MORTGAGE AND MARKET MEASURES				
Whether original mortgage (0/1)	0.0081	-0.0194	0.0289*	-0.0055
	(0.0322)	(0.0260)	(0.0175)	(0.0075)
Year of original mortgage	0.0183***	0.0127***	0.0079***	0.0035***
	(0.0040)	(0.0032)	(0.0022)	(0.0009)
Case-Shiller index decline (07-09) >=15% but <35%	0.0142	0.0150	-0.0013	0.0053
	(0.0686)	(0.0554)	(0.0374)	(0.0161)
Case-Shiller index decline (07-09) >=35	0.2348***	0.0869	0.1847***	0.0279
	(0.0738)	(0.0596)	(0.0402)	(0.0173)
Housing payment ratio (HPI)	1.4105***	1.0362***	0.5513***	0.2724***
	(0.1493)	(0.1205)	(0.0814)	(0.0349)

INCOME AND BALANCE SHEET ($1,000)				
Income head 2007 (M)	0.5606	0.4086	0.2489	0.1575
	(0.4736)	(0.3824)	(0.2582)	(0.1109)
Income head 2008 (M)	-0.8364*	-0.6820*	-0.2911	-0.2377**
	(0.4662)	(0.3764)	(0.2541)	(0.1091)
Income wife 2007 (M)	1.8557	1.1984	0.9078	0.3506
	(1.1545)	(0.9322)	(0.6293)	(0.2702)
Income wife 2008 (M)	-2.4862**	-1.6190*	-1.2021**	-0.4888**
	(1.0397)	(0.8395)	(0.5667)	(0.2433)
Number of people in household	0.0332**	0.0386***	-0.0013	0.0110***
	(0.0136)	(0.0109)	(0.0074)	(0.0032)
Wealth without equity 2007<0	0.0970*	0.0768*	0.0332	0.0211

	(0.0570)	(0.0460)	(0.0311)	(0.0133)
Value of checking and saving 2007<=2000	0.0841**	0.0860***	0.0112	0.0317***
	(0.0393)	(0.0318)	(0.0214)	(0.0092)
LABOR MARKET STATUS				
Laid off head 2007	0.2404	0.2980	-0.0458	0.0872
	(0.2688)	(0.2170)	(0.1465)	(0.0629)
Laid off head 2009	0.2612	0.2229	0.0738	0.0885**
	(0.1902)	(0.1536)	(0.1037)	(0.0445)
Unemployed head 2007	0.2407**	0.2142**	0.0536	0.0440
	(0.1154)	(0.0932)	(0.0629)	(0.0270)
Unemployed head 2009	0.4255***	0.3667***	0.1134***	0.1208***
	(0.0747)	(0.0603)	(0.0407)	(0.0175)
Disabled head 2007	-0.2133	-0.1289	-0.1043	-0.0196
	(0.1719)	(0.1388)	(0.0937)	(0.0402)
Disabled head 2009	0.4692***	0.4497***	0.0706	0.1372***
	(0.1518)	(0.1226)	(0.0828)	(0.0355)
Out of labor force head 2007	-0.7037**	-0.5323**	-0.2470	-0.1592**
	(0.2893)	(0.2336)	(0.1577)	(0.0677)
Out of the labor force head 2009	0.7598***	0.5534***	0.2798**	0.1465**
	(0.2613)	(0.2110)	(0.1424)	(0.0612)
Laid off wife 2007	0.2172	0.1143	0.1251	0.0226
	(0.1748)	(0.1412)	(0.0953)	(0.0409)
Laid off wife 2009	0.5942***	0.5528***	0.1254	0.1616***
	(0.2184)	(0.1764)	(0.1191)	(0.0511)
Unemployed wife 2007	0.0494	0.0324	0.0305	-0.0027
	(0.1638)	(0.1323)	(0.0893)	(0.0383)
Unemployed wife 2009	0.0925	0.0513	0.0574	0.0176
	(0.1099)	(0.0887)	(0.0599)	(0.0257)
Disabled wife 2007	-0.3902***	-0.2690**	-0.1789**	-0.0906***
	(0.1469)	(0.1186)	(0.0801)	(0.0344)

Disabled wife 2009	0.4331***	0.4220***	0.0657	0.1317***
	(0.1545)	(0.1248)	(0.0842)	(0.0362)
Out of labor force wife 2007	-0.0779	-0.0171	-0.0745**	-0.0117
	(0.0638)	(0.0515)	(0.0348)	(0.0149)
Out of labor force wife 2009	-0.0708	-0.0622	-0.0136	-0.0143
	(0.0689)	(0.0556)	(0.0375)	(0.0161)
Retired head 2007	-0.1464	-0.1247	-0.0399	-0.0419*
	(0.1072)	(0.0866)	(0.0585)	(0.0251)
Retired wife 2007	0.0568	0.0360	0.0265	0.0076
	(0.1221)	(0.0986)	(0.0665)	(0.0286)
No wife 2007	-0.0404	0.0743	-0.1227**	0.0210
	(0.0967)	(0.0781)	(0.0527)	(0.0226)
DEMOGRAPHIC AND EDUCATION				
African American (0/1)	0.1892***	0.1268***	0.0791***	0.0330***
	(0.0457)	(0.0369)	(0.0249)	(0.0107)
Some college (0/1)	-0.1378***	-0.1076***	-0.0488*	-0.0332***
	(0.0475)	(0.0384)	(0.0259)	(0.0111)
Graduate school (0/1)	-0.1337**	-0.1009**	-0.0554	-0.0334**
	(0.0632)	(0.0510)	(0.0345)	(0.0148)
Intercept	-36.6010***	-25.5756***	-15.9354***	-7.1823***
	(8.0013)	(6.4606)	(4.3612)	(1.8727)
Number of observation	1921	1921	1921	1921

Note:

Numbers in the parentheses are the standard deviations.

*, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 2.3: Mortgage Distress Index

Interviewed after August 2009	0.0216
	(0.0250)

MORTGAGE AND HOME FINANCIAL MEASURES

Whether original mortgage (0/1)	-0.0112
	(0.0097)
Year of original mortgage	0.0022*
	(0.0012)
Case-Shiller index decline (07-09) >=15% but <35%	0.0072
	(0.0205)
Case-Shiller index decline (07-09) >=35	0.0614***
	(0.0220)
Housing payment ratio	0.1655***
	(0.0452)

INCOME AND BALANCE SHEET

Income head 2007 (M)	0.2986**
	(0.1454)
Income head 2008 (M)	-0.2786*
	(0.1435)
Income wife 2007 (M)	0.3714
	(0.3444)
Income wife 2008 (M)	-0.4947
	(0.3105)
Number of people in household	0.0027
	(0.0041)
wealth without equity 2007<0	0.0676***
	(0.0171)
0<wealth without equity 2007<=5,000	0.0185
	(0.0219)

5,000<wealth without equity 2007<=10,000	-0.0420**
	(0.0209)
50,000<wealth without equity 2007<=79,000	-0.0341**
	(0.0172)
wealth without equity 2007>79,000	-0.0119
	(0.0127)
value of checking and saving 2007<=2000	0.0007
	(0.0119)
LABOR MARKET STATUS	
Laid off head 2007	0.1112
	(0.0791)
Laid off head 2009	0.0070
	(0.0560)
Unemployed head 2007	0.0986***
	(0.0350)
Unemployed head 2009	0.0424*
	(0.0224)
Disabled head 2007	0.1158**
	(0.0514)
Disabled head 2009	0.0937**
	(0.0463)
Out of labor force head 2007	-0.1119
	(0.0852)
Out of labor force head 2009	0.1348*
	(0.0771)
Laid off wife 2007	0.0222
	(0.0534)
Laid off wife 2009	0.1636**
	(0.0643)
Unemployed wife 2007	-0.0221

	(0.0483)
Unemployed wife 2009	0.0292
	(0.0329)
Disabled wife 2007	-0.0765*
	(0.0433)
Disabled wife 2009	0.0406
	(0.0457)
Out of labor force wife 2007	-0.0399**
	(0.0192)
Out of labor force wife 2009	-0.0083
	(0.0210)
Retired head 2007	0.0135
	(0.0320)
Retired wife 2007	-0.0494
	(0.0367)
No wife 2007	-0.0155
	(0.0290)
Work weeks head 2008	0.0012**
	(0.0006)
Work weeks wife 2008	-0.0008*
	(0.0005)
DEMOGRAPHIC AND EDUCATION	
African American (0/1)	0.0246*
	(0.0137)
Some college (0/1)	-0.0147
	(0.0144)
Graduate school (0/1)	-0.0165
	(0.0191)
Intercept	-4.4556*
	(2.4600)

Number of observations	1827

Note:

Included variables but not reported are: age categories, city size, region, and some labor market status measures such as student and retired which bore no relationship to the outcome. Available upon request.

Numbers in the parentheses are the standard deviations.

*, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 2.4: Mortgage Foreclosure, 2009-2011
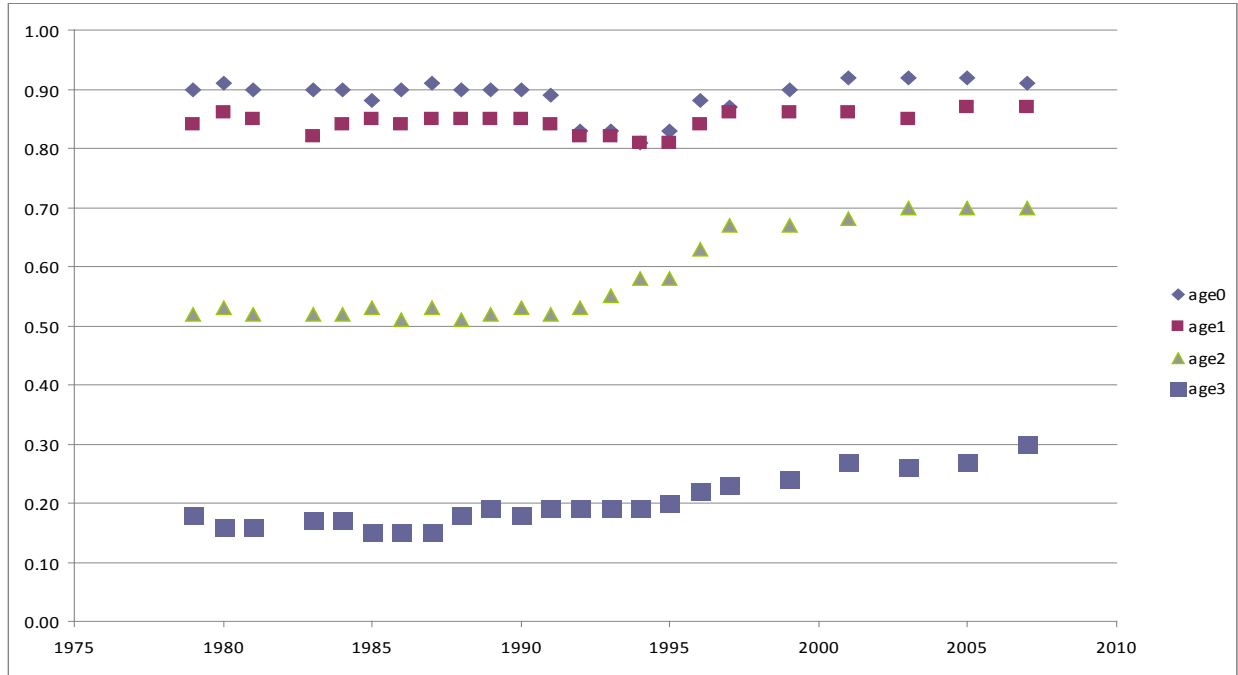
Figure 2.1: Percent of Home-owning Families Holding a Mortgage

(Age 25-34, 35-49, 50-64 and 65 and older)
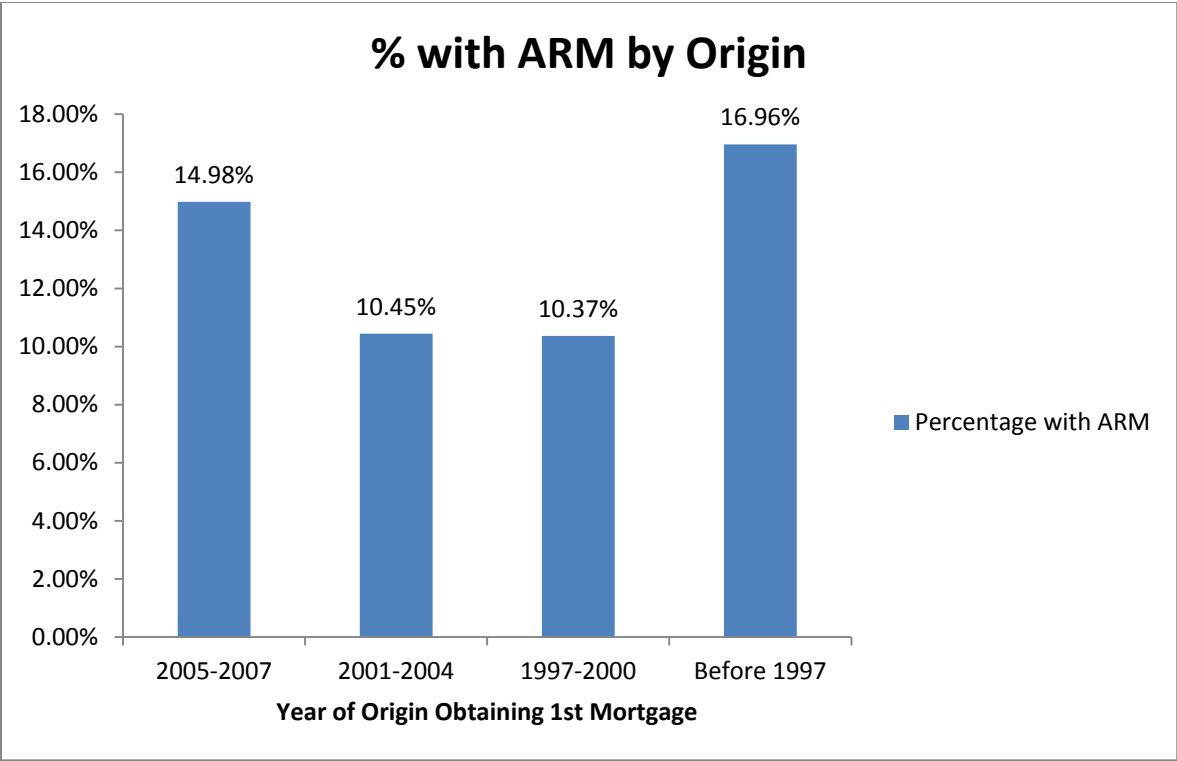
Figure 2.2: Adjustable Rate Mortgage as the Primary Loan by Year of Origin

	Mean	Std Dev
Interviewed after August 2009	0.044248	0.205699
Whether original mortgage (0/1)	0.500781	0.50013
Year of original mortgage	2003.02	4.115522
Case-Shiller index decline (07-09) >=15% but <35%	0.113483	0.317264
Case-Shiller index decline (07-09) >=35	0.107756	0.310153
Housing payment ratio (HPI)	0.191067	0.111436
Income head 2007 (M)	0.064306	0.060464
Income head 2008 (M)	0.06426	0.06115
Income wife 2007 (M)	0.029203	0.032854
Income wife 2008 (M)	0.030245	0.035684
Number of people in household	3.19417	1.328097
Wealth without equity 2007<0	0.141593	0.348723
Value of checking and saving 2007<=2000	0.291515	0.454578
Laid off head 2007	0.003123	0.055814
Unemployed head 2007	0.006247	0.07881
Retired head 2007	0.017699	0.13189
Disabled head 2007	0.047371	0.212487
Keeping house head 2007	0.014055	0.117749
No wife 2007	0.020302	0.141068
Laid off wife 2007	0.003644	0.060271
Unemployed wife 2007	0.004685	0.068305
Retired wife 2007	0.007288	0.08508
Disabled wife 2007	0.004685	0.068305
Keeping house wife 2007	0.00885	0.093679
Laid off head 2009	0.021864	0.146276
Unemployed head 2009	0.016137	0.126037
Disabled head 2009	0.015096	0.121968

Keeping house head 2009	0.148881	0.356064
Laid off wife 2009	0.14836	0.355549
Unemployed wife 2009	0.058824	0.235355
Disabled wife 2009	0.025508	0.157702
Keeping house wife 2009	0.077564	0.267554
African American (0/1)	0.155648	0.362616
Some college (0/1)	0.479958	0.499728
Graduate school (0/1)	0.1114	0.314709

Appendix 2.1: Descriptive Statistics

	HPI
Intercept	-8.1336***
	(1.224)
Whether original mortgage (0/1)	0.0066
	(0.005)
Year of original mortgage	0.0042***
	(0.0006)
Case-Shiller index decline (07-09) >=15% but <35%	0.0235***
	(0.0078)
Case-Shiller index decline (07-09) >=35	0.0484***
	(0.0081)
wealth without equity 2007<0	0.0143*
	(0.0081)
0<wealth without equity 2007<=5,000	0.048***
	(0.0115)
5,000<wealth without equity 2007<=10,000	-0.0017
	(0.0114)
50,000<wealth without equity 2007<=79,000	-0.0251***
	(0.0093)
wealth without equity 2007>79,000	-0.02***
	(0.0063)
African American (0/1)	-0.0099
	(0.0069)
Some college (0/1)	-0.0158***
	(0.0056)
Graduate school (0/1)	-0.0125
	(0.009)
0<Occupation Code<=355	-0.0205***
	(0.0062)

355<Occupation Code<=599	-0.0025
	(0.0066)
Number of observation	1915

Numbers in the parentheses are the standard deviations.

*, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

Appendix 2.2: HPI of Families with a Mortgage as of 2007

Chapter 3: Stock Market Participation: Responses Before and During the Great Recession

1. Introduction

The decision to own or not to own stocks is a part of a wider decision of how to structure the household portfolio. How people allocate their portfolios affects wealth accumulation. People with similar active saving rates may end up with very different wealth levels due to differing returns on their investments. Moreover, the shift toward defined contribution (DC) pension plans has created a reality where individuals are given more responsibility for investment choices. The quality of such decisions bears heavily on the adequacy of financial preparedness for retirement. Many of those individuals under age 65 cashed in substantial amounts of their defined contribution pension plans in both the 2000-2001 and 2008-2009 recessions (Bridges and Stafford, 2012). Here we set out an assessment of the decisions of U.S. households with respect to their non-pension holdings of stocks, 2007-2009. Studying what influences the decision to invest in stocks may help in understanding whether such transfer of responsibility in pension allocations and encouraging wider non-pension ownership is well justified or can be improved by better knowledge on the part of households.

During the 1990's, stock ownership rates experienced substantial growth (Poterba 2001). On a wide definition to include pension holding, participation grew from about 30 percent up to 50 percent. At the same time there were considerable developments in the factors that might have potentially fueled this growth. Among such factors were the decreasing participation costs and the booming stock market. Stock market participation costs comprise a broad set of categories

that include out-of-pocket costs -- brokerage commissions, sign-up fees, costs of gathering information -- and perceived costs related to overcoming investor inertia. During the 1990's, a reduction in these costs can be linked to a number of factors (Guiso et al. 2003). First, a shift toward DC plans contributed to increased awareness of stocks as an investment option and provided opportunities for learning about how to participate in the stock market. Second, with increased computer usage and the introduction of online trading, the world of stock trading became a click away (Bogan 2004). Third, proliferation of mutual funds provided low-cost access to diversified portfolios. Finally, advertisement and financial news and advice abounded in the media during periods of stock market gains.

Another factor at work or being shaped by increased participation during the 1990s was an unprecedented run-up in the stock market. From 1995 through 1999, the S&P 500 index rose at 22 percent a year. The prolonged period of high returns might have affected people's beliefs about both greater future expected returns (Dominitz and Manski, 2011) and reduced riskiness of stocks, leading to higher stock ownership rates. In the 1960's a parallel increase in the participation rate occurred during the rise in stock market valuations. The share of families participating rose from 16% in 1962 to 21% in 1963 and 1964 (Survey of Consumer Finances 1964). So, higher returns can be both a cause of and result of increased participation. Yet, it may not be the new participants, but rather changes in the amounts held by the existing participants that shapes more of the market movement.

After some exodus from the stock market through reduced DC pension plan participation and withdrawals from accumulated balances after 9/11, including some very sizable withdrawals, participation increased once again, 2003-2007, only to fall again in 2008-2009. Data from the Panel Study of Income Dynamics (PSID) on non-pension holdings of stocks indicate that the

percent of families owning stock declined after 2001. Specifically, while as of 2001, 30.2 percent of families held non-pension equities, as of 2003 this had declined to 26.8 percent and then down to 24.4 percent as of 2005 and 24.1 percent in 2007 (Gouskova and Stafford, 2009).

In this paper we study stock ownership using the PSID with a focus on dynamics between 2007 and 2009.[34] How did participation responses vary by different age and education groups and to what extent did some families seek to restructure their portfolios during the on-going financial crisis of 2008-2009? How different are the patterns of stock market participation and adjustment, 2007-2009, compared to 2005-2007? Notably, which families remained active in the stock market – both buying and selling – and which families simply ceased to participate entirely? Related to their changing positions in the stock market, which families shifted their holdings into lower risk and highly liquid assets? Which families continued to participate even as the market was declining? What amounts were taken out or added to their stock market holdings? Which families experienced capital losses?

Knowing who were the people exiting the stock market during the recessionary period is important for understanding what factors shape people's decision to participate in the stock market. Of particular concern is that, especially during periods of strong expected returns, lower costs might have invited entry among less well off and less financially sophisticated families. Then later one can see them exit, bearing losses as the market fell. In the analysis we answer whether exit among such groups was relatively high compared to others. Also, do the patterns of reallocation differ by age? During the market boom, 1994-1999, participation persisted at relatively high rates among older households, a pattern which departed from the normal life cycle asset allocation model (Campbell and Viciera, 2002). What was the age pattern of

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[34] The data in PSID are regarded as representative of family net worth holdings up to about the 98th percentile (Juster, et.al, 1999). The issue of the validity of the measures in the various household measures has been studied only indirectly, such as by comparisons with alignment with Flow of Funds data (Antoniewicz, 2000).

participation changes, 2007-2009?

Compared with cross-section data, the PSID panel data allow better understanding of participation dynamics, providing information on who entered and exited the stock market during the period. The longitudinal nature of the data also allows some accounting for unobserved heterogeneity among the households. The analysis is based on comparison of stock market participation patterns conditional on demographic and economic factors. The comparison is done in the framework of the logit model and related models. We also present basic descriptive patterns as part of the data analysis.

The paper is organized as follows. In Section 2 A we review the static mean-variance portfolio theory and discuss implications that provide a basis for our empirical analysis. Section 2 B assesses the implications of the life cycle asset allocation theory. These provide expected patterns of allocation between stocks and other assets in response to a perceived increase in the riskiness of equity investments. Section 3 presents the empirical analysis, beginning with overall descriptive statistics in Section 3 A and 3 B. Empirical analysis is provided in Section 3 C. Section 4 concludes.

2. Implications of Asset Allocation Theories

A. Static Mean-Variance Theory

To begin, the stock market participation decision can be set out in the framework of the static mean-variance portfolio choice model developed by Markovitz. The exposition is based on Guiso, Haliassos and Jappelli and Campbell 2002. Suppose there are two assets available to an investor. One asset is riskless with return R_f. The other is risky with expected return ER_r and variance σ_r^2. Further assume that investor's preferences are quadratic in wealth with risk aversion to variance of k. The investor's problem is to allocate wealth between the two assets, i.e. to

decide what share of wealth should be in risky assets. The solution to this problem is given by the following:

$$\lambda = \frac{ER_r - R_f}{k\sigma_r^2}$$

Assuming $ER_r - R_f > 0$, the risk averse investor still always participates in the stock market ($\lambda > 0$) no matter how risk averse. However, in reality, to participate in the stock market requires knowledge of how to invest in equity, paying commissions and sign up fees as well as time to monitor the investment. Given such costs, suppose these constitute fixed entry and participation costs, C. The consumer participates in the stock market if utility of participation is higher than utility of non-participation.

$$E\left[U\left(R_f W + \lambda W\left(R_r - R_f\right) - C\right)\right] > U\left(R_f W\right)$$

Let $R_f W + \lambda W\left(\hat{R}_r - R_f\right)$ be a certainty equivalent level of final wealth with $\hat{R}_r$ being certainty equivalent return on stocks. $\hat{R}_r$ is between R_f and ER_r. A consumer will participate in the stock market if $\lambda W\left(\hat{R}_r - R_f\right) > C$. Adding fixed entry costs implies that households with wealth below a threshold level that makes participation worthwhile will not hold equity. Lowering C increases the net benefit from participation in the stock market—the difference between the interest cash flow from participating in the stock market, the left hand side of the inequality, and the participation cost, C[35].

A decrease in C is predicted to induce entry into the stock market among some lower wealth households. On the other hand, an increase in perceived riskiness or a reduced mean expected return leads to a smaller utility equivalent for all households, and those operating just

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[35] The fixed cost may be higher for lower wealth families since it can include the need to review the investment outcomes and higher education families generally hold more wealth. For older families the fixed costs of participation will have a shorter horizon the recover the investment.

past the fixed costs threshold will have incentives to cease participation. Households that for some reason have chosen not to participate and for whom participation costs are not binding might not be strongly encouraged by the effect of decrease in participation costs. A decline in returns or increased riskiness should not induce non-participation for those whose initial position is well above the fixed cost threshold. Of course the extent of their allocation to stocks will be declining with perceived increases in risk and lower returns. That is, shocks to expectations about future returns or riskiness of stocks are likely to affect broader groups of households by moving the threshold wealth level as well as changing optimal share, λ.

In particular, the optimal share increases when σ_r^2 decreases and/or higher returns are expected. In addition, an increase in expected return and/or decrease in σ_r^2 increases the certainty equivalent premium, $\hat{R}_r - R_f$. Thus, an increase in ER_r and/or decrease in σ_r^2 should result in entry among the households previously restricted by participation costs but also raise the *extent* of participation among wealthier households as the higher optimal share relates to higher level of participation.

Compared to the situation with changing costs, in the case of changing expected returns we might expect more active response among wealthier households, as the benefits of participation increase proportionally to wealth level and thus it is costly, in absolute terms, not to adjust their portfolios for households with substantial level of financial wealth. These considerations suggest that observing the dynamics in participation patterns can be potentially informative about the underlying factors.

B. Extensions

Going from the basic framework set out above there are life-cycle extensions, offering insight into the age pattern to the portfolio composition. In addition there is emerging strong

evidence of education and knowledge as factors leading to a better understanding of financial markets (Kĕdzi and Willis, 2011). As a minimum the simple framework above can suggest that better education and higher financial literacy lower the fixed costs of participation. As well, the expected returns may be higher and better ability to avoid investing pitfalls should provide a basis for expecting education to matter both for ownership and ability to navigate market fluctuations. One simple extension of the model is to think of a series of investment plans. Each has some fixed cost. For the initial participation decision the cost is set out as above, namely C. For future periods there will still be a fixed cost per period, P. This should generally be lower than C, but still involves an assessment of the family circumstance and market conditions. This implies that there are recurring costs, independent of the dollars invested, and this can also lead to non-participation.

According to the theoretical life cycle models (Campbell and Vicirea, 2002) younger households should be willing to participate in the stock market as they possess an implicit stock of another asset — human capital. The lower rates of participation among young households are generally attributed to borrowing constraint and low levels of buffer stock cash-on-hand as young households likely to be faced with a number of financial arrangements such as mortgage payments, or private education for children (Deaton, 1992). With participation costs and low financial wealth, investing in stocks can be not worthwhile for young families.

Later in the life cycle, financial wealth accumulates while human capital declines. The latter leads to adjustment in the optimal share allocated to the risky assets — the portfolio gets tilted away from risky assets given a smaller balance of remaining discounted earnings from human capital. This implication of the life cycle model is consistent with popular advice from financial planners that with age the stock exposure should be reduced. It is also consistent with

empirical evidence that indicates that participation in equities markets normally declines in older age.

On the other hand, shocks to expected returns could have a substantial effect on both the participation decision and extent of holdings among the older households. In particular, the expectations of reduced returns make investment in equities less attractive and may lead to an earlier shift away from the stock market among these households. Irrational expectations about future returns can affect all groups. Without data on expected returns, it may not be obvious if certain socio-demographic groups are swept away by beliefs that future returns are especially good or especially poor.

In the paper, we analyze stock ownership dynamics between both 2005-2007 – with strong market conditions - and 2007-2009 – a period of general stock market declines. We focus on changing participation patterns as function of age, education, initial wealth and its composition. During the period, undoubtedly both factors, (1) changing participation costs arising from the need to reassess the future for equities and (2) the end of a boom market, affected households' portfolio decisions. Analyzing what types of households were more likely to enter, stay, and leave the stock market can potentially reveal which of the factors had a stronger effect. In addition, we have the capacity to look at companion moves in the portfolio. Did those cutting back on equity holdings shift into safer and highly liquid assets to protect an uncertain cash flow?

3. Data and Estimation

A. Basic Measures and Analysis Outline

In this analysis we have used observations from the Panel Study of Income Dynamics (PSID), a longitudinal study of U.S. households starting in 1968. The PSID data are from three

waves, 2005, 2007 and 2009. During the time period of 2007-2009, the financial crisis occurred with the stock market falling from a 2007 peak to a low in the mid-year of 2009 and unemployment rising sharply in the latter half of 2008. In contrast, during the time period of 2005-2007, both the financial market and the overall labor market were robust. By comparing the different responses of households in those two different time periods, we can compare households' asset portfolio management actions during a period of prosperity and a period of recession. Data from the PSID include both levels of stocks and active saving in stocks (Juster, et. al., 2006).

In using the PSID main family-level data from 2005 to 2009, it should be remembered that the data were collected in those calendar years over the approximate time window of April to November. This is important especially for our use of the active savings in stocks measure. The reference period for buying only, selling only, and for net sales and purchases of stocks is from January 1 of the period beginning two calendar years prior to data of the survey. In the 2007 – 2009 to date of survey time window a family reporting selling stocks could have done so at the peak or near peak of the market or could have sold at or near the bottom. For this reason the changing patterns of selling and buying need to be considered to have measurement error. For example, one might treat selling in the 2007-2009 data period as unwise or 'bad timing'. Yet, the family may have sold in early 2008 before the sharp decline or may have had a specific portfolio which was not adversely affected by the wider market decline.

From information in 2005, 2007, and 2009 we constructed two balanced panels corresponding to 2005-2007 and 2007-2009 time periods. The samples were restricted to the households with the same head at the beginning and at the end of each period. The primary variables of interest are a binary indicator of stockownership, S_t, and dollar amounts by which

families increased or decreased their equity holdings in the 2007 and 2009 panels. As suggested earlier a potential limitation of our data is that it ignores participation through defined contribution plans. Such information is desirable in order to obtain the fuller picture of participation dynamics. However, as allocation choices in the defined contribution plans can be limited, this information may be less useful for our purposes of determining how cost reductions and presumably increased riskiness of holding equities may have affected the participation decision.

Our analysis is organized in three parts. In the first part we document the stock market participation patterns in 2005 and 2007 by providing descriptive statistics of various characteristics and comparing their mean values in these two periods. The longitudinal nature of the data allows us also to distinguish those who recently exited ($S_t = 0, S_{t-1} = 1$) and entered ($S_t = 1, S_{t-1} = 0$) the stock market. Considering these two groups may shed light on whether the participation changes are more likely to be driven by changes in the entry decision or the exit decision. To estimate the effects of income, wealth, age, and education on the stock market participation and also to explore changes in these effects, a multivariate approach is required.

The methods used are OLS regression and logistic regression for our analysis, depending on the different types of dependent variables. The PSID core/immigrant family weights in 2005 and 2007 are used in the regression analysis for the period of 2005-2007 and 2007-2009. For the regression analysis in the period of 2007-2009, except for the analysis of creating stock account, we initially analyze only the households who had stock accounts as of 2007. A similar analysis was carried out for 2005-2007. Some invalid and extreme cases were excluded.

B. Descriptive Statistics on Net Worth and Transitions

Table 1 provides a cross-sectional description for the 2005 and 2007 household net worth,

based on the whole sample. The results for the whole sample indicate no increase in stock market participation between 2005 and 2007. Data in the PSID also include reports of active saving in stocks. The questions ask if they have only bought or only sold shares since January of two calendar years prior. If so, they are asked the amount sold or purchased. If they report both buying and selling, they are then asked how much did they buy or sell, 'on balance'.

Notable changes in the sample of 2005-2007 include an increase in wealth, from ($1,000) $340.2 in 2005 to $390.1 in 2007 and growth of home equity from $110.1 to $117.2. While about 25 percent of families report owning stock in 2005 and 2007, as a point of reference the percent of families owning stock as of 2001 (primarily observed before 9/11) was approximately 30 percent.

To get a better understanding of the basic stockownership dynamics in 2005 to 2007 and to 2009, the observations were divided into one of four groups based on the ownership status in the current year and two years prior. These percents fall into these four groups: those who recently entered ($S_t = 1, S_{t-1} = 0$), those who recently exited ($S_t = 0, S_{t-1} = 1$), those who stayed ($S_t = 1, S_{t-1} = 1$) and those who were persistent non-participants ($S_t = 0, S_{t-1} = 0$) in the stock market. See Table 2. As can be seen, for each of these weighted balanced panels the percent of families with non-pension stocks was only slightly lower in the period ending at the date of the survey in 2009 (24.4 versus 25.0 percent). The transition from owning to not owning shows that 29.2 percent of owners as of 2007 had become non-owners as of 2009 and a somewhat smaller transition to non-ownership, 27.2 percent, can be observed for 2005-2007. (Z=6.34) These are potentially quite noticeable shifts in relative demand for shares as measured by ownership. On the other hand, the Table 2 patterns suggest that there was not a major change in participation rates, possibly because participation costs did not change much (Vissing-

Jorgenson, 2002).[36] Yet, who were those shifting out of equity ownership, and, perhaps more importantly, by what magnitudes were families adjusting their share values? For families who are stock holders in two-year panels, the measured mobility within the value ranges is very substantial. See Appendix.

C. **Factors Shaping Stock Market Dynamics**

We begin by analyzing the families who held stocks as of 2007 but who no longer report holding stocks as of 2009 (the 29 percent in Table 2). These we assume to be primarily families who completely closed their stock accounts, 2007-2009. We use the following variables as the predictors: the sex of household head in 2009 (1-male and 0-female), the age group of household head in 2009, the education level of household head in 2009, the employment status of household head in 2007 and 2009, the employment status of wife in 2007 and 2009 (1-employed at the time of survey and 0-otherwise), whether there is a "wife"[37] in the household (1-yes and 0-no) in 2007 and 2009, the household non-pension wealth excluding home equity and stock holdings as of the 2007 survey[38], the change in total annual family income from the calendar year 2006 to calendar year 2008, whether the household has mortgage in 2009 (1-yes and 0-no), whether the household has mortgage distress in 2009 (1-yes and 0-no)[39], the household business/farm value category in 2007, and the household stock value category in 2007. For the regression analysis in the period of 2005-2007, we just move backward by two years and use the

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[36] Another approach is to consider C_i, where there are family specific fixed costs, resulting in only those at the margin of participation entering the stock market as expected returns improve.

[37] The household head can be female. "No wife" means the household head is single.

[38] Families with equity in own business are found to hold less in the form of publicly traded shares. See Gouskova and Stafford, 2005.

[39] We define the household has mortgage distress if any of the following three cases occurs: (1) currently behind on the mortgage/loan payment; (2) have worked with the bank or lender to restructure or modify the mortgage/loan; (3) very likely or somewhat likely will continue to be behind (or will fall behind) on the mortgage/loan payment in the next 12 months. See Chen Hurst and Stafford, 2013.

same independent variables except for the variable of "whether the household has mortgage distress" because the mortgage distress measure variables are not available in the 2007 PSID main family-level survey.

Table 3 presents the logit regression result. The dependent variable is a dummy variable (1-closed the stock account and 0-did not close the stock account). The higher is the education level of head, the less likely is the household to have closed their stock account. People with some college or higher education are more knowledgeable and may believe they can weather the storm. Another interpretation lies along the lines of fixed costs. With a major shift in the market, there are then new fixed costs, P, for deciding to go forward. These are costs of assessing the changed nature of the market and how such an investment may fit their longer term plans. For those with more education, these costs, P, should generally be lower. People with a higher education level are more likely to have stable jobs and better access to credit. This financial stability may not be captured with our overall income change measure; more educated families may not need to clear their stock accounts when they meet an unexpected negative cash shock.

Those with mid-range stock holdings ($40,001-$150,000) can be seen as more likely to exit the market than those with higher amounts ($150,001 or greater) in 2007-09. In the 2005-2007 period the families with more stock (>$40,000) are less likely to exit. Households with mortgage distress are more likely to close their stock accounts because they need money to pay their mortgage debts. Households with equity in their own business showed no differential exit from the stock market, 2007-2009. The one case where business equity mattered was for a lower exit probability of families with modest wealth in their own business as of 2005.

Did people seek greater liquidity as a protection against risk in 2007-2009 (Stafford Chen and Schoeni, 2012; Federal Reserve Board, 2012; Sandmo, 1967)? Here we analyze household actions on liquid assets. The liquid asset measure includes checking or saving accounts, money market funds, certificates of deposit, government saving bonds, and Treasury bills. Table 4 is the OLS regression result of the change in liquid assets. The dependent variables are the change in liquid assets in the period of 2007-2009 and 2005-2007. One interesting finding is that households increased the value of liquid assets when family income increased with a marginal propensity to save of .15, at low level of significance in the period of 2005-2007, but they did not significantly do so in the period of 2007-2009. The insignificance of the estimated coefficient of "increase of family income 06-08" in the 2007-2009 regression is the basis for the large standard error, which can be interpreted as indicating a great diversity of household actions. When the family income increased, 2006-08, some households increased their liquid assets, while other households did not do so because of other cash needs.

To analyze the net actual transaction amount of stock, we generated a new variable called Net Active Stock Allocation (NASA), which measures the actual net transaction value of stock (a positive value means net buy and negative value means net sell). As noted above, this variable is subject to measurement errors by virtue of the long recall period (at least 24 and up to 32 months). Also, there is wording on the net amount bought and sold. What was the amount, 'on balance,' for those reporting that they both bought and sold? Table 5 presents the regression result for NASA. One pattern is that of more funds inflowing 2005-07 from those with more wealth as of 2005, and those with more stocks as of 2005. In line with the basic wealth allocation model in Section II, households with more wealth are significantly more likely to buy more stocks in 2005-07, but not significantly in 2007-09. ($t > 15$)

Households with mortgage distress in 2009 were more likely to sell stock in 2007-2009. Households with greater business/farm value are less likely to buy more stock because the business/farm can suffice as a risky asset in the overall portfolio. The households who have more than $150,000 in stock in 2005 are more likely to buy more stock during the period of 2005-2007. But, we do not find the similar result in the period 2007-2009. (t>15) This is because 2005-2007 was a good time period for both the overall economy and households, and stock was seen as a good investment, and those with more holdings were able to increase them the most. When the markets deteriorated, 2007-2009 there was neither a notable dollar reduction nor an increase via active (dis)saving in stocks.

In light of measurement concerns over the complex nature of the NASA measure and to further analyze the buy/sell action of households, we generated a simpler categorical variable to measure household buy/sell action (neither buy nor sell, only buy or net buy, and only sell or net sell). Table 6 presents the logistic regression results. Households with more wealth were more likely to buy stock in both the periods of 2005-2007 and 2007-2009. People with mortgage distress in 2009 were less likely to buy stock in the period of 2007-2009. Households with greater business/farm value were less likely to buy stock, which is consistent with the results in Table 5. Households with more stock are more likely to buy stock in both the period of 2005-2007 and of 2007-2009.

As a function of age, the fraction of stockholders has often been found to exhibit a hump-shape pattern (Americks and Zeldes, 2001; Wang 2003). From Table 3, we have seen that as of 2007 the older families (age 65 and older is the excluded group) were less likely to exit the stock market. Presumably higher expected returns (ER_r) on stocks relative to safer assets motivated persistence, even if they saw more risk and were becoming less risk tolerant ($k\sigma_r^2$ rising).

Review of age stock-ownership profiles as of 1999 when the dot-com market was in full effect also shows a departure from the expected pattern of lower ownership of equities among the older age families.

In contrast to the analysis of closing stock account in Table 3, we also analyze the case of opening new stock account. Table 7 is the logit regression result of opening new stock account. In the sample for 2007-2009, we only include the households without stock account as of the survey date in 2007. The dependent variable is a dummy variable (1-open a stock account before the 2009 survey and 0 - still no stock account at the time of the 2009 survey). We carry out a similar analysis for the period of 2005-2007. Young people are less likely to open new stock accounts in both the period of 2005-2007 and of 2007-2009.

In comparison to those of age 35-64, older households are more likely to become new stock owners as of 2005-07. So, in times of good stock market performance it appears that older families, were less likely to exit and, in an additional apparent contradiction to the life cycle asset allocation perspective, they were more likely to become new entrants. This suggests an augmented conceptual perspective with possibly a retirement financial plan which relies more on stocks in early retirement years for the sake of a better return, even at the cost of added risk. Further, they may allocate to a set of lower risk stocks, and this is not captured by the measure used here.

The data analyzed so far can be reorganized to create another measure of weathering the financial storm; namely, capital losses in the stock market. The measure can be defined as

CAP LOSS/GAIN = STOCK07 – STOCK09 + NASA. Table 8 presents the results. Here it is quite important to allow for the widely varying scale of stock ownership. Here we allow for the

wide range of stock values by adding measures of ranges of initial stock holdings. One pattern to be observed is that in 2005-2007 older families were less likely to experience a loss, but in 2007-2009, 'older but wiser' seems not to apply. Only the youngest age group seems to have experienced somewhat larger capital losses. Education seems to have little relationship to capital losses.

In the context of the investment cost and risk model of Section II, we can see how a drop in the market can impact those with a substantial initial exposure. For both 2005-07 and 2007-09, those with greater initial balances were those with larger losses. For 2005-2007 these losses may reflect mean reversion – reversion to a stable or even rising mean. For 2007-2009 there is also likely mean reversion, but the overall mean is also declining, leading to even larger losses for those with more in the game as of 2007. From the patterns in Table 8 we do not know if those with the large losses were realized through selling at a loss beyond the date of interview in 2009. However, we do know that capital value changes in equities appear to shape consumption and saving (Juster, et.al., 2006), even if going forward the value recovers.

4. Conclusion

Based on panel data, we have been able to explore the financial behavior of households with respect to stock market participation, both in a time of rising equity values and then a substantial overall decline. The panel supports the study of difference in levels and includes additional measures of active saving and dissaving in the form of equities. While the latter measures are quite imperfect, owing in part to the long and variable time intervals of recall, they do help provide a more complete picture of stock market activity. As expected, the repeated panels show a decline in new entrants to the stock market and some rise in exits from the stock

market when comparing 2007-09 to 2005-07. The issue of ceasing to participate by those at low levels of stock holdings, as predicted by a basic portfolio theory with fixed costs, seems to be in close alignment with the empirical results. In addition, the exit and activity patterns are consistent with the overall market changes. Those with more education are shown to be less likely to exit, especially during the 2007-2009 period.

In terms of life cycle effects, families headed by a person age 65 or older were less likely to exit in good times (2005-07) and were more likely to become stock owners in both 2005-07 and 2007-09. This appears inconsistent with the basic life cycle asset allocation (LCAA) perspective. It may be that those 65 and older are reallocating for better returns at the expense of added risk. Since our measures do not include the specific composition of stocks, the older population may be shifting to a lower risk portfolio in terms of the composition of the stocks by moving to broader index funds, for example. On the other hand, using the simple indicator measure (Table 6) or in the net active asset allocation (NASA) measures, there are not indications of greater allocations into stocks by the elderly, and in 2007-09 there are greater levels of buy or net buy among the younger households, a pattern consistent with the LCAA thesis.

Our exploration of who shifted to safer lower risk assets (Table 4) showed little in the way of clear patterns. While families may have wished to reallocate to safer liquid assets, in the context of the recession, many found themselves drawing down liquid assets. During the more normal 2005-2007 period, there was the expected relationship between current income change (2006-2008) and greater saving in the form of liquid assets.

The panel analysis based on flow measures in comparison with the change in levels provides some different information. The exit and enter decision can be over modest dollar values of holdings. One model was based on the combined use of the levels and NASA measures. Namely a measure of net capital losses or gains was constructed. This measure offered some quite interesting insights.   The predictors included the value ranges in the baseline year. For higher levels of market exposure, the extent of capital losses was greater in both the 2005-07 and in 2007-09 periods. However, the magnitude of the losses at a given value range in the upper two value ranges ($40,001 - $150,000 and $150,001 or greater) was notably greater during 2007-09. This suggests a model of inter-temporal variability and reversion to the mean. In 2007-2009 this process was operating, and, in addition, the overall mean was declining substantially. Overall, the patterns speak to the premise of risk of greater loss for larger allocations to risky asset categories.

The recession of 2008-09 was accompanied by substantial disruption in the housing market, especially in terms of mortgage problems. The observed connection between mortgage distress and then exiting, selling, not buying and not entering the stock market creates a concerning feedback wherein the housing market crisis pushed a move away from the stock market. With PSID families representing $6 trillion in the stock market as of 2007, the induced decline in the stock market likely fed into the on-going recession.

References

Ameriks, J. and Zeldes, S. P. [2001], How do household portfolio shares vary with age?
http://www-1.gsb.columbia.edu/faculty/szeldes/Research.

Antoniewicz, Rochelle, "A Comparison of the Household Sector from the Flow of Funds Accounts and the Survey of Consumer Finances," working paper, Federal Reserve Board of Governors, October, 2000.

Bertaut, C. [1998], 'Stockholding behavior of U.S. households: Evidence from the 1983-1989 Survey of Consumer Finances', Review of Economics and Statistics, 80.

Bertaut, C. C. and Starr-McCluer, M. [2002], "Household portfolios in the united states," in Household Portfolios, Cambridge, MA: MIT Press, pp. 181–217.

Bogan, V. [2004], "Stock Market Participation and the Internet." working paper, Brown University.

Bridges, Thomas and Frank P.Stafford, "At the Corner of Main and Wall Street: Family Pension Responses to Liquidity Changes and Perceived Returns," Working Paper, Michigan Retirement Research Center, 2012.

Campbell, John Y. and Luis M. Viciera, Strategic Asset Allocation: Portfolio Choice for Long Term Investors, Oxford University Press, 2001.

Deaton, Angus, Understanding Consumption, Oxford University Press, 1992.

Dominitz, Jeff, and Charles F. Manski, "Measuring and Interpreting Expectations of Equity Returns," Journal of Applied Econometrics, Vol. 26, p 352-370, 2011.

Federal Reserve Board, Flow of Funds Accounts of the United States, Federal Reserve Statistical Release, Table F.225.i, June 7, 2012.

Gouskova, Elena, Ngina S. Chiteji and Frank P. Stafford, "Financial Market Participation Over the Life Course," in Wealth Accumulation and Communities of Color in the United States: Current Issues (Jessica Gordon Nehmbard and Ngina Chiteji, eds), 2006

Guiso, L., Haliassos, M. and Jappelli, T. [2003], "Household stockholding in Europe where do we stand and where do we go? " CEPR Discussion Papers 3694.

Haliassos, M. and Bertaut, C. [1995], 'Why do so few hold stocks?' Economic Journal 105(432), 1110–1129.

Haliassos, M. and Michaelides, A. [2003], 'Portfolio choice and liquidity constraints'

International Economic Review, 44(1), 143–177.

Hurd, Michael, and Suzanne Rohwedder, "Stock Price Expectations and Stock Trading," Working Paper 17973, National Bureau of Economic Research, April, 2012.

Hudomiet, Péter, Gábor Kédzi and Robert J. Willis, "Stock Market Crash and Expectations of American Households," Journal of Applied Econometrics, Vol. 26, p. 393-415, 2011.

Juster, F. Thomas, James P. Smith and Frank P. Stafford, "The Measurement and Structure of Household Wealth,' Labour Economics, Vol. 6, No. 2, June, 1999.

_____, Joseph Lupton, James P. Smith and Frank P. Stafford, "The Decline in Household Savings and the Wealth Effect," Review of Economics and Statistics, 2006.

Kédzi, Gabor and Robert Willis, "Household Stock Market Beliefs and Learning," Working Paper 17614, National Bureau of Economic Research, November, 2011.

Paiella, M. [2001], "Limited financial market participation: a transaction cost-based explanation," The Institute for Fiscal Studies, UK, working paper.

Poterba, J. M. [2001], The rise of the "equity culture" U.S. stockownership patterns, 1989-1998. working paper, http://econ -www.mit.edu/faculty/poterba/files/aea2001.pdf.

Sandmo, Agnar, "The Effect of Uncertainty on Savings Decisions," Review of Economic Studies, Vol. 37, No. 3, p.353-360.

Stafford, Frank P., Erik Hurst, and Bing Chen, "Diminishing Margins: Housing Market Declines and Family Financial Responses," Working Paper 2012-276, Michigan Retirement Research Center, December 2012.

_____, Bing Chen and Robert Schoeni, "Mortgage Distress and Financial Liquidity: How U.S. Families are Handling Savings, Mortgages and Other Debts," Research Note, Institute for Social Research, May, 2012.

Survey of Consumer Finances [1964]. Institute for Social Research, University of Michigan, Ann Arbor, 1962.

Vissing-Jorgensen, A., "Towards an Explanation of Household Portfolio Choice Heterogeneity: Nonfinancial Income and Participation Cost Structure," working paper, Northwestern University, 2002.

Wang, Y., "Participation decision and portfolio choice over the life-cycle," working paper, University of Chicago. 2002.

Wooldridge, J. M. [2001], Econometric Analysis of Cross section and Panel data, MIT Press.

	2005			Conditional on Own		2007			Conditional on Own	
	Mean	Median	Percent Own	Mean	Median	Mean	Median	Percent Own	Mean	Median
Business	45.2	0.0	11.8%	396.4	65.9	70.2	0.0	11.6%	626.2	103.5
Checking/Savings	27.4	3.3	83.5%	33.9	5.5	29.2	3.1	85.2%	35.5	5.6
Other Debt	9.0	0.2	52.7%	17.6	6.6	11.3	0.2	52.6%	22.2	8.3
Real Estate	46.0	0.0	16.5%	290.3	87.8	57.4	0.0	16.5%	361.9	103.5
Stocks	50.0	0.0	25.2%	204.4	49.5	56.1	0.0	24.9%	232.9	51.7
IRA	40.0	0.0	34.4%	120.6	44.0	46.4	0.0	33.4%	143.4	46.6
Vehicle	14.7	8.8				14.7	8.3			
Other	15.6	0.0	19.6%	82.9	16.5	10.2	0.0	17.8%	59.4	15.5
Home Equity	110.1	39.3	71.0%	169.3	98.8	117.2	41.4	69.9%	182.8	104.5
Total	340.2	87.8				390.1	91.1			

Table 3.1: Household Wealth: Panel Study of Income Dynamics (Thousands of 2009 dollars)

Notes: [40]
1. Ownership status for vehicles was not asked. Only the value was asked.
2. All calculations are done using PSID weights.
3. The full sample includes all households in a given year. The race distinction in these tables do not 'aggregate' to these full sample values since they do not include non-black, non-white Hispanics which are included in the full sample.
4. PSID wealth does not include pension wealth. Therefore, this excludes the present value of private defined contribution and defined benefit plans. It also excludes rights to Social Security payments.

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[40] Source: Trends in Household Wealth Dynamics, 2005-2007 (Elena Gouskova and Frank Stafford). We adjusted the data by the 2009 CPI.

		Whether Own Stock in 2009		
		Yes	No	Total
Whether Own Stock in 2007	Yes	17.27%	7.12%	24.39%
	No	6.09%	69.52%	75.61%
	Total	23.36%	76.64%	

		Whether Own Stock in 2009		
		Yes	No	Total
Whether Own Stock in 2007	Yes	70.80%	29.20%	100.00%
	No	8.05%	91.95%	100.00%

		Whether Own Stock in 2007		
		Yes	No	Total
Whether Own Stock in 2005	Yes	18.22%	6.79%	25.02%
	No	6.76%	68.22%	74.98%
	Total	24.98%	75.02%	

		Whether Own Stock in 2007		
		Yes	No	Total
Whether Own Stock in 2005	Yes	72.84%	27.16%	100.00%
	No	9.02%	90.98%	100.00%

Table 3.2: Changing Ownership of Non- Pension Stocks, 2007-09 and 2005-07

	Clear Stock Account	
	2007-2009	2005-2007
Intercept	-0.2099	0.3218
	(0.4899)	(0.4526)
sex_head_09 (07)	0.6133**	-0.2711
	(0.3114)	(0.2995)
age_head_09 (07)<=34	0.025	0.7145**
	(0.3244)	(0.3417)
34<age_head_09 (07)<=49	-0.0376	0.5992**
	(0.2999)	(0.2947)
49<age_head_09 (07)<=64	-0.0253	0.6448**
	(0.2732)	(0.2686)
edu_head_09 (07)=12	-0.3063	-0.2626
	(0.3777)	(0.3428)
12<edu_head_09 (07)<=16	-0.8821**	-0.5003
	(0.3715)	(0.3293)
edu_head_09 (07)=17	-1.0116***	-0.9513***
	(0.391)	(0.3666)
Employed_head_07 (05)	-0.2029	-0.3383
	(0.3078)	(0.2743)
Employed_wife_07 (05)	0.4821*	-0.09
	(0.2611)	(0.2714)
No_wife_07 (05)	0.5404	-0.2254
	(0.4294)	(0.5072)
Employed_head_09 (07)	0.2277	-0.0588
	(0.2659)	(0.2727)
Employed_wife_09 (07)	-0.4004	-0.0538
	(0.2478)	(0.2692)
No_wife_09 (07)	-0.2164	0.1702
	(0.4148)	(0.5156)
wealth exclude home equity and stock_07 (05) (K)	-0.0009***	-0.0004
	(0.0003)	(0.0003)
Increase of family income 06-08 (04-06) (K)	-0.0028	-0.0025
	(0.0018)	(0.002)
Whether own mortgage_09 (07)	0.1275	-0.116
	(0.182)	(0.171)
Whether have mortgage distress	0.5954**	
	(0.2594)	
50K<business value_07 (05)<=200K	0.2116	-0.8862*
	(0.3367)	(0.505)
business value_07 (05)>200K	0.4365	0.3597
	(0.3571)	(0.4403)

10K<Stock value in 07 (05)<=40K	-0.5905***	-0.2742
	(0.2121)	(0.2022)
40K<Stock value in 07 (05)<=150K	-0.5825***	-0.9292***
	(0.2079)	(0.2143)
Stock value in 07 (05)>150K	-1.0019***	-0.8587***
	(0.2488)	(0.2492)
Number of observation	1188	1187

Note:

Numbers in the parentheses are the standard deviations.

*, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 3.3: Stock Market Exit of those Owning as of 2005 and 2007

	Δ Liquid Asset ($1,000)	
	2007-2009	2005-2007
Intercept	-33.3607*	22.4946
	(18.9752)	(15.6958)
sex_head_09 (07)	26.2158*	2.372
	(13.961)	(9.0472)
age_head_09 (07)<=34	-20.1257*	-10.2589
	(10.994)	(7.4736)
34<age_head_09 (07)<=49	-16.0352	-7.7622
	(11.997)	(8.598)
49<age_head_09 (07)<=64	-2.2029	-2.2166
	(10.6881)	(7.573)
edu_head_09 (07)=12	9.5184	-6.0049
	(10.6552)	(14.3554)
12<edu_head_09 (07)<=16	6.0109	-11.3725
	(9.9885)	(13.3179)
edu_head_09 (07)=17	11.907	-7.7556
	(10.3187)	(13.7927)
Employed_head_07 (05)	11.9573	13.0385
	(10.3471)	(10.3772)
Employed_wife_07 (05)	9.0052	23.495**
	(9.2258)	(10.5591)
No_wife_07 (05)	34.8047**	18.4312
	(14.809)	(13.8471)
Employed_head_09 (07)	8.9526	-12.5475
	(10.3545)	(9.6312)
Employed_wife_09 (07)	-5.6891	-23.0026**
	(8.7789)	(10.7261)
No_wife_09 (07)	-17.1906	-17.8933
	(14.1848)	(13.9183)
wealth exclude home equity and stock_07 (05) (K)	0.0042	-0.011
	(0.0185)	(0.0085)
Increase of family income 06-08 (04-06) (K)	0.1064	0.151*
	(0.0843)	(0.0771)
Whether own mortgage_09 (07)	-8.0132	-1.5906
	(5.9491)	(5.351)
Whether have mortgage distress	-3.4049	
	(6.808)	
50K<business value_07 (05)<=200K	-12.5983	-14.8789
	(16.5161)	(10.1483)
business value_07 (05)>200K	24.7199	21.7393

	(19.4085)	(15.8416)
10K<Stock value in 07 (05)<=40K	-10.9381	-0.1758
	(7.0336)	(6.1339)
40K<Stock value in 07 (05)<=150K	-4.1961	-1.0536
	(7.64)	(6.2363)
Stock value in 07 (05)>150K	11.7386	-0.0635
	(9.4009)	(7.883)
Number of observation	1183	1181

Note:

Numbers in the parentheses are the standard deviations.
*, ** and *** denote statistical significance at the 10%, 5%, and
1% levels.

Table 3.4: Changing Value of Liquid Assets, 2005-07 and 2007-09

	NASA ($1,000)	
	2007-2009	2005-2007
Intercept	-2.2579	-1.5831
	(4.3235)	(1.9919)
sex_head_09 (07)	3.3406	-0.2
	(2.5133)	(1.7577)
age_head_09 (07)<=34	-0.7058	-2.2427
	(1.6517)	(2.2359)
34<age_head_09 (07)<=49	1.7139	-2.2695
	(1.9096)	(2.3331)
49<age_head_09 (07)<=64	-0.5245	-2.9015
	(1.6837)	(2.1925)
edu_head_09 (07)=12	-2.6104	-0.3244
	(2.7181)	(1.3534)
12<edu_head_09 (07)<=16	-2.5995	0.8717
	(2.7873)	(1.0107)
edu_head_09 (07)=17	-1.5423	-0.7299
	(3.0479)	(1.5032)
Employed_head_07 (05)	0.5235	4.6436**
	(1.6996)	(2.0798)
Employed_wife_07 (05)	-0.5341	0.1881
	(1.4755)	(2.2786)
No_wife_07 (05)	5.0802**	-3.5229
	(2.4776)	(2.5715)
Employed_head_09 (07)	0.0408	0.3012
	(1.7228)	(1.9388)
Employed_wife_09 (07)	0.3666	0.4986
	(1.3496)	(2.1918)
No_wife_09 (07)	-2.2093	3.261
	(2.2447)	(2.7018)
wealth exclude home equity and stock_07 (05) (K)	0.0032	0.0047**
	(0.002)	(0.0022)
Increase of family income 06-08 (04-06) (K)	0.0409***	0.0085
	(0.0149)	(0.0187)
Whether own mortgage_09 (07)	0.4357	-1.6198
	(1.2711)	(1.198)
Whether have mortgage distress	-3.6106**	
	(1.5426)	
50K<business value_07 (05)<=200K	-6.6172*	-6.0914
	(3.6806)	(3.9947)
business value_07 (05)>200K	-2.1311	-5.5921**

	(2.8328)	(2.3468)
10K<Stock value in 07 (05)<=40K	1.9417**	1.1876
	(0.9813)	(1.0125)
40K<Stock value in 07 (05)<=150K	0.1796	-0.7712
	(0.9013)	(1.0116)
Stock value in 07 (05)>150K	2.1692	5.8036***
	(1.8945)	(2.048)
Number of observation	1083	1070

Note:

Numbers in the parentheses are the standard deviations.

*, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 3.5: Net Active Stock Allocation

	2007-2009		2005-2007	
	Buy or net buy	Sell or net sell	Buy or net buy	Sell or net sell
Intercept	-2.4414***	-2.6694***	-3.0795***	-3.4682***
	(0.6981)	(1.0082)	(0.5962)	(1.2055)
sex_head_09 (07)	0.1561	-0.1865	0.4105	0.0871
	(0.3854)	(0.422)	(0.3443)	(0.4617)
age_head_09 (07)<=34	0.9872***	0.091	0.3777	0.2401
	(0.3726)	(0.4937)	(0.3726)	(0.5334)
34<age_head_09 (07)<=49	1.0643***	-0.0891	0.4552	0.1266
	(0.3241)	(0.4238)	(0.3132)	(0.468)
49<age_head_09 (07)<=64	0.6528**	0.2793	-0.0328	0.0709
	(0.2794)	(0.3478)	(0.2843)	(0.3601)
edu_head_09 (07)=12	-0.1535	0.1633	0.1879	1.527
	(0.5343)	(0.816)	(0.49)	(1.0624)
12<edu_head_09 (07)<=16	0.5527	0.9094	0.5225	1.6434
	(0.5111)	(0.7757)	(0.4596)	(1.048)
edu_head_09 (07)=17	0.3942	0.7441	0.5116	1.7639*
	(0.5298)	(0.7886)	(0.4838)	(1.056)
Employed_head_07 (05)	-0.017	-0.0121	0.4863*	-0.429
	(0.2828)	(0.3691)	(0.2888)	(0.4698)
Employed_wife_07 (05)	-0.7426***	-0.1617	-0.163	-0.374
	(0.2814)	(0.4114)	(0.2655)	(0.3786)
No_wife_07 (05)	0.7914*	-0.7714	-0.0698	0.166
	(0.4711)	(0.6915)	(0.4236)	(0.672)
Employed_head_09 (07)	-0.2118	-0.0344	-0.1745	0.0877
	(0.2658)	(0.3503)	(0.2784)	(0.4526)
Employed_wife_09 (07)	0.2468	-0.0203	0.2717	0.3166
	(0.283)	(0.3988)	(0.2593)	(0.3889)
No_wife_09 (07)	-1.1329**	0.8997	0.503	-0.1021
	(0.505)	(0.6405)	(0.4253)	(0.713)
wealth exclude home equity and stock_07 (05) (K)	0.0004*	0.0003	0.0007***	0.0003
	(0.0002)	(0.0004)	(0.0002)	(0.0003)
Increase of family income 06-08 (04-06) (K)	0.0022	0.0005	0.0029	0.0031
	(0.002)	(0.0022)	(0.0021)	(0.0028)
Whether own mortgage_09 (07)	0.0222	0.0018	-0.0691	-0.014
	(0.2039)	(0.2651)	(0.1877)	(0.2682)
Whether have mortgage distress	-0.8847**	0.4284		
	(0.3775)	(0.3633)		
50K<business value_07 (05)<=200K	-0.4611	0.5159	0.034	-0.0992
	(0.4353)	(0.3898)	(0.3581)	(0.564)
business value_07 (05)>200K	-0.7525*	-1.2767	-0.9426**	0.1132

	(0.4066)	(0.8069)	(0.4447)	(0.5464)
10K<Stock value in 07 (05)<=40K	0.6799**	0.1412	0.7584***	-0.0548
	(0.2653)	(0.3517)	(0.2439)	(0.3412)
40K<Stock value in 07 (05)<=150K	0.7671***	0.3062	0.7123***	0.2724
	(0.2537)	(0.3278)	(0.2526)	(0.3062)
Stock value in 07 (05)>150K	1.2387***	0.6639*	1.0473***	0.1887
	(0.2632)	(0.3392)	(0.2633)	(0.3399)
Number of observation	1164		1164	

Note:

Numbers in the parentheses are the standard deviations.

*, ** and *** denote statistical significance at the 10%, 5%, and 1%

levels.

Table 3.6: Stock Market Ordinal Actions, 2005-07 and 2007-09

	Create Stock Account	
	2007-2009	2005-2007
Intercept	-2.9968***	-2.7966***
	(0.4458)	(0.374)
sex_head_09 (07)	-0.2631	-0.1588
	(0.2639)	(0.2529)
age_head_09 (07)<=34	-0.5352**	-0.8921***
	(0.2353)	(0.2709)
34<age_head_09 (07)<=49	-0.796***	-0.7437***
	(0.2448)	(0.2519)
49<age_head_09 (07)<=64	-0.4445*	-0.6158**
	(0.227)	(0.2561)
edu_head_09 (07)=12	0.695**	0.6786***
	(0.3207)	(0.2442)
12<edu_head_09 (07)<=16	1.2875***	0.9727***
	(0.3073)	(0.2454)
edu_head_09 (07)=17	1.3355***	1.3375***
	(0.3671)	(0.3017)
Employed_head_07 (05)	-0.1855	0.111
	(0.2276)	(0.2351)
Employed_wife_07 (05)	-0.0304	0.2525
	(0.2126)	(0.26)
No_wife_07 (05)	-0.0682	-0.1006
	(0.3964)	(0.4998)
Employed_head_09 (07)	0.1715	-0.0556
	(0.2054)	(0.2067)
Employed_wife_09 (07)	0.2743	0.145
	(0.2076)	(0.2563)
No_wife_09 (07)	-0.2501	-0.2362
	(0.3917)	(0.5064)
wealth exclude home equity and stock_07 (05) (K)	0.0009***	0.001***
	(0.0003)	(0.0003)
Increase of family income 06-08 (04-06) (K)	0.0048**	0.0016
	(0.0021)	(0.0019)
Whether own mortgage_09 (07)	0.5434***	0.4118***
	(0.1604)	(0.1581)
Whether have mortgage distress	-0.7699***	
	(0.2437)	
50K<business value_07 (05)<=200K	-0.0445	0.6837**
	(0.381)	(0.3189)
business value_07 (05)>200K	0.0984	-0.1815

	(0.4845)	(0.5741)
Number of observation	5507	5231

Note:

Numbers in the parentheses are the standard deviations.

*, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 3.7: Becoming a Stock Owner, 2005-07 and 2007-09

	Capital Loss (K)	
	2007-2009	2005-2007
Intercept	-30.5369	15.2761
	(23.591)	(22.5781)
sex_head_09 (07)	19.5566	-22.8025*
	(13.2895)	(13.1267)
age_head_09 (07)<=34	20.356*	45.0234***
	(11.8055)	(13.755)
34<age_head_09 (07)<=49	14.2781	36.9654***
	(10.9502)	(13.5494)
49<age_head_09 (07)<=64	4.4151	39.6979***
	(11.0342)	(13.6898)
edu_head_09 (07)=12	1.2558	-20.1707
	(17.5514)	(17.6944)
12<edu_head_09 (07)<=16	-9.1527	-16.6539
	(17.646)	(17.5498)
edu_head_09 (07)=17	-2.647	-51.2671***
	(19.0652)	(19.3384)
Employed_head_07 (05)	1.0502	-1.7555
	(10.687)	(12.0817)
Employed_wife_07 (05)	9.1734	9.6844
	(9.0212)	(13.6495)
No_wife_07 (05)	40.9221	-21.8444
	(28.6967)	(21.997)
Employed_head_09 (07)	-0.1256	-31.046**
	(9.4134)	(12.5044)
Employed_wife_09 (07)	-15.606*	0.4079
	(8.2353)	(13.3509)
No_wife_09 (07)	-36.1252	26.857
	(29.1269)	(22.1344)
wealth exclude home equity and stock_07 (05) (K)	0.0011	-0.0531***
	(0.0129)	(0.0176)
Increase of family income 06-08 (04-06) (K)	-0.0578	-0.018
	(0.0826)	(0.1326)
Whether own mortgage_09 (07)	2.2534	11.3682
	(6.6434)	(8.8199)
Whether have mortgage distress	2.1102	
	(8.0031)	
50K<business value_07 (05)<=200K	19.4048	-22.1201
	(12.7499)	(19.4868)

business value_07 (05)>200K	-0.1387	56.9734***
	(17.8939)	(20.7584)
10K<Stock value in 07 (05)<=40K	4.9726	4.8171
	(4.8823)	(6.0319)
40K<Stock value in 07 (05)<=150K	44.0414***	20.5792***
	(5.6541)	(7.1159)
Stock value in 07 (05)>150K	166.6392***	105.5345***
	(12.2247)	(15.3229)
Number of observation	1025	1015

Note:

Numbers in the parentheses are the standard deviations.

*, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

Table 3.8: Capital Losses in Equities, 2005-07 and 2007-09

		2007					
		Stock Value<=15K	15K<Stock Value<=70K	70K<Stock Value<=216K	216K<Stock Value<=1000K	Stock Value>1000K	Total
2005	Stock Value<=12.1K	17.14%	4.61%	2.55%	0.80%	0.00%	25.10%
	12.1K<Stock Value<=50K	5.13%	13.71%	4.00%	2.30%	0.08%	25.22%
	50K<Stock Value<=190K	2.35%	4.60%	12.02%	5.42%	0.64%	25.03%
	190K<Stock Value<=800K	0.89%	1.64%	4.93%	11.37%	0.90%	19.74%
	Stock Value>800K	0.17%	0.50%	0.87%	1.39%	1.98%	4.92%
	Total	25.69%	25.06%	24.37%	21.28%	3.60%	

		2009					
		Stock Value<=12K	12K<Stock Value<=50K	50K<Stock Value<=200K	200K<Stock Value<=900K	Stock Value>900K	Total
2007	Stock Value<=14K	15.92%	5.30%	2.40%	1.62%	0.00%	25.24%
	14K<Stock Value<=70K	6.16%	13.67%	4.97%	1.04%	0.14%	25.98%
	70K<Stock Value<=220K	2.58%	4.42%	12.44%	3.98%	0.64%	24.06%
	220K<Stock Value<=1000K	1.32%	1.42%	6.09%	10.48%	1.30%	20.61%
	Stock Value>1000K	0.00%	0.05%	0.67%	1.16%	2.23%	4.11%
	Total	25.98%	24.86%	26.57%	18.29%	4.30%	

Appendix 3.1: Stock Market Holdings Transition Table