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Financial Stress and Asymmetric Financial Decisions

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Abstract

Building wealth requires saving, borrowing, and investing. These decisions may depend on stress due to the lack of financial security (low financial assets). Stress should influence personal responses – emotional, behavioral, and cognitive – that in turn could determine financial decisions. The link between stress and financial decisions could be asymmetric, so that fewer financial assets result in larger absolute financial decisions than more assets. We first divide households between stressed (financially insecure) and not stressed (financially secure) ones, using a threshold regression. Comparatively little assets divide stressed and not stressed households. We then show that low levels of financial assets have a larger adverse effect on personal responses among stressed households than among not stressed ones. Personal responses, though, systematically determine financial decisions, such that more stress and lower personal responses lead to a more short-term focus in financial decisions. These linkages between stress, personal responses, and financial decisions indeed give rise to an asymmetric effect. The absolute effect of a stock price decrease of 30%, for instance, is 28% larger than the effect of a 30% stock price increase. Exogenous asset shocks could result in a reduced focus on long-term wealth building among households, because of the asymmetric effect of financial stress.

Key words: Financial stress, financial security, financial decisions, savings, borrowing, investing

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I. Introduction

Household wealth rose over more than two decades before the crisis hit in 2007. Data from the Federal Reserve shows that total household wealth rose on average from about four times disposable income in the 1980s to a record high of more than 6.3 times average disposable income in June 2007. This should have meant more economic security: more financial resources available for unexpected, or expected expenses such as children's college education, a new house, a new career, or a new business venture.

Many households, though, had no or only little financial security. Bucks et al. (2009), for instance, show that the average household net worth was -\$2,300 (in 2007 dollars) for the bottom fourth of the wealth distribution in 2007, below the averages for 2004 (-\$1,600) and 2001 (\$0). Edward Wolff (2010) also calculated that the share of households with zero or negative net worth was the highest since 1983 in 2007 with 18.6%.

Financial stress typically ranks high among people's worries. The inability to pay bills due to limited emergency savings, for instance, causes stress. The result is a greater focus on the short-term. The Transamerica Center for Retirement Studies (2008), for instance, finds that 32 percent of people in 2008, up from 18 percent in 2007, focused on paying off debt and delaying saving for retirement at the start of recession. The key question is if this link between stress and short-term decisions is large enough to substantially impede households' long-term wealth building efforts.

Households can build wealth by saving more, borrowing less, and earning interest on their investments. Many households, however, may face stress as an extra obstacle to building wealth, exactly because they have few financial assets and no financial security to start with. Financial insecurity could cause stress, which may focus households' attention on the short term and thus lead them to ignore long-term wealth building efforts. Stressed households should accumulate wealth more slowly than not stressed households.

This is a departure from standard economic theory. Households should remain as focused on the long run whether they are financially insecure or secure, pursuing their goal of consumption maximization over the long-term. There should hence be no systematic difference in the financial decisions of financially insecure and financially secure households.

A better understanding of the link between financial security and financial decisions could make several contributions to the literature. First, our research may help identify occasions, when personal preferences change, in this case the lack of financial security. Second, our research may show that stress is a transmission channel for persistent wealth inequality. Third, we may find that large financial market swings could impede long-term wealth building. This would be especially true if cuts in financial security result in larger absolute adverse decisions than equally sized increases in financial security. The implication would be that larger swings would create disproportionately larger differences in financial decisions than a series of smaller market swings would.

The rest of the paper is organized as follows. We provide a review of the relevant literature in section II, a summary of the data in section III, and a presentation of our multivariate analyses in section IV. Section V offers some basic simulations on the symmetry of the link between financial security and financial decisions and section VI concludes.

II. Literature Review

Wealth building depends on three decisions – saving, borrowing, and investing. Personal savings are typically described as a means to maximize lifetime utility (Modigliani and Brumberg, 1954). People decide early how much they will consume and save in each period, such that they maximize their lifetime marginal utility of consumption. Lifetime saving will depend on real income, any liquidity constraints, the real return that savers can earn on their assets, and on consumers' preferences. Savings responses – saving, borrowing, and investing – to any given amount of savings relative to desired savings should be symmetrical. Savings amounts below the optimum should result in more saving, less borrowing, while amounts above the optimum should be associated with dissaving, or more borrowing.

The literature has extended the original lifecycle theory to account for uncertainty, prevalence of liquidity constraints, and changes in family structure, to name the most relevant (Bernheim et al., 2001; Browning and Crossley, 2001; Browning and Lusardi, 1996; Carroll and Samwick, 1996; Dynan, 1993; Guiso, Jappelli, and Terlizzesie, 1992; Lusardi, 1996). Most important for our purposes is the conclusion that buffer stock savings to protect households from the uncertainty of future income tend to be small, amounting to less than 5-10% of total wealth. Very low wealth levels could cause behavioral changes if households may not own their desired buffer stock. Amounts below the buffer stock should result in accelerated saving and less borrowing, while amounts above the buffer stock should result in decelerated saving and possibly more borrowing. We investigate in the empirical section if the relationship between lower asset levels indeed results in accelerated savings and if so, if that relationship differs for households with wealth above their buffer stock savings and those below buffer stock savings.

Investment decisions also play a critical role in building wealth. Investors' portfolio allocations are based on investors' risk preferences, given the available investment opportunities, and the risk-return trade off (Grossman and Stiglitz, 1980; Merton, 1969). More risk will mean a smaller allocation into that asset, holding the rate of return constant. In addition, a lower risk tolerance, all else equal should result in a higher allocation towards risk-free liquid assets. Individuals' risk-preferences, though, should remain constant and thus be unaffected by the level of financial security that a household enjoys.

Portfolio allocations can systematically differ from what is predicted by an optimizing strategy. A number of psychological factors, such as inertia, inability to pre-commit to future decisions, and difficulty in making complex decisions, among others, can create a systematic bias in financial decisions (Bernheim and Rangel, 2005; Choi et al. 2004, 2006; DellaVigna, 2009).

Stress may be another factor influencing financial decisions. Low asset levels may create a lack of financial security, which may result in stress and therefore influence financial decisions.

Stress arises for several reasons. Stress is an imbalance between one's perception of what is demanded in a situation and one's capabilities in meeting those demands (Rettig, Danes, and Leichtentritt, 1997). Alternatively, stress is defined as a situation, in which an individual faces events perceived as physically and psychologically threatening (Deniz 2006). Moreover, stress is the inability to cope with a situation (Kagan, Kagan, and Watson, 1995). Low asset levels may thus cause stress since households can meet fewer demands on them such as bills that are due, since households may feel threatened due to the inability to cover an economic emergency, and since households may find it harder to cope with economic changes such as higher prices.

A minimum asset level is commonly equated with financial security. A relative definition of financial security is the wealth equivalent of three months of income (Caner and Wolff, 2004; Rha, Montalto, and Hanna 2006). The asset poverty literature also uses an absolute asset standard, typically three months of income at the poverty line as its core definition (CFED, 2008; Draut, Wheary, and Shapiro, 2008; Haveman and Wolff, 2005; Shapiro, 2004).

Households with few assets may experience stress. MacFayden, MacFayden, and Prince (1996), for example, conclude stress is correlated with the lack of financial support, measured by the value of owner-occupied housing, income, and labor force participation. Prawitz et al (2006) also find that insufficient assets to cover basic consumption and pay for emergencies serve as a stressor. Stress arising from the inability to cover basic consumption implies a financial security definition equal to an absolute standard, such as months of income at the federal poverty line.

Stress responses can be emotional, behavioral, and cognitive. An emotional response generates the motivational energy needed to face and define a problem, but it also lowers the capacity to cope with new circumstances (Rettig, Danes, and Leichtenritt, 1997). Deniz (2006), for instance, argues that economic stress can evoke an emotional response. Examples of emotional stress responses include less risk tolerance (Donkers and van Soest, 1999), shorter planning horizons (Rettig, Danes, and Leichtenritt, 1997), and less tolerance of conspicuous consumption (MacFayden, MacFayden, and Prince, 1996; Davig and Hakkio 2010).

Behavioral stress responses reflect reduced coping skills. Deniz (2006) argues that stress can lead people to avoid particular situations. During economic downturns, households may shun making decisions (Davig and Hakkio 2010; MacFayden, MacFayden, and Prince, 1996), e.g. people consume less during unemployment (Madsen and McAleer 2001; May, Tudela and Young 2004). In addition, Kovalchik et al. (2005) argue that stress may reduce people's confidence in the future success of their actions and thus impede actions in the present, creating inertia.

Cognitive responses mean that people become worse at processing information when stressed (Deniz, 2006). Starcke et al (2008) find that the risk of making disadvantageous decisions when stress is present even in situations with explicit rules and outcomes. Moreover, Davig and Hakkio (2010) argue that it may be optimal to wait to make a decision when risk is present.

Stress responses may impede financial decisions. Households may save less, borrow more, and make fewer investments, i.e. hold more cash, when stressed. A lower risk tolerance, for instance, which may follow from more stress, tends to go along with fewer investments in risky assets and possibly less debt (Barsky et al., 1997; Bhargava and Lown 2006; Rha, Montalto, and Hanna

2006). Households already rely on heuristics to make financial decisions (Bernartzi and Thaler, 2007), which may be further exacerbated by stress responses, such as lower risk tolerance, shorter planning horizons, and a lower ability to process financial information.

Stress may create a differential effect of current liquid asset levels on long-term financial decisions. There should be a systematic link between liquid assets and stress responses, such that lower assets reflect more stress. This link should be stronger when assets are below households' financial security threshold. Stress responses to low asset levels should be more pronounced for households who are already financially insecure than for those who are not. These stronger stress responses should then lead to larger reactions in financial decisions.

Our proposed link between stress and financial decisions differs somewhat from the predictions of prospect theory (Kahneman and Tversky, 1979). People will value potential losses more and value gains less than objective probabilities and reasonable risk aversion assumptions would suggest. The result is loss aversion, which may explain limited risky investment, particularly in stocks (Mehra and Prescott, 1985; Bernartzi and Thaler, 1995; Kocherlakota, 1996). If instead stress is the dominant motivation and not loss aversion, we should see more liquid holdings among stressed households. The predictions for savings and borrowing are the same based on loss aversion (Bowman, Minehart, and Rabin, 1999) as based on stress. Moreover, the stress based argument allows for a change in preferences, which we test for, while prospect theory allows for the possibility of changes in choices due to a change in the reference point.

Our approach thus differs from standard lifecycle theory and from prospect theory. First, we expect people to save less, borrow more, and invest more in cash if stress is systematically linked to financial decisions. Lifecycle theory, in comparison, suggests more saving, less borrowing and fewer cash investments for households with few assets. Prospect theory, finally, suggests fewer saving and more borrowing, but also less cash holdings for low asset levels. Second, we test explicitly for heterogeneous preferences associated with below and above financial security – buffer stock levels.

III. Data and variables

We use the Federal Reserve's triennial Survey of Consumer Finances (SCF). Consistent data are available from 1995 to 2007, providing five survey years. The SCF is designed to get a complete picture of household wealth, based on a representative sample. The SCF thus contains variables on household assets and debt, financial behavior, and attitudes. The SCF oversamples higher-income families since wealth is concentrated. It provides weights that represent the original distribution of the sample, incorporates adjustments for factors impacting the non-response, and allows for the best possible estimation of population statistics, given all known variables, to account for this concentration of different wealth aspects among higher-income earners. The Federal Reserve recalculates the weights of all SCF surveys back to 1989 (Kennickell, 2000), if new information becomes available, which eliminates biases over time.

Our sample is defined as follows. First, we only include households between the ages of 25 and 64, who are not retired. This naturally excludes families who are already drawing down their life savings. Lower wealth levels for retirees are often simply a reflection of their decision to retire,

instead of a lack of financial security. Second, we eliminate very low income families, defined as those with less than \$5,000 in household income in 2007 dollars. Third, we eliminate the top one percent of households with ratios of non-retirement asset – defined below – to poverty income to control for outliers. This caps the ratio of financial asset to the poverty line at 10,000%.

We want to understand if financial stress influences financial decisions. Low asset levels could cause stress, reflected in stress responses. These stress responses then may systematically determine long-term financial decisions. We discuss our operationalization of key concepts – financial security, stress responses, and financial decisions – variables, and data in this section.

Financial security

Financial insecurity may cause stress. We define financial security as assets to poverty income. We use non-retirement financial assets, which include liquid financial assets -- cash and quasi-cash, such as checking and savings accounts, CDs, direct stock and bond holdings -- plus mutual funds, managed assets, and other financial assets. The ratio of non-retirement financial assets to poverty income then indicates how likely households at different levels of financial security are to not meet their basic consumption needs and experience stress.¹

Table 1 shows the share of households with financial assets equal to six month or less, between seven and twelve months, and more than twelve months of poverty income. More than 40% of households in our sample do not have enough assets to cover six months at the poverty line, while another 38.8% of households have sufficient financial assets to cover at least a year of income at the federal poverty line.

Table 1
Distribution of financial security

	Less than six months of income at the poverty line	7-12 months of income at the poverty line	More than 12 months of income at the poverty line
Nonretirement financial assets	40.3	10.9	38.8

Notes: The sample includes families with heads of household 25 years of age and older, but younger than 65, who are not retired. The sample eliminates the approximately the top 1% of observations for each of the financial security measures. Only households with incomes above \$5,000 (in 2007 dollars) are included. Calculations based on combined data for 1995, 1998, 2001, 2004, and 2007.

Financial Stress Responses

We should observe greater emotional, cognitive, and behavioral responses, if financial insecurity is associated with stress. Table 2 shows the indicators for each of the three stress responses. We combine each response category's indicators through principal component analysis, keeping the

¹ We test the robustness of our results by using only liquid assets and by relating both non-retirement financial assets and liquid assets to current income in addition to poverty income. Our results do not differ in a material way.

components that explain at least 80% of the variation. No factor is dominant and all factors point in the same direction.² We will use these combined measures for emotional, behavioral, and cognitive responses in our multivariate analysis.

Emotional responses include risk preferences, planning horizons, and acceptance of debt for conspicuous consumption. Financial insecurity – lower assets to poverty income – should go along with more risk aversion, shorter planning horizons, and less acceptance of debt for conspicuous consumption.

Behavioral responses refer to savings and borrowing decisions. The SCF collects information on whether families are saving. Our debt variables refer to a family's acceptance of installment loans. We expect families, who are financially stressed, to be less likely to save and to have a lower tolerance of new borrowing.

Cognitive responses include the ability to process information, but the necessary data are not available in the SCF. We instead use information collection as a proxy, assuming that households, who are better able to process information, are also more likely to collect information. We use an indicator variable if a household shops around for the best terms on savings and debt products and indicators for the sources of financial information -- professionals, such as accountants and lawyers, news outlets, and advertisements. Stressed households should be less likely to collect information and rely on any of these three information sources.

² We also estimated the multivariate regression analyses with the individual stress responses, rather than the combined ones as dependent variables. No single stress response seems to dominate our results.

Table 2
Financial stress responses

Stress response	Specific measure	Expected response
<i>Emotional responses</i>		
Risk preference	4 point ordinal scale; higher number indicates more risk tolerance	More risk aversion
Planning horizon	5 point ordinal scale; higher values correspond with longer planning horizon	Shorter planning horizon
Attitude towards conspicuous consumption	User defined ordinal 3 point scale; higher value indicates greater tolerance of borrowing for conspicuous consumption	Less willing to tolerate conspicuous consumption
<i>Cognitive responses</i>		
Shop around for the best terms	User defined ordinal 10 point scale; higher values indicate more shopping around	Less likely to shop around
Gets financial advice from professionals	User defined binary variable; “1” corresponds with getting financial advice, “0” otherwise	Less likely to get professional advice
Gathers information from news sources	User defined binary variable; “1” corresponds with getting information from the news, “0” otherwise	Less likely to collect information
Relies on ads for financial information	User defined binary variable; “1” corresponds with relying on advertisements, “0” otherwise	Less likely to rely on ads
<i>Behavioral responses</i>		
Saver	User defined 6-point ordinal scale; higher value includes greater likelihood of regular savings	Less likely to save
Has tax advantaged savings account	User defined binary variable; “1” corresponds with having a tax advantaged savings accounts, “0” otherwise	Less likely to have tax advantaged savings account
Accepts installment loans	5 point ordinal scale; higher values indicate lower tolerance of installment loans	Less willing to borrow

Table 3 summarizes data on asset levels and stress responses. We report the ratio of the average stress response of those who have more than six months of poverty income in financial assets to those who do not. The stress responses should always be higher for households with more assets than for households with fewer assets since higher values show less stress. The ratios of stress responses for the two subsamples should thus be above 100%, which is the case for all measures.

Table 3
Stress responses of households with more financial assets to those with few assets

Stress response measure	Response of households with at least six months of non-retirement financial assets in poverty income to households with fewer assets
<i>Emotional</i>	
Risk preference	127.2
Planning horizon	124.1
Attitude towards debt for conspicuous consumption	101.6
<i>Cognitive</i>	
Shop around for the best terms	112.7
Gathers information from news sources	108.5
Relies on ads for financial information	112.1
Gets financial advice from professionals	149.0
<i>Behavioral</i>	
Saver	135.8
Has tax advantaged savings account	196.7
Accepts installment loans	103.2

Notes: All figures are in percent. Higher stress response values indicate less stress. A ratio of more than 100% suggests that households with more financial assets are less stressed than households with fewer financial assets. The opposite is true – less stress associated with fewer assets – for ratios below 100%.

Stress responses and financial decisions

Saving, borrowing, and investing matter for building wealth. We choose households' probability to save for known expenses in the next decade, leverage, and the share of cash holdings out of financial assets to operationalize these three concepts. These variables are our key dependent variables and we will analyze if they are systematically correlated to stress responses. These definitions should avoid potential endogeneity between stress responses and financial decisions.

We summarize financial decisions in Table 3. Fewer financial assets are associated with less saving, more debt and more cash holdings – in line with our expectations. We present the average probability to save for known, major expenses, the median leverage, and the median relative cash holdings. Households with low assets have a 43.4% chance of saving for known, major expenses, compared to 72.5% for households with more assets. In addition, households with few assets have a median ratio of debt to assets of 70.6%, compared to 29.4% for

households with more assets. Moreover, the median share of cash holdings out of financial assets stands at 48.7% for households with few assets, compared to 12.7% for households with more assets.

Table 4
Summary statistics on savings, debt, and diversification

Nonfinancial retirement asset thresholds	Probability of saving for known expense in the next ten years	Median leverage for households with debt	Median cash holdings out of financial assets
Below six months of poverty income	43.4	70.6	48.7
Above six months of poverty income	72.5	29.4	12.7

Notes: The probability of saving for a known expense in the next ten years only applies to those households, who indicate that they will have a known expense. Leverage calculations are done only for households with any debt.

Additional determinants of stress responses and financial decisions

We include several additional variables in our multivariate analyses. These consist of demographic and economic characteristics, such as age, household status, race, ethnicity, and educational attainment. Our analysis of stress responses further includes known stressors, such as family size, health insurance coverage, labor force status, and home ownership (MacFayden, MacFayden, and Prince, 1997).³ We also include peer effects. Personal networks of and interactions with peers often impact individual financial choices (Duflo and Saez, 2002; Krauth, 2006; Maurer and Meier, 2008; Pinheiro, 2008). Peer effects specifically change the reference points among individuals in a group and thus the criteria by which comparisons are made such as investment performance and income growth. A feedback loop emerges as the reference point changes within a peer group (Bannerjee, 1992; Baucells and Rata, 2006; Dominitz and Manski 1997; Duflo and Saez, 2002; Hong, Kubik, and Stein, 2004). We expect that the peer effect is determined by the average level of assets for the relevant peer group, defined by race, marital status, education, and age in line with the literature (Duflo and Saez, 2002; Pinheiro, 2008). We expect that higher peer group averages will result in more stress, all else equal (Maurer and Meier, 2008; Pinheiro, 2008; Rayo and Becker, 2006). Finally, we control for macroeconomic stressors by including growth expectations about interest rate expectations. Future expectations tend to be strongly correlated with the most recent past (Inoue, Kilian, and Kiraz, 2009; Ranyard et al., 2008; Roos, 2005). Growth expectations reflect experiences with the business cycle and interest rate expectations should capture households' inflation expectations.

IV. Empirical strategy

Our goal is to analyze the possible link between financial security and financial decisions to see if financial stress changes financial behavior. We proceed in four steps to analyze the importance of stress as an intervening factor in financial decisions.

³ Low income is also a well-known stressor, but our financial security measures already incorporate income.

We first define households as financially secure or insecure. We want to know which level of financial assets separates households between financial security and financial insecurity. We use a threshold regression to determine this split,⁴ specifically using a model set up – defined below that controls for potential sources of endogeneity.

We then estimate the determinants of stress responses for financially secure and insecure households separately. This will allow us to see if stressed households respond differently to low asset levels than not stressed households.

We next estimate the determinants of financial decisions, particularly the role that stress responses may play. We thus can investigate if there is a systematic relationship between stress responses and financial decisions.

Finally, we offer some basic simulations for the effect of changes in asset levels and their impact on financial decisions, based on our parameter estimates. This will allow us to see if there is a potential asymmetry in the link between lower and higher asset levels and financial decisions and if so, what the size of the asymmetry may be.

Threshold regression

Our first goal is to identify a sample split between stressed and not stressed households, based on their ratio of financial assets to poverty income. We use a threshold regression (Caner and Hansen, 2004; Hansen, 1996, 1999, 2000; Kourtellos, Stengos, and Tan, 2009) to identify this split. The dependent variables are stress responses and the key explanatory variable is the ratio of assets to poverty income, creating a potential endogeneity between stress responses and asset levels. We thus use the threshold regression methodology developed by Kourtellos, Stengos, and Tan (2009) for an instrumental variable estimation with an endogenous threshold – asset levels.

This estimation includes three steps. We first estimate the determinants of asset levels separately for households with asset levels above and below all possible thresholds to develop an instrumented explanatory variable. Each instrumented ratio of assets to poverty income – above and below all possible thresholds – is then used as a determinant of stress responses for the respective subsamples. The optimal threshold is the sample split that minimizes the estimated residual sum of squares summed over both subsamples.

Our instrumental variable estimation includes two exogenous variables: the number of banks, with which the household has a financial relationship, and the annual tax advantage that the household receives from saving in tax advantaged retirement savings accounts. Both variables should be related to the assets in non-retirement accounts, but not to stress responses. Personal attitudes should be independent of the number of banks, with which the household has a financial relationship. The number of banks, though, should be related to assets since more banking relationships should reflect a more competitive financial market and thus lower costs of saving and hence more assets. The amount of tax advantages should again be unrelated to financial

⁴ Our data do not allow us to use an exogenous determination, such as change of stock market prices during the year before the survey date, to test for the robustness of our results. The SCF does not include the date of the survey and we thus cannot assign asset price changes to each household in any given year.

stress responses since attitudes should not change because of a smaller or larger tax advantage that a household enjoys. The amount of each household's total tax advantage should be negatively correlated with financial assets as a greater incentive to invest in tax advantaged accounts leaves fewer resources to be saved in non-tax advantaged savings vehicles. The estimated parameters are consistent with our expectations and statistically significant.⁵ We use the exogenous variables to instrument assets for our regression analyzing the determinants of stress responses.

The optimal threshold is then identified by minimizing the residual sum of squares for the estimation summed over both subsamples, while also correcting for the endogeneity of the threshold variable:

$$S_n(\gamma) = \sum_{i=1}^n (y_i - \hat{g}'_i \beta - \hat{g}'_{i,\gamma} \delta_n - \hat{\kappa}_n \hat{\lambda}_i(\gamma))^2 \quad (1)$$

where \hat{g}'_i denotes observations below the threshold, γ , and $\hat{g}'_{i,\gamma}$ indicates the matrix of observations above the threshold. The respective coefficients in determining financial stress responses, y , are β for observations below the threshold and δ_n are the coefficients for observations above the threshold. This expression includes the instrumented financial security variable as part of the matrix g' of independent observations. The final term in equation (1), λ_i , is the sum of the inverse Mills Ratios, with the estimated coefficient κ_n . The inverse Mills ratios above and below the threshold are defined by:

$$\lambda_i(\gamma) = \lambda_{1,i}(\gamma)I(q_i \leq \gamma) + \lambda_{2,i}(\gamma)I(q_i > \gamma) \quad (2)$$

where I is an indicator variable for observations below and above the threshold, determined by the continuous threshold function q , and

$$\lambda_{1,i}(\gamma) \equiv \lambda_1(\gamma - z'_i \pi_q) \quad (3)$$

and

$$\lambda_{2,i}(\gamma) \equiv \lambda_2(\gamma - z'_i \pi_q) \quad (4)$$

with $z'_i \pi_q$ shows the set of estimated coefficients times the observations for the determinants of the instrumented variable, when all coefficients can vary between observations below and above the threshold. The two components of the bias error correction term are then set equal to:

$$\lambda_1(\gamma - z'_i \pi_q) = -\frac{\phi(\gamma - z'_i \pi_q)}{\Phi(\gamma - z'_i \pi_q)} \quad (5)$$

⁵ Details are available from the authors upon request.

$$\lambda_1(\gamma - z'_i \pi_q) = -\frac{\phi(\gamma - z'_i \pi_q)}{1 - \Phi(\gamma - z'_i \pi_q)} \quad (6)$$

with $\phi(\cdot)$ as the normal probability distribution function and $\Phi(\cdot)$ as the normal cumulative density function.

The optimal threshold lies where the residual sum of squares minimizes the expression in equation (1). We summarize the optimal thresholds for all three stress responses in Table 5. Financial assets equal to 17 months of poverty income is the optimal threshold for emotional responses, one month is the optimal threshold for cognitive responses, and three months is the optimal threshold for behavioral responses.⁶ Between one-third and two-thirds of households fall below the threshold, depending on the response.

Table 5
Estimated thresholds of asset to income at the poverty level for each stress response

	Search range for thresholds	Optimal threshold (in number of months of poverty income held in non- retirement financial assets)	Share of households below threshold	Average value below threshold	Average value above threshold
Emotional	{0, 1, 2, .24}	17	67.91	0.31 (0.37)	9.37 (13.01)
Cognitive	{0, 1, 2, .24}	1	27.08	0.02 (0.03)	4.41 (9..69)
Behavioral	{0, 1, 2, .24}	3***	41.11	0.07 (0.07)	5.42 (10.54)

Notes: Thresholds are expressed in months and are defined such that observations that are less or equal to the threshold fall into one subsample and all other observations fall into the other subsample. Thresholds * indicates significance at the 10% level, ** indicates significance at 5% level, and *** indicates significance at 1% level. Figures in parentheses are standard deviations.

Financial security and financial stress responses

We next present estimates our complete for financially secure and financially insecure households split at the optimal threshold in Table 6. There are three dependent variables: emotional, behavioral, and cognitive stress responses. The explanatory variables are those that we discussed before. We instrument financial security with the number of banks with which the household has a financial relationship, and by the estimated amount of tax advantages that a household receives from contributing to a tax advantaged retirement savings account.

The estimated coefficients have the expected sign or are statistically insignificant (Table 6). More assets to poverty income are associated with more positive stress responses. The

⁶ Optimal thresholds for sample splits based on alternative financial security measures also fall between one and six months of poverty income or current income.

differences in the size of the estimated coefficients between the two subsamples for the three stress responses are also statistically significant, not shown here.

Households below the threshold show stronger emotional and behavioral stress responses and weaker cognitive stress responses than is the case for households above the threshold. An increase in the ratio of assets to poverty income equal to one standard deviation -- 37% or about four months of poverty income -- equals an increase of 1.00 in the emotional stress response below the threshold. The comparable effect for households above the threshold is 0.86 or 14% less. And, the effects for behavioral responses are 1.21 for households below the threshold and 0.86 above the threshold following a one standard deviation increase in the asset to poverty income ratio. Cognitive responses are 0.20 for households below the threshold and 0.43 for households above the threshold, following a one standard deviation increase in assets to poverty income.

Our results indicate that preferences differ systematically and substantially with the level of financial security. Financially insecure households are more likely to become risk averse, to shorten their planning horizon, to tolerate conspicuous consumption, to save less, to have no tax advantaged savings accounts, and to have installment loans associated with less financial security than households above the threshold. There is a greater reduction in the likelihood to shop around for the best financial deals and to collect information associated with less financial security above the threshold than below the threshold.

Our equation also includes labor force participation, homeownership, and health insurance coverage as other potential stressors (Table 6). Lack of a job, renting, and no health insurance should increase stress. This is typically the case. Labor force participation, for instance, reduces stress in two instances and is otherwise statistically significant. Homeownership reduces stresses in all three cases above the threshold, but it increases behavioral stress responses below the threshold. In this instance, homeownership results in less saving, more installment loans, and fewer tax advantaged savings accounts. And, health insurance coverage reduces emotional and behavioral stress responses above the threshold, but health insurance coverage is associated with a stronger emotional stress response below the threshold. In this unexpected case, health insurance coverage is associated with a more risk aversion, shorter planning horizons, and a more positive attitude towards conspicuous consumption.

We also add a household's perception of its peers and the macro economy to the regression. A more positive outlook on the macro economy and financial markets translates into less financial stress. Higher levels of financial security in the peer group, in comparison, translate into more stress, reflecting peer pressures to maintain a comparable level of financial security.

Our findings on all stressors are consistent with the literature. We therefore are confident that our model captures the determinants of stress responses and that financial insecurity can be a source of stress.

Table 6
Determinants of Financial Stress Responses, Below and Above Threshold, Nonretirement Financial Assets to Income at Poverty Line as Financial Security Measure

Explanatory variable	Exp. sign	Emotional		Cognitive		Behavioral	
		Below 17 months	Above	Below One month	Above	Below Three months	Above
Threshold							
Age	“+”	0.014 (0.013)	0.023 (0.018)	0.016 (0.010)	0.019*** (0.007)	0.031* (0.019)	0.036*** (0.013)
Age ²	“-”	-0.0003** (0.0002)	-0.0005*** (0.0001)	-0.0003** (0.0001)	-0.0004*** (0.0001)	-0.0004* (0.0002)	-0.0006*** (0.0001)
Black	“+/-”	-0.035 (0.059)	-0.364*** (0.138)	0.045 (0.049)	0.004 (0.004)	0.380*** (0.077)	-0.135* (0.076)
Hispanic	“+/-”	-0.105 (0.076)	-0.406** (0.168)	-0.018 (0.057)	-0.070 (0.053)	0.304*** (0.089)	-0.314*** (0.092)
Other race	“+/-”	-0.101 (0.085)	0.005 (0.113)	-0.032 (0.085)	0.033 (0.045)	0.280** (0.125)	-0.068 (0.078)
Married	“+/-”	-0.121* (0.067)	-0.209** (0.094)	0.080* (0.046)	0.021 (0.034)	-0.072 (0.081)	-0.032 (0.065)
Single women	“+/-”	-0.105** (0.052)	-0.066 (0.079)	0.087** (0.040)	0.075*** (0.029)	-0.053 (0.066)	0.145*** (0.053)
No. of household members	“+/-”	0.041*** (0.013)	0.024 (0.018)	0.0003 (0.095)	0.011 (0.007)	0.052*** (0.015)	-0.002 (0.013)
Labor force participation	“+”	-0.067 (0.037)	0.163*** (0.059)	-0.011 (0.029)	0.032 (0.022)	-0.032 (0.046)	0.279*** (0.041)
Nonretirement financial assets to income at poverty line	“+”	2.701*** (0.226)	0.066*** (0.012)	6.648*** (1.931)	0.044*** (0.005)	17.226*** (1.232)	0.082*** (0.011)
Health insurance	“+”	-0.110** (0.044)	0.222** (0.091)	0.037 (0.033)	0.032 (0.030)	0.086 (0.055)	0.618*** (0.055)
Home ownership	“+”	-0.079	0.299**	0.083	0.203***	-0.223**	0.436***

		(0.083)	(0.138)	(0.065)	(0.045)	(0.104)	(0.082)
Less than high school	“+/-“	0.048	0.027	-0.129**	0.011	0.298***	-0.094
		(0.068)	(0.139)	(0.054)	(0.043)	(0.084)	(0.092)
High school	“+/-“	0.063	0.007	-0.081*	0.063**	0.208***	0.053
		(0.052)	(0.071)	(0.041)	(0.029)	(0.066)	(0.058)
Some college	“+/-“	0.090*	0.040	-0.076*	0.104***	0.132**	0.031
		(0.050)	(0.061)	(0.045)	(0.025)	(0.067)	(0.47)
Average nonretirement financial assets to poverty line for peer group	“+”	-0.003	-0.061	-0.035	-0.076***	0.042	-0.103***
		(0.027)	(0.047)	(0.023)	(0.017)	(0.035)	(0.030)
Growth expectations	“+”	0.036*	0.038	0.019	0.029***	0.006	0.046**
		(0.021)	(0.025)	(0.018)	(0.011)	(0.026)	(0.018)
Interest rate expectations	“+”	0.004	0.041	0.023	0.030**	0.057	0.041
		(0.027)	(0.036)	(0.022)	(0.014)	(0.036)	(0.025)
1998	“+/-“	0.033	0.149**	-0.063	-0.096***	-0.006	0.135***
		(0.050)	(0.068)	(0.046)	(0.027)	(0.066)	(0.046)
2001	“+/-“	0.052	0.155	-0.036	-0.084**	-0.012	0.171***
		(0.056)	(0.099)	(0.046)	(0.033)	(0.067)	(0.055)
2004	“+/-“	-0.014	0.097	-0.001	-0.117***	0.033	0.145***
		(0.048)	(0.076)	(0.042)	(0.028)	(0.063)	(0.046)
2007	“+/-“	0.002	0.139**	-0.035	-0.062**	0.170***	0.168***
		(0.048)	(0.069)	(0.041)	(0.027)	(0.065)	(0.045)
Constant	“+/-“	-1.020	-0.788**	-0.395*	-0.185	-3.078***	-1.880***
		(0.295)	(0.390)	(0.229)	(0.149)	(0.378)	(0.267)
N		7759	5522	3075	10201	4649	8631
F-statistic		35.81	12.26	6.33	17.54	30.21	39.13
p-value		0.000	0.000	0.000	0.000	0.000	0.000

Notes: All demographic variables refer to the head of households. All regressions are two stage least squares instrumental variable regressions. Exogenous variables are the tax advantage from tax advantaged savings and the number of financial institutions, with which the household maintains financial relationships. Higher values in the stress response variables indicate less stress. Negative coefficients thus indicate a positive correlation with stronger stress responses, while positive coefficients show a negative relation with stronger stress responses. Figures in parentheses are standard errors. * indicates significance at 10% level, ** indicates significance at 5% level, and *** indicates significance at 1% level.

Stress responses and financial decisions

We next test the relationship between stress responses and financial decisions. We consider specifically the probability of saving for known, major financial expenses in the coming decade, the ratio of debt to assets, and the share of cash out of total financial assets as dependent variables and stress responses as key determinants.

We first estimate a probit regression for the probability of saving for any known major future financial expenses. The explanatory variables include demographic and economic characteristics and stress responses. We expect that larger stress responses – indicating less stress – are positively correlated with the probability to save for long-term goals.

We next estimate the determinants of a household's leverage – debt to total assets – using a tobit regression. We use the same explanatory variables as before and focus primarily on stress responses. Behavioral responses, which include attitudes towards installment loans, should have a negative relationship with debt, such that more stress is associated with more debt. Emotional stress could mean a lower willingness to borrow for investments, such as homeownership or business creation, but it could also mean more debt for consumption, leaving an ambiguous relationship between emotional stress and leverage. And, cognitive responses could result in more debt for a stressed household if the household is less willing to seek financial advice.

We then estimate the correlation between stress responses and cash holdings again using a tobit regression. The dependent variable is the ratio of liquid assets to financial assets. More cash may mean less risk. We expect that all three financial stress responses are negatively correlated with the cash allocation in a household's portfolio. Less stress – and a more positive stress response -- should result in fewer cash holdings and more, higher-return investments.

We present our estimates in Table 7. All coefficients have the expected sign or are statistically insignificant. Stress responses are positively associated with a greater probability to save for known, major future expenses. The average marginal effect is largest for behavioral responses with an average increase of 71.3%, followed by a 19.9% effect of cognitive responses, and an 8.2% effect of emotional stress responses.⁷ Financial security will hence increase a household's propensity to save for known future expenses and thus help to faster build wealth in the long-run.

⁷ Marginal effects are not shown here.

Table 7
Saving for known, future expenses, leverage, and cash holdings

Explanatory variable	Probability of saving for known, major expenses	Leverage	Cash holdings
Age	-0.019 (0.015)	-0.265*** (0.068)	-0.008*** (0.003)
Age ²	0.0002 (0.0002)	0.002*** (0.001)	0.00001 (0.00003)
Black	0.132** (0.052)	0.028 (0.284)	-0.007 (0.012)
Hispanic	0.290*** (0.065)	0.026 (0.384)	0.091*** (0.014)
Other race	0.285*** (0.101)	-0.013 (0.514)	0.038* (0.021)
Married	-0.098 (0.061)	0.237 (0.264)	0.008 (0.012)
Single women	-0.100 (0.061)	1.042*** (0.318)	0.001 (0.013)
No. of household members	0.023* (0.014)	0.101 (0.065)	-0.005* (0.003)
Income (logged)	0.133*** (0.027)	-0.006 (0.132)	-0.041*** (0.006)
Less than high school	-0.131* (0.072)	-0.979*** (0.333)	0.043*** (0.015)
High school	-0.080* (0.044)	-0.269 (0.184)	0.008 (0.009)
Some college	-0.116** (0.047)	0.110 (0.210)	-0.003 (0.009)
Emotional stress response	0.051** (0.020)	-0.160*** (0.092)	-0.024*** (0.004)
Behavioral stress response	0.448*** (0.020)	-1.038*** (0.093)	-0.170*** (0.004)
Cognitive stress response	0.125*** (0.029)	0.322* (0.135)	0.001 (0.006)
1998	-0.025 (0.054)	0.283 (0.220)	0.030*** (0.011)
2001	-0.067 (0.054)	0.393 (0.245)	0.047*** (0.011)
2004	-0.085 (0.053)	0.452** (0.230)	0.066*** (0.011)
2007	-0.107** (0.054)	0.544** (0.233)	0.058*** (0.011)
Constant	-0.720* (0.393)	6.901*** (0.336)	1.011*** (0.086)
N	7889	12781	12604
F-statistic	54.89	2.72	238.18
p-value	0.000	0.000	0.000

Notes: Probability of saving for known, major expenditures is estimated using a probit regression. Determinants of leverage and cash holdings are estimated using tobit regressions. Sample for determinants of leverage excludes families with leverage greater than 10,000% to control for outliers, eliminating less than one percent of the observations. Numbers in parentheses are standard errors. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level.

Table 7 shows our results for household leverage. All estimates have the expected sign or are statistically insignificant. Behavioral responses are negatively correlated with leverage, such that more stress may be associated with more debt. A decrease in the behavioral response by half a standard deviation increases household leverage by 51.5 percentage points. There is also a negative relationship between emotional responses and leverage, suggesting that shorter planning horizons, less risk tolerance, and a greater willingness to tolerate conspicuous consumption translate into more debt. Here, half a standard deviation decline in the stress response increases leverage by 7.7 percentage points. And, lower cognitive stress responses result in more debt. Half a standard deviation decrease in the stress response results in a decrease of household leverage by 9.6 percentage points. More financial stress thus has an ambiguous effect on household leverage, as there are competing channels between stress and debt. The size of the effects, though, varies and suggests that low financial security likely overall increases debt.

The final set of results in Table 7 shows our estimates for cash holdings. Stress responses suggest that stress may be associated with more cash as more negative stress responses correlate with larger relative cash holdings. A decrease in the behavioral stress response equal to half a standard deviation increases relative cash holdings by 8.7 percentage points and a similar decline in the emotional stress response shows a rise in relative cash holdings equal to 0.7 percentage points.

Asymmetric stress responses and financial decisions

Our results show that stress may reduce the chance that households build wealth for the long run. The effect may be asymmetric since the linkages are stronger among households below the threshold than above the threshold. We next calculate the differences of these effects.

We calculate the likely effects of a 10%, 20%, and 30% decline in non-retirement financial assets on financial decisions and compare those to the impact of equally sized increases in assets.

These are not unusual changes in financial assets. The Federal Reserve's Flow of Funds Accounts for the United States show comparable household data as the SCF in the aggregate on a quarterly basis. Household financial assets decreased by 17.4% from December 2007 to December 2008 and rose by 15.9% from March 2009 to March 2010.⁸ These movements likely understate the actual declines and possibly overstate the increases that many families experience since these are changes net of additional contributions during the year.

Our simulations proceed as follows. We first adjust financial assets for the assumed increases or decreases. We then calculate the resulting changes in financial stress responses, holding all other factors constant. We next analyze the effect of the changes in financial stress responses on the long-term wealth building variables.

Table 8 presents a number of summary calculations for our simulations. We first calculate the shares of households that move above or below the threshold for each of the financial stress responses and for each of the decreases or increases. Next, we show the average or median

⁸ Authors' calculations based on BOG (2010).

change in the outcome variable that results from the respective decreases or increases. And finally, we summarize the difference in changes for each household.

Table 8 shows that there is indeed an asymmetry in the outcome variables. Households especially increase their leverage and cash holdings more after a financial asset loss than they decrease their leverage and cash holdings in response to a similarly sized financial asset gain. The difference in the median change is substantial. A 30% loss of financial assets leads to a change in leverage and relative cash holdings that is about 26% to 28% greater than the absolute impact of a similarly sized 30% financial asset gain. Relative cash holdings, for instance, go up by 12.7 percentage points after a 30% decline in financial assets, but relative cash holdings drop by only 10.1 percentage points following a 30% upward change in financial assets. This difference results from the fact that the share of households who fall below the financial response threshold as a result of a financial asset loss is always greater than the share of households who move above the threshold in response to a comparable financial asset gain.

This reflects the fact that there are households with no assets below the threshold. We hence also calculate the difference in the absolute changes resulting from equally sized increases and decreases for each household in the sample. This will allow us to see if our conclusions hold when we compare the impacts for each household, rather than just aggregating the changes across households, as we do in Table 8. These calculations indicate that the average difference in the absolute changes – effect of decrease minus effect of increase -- are positive, i.e. the effects of a decrease on any of our three outcome variables are consistently larger than the equally sized effects of an increase. This is even the case for the probability of saving for known, major expenses. These calculations based on the comparisons between financial asset decreases and increases at the household level contradict the averages calculated for all households, which suggest that a decrease in asset prices results in a smaller absolute decline in the proportion of households saving for a known, major expenses, than the increase that results from an asset increase (Table 8). The population averages thus do not seem to paint an accurate picture of the symmetry of financial changes on households' chance to save for the long run.

Table 8
Effects of stock price changes on long-term wealth creation

	Increase	Decrease	Avg. diff. in changes
<i>Emotional responses</i>			
Share of households moving above/below threshold with 10% change	1.7	1.8	
Share of households moving above/below threshold with 20% change	3.0	3.6	
Share of households moving above/below threshold with 30% change	4.3	5.8	
<i>Behavioral responses</i>			
Share of households moving above/below threshold with 10% change	1.2	1.4	
Share of households moving above/below threshold with 20% change	2.3	3.0	
Share of households moving above/below threshold with 30% change	3.6	4.9	
<i>Cognitive responses</i>			
Share of households moving above/below threshold with 10% change	1.2	1.2	
Share of households moving above/below threshold with 20% change	2.1	2.7	
Share of households moving above/below threshold with 30% change	3.0	4.3	
<i>Changes in probability of saving for known, future expenses</i>			
After 10% change	1.2	0.8	0.9
After 20% change	2.7	1.8	2.5
After 30% change	3.3	2.7	4.3
<i>Median change in leverage</i>			
After 10% change	-3.9	4.2	1.3
After 20% change	-7.3	8.5	5.5
After 30% change	-10.1	12.7	10.3
<i>Median change in relative cash holdings</i>			
After 10% change	-0.7	0.7	0.2
After 20% change	-1.3	1.5	0.9
After 30% change	-1.8	2.3	1.7

Notes: All levels are percent. Changes are percentage points. We report averages for the probability of saving for known, major expenses since the underlying variable is an indicator and medians would show either a “0” or a “1”. We can only calculate median ratios and median changes for leverage and cash holdings since the calculation of averages of ratios would require determinants of total debt, total assets, financial assets, and cash holdings, which we do not have.

V. Conclusion

We analyze the link between financial security and financial decisions in this paper. We are particularly interested in understanding if low asset levels cause stress that then influences financial decisions. The financial decisions we are interested in are the probability of saving for known, major future expenses, how much leverage to accept, and what share of financial assets to allocate to liquid assets (cash).

Our analysis proceeds in several steps. First, we use a threshold regression to divide households between financially secure and financially insecure households. Second, we link financial security to stress responses for both financially secure and insecure households to gain a sense of how financial security influences financial stress responses and if the correlation between these two phenomena differs depending on the level of financial security. Third, we analyze the link between stress responses and financial decisions. Finally, we use our estimated parameters for simulations to see if a universal reduction in financial assets by a fixed percentage has a different effect than a similarly sized universal increase and if so, how large the difference will be.

Our results indicate that greater financial stress caused by financial insecurity, or low asset levels, is systematically correlated with stress responses. We further find that stress responses are greater for financially secure households than for financially insecure ones. Stress responses systematically determine financial decisions. We thus conclude that more financial stress reduces the probability that a household saves for known, major future expenses, that it increases a household's leverage, and that it raises a household's relative cash holdings.

Adverse effects that can lower the financial security of households may have a larger effect on financial decisions than positive exogenous shocks that can increase financial security. We consider this potential asymmetry, using a simple simulation model, which shows the difference in financial decisions if stock prices are 10%, 20%, 30% higher or 10%, 20%, 40% lower. The overall conclusion from our simulations is that an exogenous, adverse shock to asset prices has a larger absolute impact on financial decisions than a positive shock of the same magnitude.

Our findings may have three implications for the existing research on savings. First, our results indicate that financial stress may be associated with systematically different preferences than for households who are not stressed. Second, our results indicate that low financial security impedes long-term financial decisions. Financial stress may thus be a channel that can contribute to wealth inequality. Third, we find that financial stress can give rise to asymmetric financial decisions. This may impede savings when financial markets are characterized by large up and down movements since those could exacerbate the asymmetry that financial stress causes for financial decisions.

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