Expectations Uncertainty and Household Economic Behavior*

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Abstract

We show that there exists significant heterogeneity across U.S. households in how uncertain they are in their expectations regarding personal and macroeconomic outcomes, and that uncertainty in expectations predicts households' choices. Individuals with lower income or education, more precarious finances, and living in counties with higher unemployment are more uncertain in their expectations regarding own-income growth, inflation, and national home price changes. People with more uncertain expectations, even accounting for their socioeconomic characteristics, exhibit more precaution in their consumption, credit, and investment behaviors.

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1 Introduction

Households differ in their economic expectations, in terms of the levels of these expectations but also in terms of the uncertainty surrounding these levels (Dominitz and Manski (1997a), Dominitz and Manski (1997b)). Theoretically, uncertainty is important for households' economic behavior. Uncertainty regarding variables that impact future consumption should induce prudent behaviors, including increased precautionary savings and liquidity, lower levels of consumption, and lower exposure to risky financial investments, when the risks associated with these variables can not be fully hedged (e.g., Gollier and Pratt (1996), Carroll and Samwick (1998), Bertola, Guiso, and Pistaferri (2005)).

Prior work has studied the drivers and consequences of the heterogeneity across households in the levels of their expectations regarding micro- and macro-level variables such as income growth, stock market returns, inflation, or unemployment (e.g., Souleles (2004), Piazzesi and Schneider (2012), Malmendier and Nagel (2016), Das, Kuhnen, and Nagel (2017)). However, there is scant evidence regarding why households differ in their perceived uncertainty around their economic expectations, and how this uncertainty influences their choices. The lack of data sources containing measures of uncertainty as well as household economic choices has been a critical impediment for the empirical investigation of these questions.

In this paper we provide novel empirical evidence regarding the factors that contribute to households' uncertainty in their personal and macro-level economic forecasts, and the effects of this uncertainty on households' consumption, credit market, and investment decisions. We use data from the Survey of Consumer Expectations (SCE) conducted by the Federal Reserve Bank of New York monthly since June 2013, which allows us to measure the degree of uncertainty in respondents' forecasts regarding their own-income growth, the national rate of inflation, and the rate of growth in national home prices over the subsequent 12 months.

We find that there exists a high level of within-person correlation in the uncertainty expressed by individuals across the three measures of economic expectations. We then show that uncertainty in economic expectations is higher among individuals with lower income,

lower education, a more precarious financial situation as measured by their likelihood of defaulting on debt, those not working either full or part-time, and those living in counties with higher unemployment at the time of the survey. For example, having a college degree, or having $100,000 higher income per year correspond to a third of a standard deviation decrease in uncertainty about economic outcomes. These results indicate that people faced with more economic adversity are more uncertain in their economic forecasts. This pattern is in line with recent work in neuroscience which suggests that adversity changes brain function such that people from more adverse backgrounds perceive higher environmental instability (e.g., Sturge-Apple et al. (2016)). Moreover, we document significant county fixed effects in people's uncertainty, suggesting the existence of persistent local factors that drive the degree of confidence that people have when assessing economic prospects for themselves and for the nation as a whole. We find that the respondents whose subjective uncertainty is closer to the objective volatility of the economic outcomes forecasted are those with higher incomes and higher education. Finally, we show that people's uncertainty in their micro- and macro-economic forecasts predicts their economic decisions. Households that are more uncertain in their economic expectations, even accounting for their socioeconomic characteristics, are more likely to engage in precautionary behaviors—namely, they plan to reduce consumption, secure additional credit access, and have lower exposure to equity market investments.

Measures of uncertainty in households' expectations about future economic outcomes were not available until recently. Due to this lack of data, economists constructed proxies for ex-ante uncertainty by examining ex-post realized volatility in the variable of interest, which typically was income growth (e.g., Carroll and Samwick (1997) and Pistaferri (2016)).[1] The indirect nature of proxies for subjective uncertainty made it difficult to unambiguously interpret empirical results meant to test the theoretical links between ex-ante uncertainty and household economic behavior. In a seminal paper, Dominitz and Manski (1997b) provided a

[1]There are several recent studies that deviate from this paradigm. For example, Guvenen and Smith (2014) propose using observed consumer choices to infer household perceived uncertainty. Also, Feigenbaum and Li (2012) use forecast errors of projection models that allow for household superior information to measure income uncertainty.

novel approach using survey data to measure the subjective uncertainty of U.S. households, specifically regarding their future income levels, and found significant heterogeneity across those surveyed. Around the same time, Guiso, Jappelli, and Terlizzese (1996) used survey data from the Bank of Italy regarding people's assessments for the distribution of their future incomes to study the link between income risk and equity markets exposure. A decade and a half after these early papers, a new data set containing measures of household-level uncertainty regarding several economic outcomes was made possible through the creation of the SCE. This new resource has so far been used mainly to understand beliefs about inflation. Specifically, De Bruin, Manski, Topa, and Van Der Klaauw (2011) and Binder (2017a) found that uncertainty in inflation expectations is higher among women and lower-income individuals. One notable exception is Adelino, Schoar, and Severino (2018) who examine the connection between people's uncertainty regarding returns to housing as an asset class, and their interest in becoming a home owner.

We contribute to the literature in two main ways. First, we show that there is a high degree of correlation between how uncertain a person feels about their future income, which is a micro-level variable, and how uncertain the person is about macro-level variables such as inflation and home price appreciation at the national level, and that variation across people in their level of uncertainty comes in part from their socioeconomic situation.[2] Hence, the way people construct distributions of future outcomes may cause spillovers from one domain to another that our theories currently do not include, as they typically examine uncertainty with respect to one economic variable only (e.g., own-income growth, as in Carroll and Samwick (1997)). Our results suggest that people are influenced by their own or local economic

[2]De Bruin, Manski, Topa, and Van Der Klaauw (2011) find that individual forecast uncertainty regarding inflation expectations is highly persistent over time—that is, there is a positive correlation over time in uncertainty regarding a specific economic outcome. Focusing on point estimates, rather than on uncertainty, Dominitz and Manski (1997a) study individuals' assessment of the probability of three types of near-term economic misfortune: the absence of health insurance, victimization by burglary, and job loss. They find that respondents that assign a high probability to one adverse outcome tend also to assign a high probability to the other outcomes. Hence, our results together with these prior findings suggest that within-individual there seems to exist a positive correlation across expectations, in terms of point estimates, as well as in the uncertainty around these estimates.

adversity when forecasting distributions of personal as well as macroeconomic outcomes, and thus similar levels of uncertainty will permeate these individuals' forecasts about variables that fundamentally may be unrelated.[3] These findings complement the existing literature that shows that personal experiences influence the formation of expectations levels. For example, Malmendier and Nagel (2016), Kuchler and Zafar (2016), and Das, Kuhnen, and Nagel (2017) show that people's levels of expectations about macroeconomic outcomes relate to the economic experiences they experienced as a cohort, or as residents in a specific locality, or due to their idiosyncratic economic shocks.

Second, we provide novel evidence on the effects of people's expectations uncertainty on several behaviors—specifically, consumption, investment, and borrowing decisions. Unlike prior papers, where typically only one household decision could be observed in the data (e.g., the share of wealth invested in equities, as in the case of Guiso, Jappelli, and Terlizzese (1996)), here we have information regarding several interdependent behaviors that in theory should be impacted by people's uncertainty about future economic outcomes. Thus, we provide a broader assessment of the effects of uncertainty in expectations on households' economic behavior relative to the prior literature. Overall, our results indicate the uncertainty in economic expectations predicts general caution in households' behavior, as suggested by theoretical work. These results add to to the prior empirical literature on the effects on uncertainty on household actions, which is scarce and inconclusive, in part perhaps due to the lack of ex-ante measures of household uncertainty. For example, the connection between uncertainty regarding economic variables and consumption decisions has so far been empirically weaker than predicted by theory (e.g., Knotek and Khan (2011), Christelis, Georgarakos, Jappelli, and van Rooij (2016)).[4] Moreover, contrary to theoretical predictions, households'

[3]Ben-David, Graham, and Harvey (2013) also find that uncertainty transcends domains. Specifically, the degree of uncertainty that executives express about the projects of their own firm is highly correlated with the degree of uncertainty that they perceive in the stock market in general.

[4]A similar tension between theoretical predictions and empirical patterns is also found at the aggregate level. For example, Carroll and Dunn (1997) and Knotek and Khan (2011) find that the response of aggregate consumption to increases in uncertainty regarding income or general business conditions is much less pronounced than predicted by theory.

precautionary savings, especially in liquid assets, are not significantly related to income or unemployment risk (Carroll, Dynan, and Krane (2003), Fulford (2015b)). At the same time, exposure to equity markets is lower for those with higher income risk (Guiso, Jappelli, and Terlizzese (1996), Betermier, Jansson, Parlour, and Walden (2012)), as the theory would suggest. The effects on uncertainty on household behaviors in credit markets have not been addressed directly in the literature. However, the few existing empirical papers suggest that households may act in a precautionary manner in their credit-related activities, as borrowing constraints could bind at times when bad income or consumption shocks occur.[5] Specifically, Fulford (2015a), Gorbachev and Luengo-Prado (2016), and Druedahl and Jorgensen (2017) document that households expecting less access to credit in the future hold low-interest rate savings while carrying expensive debt.

Our findings that uncertainty correlates with economic actions complements the findings of recent studies documenting that expectations levels relate to behaviors. This prior work shows that households with higher inflation expectations have higher durable goods consumption (D'Acunto, Hoang, and Weber (2017)), accumulate less wealth, are less leveraged, invest less in non-liquid assets (Vellekoop and Wiederholt (2017)), and tilt their exposure toward liabilities with fixed nominal rates (Malmendier and Nagel (2016)). Households expecting higher home price growth are more likely to buy larger and more expensive homes, with higher downpayments (Bailey, Davila, Kuchler, and Stroebel (2017), Bailey, Cao, Kuchler, and Stroebel (2018)). We add to this literature by documenting a general pattern that suggests that uncertainty in expectations may lead to precautionary behaviors across several economic choices.

Our results suggest that policy interventions or messages meant to encourage household behaviors related to consumption, investment, or credit decisions may not have equal effects on all households. Examples of such policies or messages include central bank forward

[5]Di Maggio, Kermani, Ramcharan, and Yu (2017) provide evidence that credit limits faced by households are volatile. They find that increased uncertainty regarding local labor market conditions leads to a reduction in leverage for high-risk borrowers, suggesting that lenders reallocate credit towards safer borrowers when uncertainty spikes.

guidance, changes in disclosure to consumers about aspects of credit products, and changes in consumers' ease of access to investment products, or in the tax implications of such investments. Our findings imply that whether or not such policies will achieve the desired outcome at the household level will depend critically on how uncertain each household is about the future economic outcomes related to the variables that policy makers are attempting to influence. The evidence in this paper also suggests that certain segments of the population—based on socioeconomic characteristics, or location in the United States—may benefit significantly more than others from interventions that help reduce perceived economic uncertainty. Lastly, our findings indicate that aggregate macro-level indices of uncertainty (e.g., Baker, Bloom, and Davis (2016)), Binder (2017b)) could mask important differences across U.S. households, and hence, that it would be beneficial to construct and track over time measures of uncertainty for specific subgroups of the population.

2 Data

2.1 Sample Overview

We use the Survey of Consumer Expectations from the Federal Reserve Bank of New York (FRBNY). The SCE is an internet-based survey designed to collect rich, timely information about consumer expectations and behavior. The SCE uses a rotating panel structure where respondents are interviewed for up to 12 consecutive months.[6] Each month, new respondents are added to the panel as existing respondents rotate out.

Our core survey sample contains observations from June 2013 to December 2017. The full sample spans 55 months, with an average of 1,282 observations per month, and a total of 70,506 person-month observations. The SCE has a core survey component and various special modules. Questions in the core survey are administered monthly in all years while the special

[6]Respondents are household heads. They are defined as "the person in the household who owns, is buying, or rents the home." See Armantier, Topa, van der Klaauw, and Zafar (2016) for a full overview of the survey.

modules are fielded only for specific months. The core survey contains the key personal and macroeconomic expectations variables. We focus on expectations for national inflation and national house price growth as well as personal income growth. Respondents are asked to provide a point estimate and a distribution of the growth rate for each of these variables over the next 12 months. Specifically, they provide three responses: a directional indicator (increase or decrease); a numerical estimate, in percent (point estimate); and a subjective distribution (i.e., probability weights) over an exhaustive set of pre-defined outcomes (see Appendix A for details).

In addition to the core SCE survey, we use three special modules in our analysis: the Credit Access Survey run three times a year (February, June, and October), the annual Housing Survey run in February, and the annual Household Finance survey administered in August. The Credit Access Survey covers from October 2013 to February 2017 (13 waves; on average 1,100 observations per wave), the Housing Survey covers from 2014 to 2016 (3 waves; on average 1,000 observations per wave), and the Household Finance Survey covers 2014–2016 (3 waves, on average 1,000 observations per wave).

2.2 Uncertainty Measures

We measure uncertainty regarding individuals' 12-month expectations using the subjective distributions they provide. Respondents provide probabilities over a support of 10 symmetrical bins of possible values of national inflation, national house price growth, or personal income growth ranging from -12% to $+12\%$ (see Appendix A). Using these probabilities, the FRBNY estimates parametric subjective densities using a method developed by Engelberg, Manski, and Williams (2009), as described in Armantier, Topa, van der Klaauw, and Zafar (2016). We use the standard deviation of the subjective distributions as our uncertainty measure for each expectation variable. We also use the mean of these distributions to control for expectations levels.[7]

[7]Survey participants are also asked to provide a point estimate for each of these forecasts. These point estimates, while not identical to the means of the subjective densities calculated by the FRBNY, are signif-

To obtain our analysis sample, we apply the following screens to remove outliers and ensure data consistency. First, we assess the internal consistency of expectations and distributions by determining if an individual's point estimates are within the support of the subjective distributions they provide. If the point estimate is not in the support, we set the point estimate of inflation, national home price growth, and personal income growth to missing. Second, we trim the tails of the cross-sectional distribution of point estimates in each month at the 0.5% level. Respondents with point estimates that lie in the 0.5% tails are also set to missing. The questions for personal income growth are only asked to a subsample of individuals that are *actively* employed. For those seeking work, retired, studying, on disability, or otherwise not working, no question is asked regarding personal income growth. However, all participants are asked to estimate the growth rate, but not the distribution, of their *household* income. We find that the personal income growth rate and the household income growth rate point estimates have a correlation of 0.50 ($p < 0.01$). Thus, our third pass through the data replaces the missing point estimates of personal income growth with the data on household income growth to increase the sample size of our analysis and to enable us to control properly for employment status.[8] This combined income growth point estimate is denoted as $Income\ Growth\ Pt\ Est_{it}$ in our analyses.

Summary statistics for density means and standard deviations are presented in Panel A of Table 1. Density means—for individual i in month t—are denoted as: $Expected\ Personal\ Income_{it}$, $Expected\ Inflation_{it}$, and $Expected\ Natnl\ Home\ Prices_{it}$. Similarly, the subjective density standard deviations are denoted as: $SD(PersonalInc)_{it}$, $SD(Inflation)_{it}$, and $SD(NatnlHP)_{it}$. Panel A shows that over the next 12 months respondents expect, on average, personal income to grow 3.12%, national inflation to be 3.60%, and national home prices to grow 4.52%, and that there is substantial cross-sectional heterogeneity for each of these subjective means. Likewise, average uncertainty for personal income growth is 1.98%,

icantly correlated with these means: for inflation, the correlation is 0.56, for national home prices it is 0.70, and for personal income growth it is 0.69 ($p < 0.01$ for all correlations).

[8] If we limit our sample to individuals who are actively employed, we find similar results to those observed in the unrestricted sample.

for inflation it is 2.50%, and for national home prices growth it is 2.82%. In our sample, we find that the three standard deviations are significantly correlated (Table 2). The standard deviation of inflation and the standard deviation of national home price growth have a pairwise correlation of 0.71 ($p < 0.01$). For those respondents with non-missing values for their standard deviation of personal income growth (i.e., those currently employed), this quantity has a correlation of 0.60 ($p < 0.01$) with the person's standard deviation of national home price growth, and a correlation of 0.56 ($p < 0.01$) with the person's standard deviation of the national inflation rate. Therefore, uncertainty in terms of these three dimensions of economic outcomes, personal or at the macro level, is significantly correlated within person.

Our main uncertainty measure, $Uncertainty_{it}$, is calculated as the average (i.e., the common component) of the $SD(PersonalInc)_{it}$, $SD(Inflation)_{it}$, and $SD(NatnlHP)_{it}$ for each individual i in month t who is employed as of that time. A secondary measure, $Uncertainty_{it}^{macro}$, is calculated by averaging the latter two components only. Since both are the average of several standard deviations of quantities measured in percentage points (i.e., growth rates, all of similar order of magnitude), then these two measures are also quantities measured in percentages.[9] Panel A in Table 1 shows that both measures are very similar regardless of the calculation method due to the high correlation of the underlying components.[10]

We do not observe large within-person correlations for the point estimates and distribution means for the three economic variables. The correlations between either personal income growth or household income growth, on the one hand, and inflation or national home price growth estimates on the other, are no larger than 0.18. This indicates more than a four-fold drop relative to the correlations observed within-person in terms of the uncertainty that people have about these variables. The point estimates for inflation and national home price growth rates have a correlation of 0.39 ($p < 0.01$), which again indicates these quantities are relatively more distinct within-person than the levels of uncertainty regarding these

[9] In unreported analyses we also use their first principal component, leading to similar findings.

[10] The pairwise correlation between the two uncertainty measures is 0.96 ($p < 0.01$).

estimates, whose correlation is equal to 0.71. These correlations can be seen in Table 2.

2.3 Household Characteristics and Behaviors

We present summary statistics for demographic and socioeconomic characteristics of respondents in the SCE in Panel B of Table 1. We observe respondents' age (Age_{it}), gender ($Female_i$), and race ($White_i$). Measures of respondents' socioeconomic status include their household income, expressed in tens of thousands of dollars ($Income/10,000_{it}$), and an indicator for whether the respondent has a college education ($College_{it}$). Income is reported in categorical bins in several \$10,000, \$25,000, and \$50,000 increments, with the last bin including all households with income greater than \$200,000 (see Appendix B for details). We also construct an indicator $Is\ Working_{it}$, which is equal to one if the person is working full-time, part-time, or is on temporary / sick leave, but has a job to which they can return. Moreover, as measures of precarious financial or economic conditions at the household or the community level, we use the probability an individual believes they will not make the minimum payment on their consumer credit in the following 3 months, $\mathbb{P}(default3months)_{it}$, and the county-level monthly unemployment rate, $County\ \%\ Unempl_{it}$, obtained from the Bureau of Labor Statistics (BLS).[11] The SCE also includes a measure of respondents' numeracy, as given by their ability to answer five basic questions about probabilities and compound interest. Participants who answer at least four of the five questions correctly are deemed to have high numeracy. In our sample, 71% of observations come from high numeracy respondents. We use this variable to assess whether it moderates of the effects of people's socioeconomic characteristics on their uncertainty in their economic expectations.

The economic behaviors that we study are related to consumption, and the use of credit and equity markets. These aspects of household decisions are not assessed all in one data set by the SCE, as certain modules are only implemented in specific months. Hence, different samples of respondents will be used in analyses that address each of these economic behaviors.

[11] See the BLS Local Area Unemployment county file, available at `https://www.bls.gov/lau/`.

Consumption decisions are obtained from the Core, Household Finance, and Housing modules. From the Core survey, we obtain an indicator of whether respondents plan to increase total household spending in the coming 12 months, $Will\ Increase\ Spending_{it}$. This variable is available every month from 2013 to 2017 and the wording of the question emphasizes total spending on a variety of items such as: groceries, clothing, housing, medical expenses, transportation, and education, among others. We also create an indicator of whether respondents plan to increase everyday spending on essential items in the coming 12 months, $Will\ Increase\ Everyday\ Spending_{it}$, from the Housing and Household Finance surveys. The samples shrink dramatically because of the infrequent administration of these special modules and because the Housing survey only included spending questions for 2014 and 2015, while the Household Finance survey only includes this question for the 2014 wave. Panel C in Table 1 shows that the average willingness to increase spending ranges from 70% to 87% across these three measures. In addition, we obtain additional measures of specific types of consumption from the Household Finance survey to use as dependent variables in our analysis. Specifically, we use questions that elicit the percent chance of purchasing home renovations, vehicles, trips, or home durables in the following 12 months after the interview date.[12] These consumption measures are present in all three waves of the Household Finance survey from 2014–2016, yielding a larger sample size of about 2,600 respondent-month observations. Overall, the average probability of consumption for these various goods in the 12 months after the survey varies from 20% to 40%.

We use the SCE core survey, as well as the Credit Access module of the SCE, to investigate behavior related to credit markets. The core survey, while not focused on assessing credit attitudes, includes data regarding people's perceptions as to whether in general it will be easier, or more difficult, to obtain loans or other forms of credit in the subsequent 12 months following the survey. We denote this variable as *Perceived Future Credit Market*

[12]Specifically, the questions ask: "In the next 12 months, what is the percent chance that you will purchase" home renovations, vehicles, trips, or home durables. We construct the home durables measure by averaging the responses for individual questions asking about appliances, electronics, and furniture.

$Conditions_{it}$. Specifically, this variable is a score from 1 to 5, indicating how easy the respondent believes that it will generally be for people to obtain credit or loans in the subsequent 12 months.[13] From the Credit Access module we obtain two measures of credit seeking behaviors. The first measure, $Seeks\ Credit\ Line\ Increase_{it}$, is a score from 1 to 5 indicating how likely the respondent is to seek an increase in available credit lines, either by asking for an increase in their credit card or other loan limits, applying for a new credit card, or for a home equity based-loan.[14] The second measure, $Seeks\ Credit\ To\ Consume_{it}$, is a score from 1 to 5 indicating how likely the respondent is to seek credit to either purchase a car or pay for education.[15] Summary statistics for each of these variables can be found in Panel D of Table 1. We observe that, on average, individuals perceive slightly tighter credit markets (2.90 Likert points) and have relatively low likelihoods of demanding more credit or obtaining credit for consumption (1.56 and 1.50 Likert points, respectively) in the following 12 months. However, there is substantial variation across respondents, as the standard deviation is about 0.8 Likert points for each of the three credit variables.

We use data from the Household Finance module to study the effects of uncertainty on three investment decisions: participation in equity markets, the proportion of equity holdings to total assets, and the value of equity holdings. We construct the variable $Invests\ in\ Equities_{it}$ as an indicator for whether the value of the respondent's equity holdings is greater than zero. We calculate the total value of equity as the sum of equity investments in defined contribution, IRA, and savings / investment accounts. Panel E of Table 1 shows that 64% of the sample participates in equity markets. We also construct the variable $EquityHoldings/Assets_{it}$ as the ratio of the dollar value of equity holdings and the dollar value of total assets of the respondent. We calculate total assets as the sum of the balances in respondents' defined contribution, IRA, and savings or investment accounts, the value of

[13] This score is obtained from item Q32 in the Core survey.

[14] Specifically, this variable is the average of the responses provided in items N17a1,2,4,5 and 6 in the Credit Access survey module.

[15] This variable is the average of the responses provided in items N17a3 and 7 in the Credit Access survey module.

their farm or small business, the value of their vehicles (e.g., cars, boats, trailers), the value of the primary home and additional real estate or land owned, and the value of other assets (e.g., estate, trust, collectibles). In the sample, equity holdings are roughly 14% of total assets. $EquityInvestments_{it}(log)$ is the natural logarithm of the sum of one plus the dollar value of equity investments.

The Household Finance module also allows us to get measures of people's liabilities, and net wealth, which we will use as controls in our analyses related to investment decisions. Specifically, respondents' liabilities, $Debt_{it}$, are calculated as the sum of total real estate-related debt on primary and other real estate or land, total consumer debt (e.g., credit cards, auto loans, student loans, other personal loans, and legal or medical bills, and total debt for which they have co-signed. The respondents' net worth is measured by the variable $NetWorth_{it}$, which is the difference between the dollar value total assets and total liabilities, divided by 100,000 (for legibility of regression coefficients).[16]

3 Results

3.1 Expectations Uncertainty Differences Across U.S. Households

We document that there is significant and predictable variation in how much uncertainty individuals in the U.S. population have in their micro- and macro-level economic expectations. The variation in uncertainty of expectations is closely linked to the socioeconomic status (SES) and environment of these individuals. As can be seen in the top panel of Figure 1, plotting the average uncertainty by location shows that counties with respondents whose uncertainty is in highest quartile of the distribution are found across the entire U.S. map.

[16]To minimize the effects of outliers in our analysis, in our regression models where we control for participants' assets or debt we use the logarithm of 1 dollar plus the amount of either assets or debt reported by these individuals. For the same purpose of minimizing the effects of outliers, when calculating the net worth of an individual, $NetWorth_{it}$, we take the difference between the dollar value of the person's assets and the dollar value of their debt (not log units), and only do so if these values are not in the top 1% of the distribution of assets or debt.

That being said, when data is aggregated at the state level, as in the bottom panel of Figure 1, a prevalence of high uncertainty respondents is observed in South-East states, suggesting the importance of geography for the formation of economic expectations.

At the respondent level, our SES measures, income and college education, are strongly associated with uncertainty of economic expectations. The top panel of Figure 2 shows that the average within-person uncertainty—measured using the average of all three SD measures, $Uncertainty_{it}$—declines appreciably as income rises. The average level of uncertainty for individuals in the lowest two income bins is about 5% compared to roughly 2% in the top two income bins; a 60% decline. We observe a similar pattern even when we split based on income and college education in the lower panel of Figure 2. The lower panel shows that individuals with a college degree, for the same level of income, have lower uncertainty in their economic forecasts compared to individuals without a college degree. However, the difference in uncertainty by college education is particularly pronounced for those with low incomes ($\leq \$45,000$).

Moreover, Figure 3 shows that a similar pattern is observed for *each* of the three components of our main uncertainty measure: lower income individuals form more uncertain expectations. The same pattern is also observed if we were to construct this figure by classifying respondents based on education (i.e., college degree or not), rather than on income.

We further examine, using OLS regressions, the effects of SES and individual- and county-level proxies for economic precariousness on respondents' uncertainty in their economic expectations. The general regression model is shown below in Equation 1. We are primarily interested in estimating the effects of SES, measured by $Income_{it}$ and $College_{it}$, on a respondent's expectations uncertainty, $Uncertainty_{it}$, and the effects of proxies for financial or economic precariousness at the household and the community levels, as captured by variables $County\ \%\ Unempl_{it}$ and $\mathbb{P}(default3months)_{it}$. As controls we include exogenous individual characteristics (Age_{it}, Age_{it}^2, $Female_i$, and $White_i$), the point estimates, or means, of their expectations, as well as fixed effects for the county where the individual i lives at the time

t of the survey.[17] We also include year-month fixed effects, denoted as μ_t. Standard errors are corrected for heteroskedasticity and clustered at the respondent level. The results of this baseline regression specification are shown in Table 3.

$$Uncertainty_{it} = \alpha + \beta Income_{it} + \gamma College_{it} + \mathbf{\Phi}' \mathbf{X}_{it}^{default,unemp} + \mathbf{\Psi}' \mathbf{X}_{it}^{controls} + \mu_t + \varepsilon_{it} \quad (1)$$

The first column of Table 3 shows the regression of our main uncertainty measure on exogenous individual characteristics. The estimated coefficients on Age_{it} and Age_{it}^2 suggest a U-shaped life-cycle pattern of expectations uncertainty, implying that young and old consumers have higher uncertainty than middle-aged individuals.[18]

In addition, female respondents have greater uncertainty in their expectations than male respondents. Holding all else constant, uncertainty for females is, on average, 0.45 percentage points higher than males, or 0.20 standard deviations higher.[19] Moreover, white individuals are significantly less uncertain in their predictions of economic variables than their non-white counterparts. Uncertainty among white respondents is 0.90 percentage points (i.e., 0.4 standard deviations) lower, on average, than among non-white respondents. Year-month fixed effects do not have significant predictive power for uncertainty during the sample we study here.

The second column in the table shows SES variables are strongly negatively correlated with uncertainty, a similar pattern to the one observed in Figure 2. Uncertainty among college-educated individuals is 0.65 percentage points (i.e., 0.28 standard deviations) lower than among non-college educated individuals. Uncertainty also decreases with the income

[17] As a measure of the mean of personal income growth we use the point estimate and for national inflation and home prices we use the means of the expectation densities. As noted in the Data section, own-income growth expectation distributions, and thus distribution means, are only elicited from respondents that are working, which is roughly 60% of the overall sample. By using the point estimate—which is asked of all respondents—we can reasonably control for the central tendency of respondent's beliefs about their personal income growth, given that we observe these measures are highly correlated with one another.

[18] This U-shape life-cycle pattern in uncertainty across macro and micro-level expectations is in line with the finding in Feigenbaum and Li (2012) that the variance of projection errors of future income conditional on the information available to the households when the projection is made is a U-shape function of age.

[19] This is obtained by dividing the coefficient of 0.45 by the standard deviation of $Uncertainty_{it}$, which is 2.31.

level, such that an $100,000 increase in annual income corresponds to a decrease in uncertainty of 0.70 percentage points, or a third of a standard deviation.

The third column includes regressors for the respondents' employment status, the precariousness of their own finances, as well as county-level unemployment. Individuals who are currently working have significantly lower levels of uncertainty in their economic expectations. A one-standard deviation increase in the respondent's expected probability of near-term default is correlated with a 20 basis point (i.e., 0.09 standard deviations) increase in uncertainty. Similarly, a one-standard deviation increase in the county unemployment rate is associated with a 10-basis point (i.e., 0.04 standard deviations) increase in uncertainty.

In the fourth column we add county fixed effects. We also include as controls expectation point estimates to absorb any effects of central tendency on uncertainty measures. There exists significant dependence of the degree of people's uncertainty on where in the U.S. they reside, even controlling for their own income, education, and other demographics. Most of the 15-percentage point increase in the R^2 between the third and fourth columns stems from the inclusion of county fixed effects which indicates the existence of significant local influences on how confident people are when envisioning their own and the country-level changes in economic conditions. The inclusion of county fixed effects leads to a loss of significance for the coefficient on the variable measuring county-level unemployment in the month of the survey, which was highly significant in the specification in the third column. This suggests that the effect of local unemployment on respondents' uncertainty is driven by persistent levels of unemployment in county, rather than by month-to-month changes in this local variable. In the remainder of the analysis where we include county fixed effect, we no longer also include county-month unemployment levels, as these are to a large extent subsided by the county fixed effects.

In the last column, we use the uncertainty measure that only relates to macroeconomic expectations since that is collected for all individuals regardless of employment status. Our main results for our SES predictors hold with similar coefficients and statistical strength as

in the fourth column, and the same is true for individual characteristics and point estimates.

To further investigate whether the effects of economic adversity variables are robust across each uncertainty measure, and across subsamples of respondents, in Table 4 we run similar regressions as in Table 3 separately for individuals who are in the workforce and those who are not. As dependent variables we use uncertainty in each specific economic variable, rather than a composite index of uncertainty. In the first three columns in the table we examine the drivers of uncertainty about personal income growth, inflation and national home prices among respondents who are working. In the last two columns we examine the drivers of uncertainty about inflation and national home prices among respondents who are not working (as these individuals are not asked to provide distributions for own income growth). We continue to find that in each subsample, and for each uncertainty measure, people who are more uncertain in their economic forecasts are those who face more economic adversity, as proxied by lower household incomes, a lack of a college degree, a higher chance of default on existing debt, or by living in a county with higher unemployment.

Forming expectations about future income, national inflation, and national house prices may be more difficult for individuals with low numeracy, a characteristic that may also be positively correlated with income or college education. Table 5 documents that high numeracy indeed reduces uncertainty of respondents economic expectations whether we use uncertainty over all three economic variables (first column) or just the macroeconomic quantities (second column). We show that, on average, high numeracy reduces respondents' expectations uncertainty by roughly 1.7 percentage points (i.e., 0.74 standard deviations). In addition, the relationship between uncertainty and SES characteristics—income, education, and active working status—is significantly lower by about two-thirds for respondents with high numeracy. However, the numeracy of the individual does not have a significant effect on the strength of the impact of the person's perceived probability of default in the following three months on their expectations uncertainty.

3.2 Dynamics of Respondent Expectations

Our analysis assumes that our uncertainty measure—the standard deviations of the distributions of subjective expectations—indeed reflects the degree to which respondents lack confidence in their forecasts for the three economic variables studied here. A necessary condition for this assumption to be correct is that consumers will update their expectations in a manner consistent with Bayesian learning. That is, when people are more uncertain, upon receiving additional information about the quantity they are predicting, they rely less on the prior forecast and more on the new information.[20] In other words, over time we should observe larger changes, in absolute value, in the point estimate produced by an individual in month t relative to that produced by the same person in month $t-1$, if this individual was more uncertain in his or her point estimate in month $t-1$.

The results in Table 6 show that this indeed the case. For each of the three expectations we examine, we find a strong and positive correlation between the standard deviation around the forecast produced for that variable in month $t-1$, and the absolute value of the change in the point estimate from month $t-1$ to t, by the same respondent. This pattern is consistent whether we examine the update in expectations about personal income growth (first column), the rate of inflation (second column), or the growth rate of national home prices (third column), over the 12 months following the time of the survey. For example, a one-percentage point larger uncertainty for personal income expectations in month $t-1$ leads to an absolute revision of 0.79 percentage points in month t. We find that the correlation between the level of uncertainty in a point estimate and the size of the revision of that estimate from one month to the next is between 0.31 and 0.44, depending on which of the three quantities are estimated (not shown). Correcting for the panel nature of the data,

[20]There is a high degree of overlap between the quantities estimated in months $t-1$ and t, as they refer to outcomes (e.g., the rate of inflation) over the subsequent 12 months—hence the time horizon of the two predictions overlaps by 11 months. This is very close to a setting where the person attempts to forecast the same variable repeatedly as new information arrives. Hence, we can use straightforward intuition from Bayesian learning regarding the effect of prior uncertainty on the extent to which the person weights their prior when forming their posterior belief.

these correlations are significant at $p < 0.01$ or better.

3.3 Subjective versus objective volatility

Our results so far indicate that lower SES households have expectations about personal and macro-level economic variables that are characterized by more uncertainty, relative to households with higher SES. Here we examine how the subjective uncertainty of people of low and high SES compares to objective benchmarks for uncertainty, or volatility, regarding these economic outcomes. Given the short time during which a respondent is in the SCE panel, we do not have sufficient data to calculate the objective volatility of the respondent's own income. Hence, we will focus on the two macro-level outcomes that these individuals forecast, namely, the rate of inflation, and the growth rate in national home prices over the subsequent year. We present this analysis in Table 7.

The table shows subjective uncertainty (i.e., volatility) values for the rate of inflation and for the rate of growth in national home prices, averaged across participants in various SES categories, as well as objective measures of uncertainty, based on realized volatilies of these variables. These objective volatility measures are calculated for two time windows: several years prior to the SCE survey (January 2000 to December 2012), and during the SCE sample period (June 2013 to December 2017). For inflation, the objective volatility is calculated following the procedure used by the Federal Reserve Board, and detailed in Hulseman and Detmeister (2017). Briefly, we obtain the 1-month annualized change in the seasonally-adjusted Consumer Price Index (CPI), then calculate the change in the annualized growth rate of the CPI for a given month t as the rate in the current month minus the rate in the previous month, and compute the standard deviation of the changes of the growth rate over the previous 60-months. We average the rolling-window standard deviations separately for the in-sample and the out-of sample periods. For national home price growth rates, we calculate the standard deviation of monthly percent changes in the seasonally-adjusted U.S. Case-Shiller Home Price index (HPI), for the out-of-sample and for the in-sample period

separately, and then we annualize the monthly standard deviation by multiplying the result by the square root of 12.

The first column in Table 7 shows average values for subjective uncertainty regarding the inflation rate, while the second column shows average values for subjective uncertainty regarding the growth rate in national home prices, separately for each income and education category. The bottom two rows of the table show the objective values for the volatility of inflation and national home prices for years before and during the survey. For CPI inflation, the in-sample (i.e., 2013-2017) objective volatility is 0.87% and for the Case-Shiller HPI the in-sample objective volatility is 0.62%. The out-of-sample (i.e., 2000-2012) values for realized volatility for inflation and national home price growth rates are 1.41% and 2.44%, respectively. As can be seen from these two columns, higher SES respondents have levels of subjective uncertainty about these two macro-level outcomes that are closer to the objective volatility of these outcomes, whether the objective value is based on data from 2000 to 2012, or from 2013 to 2017. Specifically, college-educated respondents have, on average, 2.00% volatility around their forecasts for inflation, and 2.49% volatility around their national home price growth rate forecasts, whereas the subjective volatilities for people without a college degree are 3.18% and 3.27%, respectively. Moreover, respondents in higher income categories are consistently closer to the objective volatility for either macro-level outcome, relative to those at lower income levels. For example, among people earning $25,000 per year, subjective uncertainty is 3.47% in the case of inflation, and 3.71% in the case of national home price growth rates, whereas the subjective uncertainty for these two outcomes among people earning $125,000 per year is 1.89% and 2.31%, respectively.

Overall, the evidence in Table 7 indicates that individuals with higher SES have subjective distributions about macroeconomic outcomes characterized by volatility levels that better match the objective volatility observed in these outcomes.

3.4 Expectations Uncertainty and Economic Behavior

In this section we examine the relation between the uncertainty in individuals' economic expectations and several aspects of economic behavior, namely, their consumption, credit, and investment decisions.

3.4.1 Expectations uncertainty and consumption decisions

We find that individuals with more uncertainty in their economic expectations are significantly less likely to increase their total spending as well as their everyday spending in the following 12 months. These results are presented in Table 8. For example, the first column shows a one-percentage point increase in uncertainty predicts a 0.63 percentage points decrease in the likelihood an individual will increase their spending. In other words, a one-standard deviation increase in uncertainty corresponds to a 0.04 standard deviation decrease in the likelihood to increase spending. To put this in perspective, going from not employed to actively employed leads to a 0.12-standard deviation increase in the likelihood of increased spending. Income and college education do not have significant correlations with the dependent variable. The second and third columns show similar results when looking at everyday spending in two different SCE sub-samples run at different periods during the year.[21] A one-percentage point increase in uncertainty predicts a 1.2 to 1.5 percentage points lower probability for respondents to increase their everyday spending. In addition, respondents are less likely to anticipate spending on home renovations, vehicles, and trips, but there is no statistical relationship between spending on home durables, defined as appliances, electronics, and furniture.[22] These results are presented in the last four columns in the table. All four dependent variables take values between 0 and 100 (i.e., measured in percentage

[21] The question regarding everyday spending is worded as: "Over the next 12 months, what do you expect will happen to your everyday spending on essential items? By everyday spending, we mean your daily living expenses related to what you absolutely need." Answers could be: increase, stay the same, or decrease. We create an indicator for whether "increase" was selected

[22] We construct the variable for home durables by taking the average of the respondent's answers to the three individual spending questions

points). For example, a one-percentage point (one-standard deviation) increase in uncertainty predicts a –0.93 percentage point (–0.07 standard deviation), –0.65 percentage point (–0.05 standard deviation), and –1.45 percentage point (–0.09 standard deviation) decline the probability of a home renovation, vehicle purchase, or trip purchase, respectively, in the following 12 months.

As in our prior models, here we include fixed effects for counties where participants live, and fixed effects for year-month, to account for any time-related variation in aggregate spending patterns. Controlling for these fixed-effects, we find that people with higher incomes are more likely to anticipate future home renovations (+1.16 percentage points) or consumption of trips (+2.16 percentage points) and home durables (+0.73 percentage points), but not more likely to plan on increasing their spending over the subsequent year. Expressed differently, a one-standard deviation change in income (about three bins) corresponds to an increase of 0.19 standard deviations in the likelihood of home renovations, an increase of 0.04 standard deviations in the likelihood of vehicle purchase, an increase of 0.29 standard deviations in the likelihood of purchasing a trip, and an increase of 0.18 standard deviations in the percent chance home durable purchase.[23] Once income is accounted for, the level of education does not impact the decision to increase spending or most consumption measures. However, the anticipated likelihood of purchasing a trip is strongly positively correlated with education (+7.68 percentage points).

A one-percentage point increase in the probability of the respondent defaulting on debt obligations in the near future predicts a 0.16 percentage point reduction of the probability purchasing a trip in the coming year and a 0.10 percentage point increase of the probability of purchasing vehicles in the subsequent year. Age has an inverted U-shape relationship with consumption. Female respondents are significantly less likely to increase consumption relative to men (–3.25 percentage points). White respondents are significantly more likely to increase consumption relative to non-white respondents (+4.69 percentage points). Moreover,

[23]If instead of controlling for income in a linear fashion we do so using indicators for income bins, we continue to observe that uncertainty is significantly negatively related to planned consumption.

respondent's point estimates are positively correlated with willingness to increase spending, but personal income has the largest magnitude and statistical strength. A one-standard deviation increase in the income point estimate corresponds to a 0.04-standard deviation increase in willingness to spend. Standardized coefficients for inflation and national house price coefficients are roughly 0.02.

3.4.2 Expectations uncertainty and credit decisions

We examine whether people's uncertainty in economic expectations can help predict their behaviors in the credit markets. We report our findings in Table 9.

The core survey, while not focused on assessing credit attitudes, includes data regarding people's perceptions on whether, in general, it will be easier or more difficult to obtain loans or other forms of credit in the subsequent 12 months following the survey. Specifically, this measure of credit market perceptions is a score from 1 to 5, indicating how easy the respondent believes that it will generally be for people to obtain credit or loans in the subsequent 12 months.[24] The first column of Table 9 shows that a one-percentage point increase in uncertainty corresponds to a more pessimistic outlook about future credit availability by about 0.02 Likert points. Expressed differently, a one-standard deviation increase in uncertainty corresponds to a 0.07-standard deviations decrease (i.e., a more pessimistic outlook) in perceived future credit market conditions. For comparison, a one-standard deviation increase in income (roughly three bins) results in a 0.06-standard deviations more optimistic outlook for credit access, with a similar magnitude for college vs. no college education. Furthermore, a higher probability of default significantly negatively predicts future credit access outlook. A one-standard deviation increase in the probability of default is correlated with a 0.13-standard deviations more pessimistic outlook.

More details regarding credit market behaviors are available in the Credit Access module deployed by the SCE in a subset (about a fifth) of the months in the sample. Hence,

[24]This score is obtained from item Q32 in the core SCE module. A value of 1 corresponds to "Much Harder" and a value of 5 corresponds to "Much Easier". A value of 3 is neutral.

when examining these additional variables, the sample size is reduced, due to the lower frequency with which these data are collected. Nonetheless, this additional module is useful for assessing the degree to which individuals attempt to use credit either as a means of precautionary behavior or as a means for current consumption. We examine these decisions in the second and third columns in the table. The dependent variable in the second column is a score from 1 to 5 indicating how likely the respondent is to seek an increase in available credit lines, either by asking for an increase in their credit card or other loan limits, applying for a new credit card, or for a home equity based-loan.[25] The dependent variable in the third column is a score from 1 to 5 indicating how likely the respondent is to seek credit to either purchase a car or pay for education.[26]

We find that uncertainty is positively correlated with seeking credit line increases. For each one-percentage point increase in uncertainty, individuals are 0.02 Likert points more likely to seek an increase in their credit lines (second column). Put differently, a one-standard deviation increase in uncertainty is correlated with a 0.06-standard deviations increase in the Likert score to seek credit line increases. However, we do not observe that more uncertain individuals have a higher propensity to use credit for consumption (third column). Income is a positive predictor of both seeking credit in general and seeking credit for consumption. Standardized coefficients are both about 0.04. College education positively predicts seeking credit, but negatively predicts seeking credit for consumption uses with standardized coefficients of 0.02 and –0.03, respectively. Overall, the (standardized) impact of uncertainty on credit decisions is on a similar order of magnitude of those of common predictors such as income and education level.

Age has a U-shaped relationship with the perceived ease of credit availability in general, and with the interest in increased credit lines, but it does not relate to the person's interest in getting credit for immediate consumption. Being a female is a significant and negative

[25]Specifically, this variable is the average of the responses provided in items N17a1,2,4,5 and 6 in the Credit Access survey module.

[26]This variable is the average of the responses provided in items N17a3 and 7 in the Credit Access module.

predictor of the perceived future credit market conditions and the interest in seeking an increase in credit lines.

The point estimate for the person's income growth rate is a positive predictor of the individual's perceived ease of general credit availability, their interest in having increase credit lines, and in seeking credit to finance consumption. The respondents' point estimate for the rate of inflation over the subsequent year is a significant and negative predictor of their perceived ease with which credit will generally be available over that horizon, whereas their point estimate for the growth rate in national home prices has the opposite effect. The person's interest in securing increased credit lines or in using credit for consumption is unrelated either their point estimate for inflation or for the growth in national home prices.

3.4.3 Expectations uncertainty and investment decisions

To analyze investment decisions, we use data from the Household Finance module of the SCE that was administered in August from 2014 to 2016. While the number of observations drops significantly relative to our main sample due to the infrequent administration of this module, this subsample provides detailed information regarding respondents' assets and liabilities. Thus, we can construct a control variable that is not available for the main sample: the respondents' net worth. Moreover, this module allows us to assess the relationship between uncertainty and the portfolio decisions of these individuals. Specifically, we examine participation in equity markets, the value of equities held, and the proportion of equities held to assets to understand the degree to which respondents' uncertainty in their economic expectations affects these financial decisions. We eliminate the top and bottom 1% of observations in terms of net worth, to minimize the effect of outliers.

The results of the investment decision analysis are reported in Table 10. We use three measures of exposure to equities: an indicator equal to 1 if the value of equity holdings of the respondent is greater than zero[27] (first column); the dollar value of equity holdings scaled

[27]Dollar value of total equity holdings is determined by the sum of equity holdings in defined contribution or investment accounts.

by total assets (second and third columns), and the natural logarithm of the dollar value of equity holdings (fourth and fifth columns). Aside from characteristics used in the prior analyses, we include the person's net worth, calculated as either the difference between their assets and debt (the first three columns) or the log value of assets and the log value of debt (the last two columns).

We document that individuals with higher values of uncertainty in their economic expectations are significantly less likely to invest in equities: a one-percentage point increase in uncertainty leads to a 1.3-percentage point lower likelihood of investing in equities (first column). Expressed differently, a one-standard deviation increase in uncertainty leads to a 0.06-standard deviations decrease in the likelihood of participating in equity markets. For comparison, a one-standard deviation increase in income results in a 0.20-standard deviations increase in the likelihood of investing in equities. Similarly, comparing college vs. non-college educated individuals, a college education predicts an expected increase of 0.09 standard deviations in the likelihood of investing in equities. Further, active employment predicts an expected 0.22-standard deviations increase in participation and a one-standard deviation increase in net worth (roughly $570,000) predicts an expected 0.18-standard deviations increase in participation.

Table 10 also shows that more uncertain respondents also have a significantly lower fraction of their assets invested in equities (–0.6 percentage point), whether we examine all respondents (second column) or focus only on those who do participate in the stock market (–0.7 percentage point in the third column). Put another way, a one-standard deviation increase in uncertainty predicts an expected 0.07-standard deviations lower fraction of equities (unconditionally) and a 0.08-standard deviations lower fraction of equities (conditional on participation). For context, unconditionally, income and net worth are the only two factors with larger magnitude impacts than uncertainty, with one-standard deviation changes in each predicting *ceteris paribus* an increase of 0.10-standard deviations and 0.15-standard deviations, respectively, in the equity share. Conditional on participation, uncertainty has

standardized effects similar to or larger than those of college education, active employment, and net worth.

Finally, people with more uncertain economic expectations have a lower dollar amount invested in equities. When we examine all respondents (fourth column), we observe that each one-percentage point increase in uncertainty predicts an 8% decrease in the dollar value of a respondent's equity holdings. The coefficient is nearly the same if we condition on just those who invest in stocks (fifth column). Recast in standardized form, a one-standard deviation increase in uncertainty corresponds to a 0.03-standard deviations decrease in log equity holdings, unconditionally. Conditional on participation in equity markets, a one-standard deviation increase in uncertainty predicts a 0.7-standard deviations decrease in log equity holdings. For perspective, a one-standard deviation increase in income predicts an unconditional 0.25-standard deviation increase and a conditional 0.18-standard deviation increase in log equity holdings, respectively. Also, a one-standard deviation increase in the probability of default predicts a 0.04-standard deviation unconditional decrease in log equity holdings while a one-standard deviation increase in log assets corresponds to a 0.34-standard deviation (unconditional) and 0.52-standard deviation (conditional on participation) increases in log equity holdings.

To summarize, across these models, we find that in general, higher income or education levels, active employment, and a lower probability of financial distress lead to higher exposure to equity markets. Age is not significantly related to the degree to which participants are invested in equities, but gender plays a significant role, with female respondents having less exposure to the stock market. The point estimates for income growth, inflation and national home price growth rates are not significantly related to the respondents' exposure to equities.

As expected, we find that there exist a substantial wealth effect on portfolio allocation. Specifically, people with higher net worth, or equivalently, those with higher asset levels, or those with lower levels of debt, have a larger exposure to stocks, whether this exposure is measured as the probability of participating in the stock market, or as a fraction of assets

that is comprised of equities.

4 Alternative hypotheses and robustness checks

4.1 Uncertainty in Beliefs versus or Risk Aversion

We investigate whether uncertainty in economic expectations is simply a proxy for individuals' risk aversion. Starting in April 2015, respondents in our main sample were asked two questions that capture their self-reported willingness to tolerate financial risk and their willingness to tolerate risk in general in their daily activities. These questions are administered upon a respondent's first entry into the Core survey and about 60% of the sample was asked these questions. The answers are on a scale from 1 to 7, with 7 indicating the highest level of risk tolerance. The two risk tolerance measures have a correlation coefficient of 0.48. We present the results of our analysis using only the risk preference measure defined as the willingness to tolerate financial risk in Table 11.[28]

The first column in Table 11 shows that risk tolerance is not significantly correlated with uncertainty in expectations. These two concepts are therefore orthogonal personal characteristics which may have different effects on individuals' behaviors. The next three columns show that risk tolerance also positively affects the planned consumption of the respondent in the following 12 months, in particular regarding the purchasing of durables and travel. The fifth column shows that risk tolerance has a positive and significant effect on the perceptions of ease of future credit access. Furthermore, risk tolerance has a significant and positive effect on people's exposure to equity markets, measured by whether they participate in the stock market (sixth column) or by the log value of equity positions conditional on participation (last column).[29]

[28]Repeating the analysis using the risk preference measure about the willingness to tolerate risks in daily activities yields similar results.

[29]The results obtained if other measures of equity market exposure are used (as in Table 10) are similar, so we omit them here for brevity.

Importantly, the results in Table 11 indicate that while risk tolerance impacts some of the behaviors we examine, uncertainty in expectations continues to be significantly related to households' consumption, credit or investment behaviors, even after we control for risk preferences. The effects of uncertainty on any of these behaviors in specifications where risk tolerance is included as a control are similar in size to the effects documented in the main analyses in Tables 8 through 10.

4.2 Attention During the Survey

It is possible that respondents do not attempt to answer the SCE questions to the best of their abilities, and therefore we might misinterpret the data. For example, what we infer to be true uncertainty about a particular economic forecast may in fact be a measure of people's level of disinterest in the survey. A stringent manner to test whether this is the case is to examine whether there is positive correlation between people's expectations and what eventually happens. If people simply provide noise when answering the survey questions, their answers should not correlate with the realized values of the economic variable forecasted. We investigate whether responses regarding income growth expectations (personal and household) are correlated with realized changes in actual household income. We calculate realized income growth on four horizons: 1 month, 3 months, 6 months, and 11 months. Growth is calculated as: $\frac{Income_t - Income_{t-k}}{Income_{t-k}}$ where $k \in 1, 3, 6, 11$. For each realized income growth horizon we require respondents to be in the survey for at least 2, 4, 7, and 12 months, respectively.[30] We run our correlation tests by removing outlier values by trimming the 1% tails of the expectation and realized income growth variables. The correlations between personal income growth expectations and realized income growth for the 6-month and 12-month horizons are 0.06 ($p < 0.05$). The equivalent correlations for household income expectations are 0.06 and 0.07 ($p < 0.05$), respectively. These positive correlations suggest

[30]The maximum income growth interval is 11 months because individuals only appear in the survey for up to 12 months. For example, if a respondent entered the survey in June 2013, we only have data from June 2013 to May 2014.

that survey respondents, on average, do not provide answers that are simply noise.

5 Conclusion

We document that households across the U.S. differ significantly in their uncertainty when forecasting micro- and macro-level economic variables. A significant part of this heterogeneity in uncertainty is predicted by the degree of economic adversity faced by these individuals. Specifically, people with lower incomes, education, more precarious work and financial situations, and living in counties with higher unemployment are more uncertain when asked to forecast their personal income growth as well as the rate of inflation and the rate of growth of national home prices. Better numeracy helps reduce people's uncertainty across all of their forecasts, and also, it lowers the influence of the people's specific economic situation on the degree of uncertainty that they have when making macro-economic predictions. Moreover, we find that people with higher uncertainty in their economic forecasts engage in more cautious behaviors in terms of consumption, use of credit markets, and financial portfolio allocations.

Our findings suggest that it is important to understand which households are more uncertain in their expectations, because those households' responses to policy changes targeting these expectations or behaviors driven by these expectations may be more muted than regulators expect. The fact that lower socioeconomic status individuals and those from communities with worse economic conditions are the most uncertain in the population suggests that a reduction of uncertainty would have a high impact among these individuals, in terms of economic behavior per se but also in terms of reducing the cognitive burden that financial stress, likely related to uncertainty, imposes on these individuals (Mani, Mullainathan, Shafir, and Zhao (2013), Carvalho, Meier, and Wang (2016)).

Also, if uncertainty in expectations varies with the business cycle, this can help explain the differences in households' consumption, credit, and investment decisions between good and

bad economic times. The importance of this uncertainty channel as a driver of the cyclical nature of these household economic outcomes may be particularly high for households facing more adversity. These implications are corroborated by the evidence in Pistaferri (2016) who documented that households felt less secure following the recession of 2008–2009, and in Mian, Rao, and Sufi (2013), who report that the consumption decline was sharpest in areas of greatest home prices decline and highest levels of leverage and attribute these results to an increase in the income uncertainty that households faced and their presumed precautionary response.

Our findings also speak to the interpretation of certain household behaviors as rational versus irrational. Gabaix and Laibson (2017) argue that behavior arising from imperfect foresight is hard to distinguish from behavior arising from time preferences. In their model, individuals who have a high degree of uncertainty in their forecasts appear as if they are hyperbolic discounters, even if they are perfectly patient. Hence, uncertainty in economic expectations may lead to patterns in consumption or other household decisions that may look irrational, but it simply reflects the importance of noise in the signals that households receive about future outcomes for the choices that they rationally make based on those signals.

Overall, these results point to the importance of both the first and the second moment of expectations when either modeling theoretically or interpreting empirically the economic choices of households. Perhaps in part due to lack of data regarding the second moment in beliefs, the literature has not made as much progress when investigating the causes and effects of uncertainty on household actions, as when examining point estimates. Novel data on uncertainty provided by large scale surveys can offer useful insights and help move the literature forward in better assessing the formation and role of expectations on household decisions.

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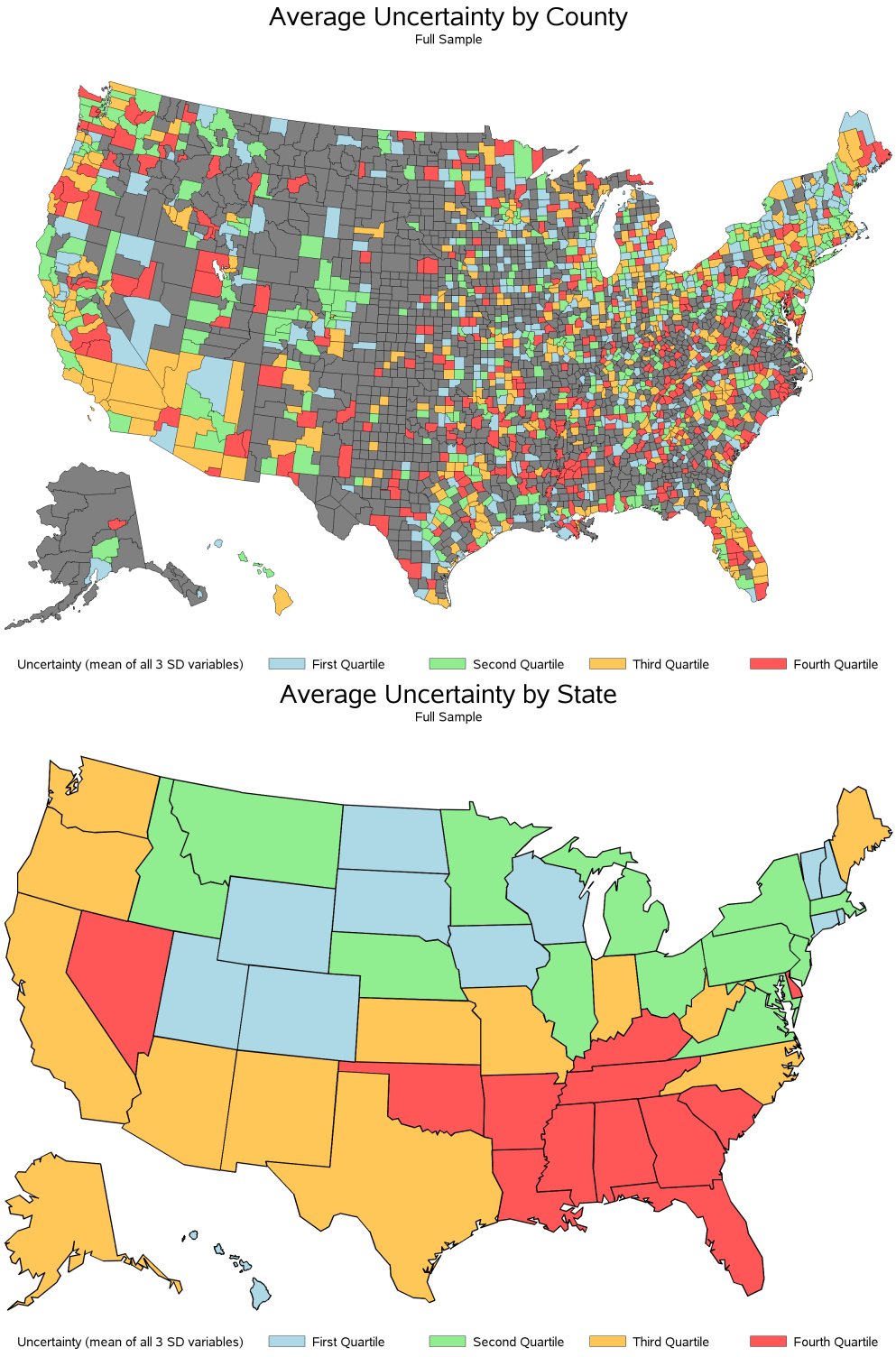

Figure 1: **Geographic heterogeneity in uncertainty.** This figure is constructed by averaging the level of uncertainty across all individuals in a location (county or state) and across time to calculate the average uncertainty in that location during the entire sample period. Quartiles of these averages are calculated and correspond to the colors in the legend shown above. Areas in gray have no data.

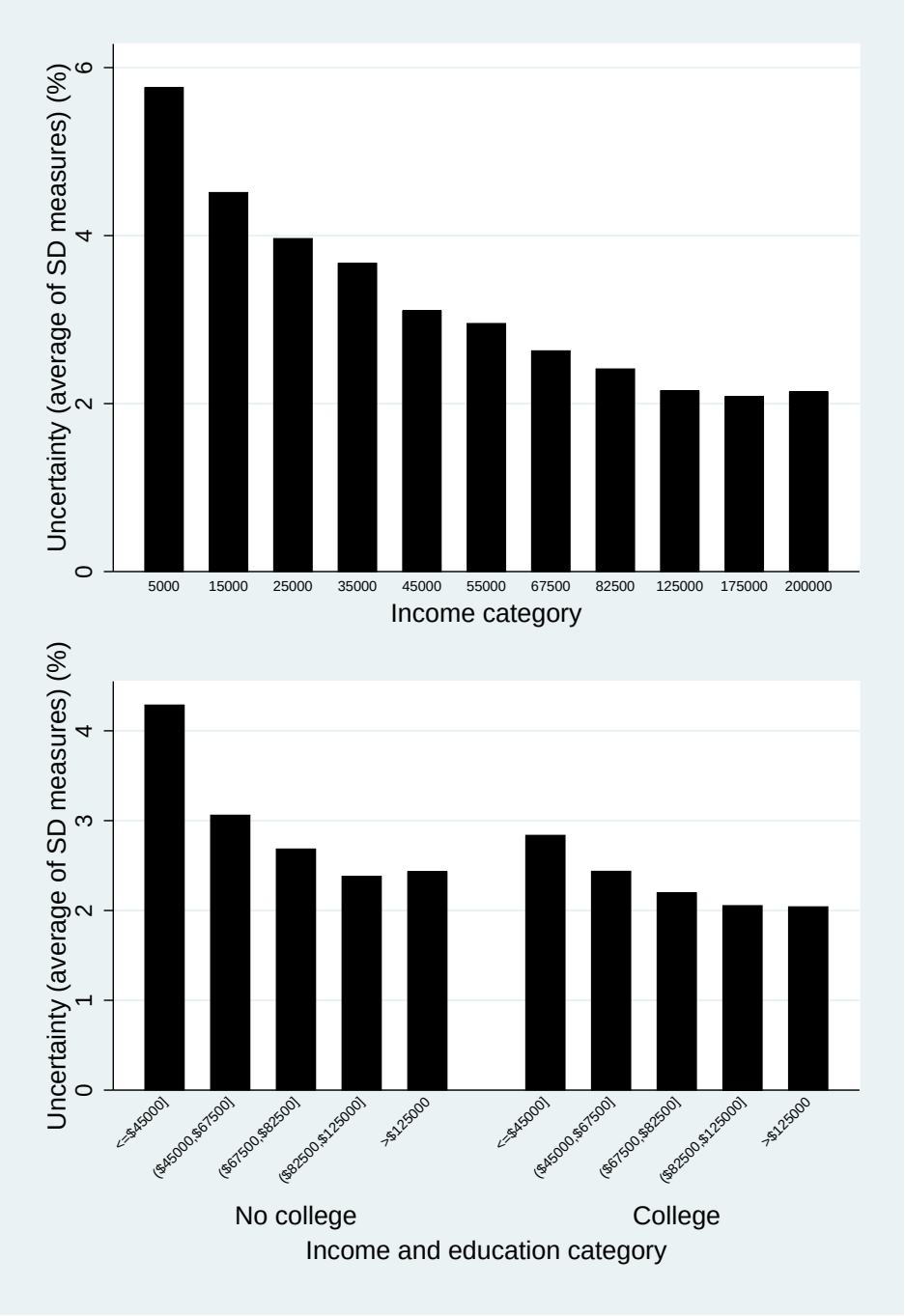

Figure 2: **Uncertainty by income and education levels.** This figure shows the average levels of uncertainty of participants across various levels of income and education. For the purpose of the figure, for each participant the income and education level are set to be equal to their maximum values across all the months when the individual was included in the survey.

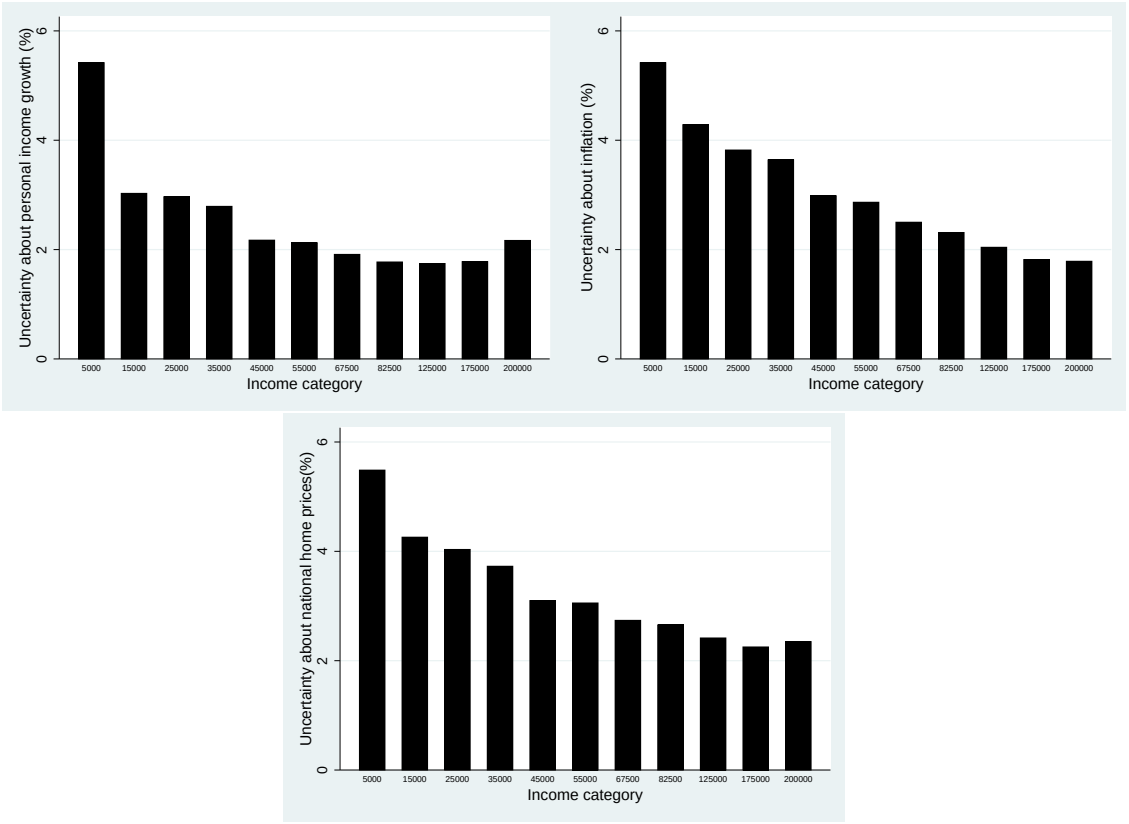

Figure 3: **Uncertainty measured separately for personal income growth, inflation rate, and growth rate of national home prices, by income.** This figure shows the average levels of uncertainty of participants in their forecast for their personal income growth (first panel), inflation rate (second panel), and the growth rate of national home prices (third panel) across various levels of income. For the purpose of the figure, for each participant the income level is set to be equal to its maximum values across all the months when the individual was included in the survey.

Table 1: Summary statistics

Summary statistics for expectations point estimates and uncertainty, respondent characteristics, and behaviors. Panel A shows beliefs variables, measured in percentage points. Those with the prefix "Expected" are subjective distribution means. The SD variables are the standard deviations of the subjective distributions. $Uncertainty_{it}$ and $Uncertainty_{it}^{marcro}$ are constructed by taking the arithmetic average of all three SD measures or just the two macro measures, respectively. Panel B shows socioeconomic and demographic variables. $Income/10,000_{it}$ is the midpoint value of the bin selected by respondents (see Appendix B). $College_{it}$ is an indicator for higher education. Panels C, D, and E show variables related to consumption, credit, and equity markets behaviors. Credit conditions variables are measured on a 5-point Likert scale.

	Mean	*Std Dev.*	*Min*	*Max*	*N*
Panel A: Expectations					
$Expected\ Personal\ Income_{it}$	3.12	4.25	-25.27	36.28	35281
$Expected\ Inflation_{it}$	3.60	4.27	-25.00	28.00	51671
$Expected\ Natnl\ Home\ Prices_{it}$	4.52	4.90	-25.00	36.28	51671
$SD(PersonalInc)_{it}$	1.98	2.33	0.37	20.83	35281
$SD(Inflation)_{it}$	2.50	2.65	0.37	21.92	51671
$SD(NatnlHP)_{it}$	2.82	2.56	0.42	21.29	51671
$Uncertainty_{it}$	2.53	2.31	0.42	20.19	51671
$Uncertainty_{it}^{macro}$	2.66	2.41	0.42	20.19	51671
Panel B: Socioeconomic Status and Demographics					
$Income/10,000_{it}$	8.03	5.27	0.50	20.00	51671
$College_{it}$	0.58	0.49	0.00	1.00	51671
Age_{it}	50.62	14.95	17.00	99.00	51652
$Female_i$	0.45	0.50	0.00	1.00	51671
$White_i$	0.86	0.34	0.00	1.00	51671
$Is\ Working_{it}$	0.68	0.47	0.00	1.00	51671
$\mathbb{P}(default3months)_{it}$	10.32	20.49	0.00	100.00	51533
$County\ \%\ Unempl_{it}$	5.34	1.73	1.40	27.20	51671
Panel C: Consumption					
$Will\ Increase\ Spending_{it}$	78.84	40.85	0.00	100.00	51669
$Will\ Increase\ Everyday\ Spending_{it}$ (Housingmodule)	69.98	45.85	0.00	100.00	1812
$Will\ Increase\ Everyday\ Spending_{it}$ (HHFmodule)	87.82	32.73	0.00	100.00	903
$\%\ Chance\ Purchase\ Home\ Reno\ Next\ 12\ months_{it}$	28.75	32.29	0.00	100.00	2609
$\%\ Chance\ Purchase\ Vehicles\ Next\ 12\ months_{it}$	23.74	29.30	0.00	100.00	2609
$\%\ Chance\ Purchase\ Trips\ Next\ 12\ months_{it}$	39.34	39.04	0.00	100.00	2609
$\%\ Chance\ Purchase\ Home\ Durables\ Next\ 12\ months_{it}$	20.73	21.20	0.00	100.00	2609
Panel D: Credit-related variables					
$Perceived\ Future\ Credit\ Market\ Conditions_{it}$	2.90	0.83	1.00	5.00	51660
$Seeks\ Credit\ Line\ Increase_{it}$	1.56	0.75	1.00	5.00	11117
$Seeks\ Credit\ To\ Consume_{it}$	1.50	0.78	1.00	5.00	11117
Panel E: Investment-related variables					
$Invests\ in\ Equities_{it}$	64.06	47.99	0.00	100.00	2524
$EquityHoldings/Assets_{it}$	13.78	20.01	0.00	100.00	2524
$EquityInvestments_{it}$ (log of (1+ $ amount))	6.68	5.32	0.00	15.52	2524
$Assets_{it}$ (log of (1+ $ amount))	11.70	3.05	0.00	18.50	2596
$Debt_{it}$ (log of (1+ $ amount))	9.26	3.98	0.00	15.44	2584
$NetWorth_{it}$ (hundred thousand $s)	3.71	5.73	-5.47	45.05	2533

Table 2: Commonality across uncertainty measures and across distribution means

The table shows the pairwise correlations between uncertainty measures, and expected values (based on the distributions) for the three economic variables measured in the core survey: personal income growth, the rate of inflation, and the rate of growth of national home prices in the 12 months following the time of the survey.

	$Expected\ Personal\ Income_{it}$	$Expected\ Inflation_{it}$	$Expected\ Natnl\ Home\ Prices_{it}$	$SD(PersonalInc)_{it}$	$SD(Inflation)_{it}$	$SD(NatlHP)_{it}$
$Expected\ Personal\ Income_{it}$	1.0000					
$Expected\ Inflation_{it}$	0.0991***	1.0000				
$Expected\ Natnl\ Home\ Prices_{it}$	0.1819***	0.3901***	1.0000			
$SD(PersonalInc)_{it}$	0.2647***	-0.0639***	-0.0649***	1.0000		
$SD(Inflation)_{it}$	-0.0087	0.2168***	0.0139***	0.5607***	1.0000	
$SD(NatnlHP)_{it}$	0.0217***	0.0438***	0.2146***	0.6019***	0.7140***	1.0000

Table 3: Uncertainty differences across the U.S. population

In the first four columns of the table the dependent variable is the average of the uncertainty each participant i has regarding their point estimate for their personal income growth ($SD(PersonalInc)_{it}$, if elicited), for the rate of inflation ($SD(Inflation)_{it}$), and the growth rate of national home prices ($SD(NatnlHP)_{it}$), all estimated for the 12-month period following the time of the survey, i.e., month t. In the last column, the dependent variable is the average of only the latter two variables, namely, $SD(Inflation)_{it}$ and $SD(NatnlHP)_{it}$. Standard errors are corrected for heteroskedasticity and clustered at the respondent level. t-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	$Uncertainty_{it}$	$Uncertainty_{it}$	$Uncertainty_{it}$	$Uncertainty_{it}$	$Uncertainty_{it}^{macro}$
$Income/10,000_{it}$		-0.070***	-0.052***	-0.044***	-0.051***
		(-15.57)	(-11.85)	(-9.07)	(-10.17)
$College_{it}$		-0.647***	-0.598***	-0.622***	-0.675***
		(-12.10)	(-11.35)	(-10.55)	(-11.06)
$Is\ Working_{it}$			-0.527***	-0.436***	-0.235***
			(-8.18)	(-6.85)	(-3.67)
$\mathbb{P}(default3months)_{it}$			0.010***	0.009***	0.010***
			(8.40)	(7.41)	(7.76)
$County\ \%\ Unempl_{it}$			0.056***	0.023	0.030
			(3.34)	(0.78)	(0.97)
Age_{it}	-0.064***	-0.053***	-0.044***	-0.048***	-0.045***
	(-5.26)	(-4.42)	(-3.60)	(-3.89)	(-3.55)
Age_{it}^2	0.001***	0.000***	0.000**	0.000***	0.000***
	(5.12)	(3.80)	(2.50)	(3.01)	(2.58)
$Female_i$	0.455***	0.281***	0.251***	0.255***	0.346***
	(8.70)	(5.49)	(4.92)	(4.86)	(6.39)
$White_i$	-0.904***	-0.863***	-0.818***	-0.600***	-0.626***
	(-9.27)	(-9.29)	(-8.85)	(-6.43)	(-6.53)
$Income\ Growth\ Pt\ Est_{it}$				0.020***	0.008***
				(9.66)	(4.06)
$Expected\ Inflation_{it}$				0.031***	0.047***
				(5.56)	(8.12)
$Expected\ Natnl\ Home\ Prices_{it}$				0.024***	0.041***
				(5.44)	(9.09)
Year-Month FEs	Yes	Yes	Yes	Yes	Yes
County FEs	No	No	No	Yes	Yes
Adjusted R^2	0.03	0.09	0.11	0.26	0.26
Observations	51652	51652	51514	51433	51433

Table 4: Uncertainty among working and non-working respondent subsamples

In the table we examine the determinants of uncertainty about specific economic variables, separately for the subsamples of respondents who are working (the first three columns), and those who are not working (the last two columns). Only working respondents in the survey are asked about the distribution of their own income growth over the subsequent 12 months. Non-working respondents are only asked about the distribution of the two macro-level variables, inflation and national home price growth. In each column in the table, the dependent variable is the uncertainty each participant i has regarding their point estimate for their personal income growth ($SD(PersonalInc)_{it}$), the rate of inflation ($SD(Inflation)_{it}$), or the growth rate of national home prices ($SD(NatnlHP)_{it}$), all estimated for the 12-month period following the time of the survey, i.e., month t. Standard errors are corrected for heteroskedasticity and clustered at the respondent level. t-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Subsample: Working Respondents			Subsample: Non-working Respondents	
	$SD(PersonalInc)_{it}$	$SD(Inflation)_{it}$	$SD(NatnlHP)_{it}$	$SD(Inflation)_{it}$	$SD(NatnlHP)_{it}$
$Income/10,000_{it}$	-0.027***	-0.053***	-0.040***	-0.063***	-0.060***
	(-4.23)	(-8.78)	(-6.46)	(-6.23)	(-6.26)
$College_{it}$	-0.312***	-0.753***	-0.435***	-1.004***	-0.749***
	(-4.25)	(-9.54)	(-5.71)	(-9.19)	(-7.34)
$\mathbb{P}(default3months)_{it}$	0.008***	0.010***	0.009***	0.009***	0.008***
	(5.92)	(6.56)	(6.76)	(3.83)	(3.46)
Age_{it}	-0.075***	-0.065***	-0.070***	-0.029	-0.056***
	(-4.19)	(-3.67)	(-4.04)	(-1.28)	(-2.58)
Age^2_{it}	0.001***	0.001***	0.001***	0.000	0.000*
	(3.92)	(3.07)	(3.16)	(0.83)	(1.96)
$Female_i$	-0.180***	0.295***	0.076	0.712***	0.487***
	(-3.04)	(4.68)	(1.22)	(6.24)	(4.51)
$White_i$	-0.481***	-0.603***	-0.498***	-0.937***	-0.796***
	(-4.36)	(-5.33)	(-4.44)	(-4.86)	(-4.40)
$Expected\ Personal\ Income_{it}$	0.141***				
	(16.17)				
$Expected\ Inflation_{it}$		0.131***		0.098***	
		(14.04)		(8.25)	
$Expected\ Natnl\ Home\ Prices_{it}$			0.126***		0.100***
			(17.59)		(10.96)
Year-Month FEs	Yes	Yes	Yes	Yes	Yes
County FEs	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.22	0.27	0.23	0.39	0.38
Observations	35071	35071	35071	16219	16219

Table 5: Numeracy effects on uncertainty

The dependent variable is $Uncertainty_{it}$, measured as the average of the SD of income growth, inflation and national home price growth in the first column, and, $Uncertainty_{it}^{macro}$, the average of the SD of inflation and national home price growth in the second column. Variable $High\ Numeracy_{it}$ is an indicator equal to 1 if respondent i at time t answered at least 4 of the 5 numeracy questions in the survey correctly, and 0 otherwise. The regressions control for gender, age, age squared, county fixed-effects, year-month fixed-effects, and for the point estimates (i.e., means) provided by the respondent regarding personal (or household) income growth, inflation and national home price growth rates over the 12 months following time t. Standard errors are corrected for heteroskedasticity and clustered at the respondent level. t-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	$Uncertainty_{it}$	$Uncertainty_{it}^{macro}$
$Income/10,000_{it}$	-0.098***	-0.104***
	(-8.46)	(-8.71)
$Income/10,000_{it} \times High\ Numeracy_{it}$	0.077***	0.077***
	(6.18)	(6.00)
$College_{it}$	-0.697***	-0.757***
	(-5.98)	(-6.30)
$College \times High\ Numeracy_{it}$	0.312**	0.326**
	(2.44)	(2.46)
$Is\ Working_{it}$	-0.659***	-0.349***
	(-5.43)	(-2.84)
$Is\ Working_{it} \times High\ Numeracy_{it}$	0.401***	0.240*
	(3.13)	(1.84)
$\mathbb{P}(default3months)_{it}$	0.010***	0.010***
	(4.15)	(4.32)
$\mathbb{P}(default3months)_{it} \times High\ Numeracy_{it}$	-0.002	-0.002
	(-0.88)	(-0.77)
$High\ Numeracy_{it}$	-1.688***	-1.622***
	(-11.15)	(-10.59)
Controls for point estimates for growth rates of income, inflation, and national home prices	Yes	Yes
Gender, age, race controls	Yes	Yes
Year-month FEs	Yes	Yes
County FEs	Yes	Yes
Adjusted R^2	0.28	0.28
Observations	51433	51433

Table 6: Uncertainty and point estimate revisions over time

The dependent variable in the linear regression models in the table is the absolute value of the change between month $t-1$ and month t in the point estimates provided by respondents regarding their personal income growth (first column), inflation rate (second column), and rate of growth of national home prices (third column), over the subsequent 12 months. The independent variable in each model is the uncertainty the respondent had in their point estimate in month $t-1$. Standard errors are corrected for heteroskedasticity and clustered at the respondent level. t-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	$\lvert\Delta Personal\ Income\ Growth\ Point\ Estimate_{it-1,it}\rvert$	$\lvert\Delta Inflation\ Rate\ Point\ Estimate_{it-1,it}\rvert$	$\lvert\Delta National\ Home\ Price\ Point\ Estimate_{it-1,it}\rvert$
$SD(PersonalInc)_{i,t-1}$	0.793^{***}		
	(18.87)		
$SD(Inflation)_{i,t-1}$		1.030^{***}	
		(34.83)	
$SD(NatnlHP)_{i,t-1}$			0.543^{***}
			(26.58)
Constant	0.673^{***}	0.166^{***}	1.381^{***}
	(10.49)	(2.87)	(27.60)
Adjusted R^2	0.11	0.19	0.10
Observations	30438	48329	42021

Table 7: Subjective versus objective volatility

The table presents subjective uncertainty (i.e., volatility) values for the rate of inflation and for the rate of growth in national home prices, averaged across participants in various SES categories, as well as objective measures of uncertainty, based on realized volatilies of these variables. These objective volatility measures are calculated for two time windows: several years prior to the SCE survey (January 2000 - December 2012), and during the SCE sample period (June 2013 - December 2017). For inflation, the objective volatility is calculated according to a procedure employed by the Federal Reserve Board, which is detailed in Hulseman and Detmeister (2017). Namely, we first obtain the 1-month annualized change in the seasonally-adjusted Consumer Price Index, then calculate the change in the annualized growth rate for a given month t as the rate in the current month minus the rate in the previous month, and then compute the standard deviation in changes of the growth rate over the previous 60-months from month t. We average the rolling-window standard deviations separately for the in-sample and the out-of sample periods. For national home price growth rates, we calculate the standard deviation of monthly percent changes in the seasonally-adjusted Case-Shiller Home Price index, for the out-of-sample and for the in-sample period separately, and then we annualize the monthly standard deviation by multiplying the result by the square root of 12. The first column shows average values for subjective respondent inflation uncertainty and the second column shows average values for subjective national house prices uncertainty, separately for each income and education category. The bottom two rows of the table show the objective values for the volatility of inflation and that of the growth rate of national house prices, for the out-of-sample and the in-sample periods. All values in the table are reported in percent.

	Expectation Uncertainty For:		
	Inflation Rate (%)	*National House Prices (%)*	*N*
SES by Education			
No College	3.18	3.27	21924
College	2.00	2.49	29747
SES by Income			
\$5,000	4.84	4.85	1330
\$15,000	3.89	4.01	3016
\$25,000	3.47	3.71	4215
\$35,000	3.12	3.26	4278
\$45,000	2.75	2.95	4666
\$55,000	2.58	2.80	4602
\$67,500	2.24	2.57	6529
\$82,500	2.08	2.46	7999
\$125,000	1.89	2.31	8556
\$175,000	1.75	2.28	3467
\$200,000	1.63	2.29	3013
Objective Uncertainty (2000 – 2012)	1.41	2.44	
Objective Uncertainty (2013 – 2017)	0.87	0.62	

Table 8: Uncertainty and consumption decisions

The dependent variables in the first three columns are indicators (equal to 0 or 100, for ease of coefficient interpretation) for whether the respondent expects that their total household spending will increase over the 12 months following time t or whether their everyday spending will increase over that time frame, respectively. The dependent variables in the subsequent four columns are the percent chance that in the following 12 months the respondent will purchase home renovations, vehicles, trips, or home durables consisting of appliances, electronics, and furniture. Values for the dependent variable in the second column come from the SCE Housing module administered only in February 2014 and February 2015, which reduces the sample size. Values for the dependent variables in the last five columns come from the SCE Household Finance module which is administered only in August 2014, August 2015, and August 2016. Standard errors are corrected for heteroskedasticity and clustered at the respondent level. t-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Dependent variable	*Will Increase Spending*$_{it}$	*Will Increase Everyday Spending*$_{it}$	*Will Increase Everyday Spending*$_{it}$	*% Chance Will Purchase:* *Home Reno*$_{it}$	*Vehicles*$_{it}$	*Trips*$_{it}$	*Home Durables*$_{it}$
	data from core survey	data from housing module		data from household finance module			
Uncertainty$_{it}$	-0.627***	-1.165**	-1.523*	-0.928***	-0.648**	-1.448***	-0.191
	(-4.20)	(-1.98)	(-1.76)	(-3.17)	(-2.20)	(-4.18)	(-0.93)
Income$/10,000_{it}$	0.058	-0.131	0.320	1.160***	0.142	2.162***	0.725***
	(0.75)	(-0.47)	(0.89)	(6.76)	(0.88)	(11.20)	(6.57)
College$_{it}$	-0.345	-2.319	-6.440*	1.149	0.389	7.681***	0.410
	(-0.42)	(-0.79)	(-1.65)	(0.68)	(0.24)	(3.92)	(0.37)
Is Working$_{it}$	5.228***	0.647	-3.447	-0.674	1.574	-2.369	0.278
	(5.99)	(0.20)	(-0.92)	(-0.35)	(0.84)	(-1.07)	(0.23)
$\mathbb{P}(default3months)_{it}$	-0.031*	-0.045	-0.030	-0.051	0.097**	-0.159***	-0.016
	(-1.86)	(-0.58)	(-0.33)	(-1.35)	(2.50)	(-3.62)	(-0.64)
Age$_{it}$	-0.603***	-1.295**	-1.747***	0.425	0.026	-1.470***	-0.474**
	(-3.75)	(-2.40)	(-2.66)	(1.34)	(0.09)	(-3.86)	(-2.27)
Age^2_{it}	0.007***	0.014**	0.015**	-0.004	-0.002	0.013***	0.002
	(4.19)	(2.56)	(2.33)	(-1.26)	(-0.83)	(3.34)	(1.00)
Female$_i$	-3.256***	-9.622***	-7.495**	-0.955	-3.955***	-1.786	-1.141
	(-4.34)	(-3.61)	(-2.33)	(-0.62)	(-2.71)	(-0.99)	(-1.10)
White$_i$	4.694***	1.511	-3.037	5.824***	0.665	2.586	0.887
	(4.16)	(0.38)	(-0.57)	(2.87)	(0.31)	(1.00)	(0.58)
Income Growth Pt Est$_{it}$	0.425***	0.178	0.215	0.013	-0.041	0.158*	0.132**
	(12.80)	(1.30)	(1.39)	(0.15)	(-0.47)	(1.70)	(2.30)
Expected Inflation$_{it}$	0.211***	0.462	0.193	0.047	0.251	-0.231	-0.112
	(3.23)	(1.31)	(0.47)	(0.28)	(1.27)	(-1.07)	(-1.05)
Expected Natnl Home Prices$_{it}$	0.236***	-0.308	0.353	-0.140	0.064	0.008	0.018
	(4.15)	(-1.03)	(1.35)	(-0.88)	(0.37)	(0.04)	(0.17)
Year-Month FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.09	0.19	0.01	0.09	0.02	0.17	0.11
Observations	51431	1408	593	2149	2149	2149	2149

Table 9: Uncertainty and credit decisions

The dependent variable in the first column is a score from 1 to 5, indicating how easy the respondent believes that it will generally be for people to obtain credit or loans in the 12 months following the survey (item Q32 in the core survey). The dependent variable in the second column is a score from 1 to 5 indicating how likely the respondent is to seek an increase in available credit lines (item N17a1,2,4,5 and 6 from the credit access survey module). The dependent variable in the third column is a score from 1 to 5 indicating how likely the respondent is to seek credit to either purchase a car or pay for education (item N17a3 and 7 from the credit access survey module). Standard errors are corrected for heteroskedasticity and clustered at the respondent level. t-statistics are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Perceived Future Credit Market Conditions$_{it}$	*Seeks Credit Line Increase*$_{it}$	*Seeks Credit To Consume*$_{it}$
Uncertainty$_{it}$	-0.021***	0.023***	-0.000
	(-6.35)	(5.10)	(-0.01)
Income$/10,000_{it}$	0.010***	0.005**	0.005**
	(6.16)	(2.49)	(2.55)
College$_{it}$	0.099***	0.014	-0.053**
	(5.50)	(0.71)	(-2.49)
Is Working$_{it}$	0.040**	0.033	0.024
	(2.13)	(1.44)	(1.02)
$\mathbb{P}(default3months)_{it}$	-0.005***	0.002***	0.002***
	(-14.88)	(4.16)	(4.37)
Age$_{it}$	-0.026***	-0.028***	-0.008*
	(-7.35)	(-6.63)	(-1.88)
Age^2_{it}	0.000***	0.000***	-0.000
	(7.02)	(3.49)	(-0.72)
Female$_i$	-0.068***	-0.091***	-0.029
	(-4.09)	(-4.77)	(-1.48)
White$_i$	0.083***	0.049*	-0.029
	(3.21)	(1.70)	(-0.92)
Income Growth Pt Est$_{it}$	0.004***	0.003**	0.002**
	(6.10)	(2.49)	(2.06)
Expected Inflation$_{it}$	-0.018***	-0.000	-0.002
	(-10.79)	(-0.11)	(-0.85)
Expected Natnl Home Prices$_{it}$	0.006***	0.000	-0.000
	(4.49)	(0.22)	(-0.16)
Year-Month FEs	Yes	Yes	Yes
County FEs	Yes	Yes	Yes
Adjusted R^2	0.16	0.14	0.09
Observations	51422	10844	10844

Table 10: Uncertainty and equity investment decisions

The dependent variable in the first column is an indicator (equal to 0 or 100, for ease of coefficient interpretation) for whether the value of stock market holdings of the respondent is greater than zero. In the second and third columns the dependent variable is the respondents' value of equity holdings, scaled by the total value of their assets, expressed as percentage points (i.e., up to 100). In the last two columns the dependent variable is the log of the dollar value of equity holdings (log(1+amount)) of the respondent. Control variables include net worth, which is the difference between the person's assets and debt (first three columns), or the log value of assets and the log value of debt (last two columns). Balance sheet data is only available in the SCE Household Finance Survey. Standard errors are corrected for heteroskedasticity and clustered at the respondent level. t-statistics are shown in parentheses.*, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	$Invests\ in\ Equities_{it}$	$EquityHoldings/Assets_{it}$	$EquityHoldings/Assets_{it}\ if\ Invests\ in\ Equities_{it}=1$	$Equity\ Holdings_{it}(log)$	$Equity\ Holdings_{it}(log)\ if\ Invests\ in\ Equities_{it}=1$
$Uncertainty_{it}$	-1.307**	-0.550***	-0.728*	-0.080	-0.081**
	(-2.33)	(-2.62)	(-1.94)	(-1.53)	(-2.48)
$Income/10,000_{it}$	1.839***	0.380***	-0.028	0.249***	0.061***
	(6.88)	(3.04)	(-0.17)	(9.29)	(4.94)
$College_{it}$	4.458*	2.299**	2.974*	0.508**	0.309**
	(1.77)	(2.02)	(1.75)	(2.00)	(2.46)
$Is\ Working_{it}$	10.652***	3.114***	3.294*	0.309	-0.044
	(3.66)	(2.61)	(1.72)	(1.09)	(-0.25)
$\mathbb{P}(default3months)_{it}$	-0.211***	-0.004	0.069	-0.010*	-0.001
	(-3.80)	(-0.15)	(1.31)	(-1.93)	(-0.25)
Age_{it}	-0.215	-0.053	0.019	0.054	0.024
	(-0.44)	(-0.24)	(0.05)	(1.13)	(0.95)
Age^2_{it}	0.001	0.000	-0.000	-0.000	-0.000
	(0.25)	(0.20)	(-0.02)	(-0.97)	(-0.58)
$Female_i$	-3.678*	-2.376**	-2.383	-0.682***	-0.155
	(-1.65)	(-2.26)	(-1.56)	(-3.08)	(-1.43)
$White_i$	-3.549	-0.375	1.442	-0.187	0.357**
	(-1.13)	(-0.25)	(0.65)	(-0.62)	(2.08)
$Income\ Growth\ Pt\ Est_{it}$	0.049	-0.069	-0.121	0.007	-0.004
	(0.38)	(-1.47)	(-1.47)	(0.61)	(-0.57)
$Expected\ Inflation_{it}$	-0.666**	-0.218*	-0.328	-0.045	-0.005
	(-2.12)	(-1.93)	(-1.37)	(-1.47)	(-0.28)
$Expected\ Natnl\ Home\ Prices_{it}$	0.152	0.026	0.093	0.006	0.007
	(0.61)	(0.28)	(0.50)	(0.22)	(0.55)
$NetWorth_{it}$	1.670***	0.526***	0.238*		
	(7.15)	(5.08)	(1.84)		
$Assets_{it}(log)$				0.663***	0.835***
				(17.03)	(15.63)
$Debt_{it}(log)$				-0.031	-0.027*
				(-1.00)	(-1.84)
Year-Month FEs	Yes	Yes	Yes	Yes	Yes
County FEs	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.22	0.10	0.05	0.36	0.48
Observations	2015	2015	1218	2015	1218

Table 11: Uncertainty in expectations versus risk preferences

Risk tolerance is measured in the first month of participation in the core survey, as well as in the months when respondents also complete the household finance module. We use the former in the first and fifth columns, and the latter in the other columns, since the dependent variables there are obtained from the Household Finance module. Each regression contains the same set of control variables as in Tables 8-10 (i.e., demographics, point estimates, year-month as well as county fixed effects.) Standard errors are corrected for heteroskedasticity and clustered at the respondent level. t-statistics are shown in parentheses.*, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

		% *Chance Will Purchase:*					
	$Uncertainty_{it}$	*Home* $Reno_{it}$	$Vehicles_{it}$	$Trips_{it}$	*Perceived Future Credit Market* $Conditions_{it}$	*Invests in* $Equities_{it}$	$Equity\ Holdings_{it}$ *if Invests in* $Equities_{it} = 1$
$Uncertainty_{it}$		-0.959***	-0.700**	-1.481***	-0.022***	-1.380**	-0.081**
		(-3.28)	(-2.35)	(-4.34)	(-4.65)	(-2.41)	(-2.44)
$Risk\ Tolerance_{it}$		1.105**	0.177	2.363***		5.384***	0.095**
from HH Finance Module		(2.20)	(0.35)	(4.01)		(7.45)	(2.56)
$Risk\ Tolerance_i$	-0.012				0.026***		
from Core Survey	(-0.42)				(2.99)		
Adjusted R^2	0.33	0.09	0.02	0.19	0.19	0.24	0.48
Observations	23957	2116	2116	2116	23951	2008	1213

Appendix

A. Eliciting point estimates and subjective distributions in the SCE

As an example we show the questions used in the SCE to elicit point estimates (first excerpt below) and subjective distributions (second excerpt) regarding the change in national home prices over the 12 months following the survey. The questions regarding the point estimates and distributions for personal income growth, and for the rate of inflation, are constructed similarly to the questions regarding home prices.

Q31v2

Next we would like you to think about home prices nationwide.

Over the next 12 months, what do you expect will happen to the average home price nationwide?
Instruction H8.

Over the next 12 months, I expect the average home price to...

❍ increase by 0% or more

❍ decrease by 0% or more

Q31v2part2

By about what percent do you expect the average home price to [increase/decrease as in Q31v2]? Please give your best guess.

Instruction H9.

Over the next 12 months, I expect the average home price to [increase/decrease as in Q31] by __ %

And in your view, what would you say is the percent chance that, **over the next 12 months,** the average home price nationwide will...

Instruction H4.

increase by 12% or more	_____	percent chance
increase by 8% to 12%	_____	percent chance
increase by 4% to 8%	_____	percent chance
increase by 2% to 4%	_____	percent chance
increase by 0% to 2%	_____	percent chance
decrease by 0% to 2%	_____	percent chance
decrease by 2% to 4%	_____	percent chance
decrease by 4% to 8%	_____	percent chance
decrease by 8% to 12%	_____	percent chance
decrease by 12% or more	_____	percent chance
Total	**100**	

B. Income bins

Below are the bins that respondents in the SCE use to report their total annual household income. The same question is also asked to repeat respondents.

Q57

[if new respondent] Which category represents the total combined pre-tax income of all members of your household (including you) during the past 12 months?

Please include money from all jobs, net income from business, farm or rent, pensions, interest on savings or bonds, dividends, social security income, unemployment benefits, Food Stamps, workers compensation or disability benefits, child support, alimony, scholarships, fellowships, grants, inheritances and gifts, and any other money income received by members of your household who are 15 years of age or older.

Instruction H5.

- ❍ Less than $10,000
- ❍ $10,000 to $19,999
- ❍ $20,000 to $29,999
- ❍ $30,000 to $39,999
- ❍ $40,000 to $49,999
- ❍ $50,000 to $59,999
- ❍ $60,000 to $74,999
- ❍ $75,000 to $99,999
- ❍ $100,000 to $149,999
- ❍ $150,000 to $199,999
- ❍ $200,000 or more