The Economics of Financial Stress*

Dmitriy Sergeyev ® Chen Lian ® Yuriy Gorodnichenko

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Abstract

We study the psychological costs of financial constraints and their economic consequences. Using a representative survey of U.S. households, we document the prevalence of financial stress in U.S. households and a strong correlation between financial stress and measures of financial constraints. We incorporate financial stress into an otherwise standard dynamic model of consumption and labor supply. We emphasize three key results. First, a psychology-based theory of poverty traps requires two equally important components: financial stress itself and naivete about financial stress. Specifically, sophisticates save enough to escape high-stress states, understanding that doing so alleviates the economic consequences of financial stress. On the other hand, naifs dis-save, fall into a poverty trap, and incur high welfare losses. Second, the financial stress channel can reverse the counterfactual negative wealth effect of labor supply because relieving stress releases cognitive resources for productive work. Third, financial stress has macroeconomic consequences such as higher wealth inequality and higher fiscal multipliers.

*Sergeyev: Bocconi University, CEPR, and IGIER, dmytro.sergeyev@unibocconi.it; Lian: UC Berkeley and NBER, chen_lian@berkeley.edu; Gorodnichenko: UC Berkeley and NBER, ygorodni@econ.berkeley.edu. For helpful comments and suggestions, we are grateful to Marios Angeletos, Abhijit Banerjee, David Berger, Tito Boeri, James Choi, Stefano Dellavigna, Eliana La Ferrara, Pierre-Olivier Gourinchas, Jonathon Hazell, Supreet Kaur, Peter Maxted, Sendhil Mullainathan, Emi Nakamura, Neil Thakral, Ricardo Perez-Truglia, Jon Steinsson, Frank Schilbach, Martin Schneider, Benjamin Schoefer, Christopher Tonetti, and seminar participants at Bocconi, TSE, Stanford, SED, UC Berkeley, UC Davis, and the 16th CSEF-IGIER Symposium on Economics and Institutions. The survey was approved by UC Berkeley IRB 2021-11-14868. We thank Zhuoran Lyu, Emily Martell, and Laura Waring for excellent research assistance.

1 Introduction

Financial constraints are a painful reminder that our wishes are limited by our means. Finding ways to reduce the pain from stressful tradeoffs is the bread and butter of economics. And yet, financial stress, the number one source of stress for Americans, is not a key object for macroeconomics, household finance, or related fields.[1] Although the traditional approach does concentrate on financial constraints as a pervasive limiting factor[2] for consumption smoothing, portfolio allocations, and the like, stress itself is out of the picture. This status quo is striking, given that behavioral economics has underscored a wide spectrum of negative effects stemming from financial stress. For example, Mani et al. (2013) and Mullainathan and Shafir (2013) argue that financial stress leads to a "scarcity" of cognitive resources and pushes people into a state of tunneling (i.e., neglecting activities outside the "financial stress" tunnel). As a result, financially stressed people have difficulty focusing, perform worse in economic tasks, and make poor decisions which lead to important economic consequences for labor supply and earnings, time and risk preferences, and human capital investment (Haushofer and Fehr, 2014; Haushofer and Shapiro, 2016; Ong, Theseira and Ng, 2019; Lichand and Mani, 2020; Banerjee et al., 2020; Kaur et al., 2022).[3]

To broaden the perspective and link behavioral and traditional takes on financial constraints, we develop a tractable theoretical model incorporating the psychological costs of financial constraints, i.e., financial stress. In this framework, financial stress not only has a direct effect on households' utility but also influences their economic behavior. This behavioral impact is especially costly for those not sophisticated enough to make complex optimization decisions. Using our survey of U.S. households to discipline the model, we show that financial stress can significantly alter household consumption, saving, and labor supply decisions and incur extra welfare costs. Together, our analysis sheds new light on the causes of widening wealth inequality and the impact of stimulus checks issued to households during the COVID-19 crisis and previous recessions.

In the first step, we run a representative survey of Americans (we target prime age workers) to document a series of facts about financial stress. Building on earlier survey work, we introduce questions that help quantify the intensity of financial stress, a valuable contribution that provides a

[1] According to Capital One CreditWise survey (CNBC, 2021), 73 percent of Americans rank finances as the No.1 stress in life. The post-COVID inflation makes things worse. American Psychological Association (2022) shows that 87 percent of Americans are stressed about their finance in March 2022, the highest number in the history of APA's Stress in America survey.

[2] For example, according to a report (Board of Governors of the Federal Reserve System, 2021), 36 percent of US households have difficulty covering a mere $400 emergency expense.

[3] Popular personal finance books also discuss financial stress and its impact extensively. For example, Chilton (1998, p.171) wrote: "And, not only can excessive borrowing tap your cash flow, it can also cause stress." Olen and Pollack (2016, p.21) wrote: "The harder it is to make it through to the next day financially – whatever the reason – the harder you will find it to make careful and disciplined decisions."

more direct mapping between data and theory. Consistent with early studies (Yakoboski, Lusardi and Hasler, 2020 and Hasler, Lusardi and Valdes, 2021), we find that the majority of survey participants feel financially stressed along a number of metrics. For example, survey participants spend a median of 6 hours per week worrying about and dealing with issues related to household finances, distracting them from productive work. We also observe that measures of financial stress are strongly correlated with measures of whether households are at their financial constraints. Another innovation of our survey is to use hypothetical questions to elicit information about how participants' financial stress would change if they received additional money (e.g., a stimulus check).

Informed by the survey evidence and previous work (e.g., Kaur et al., 2022), we introduce financial stress into an otherwise standard dynamic model of consumption, labor supply, and wealth distribution (Achdou et al., 2022). The model has three novel features. First, financial stress enters our model by crowding out valuable cognitive resources and time otherwise available for productive labor supply.[4] Second, financial stress decreases with the distance to financial constraints. Third, households' degrees of sophistication versus naivete can vary (O'Donoghue and Rabin, 1999, 2001). We calibrate our model in two ways: based on our survey results and based on the evidence in Kaur et al. (2022).

We show that the sophistication-naivete dimension is a key determinant of how financial stress shapes household behavior. In our context, sophisticated households have a strong incentive to save to avoid future financial stress, because they understanding that doing so alleviating financial stress and its impact on productive labor supply and earnings. Because sophisticates save themselves out of high-stress states, financial stress leads to fewer households at financial constraints despite stress' negative direct effect on earnings. On the other hand, naive households ("naifs") fail to internalize possible future financial stress and hence do not have this extra saving motive. With a lower productive labor supply and hence lower earnings and savings, naifs are pushed to financial constraints more often, which creates a more dispersed wealth distribution.

The sophistication-naivete dimension is also crucial in determining the welfare costs of financial stress. For this purpose, we develop a money-metric measure of the welfare costs of financial

[4]We focus on the most focused and documented channel in this literature: the impact of financial stress on productive labor supply and earnings. For example, Kaur et al. (2022) provide recent evidence. They stagger when wages of Indian manufacturing workers are paid out: some workers are paid earlier while others are paid later and remain liquidity constrained. In other words, they vary the *timing* of wage payment without affecting the total. They find that the early wage payment reduces workers' financial stress and these less stressed workers become more productive at work. Their output and earnings increase by 7 percent on average and by 13 percent for the most stressed households. The authors report additional evidence suggesting the increase comes from improved cognition: workers make fewer costly mistakes and become more attentive. Banerjee et al. (2020) and Fink, Jack and Masiye (2020) find similar evidence that reducing financial stress increases Ghanaian workers' productive labor supply and earnings.

stress. We find that the welfare costs of naifs' financial stress are ten times larger than the costs of sophisticates' financial stress, because naifs do not save enough to alleviate their financial stress. Together, our results mean that a psychology-based theory of poverty trap (Mullainathan and Shafir, 2013) requires two key important ingredients: financial stress itself and naivete about financial stress.

The financial stress channel can also reverse the counterfactual large negative wealth effect of labor supply in benchmark models (Auclert, Bardóczy and Rognlie, 2021). Intuitively, relieving financial stress releases cognitive resources for productive work, increases labor supply and, hence, earnings. Financial stress thus provides a way to bring the wealth effect on labor supply in the model closer to its empirical counterpart in Cesarini et al. (2017), Banerjee et al. (2020), and Kaur et al. (2022). This channel is particularly strong for naifs and households close to financial constraints. A corollary of the positive wealth effect of labor supply for stressed households is a new transmission mechanism for fiscal policy: lump-sum fiscal transfers can relieve financial stress, increase labor supply, and boost aggregate output. This channel breaks the Ricardian Equivalence and provides a new rationale for using fiscal transfers to stimulate the economy.[5]

Although our baseline approach follows the behavioral literature (Kaur et al., 2022) and models financial stress as crowding out scarce cognitive resources available for productive labor supply, financial stress can matter through other channels: direct utility costs, impulsive spending to alleviate the stress (e.g., alcohol or cigarettes), and a lower probability to promotion (and a higher probability of demotion) because stress impacts performance. In a series of robustness checks, we modify our model to accommodate these alternatives. In short, we find that the main insight on how sophistication versus naivete about financial stress affects household behavior is insensitive to using alternative assumptions.

We contribute to several strands of research. First, our paper builds upon and contributes to the literature about psychology of poverty and scarcity (e.g., Banerjee and Mullainathan, 2008; Mani et al., 2013; Mullainathan and Shafir, 2013; Haushofer and Fehr, 2014; Schilbach, Schofield and Mullainathan, 2016; Kaur et al., 2022). Relative to the earlier work, we focus on the US rather than a developing country. In addition, we build the first tractable intertemporal model of financial stress that can be used to study consumption and saving decisions, labor supply, and wealth distribution. We also emphasize the important role of sophistication versus naivete in determining the economic impact of financial stress.

Second, our paper also contributes to the theoretical literature on poverty traps. Galor and Zeira (1993) and Banerjee and Newman (1993) focus on the role of credit market imperfections

[5]In fact, in Biden (2021)'s speech about the American Rescue Plan Act of 2021, he mentioned that "so many people need help, because (the pandemic) caused an enormous stress," and a key role for the stimulus check is to relieve the stress caused by the pandemic.

and occupational choices. Dasgupta and Ray (1986, 1987) focus on the role of nutrition. Banerjee and Mullainathan (2010) and Bernheim, Ray and Yeltekin (2015) focus on the role of present bias and temptation. Dalton, Ghosal and Mani (2016) focus on the role of reference dependence and aspirations. Our paper advances this line of work in two ways. We provide a theory of poverty traps due to the scarcity of cognition. Furthermore, we make the model tractable enough to extensively study the implications for intertemporal choices and wealth distribution.

Finally, a recent macroeconomic literature studies models with wealth in the utility function (Straub, 2019; Mian, Straub and Sufi, 2021; Michaillat and Saez, 2021), which help to resolve shortcomings of the baseline New-Keynesian model. Financial stress provides a psychological foundation of wealth in the utility function. Our focus on how financial stress crowds out cognitive resources for productive labor supply also differs from this literature. There, utility of wealth and disutility of labor are separable and the wealth effect of labor supply is still negative.

To be clear, financial stress differs from present bias (e.g., Laibson, 1997 and Harris and Laibson, 2013). Present bias per se does not generate psychological costs of financial constraints: the costs of financial constraints still take the traditional form of imperfect consumption smoothing. By the same token, present bias cannot overturn the negative wealth effect of the labor supply. In terms of wealth distribution, present bias coupled with naivete can generate a large number of financially constrained households. But present bias pushes all households toward lower saving, while the effect of financial stress is wealth-dependent: financial stress will have a smaller impact on wealthy households.

2 Survey Design and Results

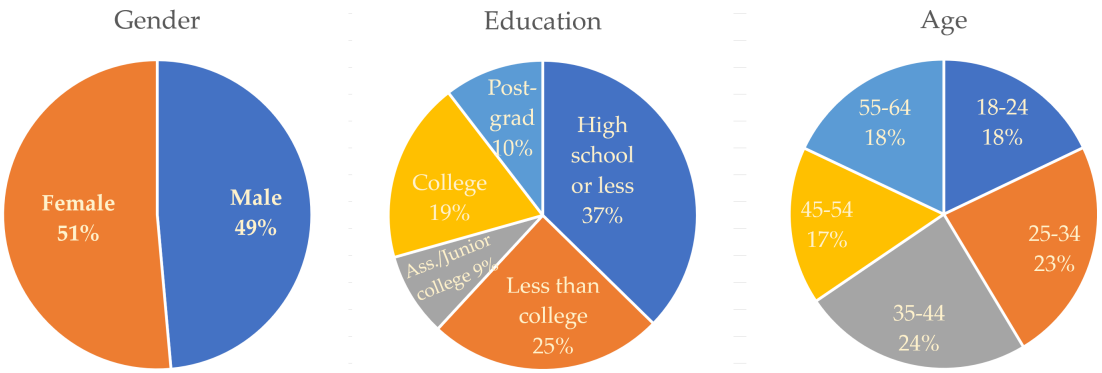
We first introduce our representative survey of US households. We document that the majority of survey participants feel financially stressed and measures of financial stress are strongly correlated with measures of whether households are at financial constraints.

2.1 The Survey Sample and Structure

For our main survey, we collect a sample of about 10,000 respondents who are prime-age, employed US workers. The sample is representative of the US population in terms of gender, age, region, total household income, and education. We collect the data in April and May 2022, in collaboration with Dynata, an online panel provider commonly used in economics (Andre et al., 2022). Figure 1 and Table 1 show the summary statistics. For instance, the median income in our sample is $45,000 and the median net assets in our sample is $5,000.

Respondents start the survey by completing a series of demographic questions. Then, they

Figure 1: Sample Characteristics: Demographics



Notes: The pie charts represent the sample characteristics based on the full sample of our survey.

answer key questions regarding financial stress and how it affects their economic lives. To ensure quality of the response, we make sure that the survey is relatively short. It has a total of 21 questions and can be finished in around 10 minutes. Appendix D contains the full survey questionnaire.

We also incorporate an attention check in the survey. In the main text, we focus on the full sample because our sampling procedure is designed so that the demographics of the full sample match the demographics of the general population. In Appendix B, we report all analysis for the restricted sample of participants who pass the attention check. The results are very similar to the full sample.

2.2 The Prevalence of Financial Stress

We first document that the majority of survey participants feel financially stressed, based on a range of different measures of financial stress. We start with a qualitative measure of financial stress.

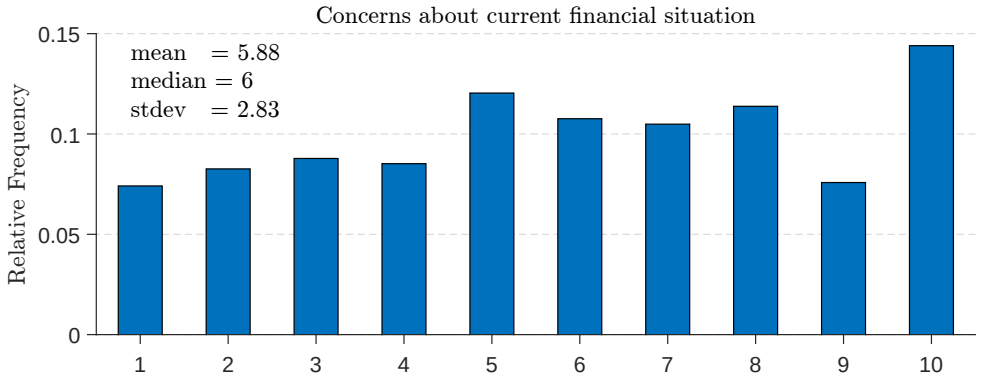
> *Q12: On a scale from 1 to 10, how concerned are you about your current financial situation? 1 represents the lowest level of concern, and 10 represents the highest level of concern.*

Table 1: Sample Characteristics: Household Size, Income, and Wealth

	Obs	Mean	Median	Std	Min	Max	q25	q75
Household size	9,813	3.3	3	1.7	1	13	2	4
Annual income	10,000	62,432	45,000	61,692	5,000	600,000	25,000	75,000
Net assets	9,959	66,791	5,000	219,362	-55,000	1,100,000	-45,000	45,000

Notes: The table shows the sample characteristics based on the full sample of our survey.

Figure 2: Qualitative Measure of Financial Stress



Notes: The figure shows the histogram of the answers to question Q12 of the survey.

The majority of survey participants feel a nontrivial degree of financial stress. Figure 2 shows the histogram of the answers to this question. The median answer is 6, suggesting that most participants are quite concerned about their finances.[6]

We then turn to quantitative measures of the economic consequences of financial stress. As a preparation, we first ask:

> *Q16: How many hours do you typically work in a week these days?*

Then, we randomize participants into answering two different questions gauging how financial stress drains valuable cognitive resources and time from productive work. The first question is motivated directly by the evidence in Kaur et al. (2022):

> *Q17ab: Over the past week, how many working hours were you distracted by your financial concerns?*

The second question is a broader measure of the impact of financial stress. This question is motivated by the TIAA Institute-GFLEC Personal Finance Index survey (Yakoboski, Lusardi and Hasler, 2020).

> *Q17c: Over the past week, how many hours did you spend thinking about and dealing with issues related to your household's finances?*

Finally, we ask the impact of financial stress on spending:

> *Q20: How much money do you typically spend per week in order to alleviate the stress driven by your financial concerns, which you would not spend if you were not financially stressed?*

[6]This result is consistent with Hasler, Lusardi and Valdes (2021). Based on qualitative measures in a national representative survey conducted in 2018, they find that 53% of U.S. adults indicated that thinking about their finances makes them anxious and 44% indicated that discussing their finances is stressful.

Table 2: Hours Worked and Quantitative Measure of Financial Stress

	Obs	Mean	Median	Std	Min	Max	q25	q75
Hours worked	9,991	39.6	40	15.0	0	100	31	45
Working hours distracted	7,428	6.4	5	6.1	0	20	1	10
Hours on financial issues	2,517	7.7	6	5.9	0	20	3	11
$ on stress	9,979	211.2	100	265.3	0	1000	25	300

Notes: "Hours worked" represent the answers to the question Q16, "working hours distracted" to the question Q17a, "hours on financial issues" to the question Q17b, and "$ on stress" to question Q20.

Table 2 shows the result. Not surprisingly, workers spent an average of forty hours per week at work, which is also the median of the distribution. For the hours distracted at work question Q17ab, the average answer is 6.4 hours per week, and the median is 5 hours per week. For the hours spent thinking about and dealing with financial issues question Q17c, the average answer is 7.7 hours per week, and the median is 6 hours per week.[7] The magnitude consistent with the TIAA Institute-GFLEC Personal Finance Index survey. In their 2020 Report (Yakoboski, Lusardi and Hasler, 2020), respondents report that they spend an average of 6.7 hours per week thinking about and dealing with issues.[8] Together, the survey results suggest that the impact of financial stress is significant. Financial stress drains valuable time from productive work, and the finding is not sensitive to the exact wording of questions.

Finally, for the dollars spent on alleviating financial stress question Q20 (e.g., alcohol or cigarettes), the average answer is 211.2 dollars per week, and the median is 100 dollars per week. The impact of financial stress is again sizable, since the average weekly income in our sample is around 1200 dollars per week.

2.3 Financial Stress and Measures of Financial Constraints

We find that measures of financial stress are strongly correlated with being financially constrained. We first ask respondents about whether they are financially constrained.[9]

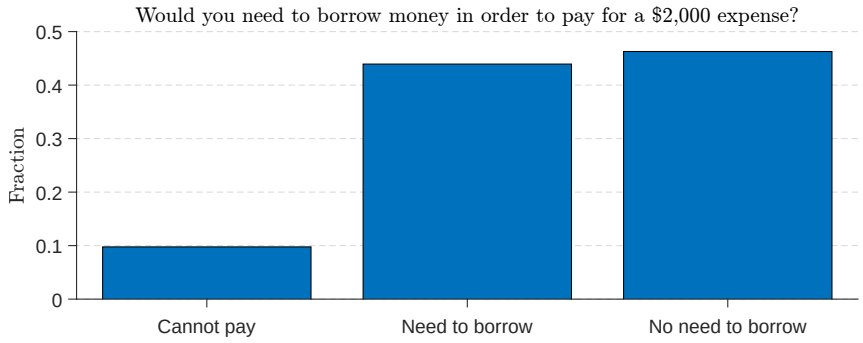
> *Q9: If your household experienced an unexpected emergency, would you need to borrow money in order to pay for a $2,000 expense?*

[7]The results based on the restricted sample of participants who pass the attention check are similar. See Table B.2 in Appendix B.

[8]To compute this average, we use Figure 3 (the distribution of financial literacy index) and Figure 17 (average hours per week thinking about and dealing with issues by financial literacy index) in (Yakoboski, Lusardi and Hasler, 2020).

[9]The question we use is based on Lusardi, Schneider and Tufano (2011) and Clark, Lusardi and Mitchell (2021), and it is shown to be a good indicator of whether households are financially constrained.

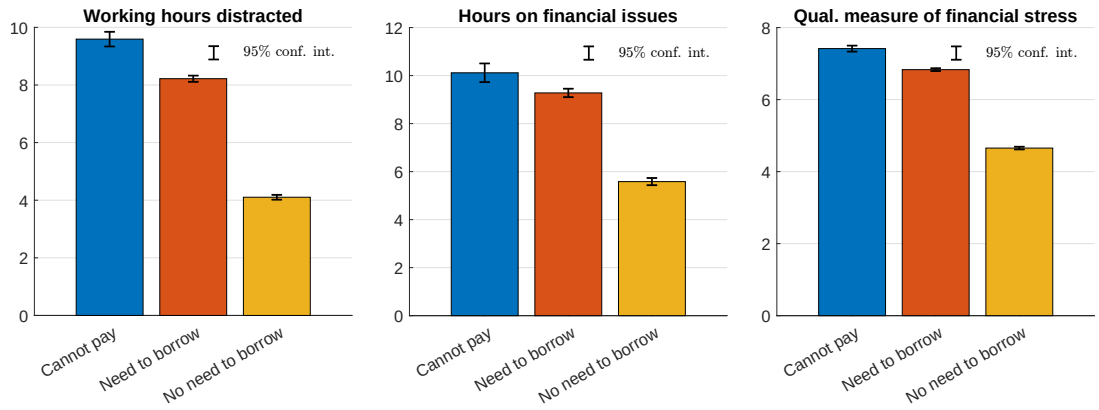
Figure 3: Measures of Financial Constraints



Notes: the figure shows the histogram of the answer to the question Q9.

From Figure 3, around 10 percent of households in our sample are severely financially constrained ("cannot pay"). Around 44 percent of households are somewhat constrained ("need to borrow"). The rest 46 percent of households are unconstrained. Figure 4 shows that this measure of financial constraint is strongly correlated with all measures of financial stress. For example, households in the "cannot pay" group report an average of 9.7 hours per week distracted at work. Households in the "need to borrow" group report an average of 8.2 hours per week distracted at work. Households in the "no need to borrow" group report an average of 4 hours per week distracted at work. The average in each group is very precisely estimated because of our large sample size. For the hours-spent-on-financial-issues question, households in the "cannot pay" group report an average of 10 hours per week, households in the "need to borrow" group report an average of 9.5 hours per week, and households in the "no need to borrow" group report an average of 5.8 hours per week.

Figure 4: Average Financial Stress by Measures of Financial Constraints



Notes: The three histograms present averages of the corresponding measures of financial stress across the three levels of liquidity constraint measure.

In Appendix C, we regress measures of financial stress (in questions Q12, Q17a, Q17b) on the measure of financial constraints (question Q9), income, asset-income ratio, and other covariates.

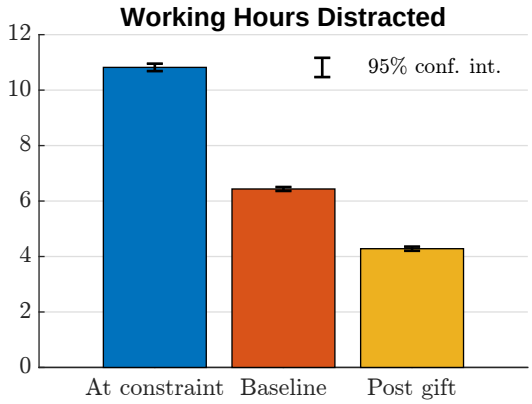
From Table C.1, we corroborate that all measures of financial stress remain strongly correlated with the measure of financial constraints.

To further gauge the relationship between financial stress and distance to financial constraints, we ask the following two additional questions.

> *Q19a: Now, I want you to imagine that your household's financial situation becomes worse, and you would struggle to quickly raise any additional money in the case of an emergency (for example, bank accounts have been depleted and credit cards are maxed out). In this alternate scenario, how many working hours would you have been distracted by your financial stress over the course of a week?*
>
> *Q19b: Now, I want you to imagine that you were gifted $2,000 at the start of last week. In this alternate scenario where you started the week with $2,000 more money, how many working hours would you have been distracted by your financial stress?*

Figure 5 shows the result. On average, participants report that they would be distracted for 10.8 hours (Q19a) per week at financial constraints. A $2,000 gift check on average would reduce the distraction at work by 2.2 hours per week from 6.4 hours (Q17ab) to 4.2 hours (Q19b), with the difference being precisely estimated. These answers corroborate that financial stress decreases with the distance to financial constraints and help calibrate our model below.

Figure 5: The Shape of Financial Stress



Notes: The histogram presents averages of distracted hours at work in a hypothetical scenario where the household has no assets to cover an emergency (question Q19a of our survey), the basedline level of distracted hours at work (questions Q17ab of our survey), distracted hours at work in a hypothetical scenario where the household receives a gift of $2,000 (question Q19b of our survey).

3 A Tractable Model of Financial Stress

In this Section, we tractably incorporate financial stress into an otherwise standard model of intertemporal decision and wealth distribution. Motivated by our survey results, and the results in

Kaur et al. (2022) and Banerjee et al. (2020), the model has two key features. First, financial stress enters our model by draining valuable cognitive resources and time from productive work. Second, financial stress decreases with the distance to financial constraints. We calibrate our model based on the survey response and the evidence in Kaur et al. (2022). We also illustrate how our modeling approach can be easily applied to other channels of financial stress.

3.1 Setup and Interpretations

Our model is built upon the standard continuous-time heterogenous-agent model in Achdou et al. (2022). Households are infinitely lived with discount rate ρ. The flow utility is given by

$$u\left(c_t, \ell_t; \Theta\left(a_t\right)\right) = \frac{c_t^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} - \varphi \frac{\left(\ell_t + \Theta\left(a_t\right)\right)^{1+\frac{1}{v}}}{1+\frac{1}{v}}, \tag{1}$$

where c_t is consumption at instant t, ℓ_t is productive labor supply at t, $\Theta\left(a_t\right) > 0$ captures the amount of cognition and/or time drained by financial stress (as a function of current net asset a_t), and σ and v parameterize the elasticity of intertemporal substitution and the Frisch elasticity.

Compared to the standard separable utility function, the only difference in (1) is that the disutility term now has two components: disutility driven by cognition/time spent on productive labor ℓ_t and cognition/time spent on worrying about and dealing with financial issues $\Theta\left(a_t\right)$.

One interpretation of (1) is that the household's cognition/time budget can be applied to three purposes: productive labor, worrying about and dealing with financial issues, and leisure. Financial stress $\Theta\left(a_t\right)$ crowds out cognition/time available for productive labor and leisure, captured by (1).

The household can borrow and save through a risk-less asset. Its budget constraint is given by

$$\dot{a_t} = r a_t - c_t + w z_t \ell_t \tag{2}$$

with borrowing constraints

$$a_t \geq \underline{a}, \tag{3}$$

where w is wage (treated as a constant), r is the interest rate, and z_t is idiosyncratic productivity following a two-state Poisson process with the support $\{z_1, z_2\}$ $(z_1 < z_2)$ and the transition intensity λ. Stochastic idiosyncratic productivity is introduced so there is a meaningful stationary wealth distribution. The two-state process follows Achdou et al. (2022) and is used for simplicity. We start from the partial equilibrium case with exogenous r but will report the results with endogenous r a la Huggett in Section 4.1. In our calibration, we focus on the case where $r < \rho$ so that a stationary wealth distribution exists.

Consistent with our survey evidence and the evidence in Kaur et al. (2022), a household's financial stress $\Theta(a_t)$ is a decreasing function of its net financial wealth a_t. This function is continuously differentiable on $a_t \geq \underline{a}$. As an example of the financial stress function, the main analysis below uses:

$$\Theta(a_t) = \bar{\Theta} \cdot e^{-\alpha(a_t - \underline{a})}, \tag{4}$$

where $a_t - \underline{a}$ captures the household's distance from the financial constraint, α parameterizes the slope of the financial stress function, and $\bar{\Theta}$ is the maximum level of financial stress at the financial constraint. The exact functional form of financial stress in (4) is unimportant and alternative functional forms are explored in Section 4.1.

Here, we treat the financial stress function $\Theta(a_t)$ as exogenous. This maps to the involuntary capture of attention view in Mullainathan and Shafir (2013) and Kaur et al. (2022), the prevalent view in the scarcity literature. That is, financial stress captures cognitive resources automatically. Households close to financial constraints involuntarily worry about their finance and they cannot consciously control the worry.

However, the benchmark model with exogenous $\Theta(a_t)$ is in fact equivalent to a model with *voluntary* capture of attention akin to rational inattention. That is, the amount of cognitive resources devoted to alleviate financial stress $\Theta(a_t)$ is chosen endogenously. See Proposition 4 below.

Alternative channels of financial stress. We model financial stress through its impact on time/cognition available for productive work, because this channel receives most attention and support in the existing behavioral development literature. It is also consistent with our survey evidence and easy to calibrate.

But our modeling approach can be easily applied to alternative channels of financial stress. As a first example, financial stress can lead to direct utility costs. That is, the flow utility in (1) becomes

$$u(c_t, \ell_t) - U^{\Theta}(a_t),$$

where $U^{\Theta}(a_t)$ captures the direct utility costs of financial stress, again decreasing in net financial wealth. This channel is a psychological foundation of wealth in the utility function commonly used in macroeconomics (Straub, 2019; Mian, Straub and Sufi, 2021; Michaillat and Saez, 2021).

Second, as our survey question Q20 suggested, to alleviate financial stress, the household may spend on items that they would not spend if they are not financially stressed. In this case, the

budget (2) becomes

$$\dot{a}_t = ra_t - c_t - C^{\Theta}(a_t) + wz_t\ell_t,$$

where $C^{\Theta}(a_t)$ captures this type of stressed spending, which does not directly enter the utility.

Third, instead of directly affecting labor earnings, financial stress can impact transition intensity $\lambda(a_t)$ between different idiosyncratic income states z_1 and z_2. That is, $\lambda(a_t)$ can depend on a_t. A financially stressed household is more likely to transition to the low-income state z_1 and less likely to the high-income state z_2. This case can capture salaried workers well. For example, because financial stress affects her performance, a stressed worker may face a lower chance of being promoted to a higher-salary job and a higher chance of being demoted to a lower-salary job.

We explore all these alternatives in Sections 4.1. The main insight on how sophistication versus naivete about financial stress affects household behavior remains. These additional channels are all temporarily shut down in the main analysis for clarity. One can hence view the impact of financial stress in our benchmark model as a lower bound of the toal impact of financial stress.

3.2 Sophistication and the Extra Saving Motive

Now, we solve our benchmark model. We start with the case of full sophistication. The terms sophistication and its opposite, naivete, are standard in behavioral economics (O'Donoghue and Rabin, 1999, 2001). In the context of financial stress, sophisticates understand that financial stress crowds out future productive labor supply and lowers earnings. They understand that extra saving can alleviate future financial stress and its negative economic consequences.

Specifically, sophisticates choose consumption and labor to maximize the present value of (1)

$$\mathbb{E}_0\left[\int_0^{+\infty} e^{-\rho t} u\left(c_t, \ell_t; \Theta\left(a_t\right)\right)\right], \tag{5}$$

subject to (2)–(3) and the process for z_t.

We use $v_j(a)$ to denote the optimal value of the objective (5) as a function of the initial asset $a_0 = a$ and the initial productivity $z_0 = z_j$ for $j \in \{1, 2\}$. We use $c_j(a)$ and $\ell_j(a)$ to denote the optimal policy rule.

The Hamilton-Jacobi-Bellman (HJB) equation of the problem is

$$\rho v_j(a) = \max_{c,\ell}\left\{u\left(c, \ell; \Theta\left(a\right)\right) + \left(ra - c + wz_j\ell\right) v_j'(a) + \lambda\left(v_{-j}(a) - v_j(a)\right)\right\}, \text{ for } j \in \{1, 2\}, \tag{6}$$

where $-j$ is the complement of j. That is, when j is 1, then $-j$ is 2 and vice versa. The optimal

policy rules $c_j(a)$ and $\ell_j(a)$ solve (6).

The household's optimal consumption choice implies

$$c_j^{-\frac{1}{\sigma}}(a) = v_j'(a) \tag{7}$$

and optimal labor supply choice yields

$$\varphi\left(\ell_j(a) + \Theta(a)\right)^{\frac{1}{v}} = wz_j c_j^{-\frac{1}{\sigma}}(a). \tag{8}$$

The borrowing constraint (3) gives rise to the state constraint boundary condition:

$$v_j'(\underline{a}) \geq \left[wz_j\left(\ell_j(\underline{a}) - \Theta(\underline{a})\right) + r\underline{a}\right]^{-\frac{1}{\sigma}}.$$

Differentiating the HJB equation (6) with respect to a and using the consumption optimality (7), we obtain the modified Euler equation:

Proposition 1. *The optimal consumption under full sophistication satisfies*

$$-\frac{\mathbb{E}_t\left[d\left(c_j^{-\frac{1}{\sigma}}(a)\right)\right]}{c_j^{-\frac{1}{\sigma}}(a)} = \left(r - \rho \underbrace{-wz_j\Theta'(a)}_{>0,\ \textit{extra saving motive}}\right)dt \tag{9}$$

Compared to the standard Euler equation in Achdou et al. (2022), sophisticates' Euler equation (9) has one additional term $-wz_j\Theta'(a)$. This term is positive since financial stress $\Theta(a)$ is decreasing in a. This term captures sophisticates' extra saving motive to get out of high financial stress states. Understanding that additional savings can alleviate financial stress and its negative economic consequences, sophisticates want to save more. This extra saving channel is so strong that, in the benchmark calibration below, sophisticates' net saving in the neighborhood of the financial constraint $\underline{a}$ is positive. As a result, there are no households at the financial constraint in the stationary wealth distribution. In other words, with sophistication, financial stress surprisingly leads to fewer households at the financial constraint compared to the case without financial stress. This happens despite the negative direct effect of financial stress on earnings. Sophisticated stressed households do not fall into the poverty trap.

3.3 Naivete and the Poverty Trap

Now we turn to the case of naivete. Naifs do not understand that financial stress crowds out future productive labor supply and lowers earnings.

Formally, we consider the general case and allow for partial sophistication, similar to O'Donoghue and Rabin (1999, 2001). That is, the household partially understands the impact of future financial stress. We use parameter $\mu \in [0,1]$ to capture the degree of sophistication. That is, the current self thinks that the future impact of financial stress is captured by $\mu\Theta(a)$ instead of $\Theta(a)$. The naivete case is nested by imposing $\mu = 0$.

Our formulation supports two different but equivalent interpretations of naivete about financial stress. First, naifs do not understand lower assets lead to more financial stress in the future. Second, even though naifs understand the aforementioned linkage, they do not understand that financial stress crowds out cognition and time available for productive labor in the future.

In the continuous-time model here, we follow Harris and Laibson (2013) and Maxted (2021) and let the transition rate from the present to the future be ∞. This captures the economic essence in a simple way. In this case, the optimal consumption policy $c_j(a)$ is determined by (10), trading off between current consumption and the perceived future value function $v_j^p(a)$:

$$c_j^{-\frac{1}{\sigma}}(a) = \left(v_j^p\right)'(a). \tag{10}$$

The HJB for the perceived value function $v_j^p(a)$ is given by

$$\rho v_j^p(a) = \max_{c,\ell} u(c,\ell;\mu\Theta(a)) + (ra - c + wz_j\ell)\left(v_j^p\right)'(a) + \lambda\left(v_{-j}^p(a) - v_j^p(a)\right), \text{ for } j \in \{1,2\}. \tag{11}$$

This is effectively the same HJB as the full sophistication case in (6), but the impact of stress is given by $\mu\Theta(a)$ instead of $\Theta(a)$. Together with (10), we establish:

Proposition 2. *The optimal consumption under naivete and partial sophistication satisfies*

$$-\frac{E_t\left[d\left(c_j^{-\frac{1}{\sigma}}(a)\right)\right]}{c_j^{-\frac{1}{\sigma}}(a)} = \left[r - \rho - wz_j\Theta'(a) + \underbrace{(1-\mu)\left(wz_j\Theta'(a) - \frac{1}{\sigma}\Theta(a)\frac{c_j'(a)}{c_j(a)}\right)}_{<0,\ \textit{less extra saving motive}}\right]dt, \tag{12}$$

and the optimal labor supply is still given by equation (8).

Compared to the Euler equation in (9) with 9, we find that naivete attenuates the extra saving motive. A smaller degree of sophistication μ means a smaller extra saving motive. This is intuitive: underestimating the impact of future financial stress undercuts the household's incentive to engage extra saving to alleviate financial stress. In the benchmark calibration below, naifs' net saving in the neighborhood of the financial constraint $\underline{a}$ is negative and naifs fall into a poverty trap. The case of naivete can generate an empirically large number of financially constrained and stressed

households.[10]

Analytical results on poverty trap. Before turning to a numerical solution of the household's problem, we analytically evaluate whether a stressed household falls into a poverty trap in the deterministic case where z_t is constant and equals z. To be precise, we say that a household falls into a poverty trap when the household's net saving is negative in the neighborhood of the constraint $\underline{a}$. Formally, a household falls into a poverty trap if and only if $\lim_{a\to(\underline{a})^+} s(a) < 0$,where $s(a) \equiv ra - c(a) + wz\ell(a)$ is net saving.

Proposition 3. *Let idiosyncratic productivity z be a constant and fix any convex financial stress function $\Theta(a)$. Consider the case that $r < \rho$, which we always focus on. We have:*

1. *Sophisticates do not fall into poverty trap if $r - \rho - wz\Theta'(\underline{a}) > 0$: $\lim_{a\to(\underline{a})^+} s(a) > 0$.*
2. *Naifs fall into poverty trap: $\lim_{a\to(\underline{a})^+} s(a) < 0$.*
3. *Without financial stress, net saving converges to 0 at $\underline{a}$: when $\Theta(a) = 0$,$\lim_{a\to(\underline{a})^+} s(a) = 0$.*

Proposition 3 analytically summarizes the main insight in this section. It is worth noting that condition $r - \rho - wz\Theta'(\underline{a}) > 0$ (under which sophisticates do not fall into the poverty trap) is satisfied when $\Theta(a)$ is sensitive to a in the neighborhood of $\underline{a}$. This is supported by Kaur et al. (2022). They find that earning losses driven by financial stress are pronounced for the most financially constrained group but decrease relatively quickly with respect to financial wealth. This condition is also satisfied in our benchmark calibration.

3.4 Calibration

We solve the model numerically based on the finite-difference method developed in Achdou et al. (2022). Table 1 displays the parameter values we use for the calibration, which are from standard references. Most non-stress parameters are from Kaplan and Violante (2022), with two exceptions. First, we switch to the more realistic borrowing constraints in Kaplan, Moll and Violante (2018) since Kaplan and Violante (2022) does not allow borrowing. Second, we use Guerrieri and Lorenzoni (2017) for productivity and labor supply parameters, since Kaplan and Violante (2022) does not allow flexible labor supply. Following the standard practice for one-asset model in the

[10]In the case of full naivete, i.e., $\mu = 0$, the saving motive is even weaker than the case without financial stress: the term in the square bracket on the right hand side of equation (12) is lower than $r - \rho$. This is because the naive household's current earning is lowered by financial stress and the naive household does not any extra motive. As a result, the naive household's net saving is lower than the non-stress household's.

Table 3: Calibration Parameters

Parameters	Justifications
ρ	match avg a/avg $y = 0.56$ (Kaplan and Violante, 2022) in the naivete about financial stress case
$\sigma = 0.5$	Kaplan and Violante (2022)
$\underline{a} = -1/4$	Kaplan, Moll and Violante (2018)
$r = 0.01$	Kaplan and Violante (2022)
$v = 1$	Guerrieri and Lorenzoni (2017)
$(\lambda, z_1, z_2) = (0.57, 0.87, 1.13)$	Guerrieri and Lorenzoni (2017)
w,θ	normalize average income and total labor hours to 1[12] in the naivete about financial stress case
$\left(\bar{\Theta}, \alpha\right) = (0.27, 11.9)$	our survey

literature (e.g., Kaplan and Violante, 2022), we calibrate ρ such that the average wealth to average income ratio in the model is equal to the average liquid wealth to average income ratio in the data.[11] We normalize average income and labor hours in our model to be 1.

In the main analysis, we use our survey to calibrate the financial stress function

$$\Theta\left(a\right) = \bar{\Theta} e^{-\alpha(a-\underline{a})}. \tag{13}$$

First, we calibrate $\bar{\Theta}$—the maximum level of financial stress at the borrowing constraints—based on the survey question Q19a.

> *Q19a: Imagine that your financial situation becomes worse, and you would now struggle to quickly raise any additional money in the case of an emergency. How many working hours would you be distracted by your financial concerns over the course of a week?*

Specifically, we find $\bar{\Theta} = 0.27$ by letting the average answer to this question in Table 2 be normalized by the average working hours in Table 1 (recall that we normalize the average total labor hours in our model to be one).

Second, we calibrate α—the slope of the financial stress function—based on the following two survey questions.

> *Q17ab: Over the past week, how many working hours were you distracted by your financial concerns?*

[11] Specifically, we calibrate ρ such that the average wealth to average income ratio in the naive financial stress case of our model is equal to its counterpart in the data. We then keep ρ constant across all other cases (e.g., sophisticated financial stress and no financial stress) to isolate the impact of financial stress. This is because, as we further argue below, the naive financial stress case is the most empirically relevant.

[12] The average income and average total labor hours are defined as $\frac{1}{2} z_1 \int \ell_1(a) g_1(a) da + \frac{1}{2} z_2 \int \ell_2(a) g_2(a) da$ and $\frac{1}{2} \int \left[\ell_1(a) + \Theta(a)\right] g_1(a) da + \frac{1}{2} \int \left[\ell_2(a) + \Theta(a)\right] g_2(a) da$, where $\{g_j(a)\}_{j=1}^{2}$ is the stationary probability density function of net wealth a for each productivity state $j \in \{1, 2\}$ We also use the fact that, in stationary distribution, exactly half of the household is at each productivity.

Q19b: In this alternate scenario where you started the week with $2,000 more money, how many working hours would you have been distracted by your financial stress?

Specifically, given the functional form in (13), we find[13]

$$\alpha = \frac{\text{avg } \log\left(Q17ab/Q19b\right)}{2000/\left(\text{avg income}\right)} = 11.9 \tag{14}$$

In this calibration, financial stress decreases with net asset relatively fast. Net asset at the level of 0.7 monthly income halves financial stress. This is consistent with the evidence in Kaur et al. (2022).

We explore two alternative calibrations of the financial stress function $\Theta(a)$. The main results about how sophistication versus naivete affects the impact of financial stress are not sensitive to the exact calibration. First, we calibrate $\left(\bar{\Theta}, \alpha\right) = (0.29, 15.5)$ based on the restricted sample of participants who pass all attention checks (see Appendix B). Second, we use the estimates in Kaur et al. (2022) to calibrate $\left(\bar{\Theta}, \alpha\right) = (0.26, 5.25)$. As further explained in the Section 4.2, Kaur et al. (2022) estimate the effect of interim payment on Indian manufacturing workers' productivity by the status of financial constraints (constrained households are defined as those which can not come up with 1000 Rupees in emergency). We find $\left(\bar{\Theta}, \alpha\right)$ by matching the model's predictions with estimates in that paper.

4 The Impact of Financial Stress: Saving Behavior and Wealth Distribution

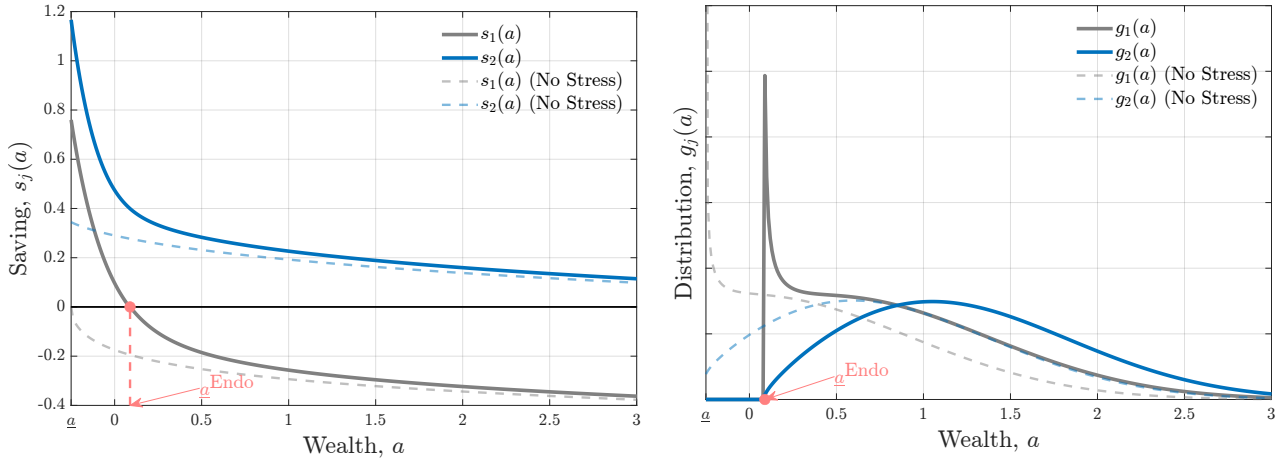
In this section, we explain how financial stress affects household's saving behavior and wealth distribution. We uncover a novel and important determinant of the economic impact of financial stress, the household's degree of sophistication about its financial stress.

Sophistication. The left panel of Figure 6 plots the net flow saving function, defined as $s_j(a) \equiv ra - c_j(a) + wz_j\ell_j(a)$, for each idiosyncratic income state, $j \in \{1, 2\}$. We compare a sophisticated stressed household with a no-stress household.

Two dashed lines in the left panel of Figure 6 capture the net flow saving of households without financial stress, i.e., $\Theta(a) = 0$ for all levels of net asset a. Consistent with the permanent income

[13]To make the average in the numerator of (14) well defined, we drop anyone who reports zero in either question Q17ab or Q19b. Conceptually, this procedure means that we exclude participants who are not affected by financial stress when estimating the additional $2000's impact on financial stress. The average income appears in the denominator in (14) because we normalize the average income in our model to be 1.

Figure 6: Saving Behavior and Stationary Wealth Distribution (Sophistication).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication.

hypothesis, households in the low income state z_1 borrow ($s_1(a) < 0$) while households in the high income state z_2 save ($s_2(a) > 0$).[14]

Two solid lines in the left panel of Figure 6 capture the net flow saving of sophisticated stressed households. They have a very strong extra saving motive to alleviate financial stress. Its net saving is *higher* than that of the non-stress household. This is despite the negative direct effect of financial stress on earnings.[15]

Moreover, because of this extra saving motive, even households in the low income state z_1 is a net saver ($s_1(a) > 0$) for all $a < \underline{a}^{\text{Endo}}$,where $\underline{a}^{\text{Endo}}$ is the point at which the net saving of the sophisticated stressed household with low income is zero:

$$s_1\left(\underline{a}^{\text{Endo}}\right) = r\underline{a}^{\text{Endo}} - c_1\left(\underline{a}^{\text{Endo}}\right) + wz_1\ell_1\left(\underline{a}^{\text{Endo}}\right) = 0. \tag{15}$$

In other words, there is no poverty trap for sophisticates. No matter the idiosyncratic state, all sophisticated stressed households are net savers around the financial constraints. In the stationary wealth distribution in the right panel of Figure 6, they all save out of the financial constraint.

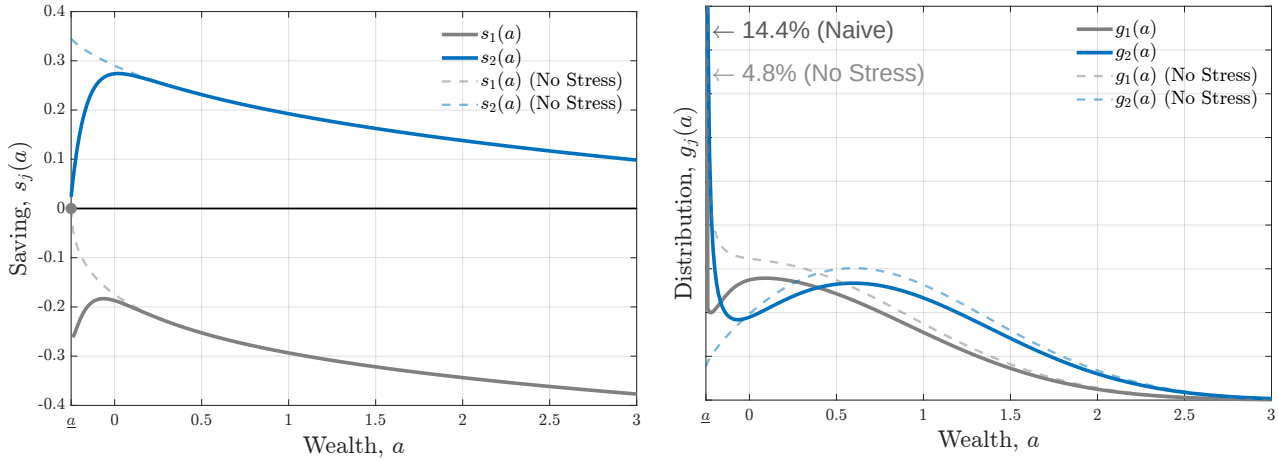
The right panel of Figure 6 plots the stationary probability density function of net wealth $g_j(a)$ for each productivity state $j \in \{1, 2\}$.[16] We compare sophisticated stressed households with

[14]The net saving $s_j(a)$ decreases with net asset a because the household is impatient ($r < \rho$) and the precautionary saving motive (driven by the possibility of binding financial constraints in the traditional sense in Carroll (1997) and Gourinchas and Parker (2002) instead of financial stress) decreases with net asset a.

[15]Specifically, there are two reasons why a sophisticated stressed household's net saving is *higher* than that of the non-stress household: the extra saving motive in (9); the extra labor supply motive in Figure 13.

[16]The stationary probability density function of net wealth $\{g_j(a)\}_{j=1}^{2}$ can be found through the Kolmogorov

Figure 7: Saving Behavior and Stationary Wealth Distribution (Naivete).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under naivete.

the no-stress benchmark. Consistent with the no-poverty-trap discussion above, the extra saving motive for sophisticated stressed households are so strong that *none* of them is close to the financial constraint $\underline{a}$. The wealth level $\underline{a}^{\text{Endo}}$, where the net saving $s_1\left(\underline{a}^{\text{Endo}}\right)$ in equation (15) is zero, serves as an endogenous lower bound on wealth in the stationary wealth distribution for the sophisticated stressed households.

Naivete. Now we turn to the case of naivete. The left panel of Figure 7 plots the net flow saving function $s_j(a) = ra - c_j(a) + wz_j\ell_j(a)$ for each productivity state. We compare naive stressed households ($\mu = 0$) with no-stress households.

Two solid lines in the left panel of Figure 7 capture the net flow saving of naive stressed households. Naif stressed households do not have the extra saving motive. They have a *lower net saving* than non-stress households, because of the negative direct effect of financial stress on earnings. Naifs' lower net saving in the left panel of Figure 7 contrasts with sophisticates' higher net saving in Figure 6.[17]

The right panel of Figure 7 plots the stationary wealth distribution. We compare naive stressed households with the no-stress benchmark. Financial stress together with naivete significantly increases the proportion of financially constrained households. Even in the context of one-asset model here, we are able to obtain a significant share of financially constrained households (14.4%).

Forward equation as in Achdou et al. (2022): $0 = -\frac{d[s_j(a)g_j(a)]}{da} - \lambda_j g_j(a) + \lambda_{-j} g_{-j}(a)$ for $j \in \{1, 2\}$.

[17]The net saving $s_1(\underline{a})$ is zero for a low-productivity household exactly at the constraint $\underline{a}$. This makes sure that the financial constraint in (3) is not violated. A jump in the net saving function $s_1(a)$ exactly at the constraint is standard for naive households (Harris and Laibson, 2013 and Maxted, 2021).

This resolves one shortcoming of one-asset models: too few financially constrained households (Krusell and Smith, 1998; Kaplan, Moll and Violante, 2018). In sum Financial stress and naivete together generate a psychology-based theory poverty trap.

Figures 6 and 7 together show that the empirically large share of financially constrained households we document (e.g., ten percent in Figure 3) is consistent with the case of naivete but not with the case of sophistication. Other evidence also points to the direction of naivete in the context of financial stress. For example, Pew Charitable Trusts (2016) find that the share of Americans who feel financially stressed rises steadily over the course of the month (as cash-on-hand dwindles), and then drops sharply by 53 percent at the start of the next month when paychecks arrive. This is consistent with naivete but is hard to square with sophistication, since paychecks are anticipated regular payments and sophisticates would have smoothed out the impact of financial stress evenly over a month. Bhargava and Conell-Price (2021) find that most employees reported substantial financial stress about their current financial situation yet expressed optimism about achieving relief from such financial stress in the future.

4.1 Extensions

This section verifies that the main results about how sophistication versus naivete affects the impact of financial stress are not sensitive to our modeling choices. We maintain the parameter values in Table 3, unless specifically mentioned.

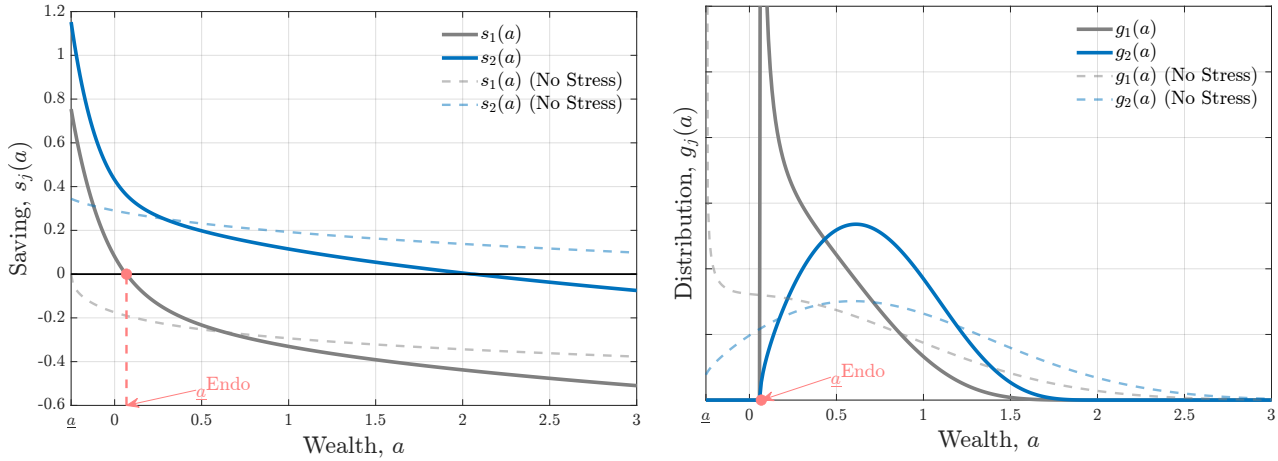
Endogenous r. We follow Huggett (1993) and Achdou et al. (2022) and endogenize the interest rate r such that the total wealth in the economy is fixed at $\int_{i\in[0,1]} a_{i,t}di = B = 0.56$, the value we use for calibrating the subjective discount factor ρ in the benchmark model in Table 2.[18] Figure 8 updates Figure 6 under endogenous r. The main lesson that sophisticates save out of the financial stress states remains true.

Endogenous stress choice. The benchmark model with exogenous $\Theta(a_t)$ and sophistication is equivalent to a model where the stress function $\Theta(a_t)$ is chosen endogenously. Specifically, consider an infinitely-lived household with discount rate ρ and flow utility:

$$\frac{c_t^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} - \varphi\frac{(\ell_t+\Theta_t)^{1+\frac{1}{v}}}{1+\frac{1}{v}} - W_{jt}(a_t,\Theta_t), \tag{16}$$

[18] For the naivete case, since the total wealth in the economy is already set to be 0.56 in the benchmark calibration, the endogenous interest rate r equals the exogenous interest rate r in Table 3.

Figure 8: Endogenous interest rate r (Sophistication).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. The interest rate adjusts endogenously to satisfy bonds market clearing condition.

wherej_t in $\{1,2\}$ captures the idiosyncratic income state at t. The household endogenously chooses consumption c_t, labor supply ℓ_t, and stress Θ_t to maximize its expected discount utility, subject to the budget constraint (2), the financial constraint (3), and the transition intensity between idiosyncratic states. This specification is motivated by the static model in Banerjee and Mullainathan (2008), where the household can endogenously choose to spend time/cognition Θ_t to alleviate disutility of financial stress $\partial W_j(a,\Theta)/\partial\Theta < 0$.[19] The next proposition summarizes the equivalence between this model of endogenous stress choice and our baseline model with exogenous stress function $\Theta(a_t)$.

Proposition 4. *There exists a disutility stress function* $\{W_j(a,\Theta)\}_{j=1}^2$ *such that the household problem with endogenous stress choice, (16), leads to the same optimal consumption and labor supply* $\{c_j(a),\ell_j(a)\}_{j=1}^2$ *as the household problem with exogenously decreasing stress function* $\Theta(a)$ *under sophistication.*

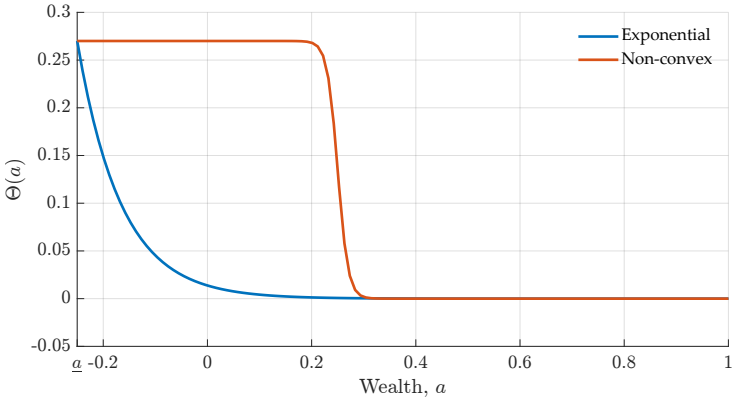
Alternative functional forms of stress: a weakly decreasing function. We consider an alternative stress function $\Theta(a)$, which takes the form of:

$$\sqrt{\Theta(a)} = \max\left\{\sqrt{\bar{\Theta}} - \alpha(a-\underline{a}), 0\right\}. \tag{17}$$

This stress function decreases with net wealth a up to a point after which it equals zero. This contrasts with the exponential stress function in (13), which is positive for all a. Similar to Section

[19]This model is also similar to Becker and Murphy (1988), where the decision maker can spend costly resources to alleviate addiction.

Figure 9: A Non-convex Stress Function



Notes: The blue line shows the exponential stress function in our benchmark model. The orange line plots a non-convex stress function $\Theta(a)$ (see equations (C.2) and (C.3) in Appendix C for the exact functional form).

3.4, we calibrate the stress function parameters based on survey questions Q17ab, Q19a, and Q19b (see Appendix C for a full explanation of the calibration procedure). Specifically, we set $\left(\bar{\Theta}, \alpha\right)$ to $(0.27, 2.06)$. Figures C.1 and C.2 in Appendix C verify that sophisticates still save out of financial stress states while naifs still fall into the poverty trap.

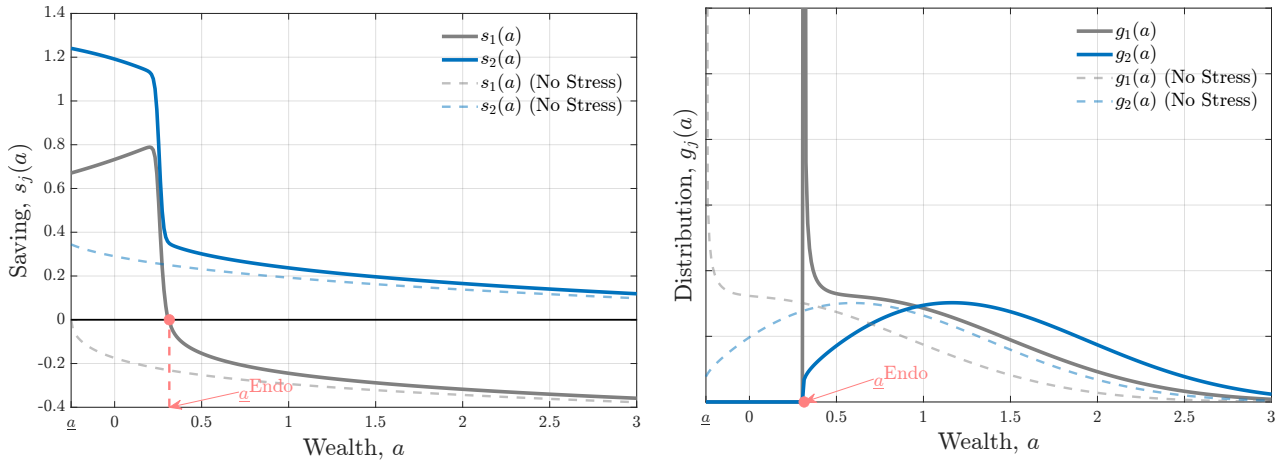
Alternative functional forms of stress: a non-convex function. One may wonder whether our result that sophisticates save out of the financial stress region depends on the convexity of the financial stress function $\Theta(a)$ in (13). We consider a robustness check with a non-convex stress function $\Theta(a)$ in Figure 9 (see Appendix C for the exact functional form). In Figure 9, the stress $\Theta(a)$ only starts to significantly decrease with a far away from the financial constraint $\underline{a}$. Is it impossible for a sophisticated household close to the financial constraint $\underline{a}$ to accumulate enough savings to be out of the financial stress region?

Figure 10 shows that sophisticates still save out of the financial stress region and that there are no sophisticates at the financial constraint in the stationary wealth distribution. To see this, note that the sophisticated household's Euler equation in (1) implies that their consumption only starts to increase at wealth levels with a high $\Theta'(a)$, away from the financial constraint. Close to the financial constraint $\underline{a}$, the sophisticated household's consumption is low and its net saving is high as in the left panel of Figure 10. This is why sophisticates still save out of the financial stress region.[20],[21]

[20] One way to generate a poverty trap under sophistication is to introduce a discontinuity in saving technology. For example, this can be a discrete human capital investment technology as in Galor and Zeira (1993). However, such a poverty trap is not robust to income uncertainty as explained in Acemoglu (2008) (Chapter 21.6).

[21] Naifs still fall into the poverty trap with the non-convex stress function $\Theta(a)$. See Appendix C.

Figure 10: Saving Behavior and Stationary Wealth Distribution (A Non-convex Stress Function under Sophistication).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. The stress function $\Theta(a)$ is non-convex as specified in equations (C.2) and (C.3) of Appendix C.

Multiplicative productivity loss. We consider a robustness check where the impact of financial stress takes the form of a multiplicative productivity loss. That is, the flow utility function in equation (1) takes the standard form of $u(c_t, \ell_t) = c_t^{1-1/\sigma}/(1-1/\sigma) - \varphi \ell_t^{1+1/v}/(1+1/v)$ and the budget in equation (2) becomes

$$\dot{a}_t = r a_t - c_t + w z_t \left[1 - \Theta(a_t)\right] \ell_t, \tag{18}$$

which features a multiplicative productivity loss driven by financial stress. Other parts of the model, including the calibration of parameters, are as in the main analysis. Figures C.4 and C.5 in Appendix C modify Figures 6 and 7. Sophisticates' saving behavior and wealth distribution are similar to the main analysis. Naifs still fall into the poverty trap, but in an extreme fashion: all naive stressed households are at the financial constraint. This is because the multiplicative productivity loss significantly decreases incentives to work at the financial constraint. As a result, even households in the high income state z_2 have negative net saving in the neighborhood of the financial constraint.

Different disutility from labor than from financial stress. In the main analysis, an increase in productive labor and an increase in cognition/time spent on finance lead to the same increase in disutility in equation (4). We consider a version of utility function where this assumption is

relaxed. That is, the utility function in equation (1) becomes:

$$u\left(c_t, \ell_t; \Theta\left(a_t\right)\right) = \frac{c_t^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} - \varphi \frac{\left(\ell_t + \chi\Theta\left(a_t\right)\right)^{1+\frac{1}{v}}}{1+\frac{1}{v}}, \tag{19}$$

where now an one unit increase in productive labor and an $1/\chi$ unit increase in cognition/time spent on finance lead to the same disutility. In Appendix C, we study the case with $\chi = 0.5$. Other parts of the model is the same as in the main analysis. We also use the same calibration for $\Theta\left(a_t\right)$ and other parameters. Figures C.6 and C.7 show the main results on sophistication versus naivete hold.

Alternative channels of financial stress: stressed spending. We study an alternative impact channel of financial stress through spending. As our survey question Q20 suggests, the household may spend on items that they would not buy if they were not financially stressed (e.g., alcohol or cigarettes). In this case, the utility function in equation (1) is $u\left(c_t, \ell_t\right) = c_t^{1-1/\sigma}/(1 - 1/\sigma) - \varphi\ell_t^{1+1/v}/(1+1/v)$ and the budget in equation (2) becomes

$$\dot{a}_t = ra_t - c_t - C^{\Theta}\left(a_t\right) + wz_t\ell_t, \tag{20}$$

where $C^{\Theta}\left(a_t\right)$ captures this type of stressed consumption. In Appendix C, we use the survey responses to Q20 to calibrate $C^{\Theta}\left(a_t\right)$ and study the impact of financial stress through stressed consumption. Figures C.8 and C.9 show that sophisticates still save out of financial stress states while naifs still fall into the poverty trap.

Alternative channels of financial stress: transition intensity between idiosyncratic income states. Instead of directly affecting labor earnings, financial stress can impact transition intensity between different idiosyncratic income states. That is, a stressed household is more likely to transition from the high income state to the low income state and is less likely to transition from the low income state to the high income state. This case can capture salaried workers well. For example, because financial stress affects her performance, a stressed worker may face a lower chance of being promoted to a higher salary job and a higher chance of being demoted to a lower salary job.

To capture this intuition in the context of our model, in Appendix C, we assume that the transition intensity from z_1 to z_2 is given by $\lambda - \bar{\lambda}e^{-\alpha(a_t - \underline{a})}$, while the transition intensity from z_2 to z_1 is given by $\lambda + \bar{\lambda}e^{-\alpha(a_t - \underline{a})}$. Other parts of the model are identical to those in the main analysis. We calibrate $\bar{\lambda}$ by setting it to $\lambda\bar{\Theta}$, where $\bar{\Theta}$ equals 0.27 as in 3.4. This means that, at the financial constraint, the maximum impact of financial stress on the transition intensity is proportional to

the maximum impact of financial stress on time and cognition available for productive work in the benchmark model (recall that we normalize the average total labor hours in the benchmark model to be 1). The calibration of α and other parameters are identical to those in the main analysis.

Figures C.10 and C.11 in Appendix C show that sophisticates' saving behavior and wealth distribution are very similar to those in the main analysis. Financial stress does not directly affect naifs' saving behavior anymore because financial stress does not directly affect their current labor earnings and does not prompt any extra saving motive. However, financial stress makes naifs more likely to be in the low income state and eventually lowers their wealth. In fact, the stationary wealth distribution for naive stressed households is very similar to the main analysis in Figure 7. In other words, even if financial stress only affects the transition intensity between different idiosyncratic income states, naive stressed households still fall into the poverty trap.

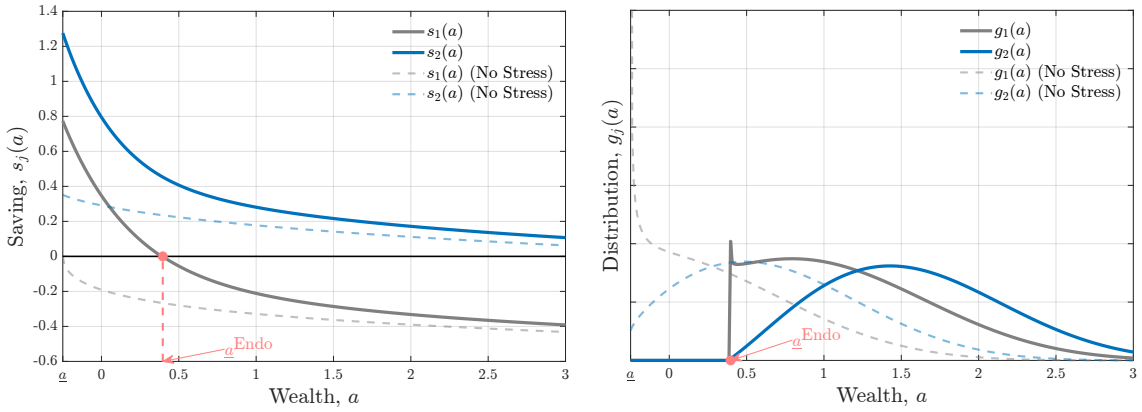
4.2 Calibration based on Kaur et al. (2022)

Here, we explore an alternative calibration of the financial stress function $\Theta(a)$ based on Kaur et al. (2022)'s estimates. They vary the *timing* of wage payment without affecting the total: some workers are paid earlier while others are paid later and remain liquidity constrained. They then estimate the effect of the interim payment on Indian manufacturing workers' productivity by measures of financial constraints.

We re-calibrate $\left(\rho, \bar{\Theta}, \alpha\right)$ to match Kaur et al. (2022)'s estimates with the model predictions of the naive financial stress case. We keep the rest of the parameters same as Table 3 for consistency. For ρ, we match Kaur et al. (2022)'s estimates that 64.5% of households in their sample cannot come up with 1000 Rs. of emergency fund (Table I). For $\left(\bar{\Theta}, \alpha\right)$, we match the two estimates in Table A.X of Kaur et al. (2022). First, the effect of interim payment (1400 Rs.) on worker's productivity for households which can't come up with 1000 Rs. of emergency fund is 9.18 percent (0.145 standard deviations of productivity). Second, the effect of interim payment on worker's productivity for households who can come up with 1000 Rs. of emergency fund is 1.46 percent (0.023 standard deviations of productivity). Kaur et al. (2022) use hourly production as their productivity measure. Its counterpart in our model is $z_j \ell_j(a) / [\ell_j(a) + \Theta(a)]$. The effect of interim payment on workers' productivity in the model is then given by $z_j \ell_j(a+\Delta) / [\ell_j(a+\Delta) + \Theta(a+\Delta)] - z_j \ell_j(a) / [\ell_j(a) + \Theta(a)]$, where Δ is the size of interim payment.

Since the average income in our model is normalized to 1, we normalize the data accordingly. We calculate the average household income of workers with characteristics similar to those in Kaur et al. (2022) based on Indian Sample Survey (77th round): (1) rural; (2) in the state of Odisha; (3) who are scheduled caste or scheduled tribe members; (4) whose primary occupation is casual labor in agriculture; (5) who own less than 1 acre of land. We find that the average household for

Figure 11: Calibration based on Kaur et al. (2022) (Sophistication).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. The calibration is based on Kaur et al. (2022)

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the restricted sample is 16871.6 Rs.[22] We then normalize all Rupees values by 16871.6 Rs., e.g., the size of interim payment $\Delta = 1400/16871.6 \approx 0.083$.

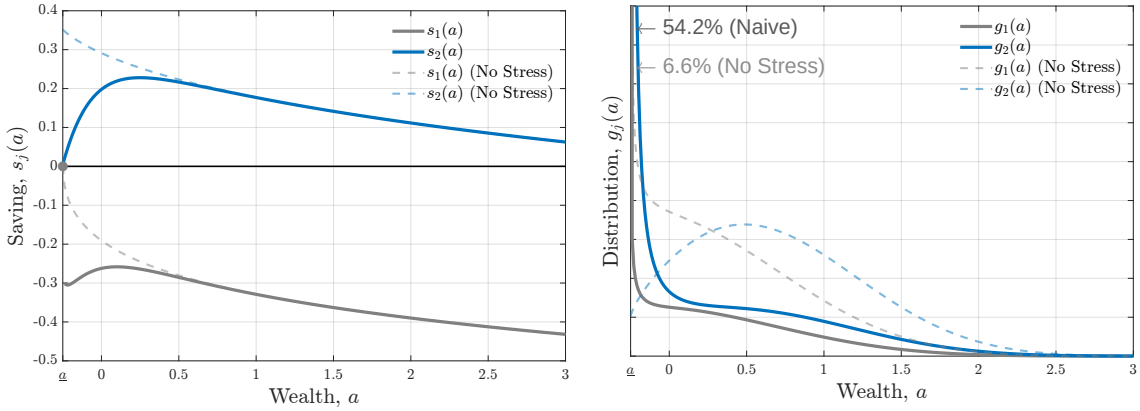
Given this calibration strategy, we find $\left(\bar{\Theta}, \alpha\right) = (0.26, 5.25)$. Compared to the main calibration in Table 3, the maximum level of financial stress $\bar{\Theta}$ is similar. Financial stress decreases with liquid asset somewhat slower here ($\alpha = 5.25$ v.s. $\alpha = 11.9$ in the main analysis). From Figures 11 and 12, we can see that the main lessons that sophisticates save out of financial stress states and naifs fall into the poverty trap remain to be true. There are more households at financial constraints for the naive case here. This is because we match Kaur et al. (2022)'s estimates that 64.5% of households in their sample cannot come up with 1000 Rs. of emergency fund, a number significantly higher than its US counterpart in Figure 3.

5 The Impact of Financial Stress: Labor Supply, Welfare, and Fiscal Stimulus

This section presents three additional implications of the model with financial stress. First, financial stress reduces the counterfactually large negative wealth effect on labor supply. Second, financial stress generates non-trivial welfare costs, especially for naifs. Finally, financial stress can make lump-sum fiscal transfers expansionary even without nominal rigidities.

[22]Results are winsorized at the top and bottom 1 percent.

Figure 12: Calibration based on Kaur et al. (2022) (Naivete).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under naivete. The calibration is based on Kaur et al. (2022)

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5.1 Financial Stress and the Wealth Effect of Labor Supply

The financial stress channel can also attenuate or reverse a counterfactually large negative wealth effect of labor supply. The sign and size of the wealth effect of labor supply are a longstanding puzzle (see Auclert, Bardóczy and Rognlie, 2021 for a recent treatment). Benchmark models with separable utility functions of consumption and labor predict a large negative wealth effect of labor supply. Nevertheless, its empirical estimates are often close to zero or even positive (Cesarini et al., 2017; Banerjee et al., 2020; Kaur et al., 2022).

The intuition why financial stress helps resolve the puzzle is simple. Relieving financial stress releases cognitive resources and time available for productive work and increases productive labor supply and earnings.

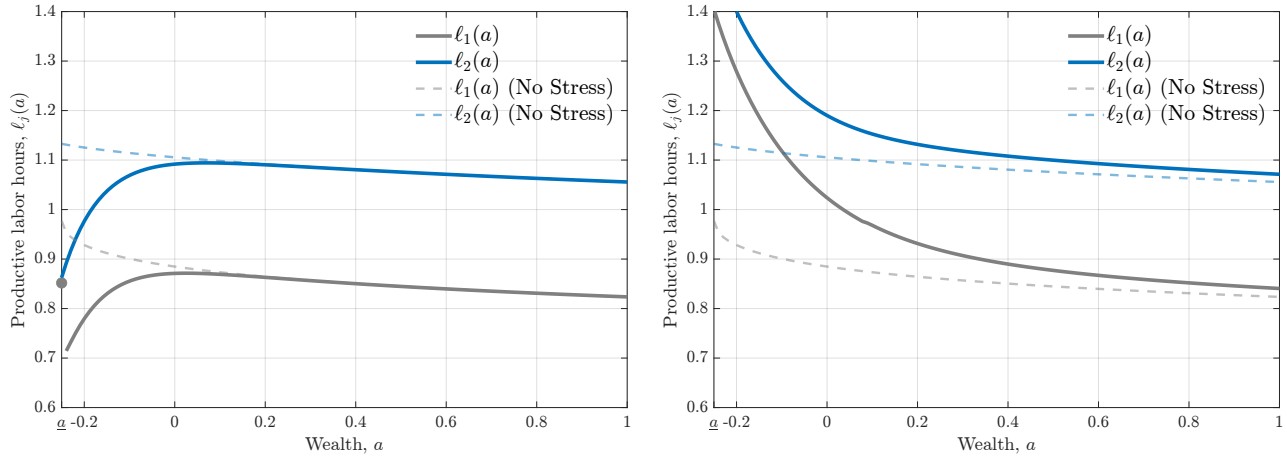
To see this, we take a derivative with respect to wealth a in the optimal labor supply in equation (8), which holds both for naifs and sophisticates:

$$\frac{d\ell_j(a)}{da} = \underbrace{-\frac{\ell_j(a)+\Theta(a)}{c_j(a)}\cdot\frac{v}{\sigma}\cdot\frac{dc_j(a)}{da}}_{<0,\text{ wealth effect}} \underbrace{-\frac{d\Theta(a)}{da}}_{>0,\text{ alleviating financial stress}} . \tag{21}$$

The first term captures the standard negative wealth effect of labor supply emphasized in Auclert, Bardóczy and Rognlie (2021). The second term captures the positive wealth effect on productive labor supply from alleviating financial stress.

The left panel of Figure 13 plots the labor supply $\ell_j(a)$ as a function of net wealth a for each productivity state $j \in \{1,2\}$. We compare a naive stressed household with a no-stress household. For a naive stressed household, the second channel in (21) dominates around financial constraints:

Figure 13: Labor Supply (Naivete vs Sophistication).



Notes: The left panel plots the labor supply function $\ell_j(a)$ at each idiosyncratic income state for the naive stressed households (solid lines) and non-stressed households (dashed lines). The right panel plots the labor supply function $\ell_j(a)$ at each idiosyncratic income state for the sophisticated stressed households (solid lines) and non-stressed households (dashed lines).

the wealth effect of labor supply is positive in the neighborhood of $\underline{a}$. Relieving financial stress releases cognitive and time available from productive work. This positive wealth effect of labor supply around financial constraints is consistent with the empirical evidence in Kaur et al. (2022) and Banerjee et al. (2020). Away from financial constraints, however, the canonical wealth effect channel, the first term in equation (21), dominates and the wealth effect of labor supply turns negative.

The right panel of Figure 13 compares a sophisticated stressed household's labor supply with a no-stress household's. For a sophisticated stressed household, the first term in equation (21) dominates. The wealth effect of labor supply is negative, even more so than the no-stress case. Akin to the extra saving motive in Figure 8, the sophisticated stressed household has an extra incentive to work because it wants to save more to alleviate future selves' financials stress. This channel contributes to the counterfactually large and negative wealth effect of labor supply.[23] Together, these observations further strengthens our belief that the evidence (Cesarini et al., 2017; Banerjee et al., 2020; Kaur et al., 2022) points to the direction of naivete in the context of financial stress.

5.2 Welfare Costs of Financial Stress

Financial stress generates non-trivial welfare costs, especially for naifs. To show this formally, we evaluate the welfare of a stressed household based on the expected discounted value of its utility

[23] Based on the left panel of Figure 6, we can infer that the sophisticated stressed household's consumption $c_j(a)$ is very sensitive to a in the neighborhood of $\underline{a}$. The first term in (21) is then large and dominates.

in equation (1) based on its consumption $c_j(a)$, labor supply $\ell_j(a)$, and the initial state $a_0 = a$ and $z_0 = z_j$ for $j \in \{1, 2\}$:

$$\omega_j(a) \equiv \mathbb{E}\left[\int e^{-\rho t} u\left(c_j(a_t), \ell_j(a_t); \Theta(a_t)\right) dt \middle| a_0 = a, z_0 = z_j\right]. \tag{22}$$

subject to the law of motion of assets (2) and the transition of idiosyncratic states. The HJB equation for $\{\omega_j(a)\}_{j=1}^2$ is

$$\rho\omega_j(a) = u\left(c_j(a), \ell_j(a); \Theta(a)\right) + \left[ra - c_j(a) + wz_j\ell_j(a)\right]\omega_j'(a) + \lambda\left[\omega_{-j}(a) - \omega_j(a)\right]. \tag{23}$$

Two points are worth clarifying. First, (22) and (23) hold under both sophistication and naivete. The differences between sophistication and naivete are summarized by decision rules$\{c_j(a), \ell_j(a)\}_{j=1}^2$. Second, under naivete, the welfare function $\{\omega_j(a)\}_{j=1}^2$ in (6) differs from the perceived value function in (11). The welfare function in (6) is evaluated from a paternalistic view point based on the correct understanding of the impact of financial stress. The perceived value function in (11) is, instead, based on the naive household's imperfect understanding of the impact of financial stress.

We then develop a money-metric measure of the welfare costs of financial stress. Given the initial state $a_0 = a$ and $z_0 = z_j$ for $j \in \{1, 2\}$, $t_j(a)$ captures the transfer needed to fully compensate the household for the impact of financial stress:

$$\omega_j\left(a + t_j(a)\right) = \omega_j^{\text{no-stress}}(a), \tag{24}$$

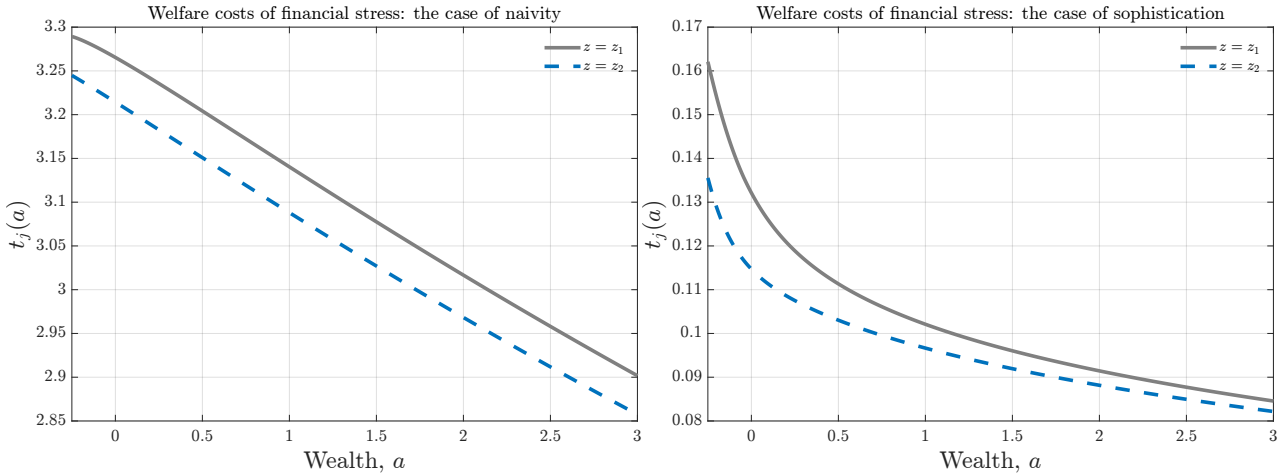
where $\omega_j^{\text{no-stress}}(a)$ captures the welfare in equation (22) without financial stress, i.e., $\Theta(a) = 0$.

Figure 14 plots the welfare costs of financial stress $\{t_j(a)\}_{j=1}^2$ under naivete and sophistication. The welfare costs of naifs' financial stress are much larger, roughly ten times larger than sophisticates. Naivete significantly worsens the welfare costs of financial stress because naifs' consumption and labor decisions are suboptimal from a paternalistic viewpoint taking account into financial stress. The lack of extra saving motive is costly.

5.3 The Financial Stress Channel of Fiscal Stimulus

A natural implication of the positive wealth effect of labor supply for stressed households in Section 5.1 is a new transmission mechanism for fiscal policy: a lump-sum fiscal stimulus relieves financial stress, increases productive labor supply, and boosts aggregate output. In fact, in Biden's speech about American Rescue Plan Act of 2021, he mentioned that "so many people need help, because (the pandemic) caused an enormous *stress*," and a key role for the stimulus check is to relieve the stress caused by the pandemic.

Figure 14: Welfare Costs of Financial Stress (Naivete vs Sophistication).



Notes: The left panel plots the welfare cost of stress $t_j(a)$ at each idiosyncratic income state for the naive stressed households. The right panel does so for the sophiscated stressed households.

To motivate this exercise, we ask in our survey the following question.

> *Q21b: On a scale from 1 to 10, how much did those checks alleviate your financial concerns?*

The respondents answer that these stimulus checks significantly alleviate there financial stress. Figure 15 shows that the median answer is 5.

To illustrate how financial stress introduces a new transmission mechanism for fiscal stimulus, we first consider a general equilibrium model with a representative financially stressed agent. That is, we consider the model in Section 3 but temporarily shut down the idiosyncratic productivity shock and treat z as a constant that equals one. We introduce a lump sum fiscal transfer T_t financed by public debt b_t.[24]

The household's budget constraint (2) becomes

$$\dot{a}_t = r_t a_t - c_t + T_t + w\ell_t,$$

while the government budget constraint and asset market clearing are given by

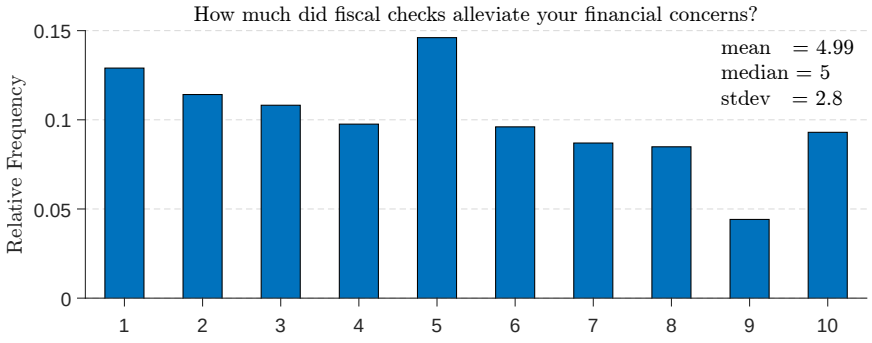
$$\dot{b}_t = r_t b_t + T_t \quad \text{and} \quad b_t = a_t.$$

On the production side, we make things simple and consider a competitive representative firm with linear production technology: $y_t = \ell_t$. Finally, good market clearing implies $c_t = y_t$.

We first revisit the no-stress benchmark.

[24] A positive T_t means a lump sum transfer and a negative T_t means a lump sum tax.

Figure 15: Stimulus Checks and Financial Stress.



Notes: The figure shows the histogram of the answers to question Q21b of our survey.

Proposition 5. *Without financial stress, i.e.,* $\Theta(a) = 0$ *for all* a*, equilibrium aggregate spending, labor supply, and output paths* $\{c_t, \ell_t, y_t\}_{t=0}^{+\infty}$ *are independent of the paths of fiscal stimulus and aggregate debt* $\{b_t, T_t\}_{t=0}^{+\infty}$

Proposition 5 is the famed Ricardian Equivalence result in Barro (1974). Fiscal transfers financed by public debt do not change the household's the present value of its life-time post-tax income, because an increase in public debt leads to increases in future taxes. As a result, these fiscal transfers do not affect the household's consumption and labor supply. Equilibrium aggregate spending, labor supply, and output are hence unchanged.

Now, we show how the financial stress channel breaks the Ricardian Equivalence and provides a new rationale for using fiscal transfers to stimulate the economy.

Proposition 6. *Fiscal stimulus financed by public debt stimulates aggregate spending and output:*

$$\frac{dy_t}{db_t} = -\frac{\varphi^v}{\varphi^v + \frac{v}{\sigma} y_t^{-\frac{v}{\sigma}-1}} \Theta'(b_t) > 0.$$

To understand this result, note that asset market clearing $a_t = b_t$ means that the equilibrium stress level $\Theta(a_t) = \Theta(b_t)$ decreases with the level of public debt b_t. Public debt-financed stimulus checks boosts private assets and alleviates financial stress. This increases effective labor supply and boosts aggregate output.

We now turn to the heterogeneous-agent version of our model with idiosyncratic risk, as in the main analysis. Taking into account the taxes, the budget constraint of a household (2) $i \in [0, 1]$ becomes[25]

$$\dot{a}_{i,t} = r a_{i,t} - c_{i,t} + w z_{i,t} \ell_{i,t} - T_t.$$

[25]The key difference from the Huggett-like endogenous r exercise in Section 4.1 is: we follow Achdou et al. (2022) there, so the household is not taxed and is subject to the budget constraint (2).

The production side of the economy is similar to above: the competitive representative firm produces given the linear technology: $y_t = \int z_{i,t}\ell_{i,t}di$. In equilibrium, goods and asset market clear: $y_t = c_t$, $\int a_{i,t}di = B_t$, and the interest rate r_t adjusts to ensure market clearing.

To assess the effect of public debt increase, we compare the aggregate output level in two stationary equilibria where the only exogenous variable that differ is the level of outstanding public debt B. In one case, public debt level $B = 0.56$, same as the aggregate asset level in Table 3 in the main analysis. In another case, public debt rises to the new steady level of $B + \Delta B$, where $\Delta B = 0.4$ (e.g., similar to the expansion of public debt during the COVID-19 pandemic). In each case, the government keeps the level of government debt at a constant level by collecting taxes $T_t = r_t B_t$ in every instant t. These taxes are levied uniformly across all agents in the economy. All the calibration parameters (except the endogenous real interest rate) are identical to our benchmark calibration in Table 3. We find that

$$\frac{y(B + \Delta B) - y(B)}{y(B)} = 1.14\%,$$

where $y(B)$ is the level of aggregate output in a stationary equilibrium with outstanding public debt B. In other words, an increase of public debt similar to the expansion of public debt during the COVID-19 pandemic can boost aggregate output by 1.14 percent. Note that this calculation isolates the supply side channel of financial stress on labor supply. Introducing demand side channel through nominal rigidities can potentially make the effect larger.

6 Conclusion

In this paper, we investigate the psychological costs of financial constraints, financial stress. We document that the majority of US households experience financial stress, and financial stress is strongly correlated with measures of financial constraints. We develop a tractable model of intertemporal decisions and wealth distribution incorporating financial stress. We show that a psychology-based theory of poverty trap requires not only financial stress itself but also naivete. The financial stress channel can also reverse the counterfactual negative wealth effect of labor supply. Financial stress also has macroeconomic consequences on wealth inequality and fiscal multipliers.

References

Acemoglu, Daron. (2008) *Introduction to Modern Economic Growth.* Princeton University Press.

Achdou, Yves, Jiequn Han, Jean-Michel Lasry, Pierre-Louis Lions, and Benjamin Moll. (2022) "Income and wealth distribution in macroeconomics: A continuous-time approach." *The review of economic studies*, 89(1): 45–86.

American Psychological Association. (2022) "Stress in America: March 2022." American Psychological Association. Available at https://www.apa.org/news/press/releases/stress/2022/infographics-march.

Andre, Peter, Carlo Pizzinelli, Christopher Roth, and Johannes Wohlfart. (2022) "Subjective models of the macroeconomy: Evidence from experts and a representative sample." *Review of Economic Studies*.

Auclert, Adrien, Bence Bardóczy, and Matthew Rognlie. (2021) "MPCs, MPEs, and Multipliers: A Trilemma for New Keynesian Models." *Review of Economics and Statistics*.

Banerjee, Abhijit, and Sendhil Mullainathan. (2010) "The shape of temptation: Implications for the economic lives of the poor." *NBER Working Paper*.

Banerjee, Abhijit, Dean Karlan, Hannah Trachtman, and Christopher Udry. (2020) "Does Poverty Change Labor Supply? Evidence from Multiple Income Effects and 115,579 Bags."

Banerjee, Abhijit V, and Andrew F Newman. (1993) "Occupational choice and the process of development." *Journal of political economy*, 101(2): 274–298.

Banerjee, Abhijit V, and Sendhil Mullainathan. (2008) "Limited attention and income distribution." *American Economic Review*, 98(2): 489–93.

Barro, Robert J. (1974) "Are government bonds net wealth?" *Journal of political economy*, 82(6): 1095–1117.

Becker, Gary S, and Kevin M Murphy. (1988) "A theory of rational addiction." *Journal of political Economy*, 96(4): 675–700.

Bernheim, B Douglas, Debraj Ray, and Şevin Yeltekin. (2015) "Poverty and self-control." *Econometrica*, 83(5): 1877–1911.

Bhargava, Saurabh, and Lynn Conell-Price. (2021) "Serenity Now, Save Later? Evidence on Retirement Savings Puzzles from a 401 (k) Field Experiment." *CMU mimeo.*

Biden, Joe. (2021) "Remarks by President Biden on the American Rescue Plan."

Board of Governors of the Federal Reserve System. (2021) "Economic Well-Being of U.S. Households in 2020 - May 2021." Available at https://www.federalreserve.gov/publications/2021-economic-well-being-of-us-households-in-2020-dealing-with-unexpected-expenses.htm.

Carroll, Christopher D. (1997) "Buffer-stock saving and the life cycle/permanent income hypothesis." *The Quarterly journal of economics*, 112(1): 1–55.

Cesarini, David, Erik Lindqvist, Matthew J Notowidigdo, and Robert Östling. (2017) "The effect of wealth on individual and household labor supply: evidence from Swedish lotteries." *American Economic Review*, 107(12): 3917–46.

Chilton, David. (1998) *The Wealthy Barber: Everyone's Commonsense Guide to Becoming Financially Independent.* Currency.

Clark, Robert L, Annamaria Lusardi, and Olivia S Mitchell. (2021) "Financial fragility during the COVID-19 Pandemic." Vol. 111, 292–96.

CNBC. (2021) "73% of Americans rank their finances as the No. 1 stress in life, according to new Capital One CreditWise survey." Available at https://www.cnbc.com/select/73-percent-of-americans-rank-finances-as-the-number-one-stress-in-life/.

Dalton, Patricio S, Sayantan Ghosal, and Anandi Mani. (2016) "Poverty and aspirations failure." *The Economic Journal*, 126(590): 165–188.

Dasgupta, Partha, and Debraj Ray. (1986) "Inequality as a determinant of malnutrition and unemployment: Theory." *The Economic Journal*, 96(384): 1011–1034.

Dasgupta, Partha, and Debraj Ray. (1987) "Inequality as a determinant of malnutrition and unemployment: policy." *The Economic Journal*, 97(385): 177–188.

Fink, Gunther, B Kelsey Jack, and Felix Masiye. (2020) "Seasonal liquidity, rural labor markets, and agricultural production." *American Economic Review*, 110(11): 3351–92.

Galor, Oded, and Joseph Zeira. (1993) "Income distribution and macroeconomics." *The review of economic studies*, 60(1): 35–52.

Gourinchas, Pierre-Olivier, and Jonathan A Parker. (2002) "Consumption over the life cycle." *Econometrica*, 70(1): 47–89.

Guerrieri, Veronica, and Guido Lorenzoni. (2017) "Credit crises, precautionary savings, and the liquidity trap." *The Quarterly Journal of Economics*, 132(3): 1427–1467.

Harris, Christopher, and David Laibson. (2013) "Instantaneous gratification." *The Quarterly Journal of Economics*, 128(1): 205–248.

Hasler, Andrea, Annamaria Lusardi, and Olivia Valdes. (2021) "Financial Anxiety and Stress among US Households: New Evidence from the National Financial Capability Study and Focus Groups." *FINRA Investor Education Foundation*.

Haushofer, Johannes, and Ernst Fehr. (2014) "On the psychology of poverty." *science*, 344(6186): 862–867.

Haushofer, Johannes, and Jeremy Shapiro. (2016) "The short-term impact of unconditional cash transfers to the poor: experimental evidence from Kenya." *The Quarterly Journal of Economics*, 131(4): 1973–2042.

Huggett, Mark. (1993) "The risk-free rate in heterogeneous-agent incomplete-insurance economies." *Journal of economic Dynamics and Control*, 17(5-6): 953–969.

Kaplan, Greg, and Giovanni L Violante. (2022) "The Marginal Propensity to Consume in Heterogeneous Agent Models." *Annual Review of Economics*, 14: 747–775.

Kaplan, Greg, Benjamin Moll, and Giovanni L Violante. (2018) "Monetary policy according to HANK." *American Economic Review*, 108(3): 697–743.

Kaur, Supreet, Sendhil Mullainathan, Suanna Oh, and Frank Schilbach. (2022) "Do Financial Concerns Make Workers Less Productive?" *NBER Working Paper*.

Krusell, Per, and Anthony A Smith, Jr. (1998) "Income and wealth heterogeneity in the macroeconomy." *Journal of political Economy*, 106(5): 867–896.

Laibson, David. (1997) "Golden Eggs and Hyperbolic Discounting." *The Quarterly Journal of Economics*, 112(2): 443–478.

Lichand, Guilherme, and Anandi Mani. (2020) "Cognitive droughts." *University of Zurich Mimeo*.

Lusardi, Annamaria, Daniel J Schneider, and Peter Tufano. (2011) "Financially Fragile Households: Evidence and Implicationss." *Brookings Papers on Economic Activity*, 83–150.

Mani, Anandi, Sendhil Mullainathan, Eldar Shafir, and Jiaying Zhao. (2013) "Poverty impedes cognitive function." *science*, 341(6149): 976–980.

Maxted, Peter. (2021) "Present bias in consumption-saving models: A tractable continuous-time approach."

Mian, Atif, Ludwig Straub, and Amir Sufi. (2021) "Indebted demand." *The Quarterly Journal of Economics*, 136(4): 2243–2307.

Michaillat, Pascal, and Emmanuel Saez. (2021) "Resolving New Keynesian anomalies with wealth in the utility function." *Review of Economics and Statistics*, 103(2): 197–215.

Mullainathan, Sendhil, and Eldar Shafir. (2013) *Scarcity: Why having too little means so much.* Macmillan.

O'Donoghue, Ted, and Matthew Rabin. (1999) "Doing it now or later." *American economic review*, 89(1): 103–124.

O'Donoghue, Ted, and Matthew Rabin. (2001) "Choice and procrastination." *The Quarterly Journal of Economics*, 116(1): 121–160.

Olen, Helaine, and Harold Pollack. (2016) *The Index Card: Why Personal Finance Doesn't Have to be Complicated.* Penguin.

Ong, Qiyan, Walter Theseira, and Irene YH Ng. (2019) "Reducing debt improves psychological functioning and changes decision-making in the poor." *Proceedings of the National Academy of Sciences*, 116(15): 7244–7249.

Pew Charitable Trusts. (2016) "Barriers to Saving and Policy Opportunities: The Role of Emergency Savings in Family Financial Security."

Schilbach, Frank, Heather Schofield, and Sendhil Mullainathan. (2016) "The psychological lives of the poor." *American Economic Review*, 106(5): 435–40.

Straub, Ludwig. (2019) "Consumption, savings, and the distribution of permanent income." *Harvard University mimeo.*

Yakoboski, Paul, Annamaria Lusardi, and Andrea Hasler. (2020) "The 2020 TIAA Institute-GFLEC Personal Finance Index: Many do not know what they do and do not know."

A Proofs

This section collects the proofs omitted from the main text of the paper.

A.1 Proof of Proposition 1

Differentiating the HJB equation (6) and using the envelope theorem, we obtain

$$\rho v_j^{'}(a) = -\varphi\left[\ell(a)+\Theta(a)\right]^{\frac{1}{v}}\Theta^{'}(a)+rv_j^{'}(a)+\left[ra-c_j(a)+wz_j\ell_j(a)\right]v_j^{''}(a)+\lambda\left(v_{-j}^{'}(a)-v_j^{'}(a)\right). \tag{A.1}$$

Together with optimal consumption in (7) and the optimal labor supply in (8), we have:

$$\rho c_j^{-\frac{1}{\sigma}}(a) = \left[r-wz_j\Theta^{'}(a)\right]c_j^{-\frac{1}{\sigma}}(a)-\frac{1}{\sigma}\left[ra-c_j(a)+wz_j\ell_j(a)\right]c_j^{-\frac{1}{\sigma}-1}(a)\,c_j^{'}(a)+\lambda\left[c_{-j}^{-\frac{1}{\sigma}}(a)-c_j^{-\frac{1}{\sigma}}(a)\right]$$

From the budget (2) and the transition intensity of the idiosyncratic productivity, we know

$$\mathbb{E}_t\left[d\left(c_j^{-\frac{1}{\sigma}}(a)\right)\right] = \left[-\frac{1}{\sigma}\left(ra-c_j(a)+wz_j\ell_j(a)\right)c_j^{-\frac{1}{\sigma}-1}(a)\,c_j^{'}(a)+\lambda\left(c_{-j}^{-\frac{1}{\sigma}}(a)-c_j^{-\frac{1}{\sigma}}(a)\right)\right]dt$$

Together, we have

$$-\frac{\mathbb{E}_t\left[d\left(c_j^{-\frac{1}{\sigma}}(a)\right)\right]}{c_j^{-\frac{1}{\sigma}}(a)} = \left[r-\rho-wz_j\Theta'(a)\right]dt.$$

A.2 Proof of Proposition 2

Differentiating the HJB equation (11) and using the envelope theorem, we get

$$\begin{aligned}\rho\left(v_j^p\right)^{'}(a) = &-\varphi\mu\left[\ell_j^p(a)+\mu\Theta(a)\right]^{\frac{1}{v}}\Theta^{'}(a)+r\left(v_j^p\right)^{'}(a)+\left[ra-c_j^p(a)+wz_j\ell_j^p(a)\right]\left(v_j^p\right)^{''}(a)\\ &+\lambda\left[\left(v_{-j}^p\right)^{'}(a)-\left(v_j^p\right)^{'}(a)\right],\end{aligned}$$

where $c_j^p(a)$ and $\ell_j^p(a)$ solve the HJB equation (11) and are given by the following first order optimality conditions

$$\begin{aligned}\varphi\left[\ell_j^p(a)+\mu\Theta(a)\right]^{\frac{1}{v}} &= wz_j\left(c_j^p(a)\right)^{-\frac{1}{\sigma}}\\ \left(c_j^p(a)\right)^{-\frac{1}{\sigma}} &= \left(v_j^p\right)^{'}(a).\end{aligned}$$

From equations (8) and (10), we know that

$$c_j^p(a) = c_j(a) \quad \text{and} \quad \ell_j^p(a) = \ell_j(a) + (1-\mu)\Theta(a).$$

Combining these insights, we obtain

$$\begin{aligned}\rho c_j^{-\frac{1}{\sigma}}(a) = &\left[r - \mu w z_j \Theta'(a)\right] c_j^{-\frac{1}{\sigma}}(a) - \frac{1}{\sigma}\left[ra - c_j(a) + w z_j \ell_j(a)\right] c_j^{-\frac{1}{\sigma}-1}(a)\, c_j'(a) \\ &+ \lambda\left[c_{-j}^{-\frac{1}{\sigma}}(a) - c_j^{-\frac{1}{\sigma}}(a)\right] - \frac{1-\mu}{\sigma} w z_j \Theta(a)\, c_j^{-\frac{1}{\sigma}-1}(a)\, c_j'(a).\end{aligned} \tag{A.2}$$

From the budget (2), the transition intensity of the idiosyncratic productivity, and Ito's lemma for jump processes, we know

$$\mathbb{E}_t\left[d\left(c_j^{-\frac{1}{\sigma}}(a)\right)\right] = \left[-\frac{1}{\sigma}\left(ra - c_j(a) + w z_j \ell_j(a)\right) c_j^{-\frac{1}{\sigma}-1}(a)\, c_j'(a) + \lambda\left(c_{-j}^{-\frac{1}{\sigma}}(a) - c_j^{-\frac{1}{\sigma}}(a)\right)\right] dt. \tag{A.3}$$

Using equation (A.3), we can rewrite equation (A.2) in a more compact form

$$\rho c_j^{-\frac{1}{\sigma}}(a) = \left(r - \mu w z_j \Theta'(a)\right) c_j^{-\frac{1}{\sigma}}(a) + E_t\left[d\left(c_j^{-\frac{1}{\sigma}}(a)\right)\right] - \frac{1-\mu}{\sigma} w z_j \Theta(a)\, c_j^{-\frac{1}{\sigma}-1}(a)\, c_j'(a),$$

which simplifies to

$$-\frac{\mathbb{E}_t\left[d\left(c_j^{-\frac{1}{\sigma}}(a)\right)\right]}{c_j^{-\frac{1}{\sigma}}(a)} = \left[r - \rho - \mu w z_j \Theta'(a) - \frac{1-\mu}{\sigma} w z_j \Theta(a) \frac{c_j'(a)}{c_j(a)}\right] dt.$$

A.3 Proof of Proposition 3

Part 1. Note that with a deterministic z, Proposition 1 implies

$$-\frac{dc_j^{-\frac{1}{\sigma}}(a)}{c_j^{-\frac{1}{\sigma}}(a)} = \frac{1}{\sigma}\cdot\frac{dc_j(a)}{c_j(a)} = \frac{1}{\sigma}\cdot\frac{c_j'(a)\, s(a)\, dt}{c_j(a)} = \left(r - \rho - w z_j \Theta'(a)\right) dt.$$

Because $c_j'(a) > 0$, $s(a)$ has the same sign as $r - \rho - w z_j \Theta'(a)$. Part 1 of Proposition 3 then follows from the fact $\Theta(\cdot) \in \mathcal{C}^1(\mathbb{R}^+)$.

Part 2. Note that, with a deterministic z and Proposition 2

$$-\frac{dc_j^{-\frac{1}{\sigma}}(a)}{c_j^{-\frac{1}{\sigma}}(a)} = \frac{1}{\sigma}\cdot\frac{dc_j(a)}{c_j(a)} = \frac{1}{\sigma}\cdot\frac{c_j'(a)\, s(a)\, dt}{c_j(a)} = \left[r - \rho - \frac{1}{\sigma} w z_j \Theta(a) \frac{c_j'(a)}{c_j(a)}\right] dt.$$

Because $r < \rho$ and $c_j'(a) > 0$, $s(a)$ has the same sign as $r - \rho - \sigma^{-1} w z_j \Theta(a) c_j'(a) / c_j(a) < 0$. This proves part 2 of Proposition 3.

Part 3. See Part 1 of Proposition 1 in Achdou et al. (2022).

A.4 Proof of Proposition 4

Consider our benchmark problem with an exogenously decreasing stress function $\Theta^{\text{benchmark}}(a)$ under sophistication studied in Section 3. Let $\{c_j^{\text{benchmark}}(a), \ell_j^{\text{benchmark}}(a)\}_{j=1}^2$ be the optimal consumption and labor supply and $\{v_j^{\text{benchmark}}(a)\}_{j=1}^2$ be the optimal value function. We can find $\{W_j(a, \Theta)\}_{j=1}^2$ such that

$$W_j(a, \Theta) = W_{0,j}(a) - \Theta W_{1,j}(a),$$

where Θ is a real number and

$$W_{1,j}(a) \equiv w z_j \left(c_j^{\text{benchmark}}(a)\right)^{-\frac{1}{\sigma}} = \varphi \left(\ell_j^{\text{benchmark}}(a) + \Theta^{\text{benchmark}}(a)\right)^{\frac{1}{v}} = w z_j \left(v_j^{\text{benchmark}}\right)'(a), \tag{A.4}$$

and

$$W_{0,j}(a) \equiv \Theta^{\text{benchmark}}(a) w z_j \left(v_j^{\text{benchmark}}\right)'(a),$$

so that

$$W_{0,j}'(a) = w z_j \left(c_j^{\text{benchmark}}(a)\right)^{-\frac{1}{\sigma}} \left(\Theta^{\text{benchmark}}\right)'(a) + \Theta_j(a) w z_j \left(v_j^{\text{benchmark}}\right)''(a). \tag{A.5}$$

Now, consider the household problem with endogenous stress choice (16) with (A.4) and (A.5). The corresponding HJB equation of the household problem is

$$\rho v_j(a) = \max_{c,\ell,\Theta} \left\{ \frac{c^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} - \varphi \frac{(\ell+\Theta)^{1+\frac{1}{v}}}{1+\frac{1}{v}} - [W_{0,j}(a) - \Theta W_{1,j}(a)] + (ra - c + w z_j \ell) v_j'(a) + \lambda [v_{-j}(a) - v_j(a)] \right\}$$

Let us use $\{c_j(a), \ell_j(a), \Theta_j(a)\}_{j=1}^2$ to denote the optimal consumption, labor supply, and stress choices and $\{v_j(a)\}_{j=1}^2$ to denote the value function evaluated at optimum. Optimal choices imply

$$w z_j v_j'(a) = w z_j (c_j(a))^{-\frac{1}{\sigma}} = \varphi (\ell_j(a) + \Theta_j(a))^{\frac{1}{v}} = W_{1,j}(a). \tag{A.6}$$

Using the definition (A.4) and the optimality condition (A.6), we deduce that

$$c_j(a) = c_j^{\text{benchmark}}(a), \quad v_j'(a) = \left(v_j^{\text{benchmark}}\right)'(a), \quad \text{and} \quad \ell_j^{\text{benchmark}}(a) + \Theta^{\text{benchmark}}(a) = \ell_j(a) + \Theta_j(a). \tag{A.7}$$

The envelope theorem implies

$$\rho v_j'(a) = -W_{0,j}'(a) + \Theta_j(a) W_{1,j}'(a) + r v_j'(a) + [ra - c_j(a) + w z_j \ell_j(a)] v_j''(a) + \lambda \left[v_{-j}'(a) - v_j'(a)\right].$$

Together with (A.4), (A.5), and (A.7), we have

$$\begin{aligned}\rho \left(v_j^{\text{benchmark}}\right)'(a) = &- \varphi \left[\ell_j^{\text{benchmark}}(a) + \Theta^{\text{benchmark}}(a)\right]^{\frac{1}{v}} \left(\Theta^{\text{benchmark}}\right)'(a) + r \left(v_j^{\text{benchmark}}\right)'(a), \\ &+ \left[ra - c_j^{\text{benchmark}}(a) + w z_j \ell_j(a)\right] \left(v_j^{\text{benchmark}}\right)''(a) + \lambda \left[\left(v_{-j}^{\text{benchmark}}\right)'(a) - \left(v_j^{\text{benchmark}}\right)'(a)\right.\end{aligned}$$

Comparing the last equation to equation (A.1) above, we get

$$\ell_j(a) = \ell_j^{\text{benchmark}}(a) \quad \text{and} \quad \Theta_j(a) = \Theta^{\text{benchmark}}(a),$$

and Proposition 4 is proved.

A.5 Proof of Proposition 5

Optimal labor supply implies

$$\varphi \ell_t^{\frac{1}{v}} = w c_t^{-\frac{1}{\sigma}}.$$

Technology $y_t = \ell_t$ and market clearing $c_t = y_t$ imply

$$w = 1 \quad \text{and} \quad c_t = \ell_t = y_t.$$

Together, we have

$$\varphi y_t^{\frac{1}{v}} = y_t^{-\frac{1}{\sigma}} \Longrightarrow y_t = \varphi^{-1/\left(\frac{1}{\sigma} + \frac{1}{v}\right)}.$$

As a result, $\{c_t, \ell_t, y_t\}_{t=0}^{+\infty}$ are independent of the path of fiscal stimulus and aggregate debt $\{b_t, T_t\}_{t=0}^{+\infty}$.

A.6 Proof of Proposition 6

Optimal labor supply and asset market clearing imply

$$\varphi \left[\ell_t + \Theta\left(b_t\right)\right]^{\frac{1}{v}} = w c_t^{-\frac{1}{\sigma}}.$$

Technology $y_t = \ell_t$ and the market clearing $c_t = y_t$ imply

$$w = 1 \quad \text{and} \quad c_t = \ell_t = y_t.$$

Together, we have

$$\varphi \left(y_t + \Theta\left(b_t\right)\right)^{\frac{1}{v}} = y_t^{-\frac{1}{\sigma}}.$$

After taking a derivative of the both sides of the last equation with respect to the level of debt b_t, we obtain

$$\frac{dy_t}{db_t} = -\frac{\varphi^v \Theta'\left(b_t\right)}{\varphi^v + \frac{v}{\sigma} y_t^{-\frac{v}{\sigma}-1}}.$$

B Analysis based on the Restricted Sample

We incorporate an attention check in the survey. We first say:

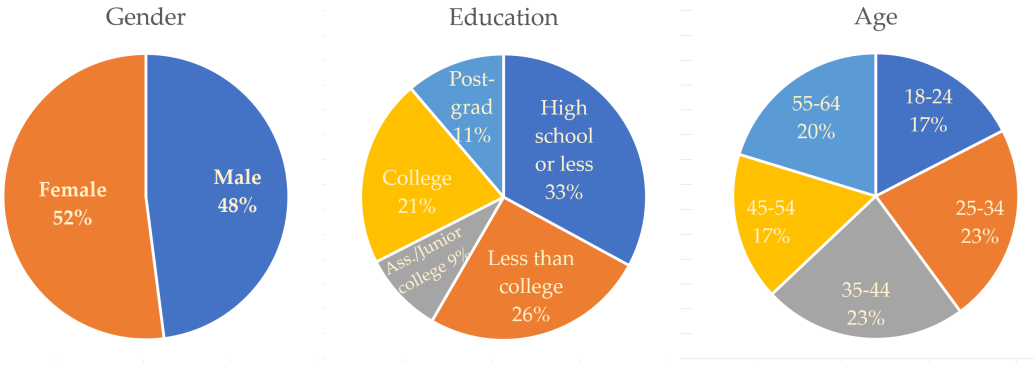
> *Q14. The next question is about the following problem. In questionnaires like ours, sometimes there are participants who do not carefully read the questions and just quickly click through the survey. This means that there are a lot of random answers which compromise the results of research studies. To show that you read our questions carefully, please enter turquoise as your answer to the next question.*

We then ask what your favorite color is. In this Appendix, we report all analysis for the restricted sample of participants who pass all attention checks. The analysis is very similar to the full sample reported in the main text.

B.1 Demographics

In Figure B.1 and Table B.1, we report the demographics of the restricted sample of participants who pass all attention checks. Compared to Figure 1 and Table 1 based on the full sample, this sample is slightly more educated. It also has a somewhat higher average annual income ($66,649 vs $62,432) and average net asset ($83,092 vs $66,791).

Figure B.1: Restricted Sample Characteristics: Demographics



Notes: These pie charts represent the sample characteristics based on the subsample of respondends who answered the screener question Q14 (see above and Appendix D) correctly.

B.2 The Prevalence of Financial Stress

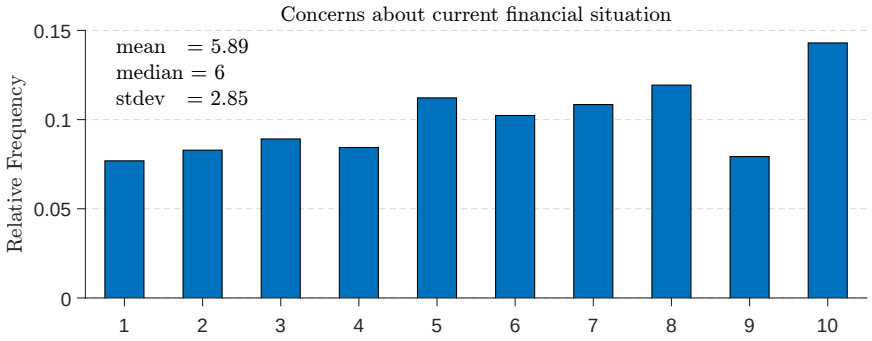
In Figure B.2 and Table B.2, we report the prevalence of financial stress in the restricted sample of participants who pass all attention checks. The qualitative measure of financial stress based on this sample is very similar to Figure 2 based on the full sample. For the quantitative measures

Table B.1: Restricted Sample Characteristics: h/h size, Annual Income, Net Assets

Vars	Obs	Mean	Median	Std	Min	Max	q25	q75
Household size	6,686	2.3	0	1.6	0	11	1	3
Annual income	6,686	66,649	55,000	63,332	5,000	600,000	25,000	85,000
Net assets	6,667	83,092	5,000	236,668	-55,000	1,100,000	-25,000	55,000

Notes: This table shows the sample characteristics based on the subsample of respondends who answered the screener question Q14 (see above and Appendix D) correctly.

Figure B.2: Qualitative Measure of Financial Stress, the Restricted Sample



Notes: The figure shows the histogram of the answers to question Q12 of the survey based on the subsample of respondends who answered the screener question Q14 (see above and Appendix D) correctly.

(compared to Table 2), the restricted sample is slightly less affected by financial stress: the average hours distracted at work is 6.0 hours (v.s. 6.4 hours) per week, the average hours hours spent thinking about and dealing with financial issues is 7.3 hours (v.s. 7.7 hours) per week, and the average amount of dollars spent on alleviating financial stress is 198.4 dollars (v.s. 211.2 dollars) per week.

B.3 Financial Stress and Measures of Financial Constraints

In Figures B.3, B.4, and B.5, we report the relationship between financial stress and measures of financial constraints in the restricted sample of participants who pass all attention checks. The distribution of the measures of financial constraints in Figure B.3 is very similar to Figure 3 based on the full sample. Figure B.4 shows that this measure of financial constraint is again strongly

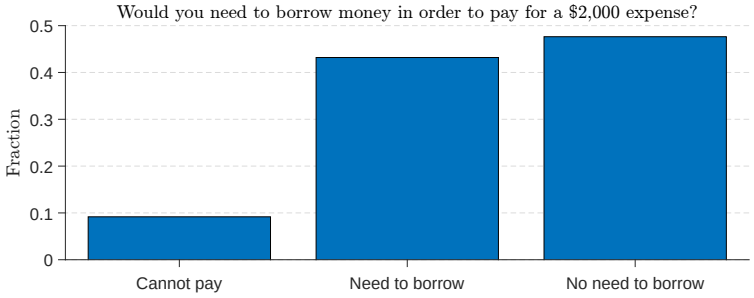
Table B.2: The Impact of Financial Stress, the Restricted Sample

	Obs	Mean	Median	Std	Min	Max	q25	q75
Hours worked	6,681	39.0	40	13.3	0	100	32	45
Working hours distracted	4,982	6.0	5	6.0	0	20	1	10
Hours on financial issues	1,648	7.3	5	5.9	0	20	3	10
$ on stress	6,679	198.4	100	257.1	0	1000	25	250

Notes: "Hours worked" represent the answers to the question Q16, "working hours distracted" to the question Q17ab, "hours on financial issues" to the question Q17c, and "$ on stress" to question Q20. The restricted sample is a subsample of respondends who answered the screener question Q14 (see above and Appendix D) correctly.

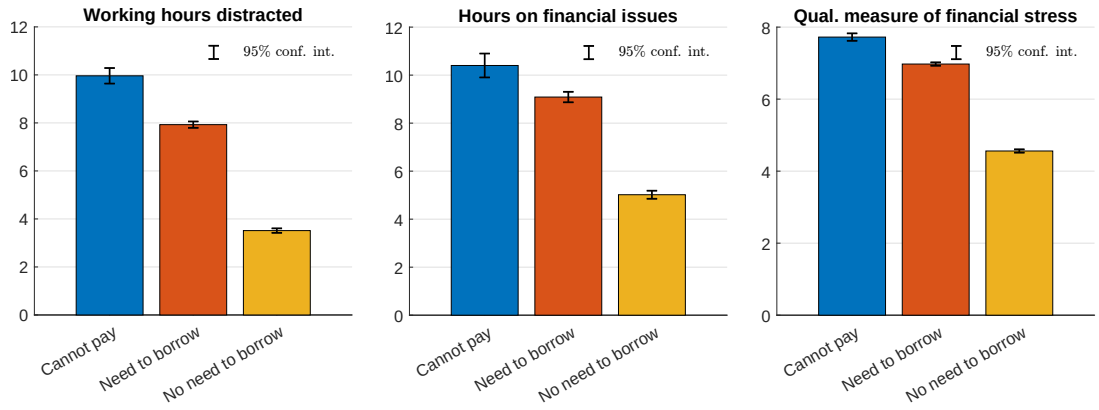
correlated with all measures of financial stress, similar to Figure 4 based on the full sample. Figure B.5 summarizes the responses to Q19a and Q19b. Compared to Figure 5, respondents in the restricted sample report that they would be distracted for 11.2 hours (v.s. 10.8 hours) per week at financial constraints. A $2,000 check on average would reduce the distraction at work by 2.6 hours (v.s. 2.2 hours) per week.

Figure B.3: Measures of Financial Constraints, the Restricted Sample



Notes: the figure shows the histogram of the answer to the question Q9 based on the subsample of respondends who answered the screener question Q14 (see above and Appendix D) correctly.

Figure B.4: Average Financial Stress by Measures of Financial Constraints, the Restricted Sample

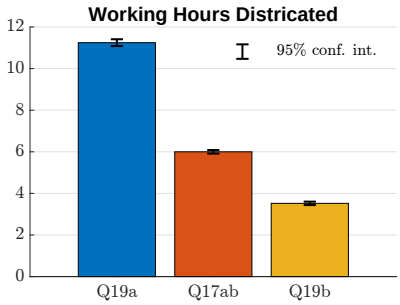


Notes: the three histograms present average of the corresponding measure of financial stress across three levels of liquidity constraint measure based on the subsample of respondends who answered the screener question Q14 (see above and Appendix D) correctly.

B.4 The Impact of Financial Stress: Household Behavior, Wealth Distribution, and Welfare Costs

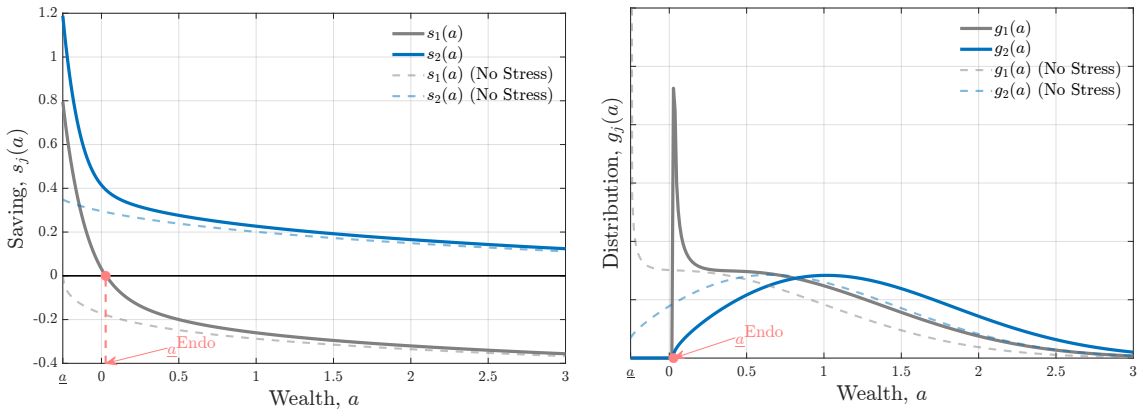
Here, we use the same produced in 3.4 but calibrate $\left(\bar{\Theta}, \alpha\right) = (0.29, 15.5)$ based on the restricted sample of participants who pass all attention checks. Other parameters are the same as in Table 3. From Figures B.6 and B.7, the main lesson that sophisticates save out of the financial stress states while naifs fall into the poverty trap remain to be true. Compare Figure B.8 with Figure 13, the financial stress channel still reverses the counterfactual large negative wealth effect of labor

Figure B.5: The Shape of Financial Stress



Notes: The histogram presents averages of distracted hours at work in a hypothetical scenario where the household has no assets to cover an emergency (question Q19a of our survey), the basedline level of distracted hours at work (questions Q17ab of our survey), distracted hours at work in a hypothetical scenario where the household receives a gift of $2,000 (question Q19b of our survey). The averages are based on the subsample of respondends who answered the screener question Q14 (see above and Appendix D) correctly

Figure B.6: Calibration based on the Restricted Sample (Sophistication).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. The calibration is based on the sample restricted to those who answered the screener question Q14 correctly. The calibration are in Appendix B.4.

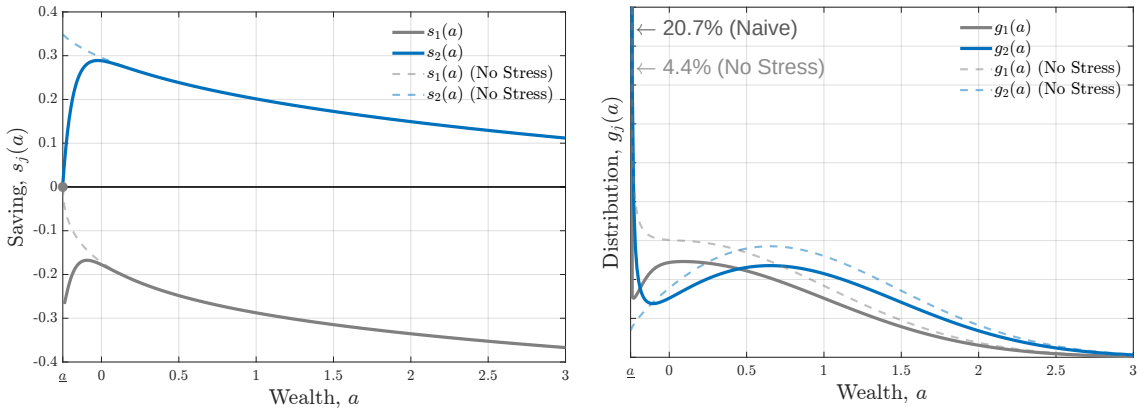
supply for naifs (but not for sophisticated). Compare Figure B.9 with Figure 14, the welfare costs of naifs' financial stress are much larger than the the welfare costs of sophisticates' financial stress.

C Additional Analysis

C.1 Financial Stress and Measures of Financial Constraints

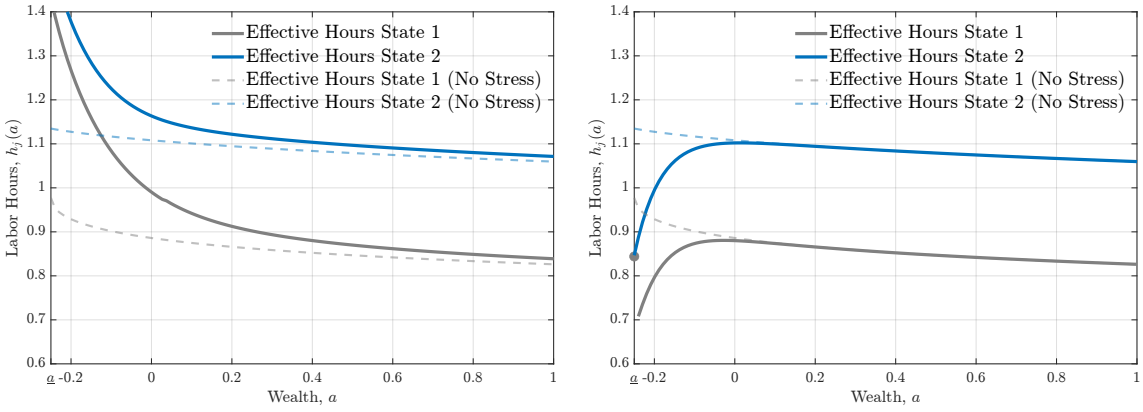
Here, we regress measures of financial stress (in Q12, Q17ab, Q17c) on measures of financial constraints (Q9), income, asset-income ratio, and other covariates based on the full sample. From Table C.1, we corroborate that measures of financial stress remain to be strongly correlated with

Figure B.7: Calibration based on the Restricted Sample (Naivete).



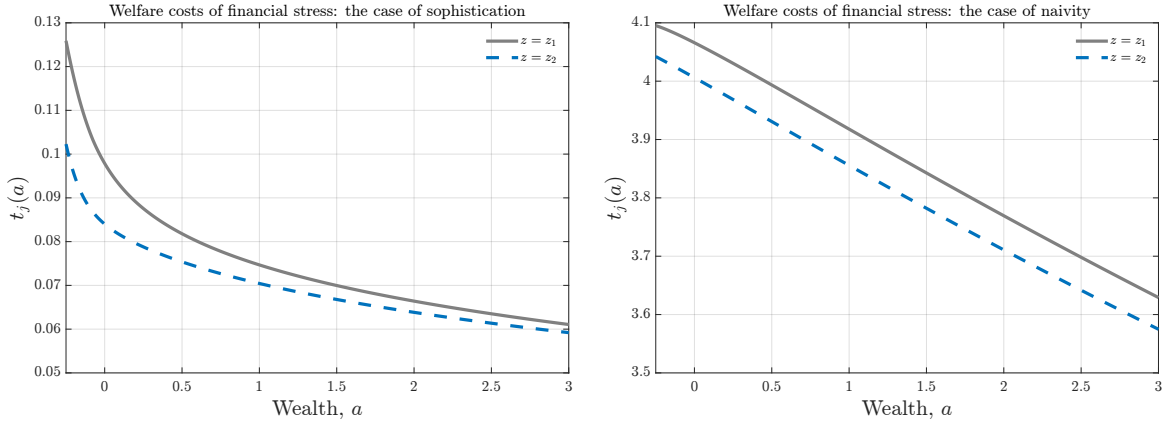
Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states of a naive household. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress. The calibration is based on the sample restricted to those who answered the screener question Q14 correctly. The details are in Appendix B.4.

Figure B.8: Calibration based on the Restricted Sample (Labor Supply: Sophistication vs Naivete)



Notes: The left panel plots the labor supply function $\ell_j(a)$ at each idiosyncratic income state for the naive stressed households (solid lines) and non-stressed households (dashed lines). The right panel plots the labor supply function $\ell_j(a)$ at each idiosyncratic income state for the sophisticated stressed households (solid lines) and non-stressed households (dashed lines). The calibration is based on the sample restricted to those who answered the screener question Q14 correctly. The details are in Appendix B.4.

Figure B.9: Calibration based on the Restricted Sample (Welfare Costs: Sophistication vs Naivete)



Notes: The left panel plots the welfare cost of stress $t_j(a)$ at each idiosyncratic income state for the naive stressed households. The right panel does so for the sophiscated stressed households. The calibration is based on the sample restricted to those who answered the screener question Q14 correctly. The details are in Appendix B.4.

measures of at financial constraints after controlling for income, asset-income ratio, and demographics. This is true no matter what measures of financial stress we use.[26]

C.2 Alternative functional forms of stress: a weakly decreasing function.

We consider an alternative functional form of the stress function $\Theta(a)$ in (17). For the calibration, $\bar{\Theta} = 0.27$ is the same as the main analysis in Table 3. To calibrate α, we use survey questions Q19a and Q19b, similar to Section 3.4. Similar to (14), we find [27]

$$\alpha = \frac{\text{avg } \left(\sqrt{Q17a} - \sqrt{Q19b}\right)}{2000/\left(\text{avg income}\right)} = 0.206 \tag{C.1}$$

From Figures C.1 and C.2, the main lessons that sophisticates save out of financial stress states and naifs fall into the poverty trap remain to be true.

[26]Since we have three dummies corresponding to each potential answer to Q9 about the financial constraint status, we do not have constants in the regression in Table C.1.

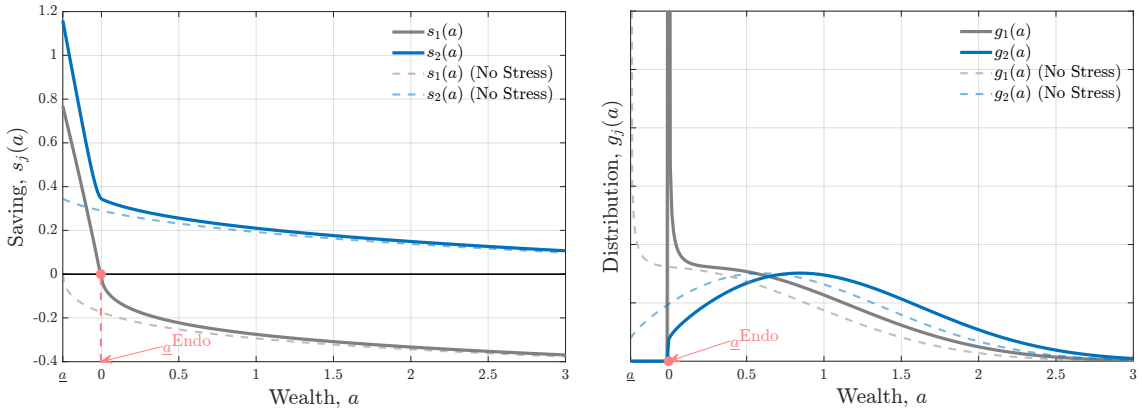
[27]Similar to Section 3.4, we drop anyone who reports zero in either Q17ab or Q19b. Conceptually, this procedure means that we exclude participants who are not affected by the financial stress. From (17), this means we estimate α using households with positive $\sqrt{\bar{\Theta}} - \alpha(a - \underline{a})$.

Table C.1: Financial Stress and Measures of Financial Constraints

	(1) Working hours distracted	(2) Hours on financial issues	(3) Qual. measure of stress
Financial Constraint			
Cannot pay	10.12***	9.138***	6.097***
	(0.460)	(0.703)	(0.176)
Need to borrow	8.178***	7.895***	5.467***
	(0.374)	(0.593)	(0.157)
No need to borrow	4.728***	4.535***	3.521***
	(0.381)	(0.600)	(0.155)
Income	-0.271***	0.0408	-0.275***
	(0.0774)	(0.185)	(0.0414)
Asset-income ratio	-0.597***	-0.137	-0.234**
	(0.0940)	(0.0909)	(0.0785)
Observations	4965	1678	6653
R^2	0.605	0.680	0.862
Covariates			
Demographics	✓	✓	✓
Primary earner	✓	✓	✓
Household size	✓	✓	✓

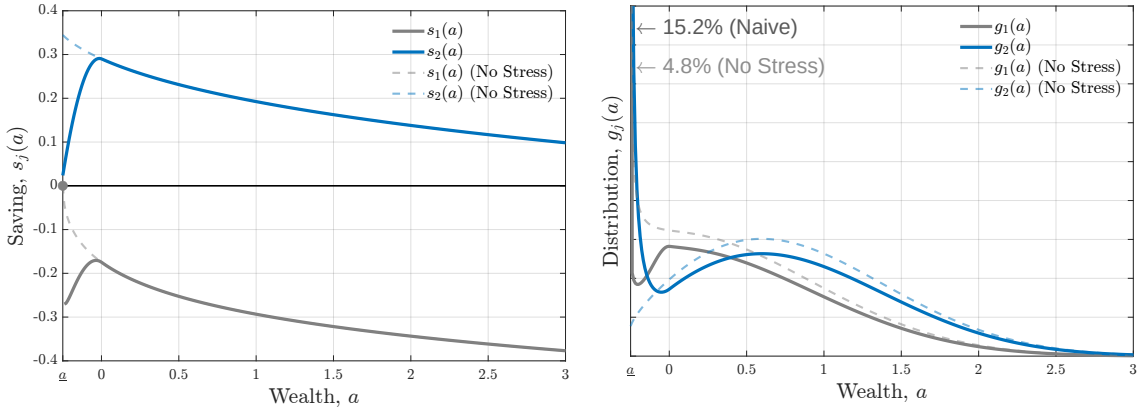
Notes: Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Income and asset-income ratio are normalized by their standard deviations.

Figure C.1: Alternative Functional Forms of Stress: a Weakly Decreasing Function. (Sophistication).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophisticaiton. The stress function takes the weakly-decreasing form as in equation (17).

Figure C.2: Alternative Functional Forms of Stress: a Weakly Decreasing Function (Naivete).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under naivete. The stress function takes the weakly-decreasing form as in equation (17).

C.3 Alternative Functional Forms: Non-convex $\Theta(a)$

The non-convex stress function $\Theta(a)$ in Figure 9 takes the following functional form:

$$\Theta(a) = \begin{cases} \bar{\Theta} & \frac{a-(\underline{a}+b)}{\delta} < 0, \\ F\left(1 - \frac{a-(\underline{a}+b)}{\delta}\right), & \frac{a-(\underline{a}+b)}{\delta} \in [0,1), \\ 0 & \frac{a-(\underline{a}+b)}{\delta} \geq 1. \end{cases} \tag{C.2}$$

where $F(\cdot)$ is a normalized logistic function

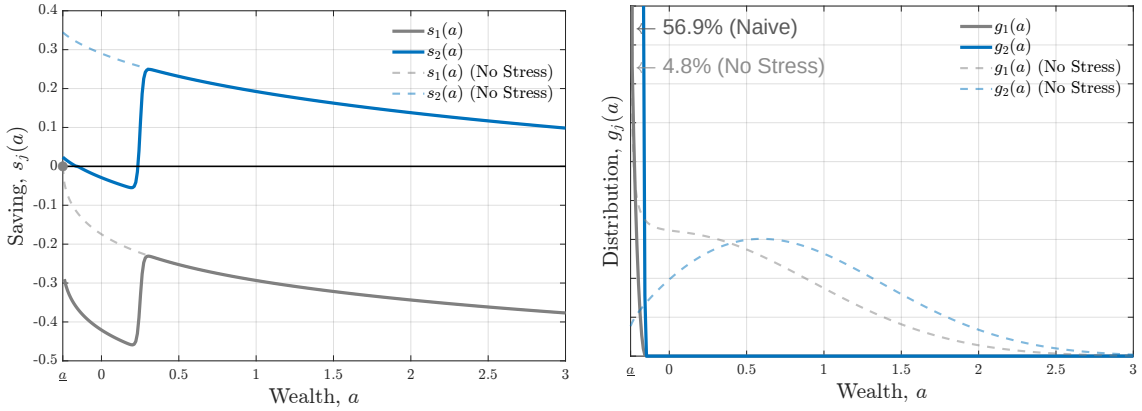
$$F(x) = \frac{\frac{1}{1+e^{-\beta\left(x-\frac{1}{2}\right)}} - \frac{1}{1+e^{-\beta\left(0-\frac{1}{2}\right)}}}{\frac{1}{1+e^{-\beta\left(1-\frac{1}{2}\right)}} - \frac{1}{1+e^{-\beta\left(0-\frac{1}{2}\right)}}}, \tag{C.3}$$

and b is a shift parameter, δ is the width of the support of the function on which the function value $\Theta(a)$ changes, and β is the speed of change of the function. In Figure 9, we consider the case with $\overline{\Theta} = 0.27$ $b = 0.5$ $\beta = 50$, $\delta = 0.5$. Figure 10 in the main text shows that sophisticates still save out of the financial stress region. Figure C.3 here shows that naifs still fall into poverty trap.

C.4 Multiplicative Productivity Loss

As explained in the main text, we consider a robustness check where the impact of financial stress takes the form of a multiplicative productivity loss. Figures C.4 and C.5 in Appendix C re-plot

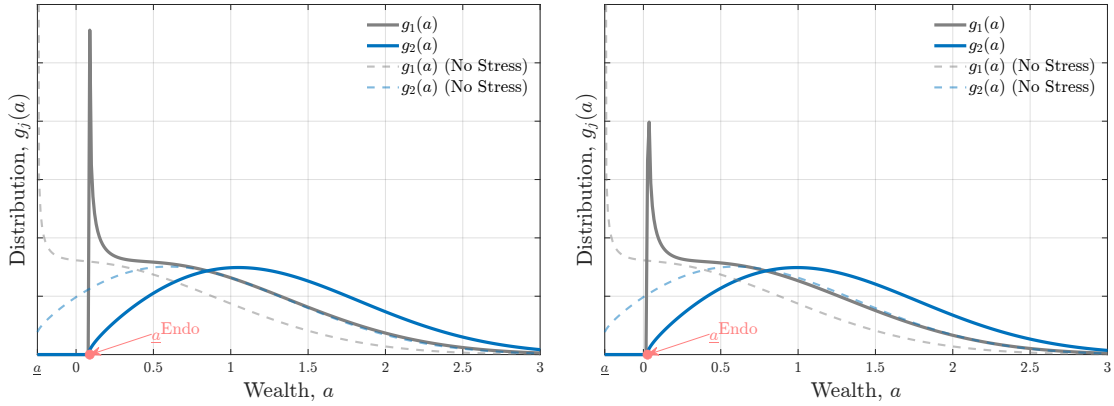
Figure C.3: Saving Behavior and Stationary Wealth Distribution (Non-convex Stress Function under Naivete).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under naivete. The stress function takes the non-convex form as in equations (C.2)-(C.3).

Figures 6 and 7. The main lessons that sophisticates save out of financial stress states and naifs fall into the poverty trap remain to be true.

Figure C.4: Multiplicative Productivity Loss (Sophistication).

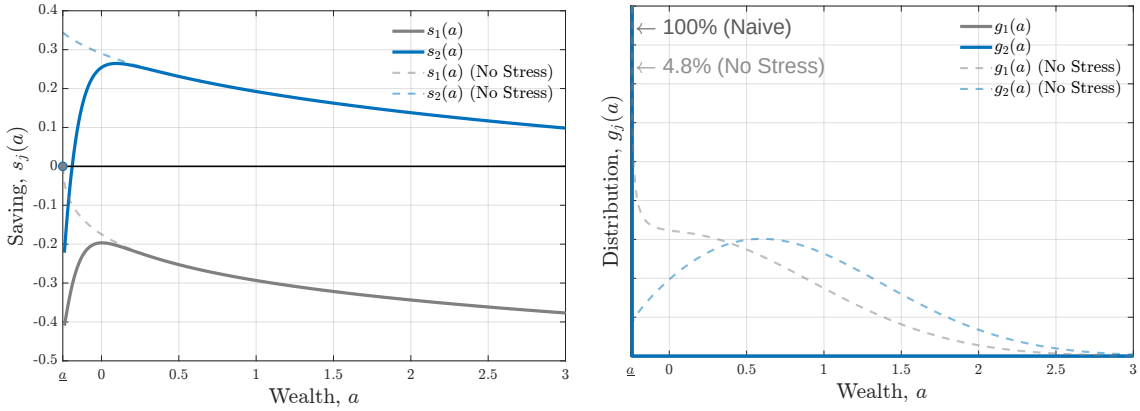


Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. The impact of financial stress takes the form of a mulplicative productivity loss as in (18).

C.5 Different Disutility from Labor than from Financial Stress

In the main analysis, an increase in productive labor and an increase in cognition/time spent on finance lead to the same increase in disutility in (4). We consider a robustness check where this assumption is relaxed. As explained in the main text, Figures C.6 and C.7 re-plot Figures 6 and 7. The main lessons that sophisticates save out of financial stress states and naifs fall into the poverty trap remain to be true.

Figure C.5: Multiplicative Productivity Loss (Naivete).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. The impact of financial stress takes the form of a mulplicative productivity loss as in (18).

C.6 Alternative Channels of Financial Stress: Stressed Spending

As explained in the main text, we study an alternative channel of the impact of financial stress through spending. For the calibration, we assume that

$$C^{\Theta}(a) = \bar{C}e^{-\alpha(a-\underline{a})},$$

where α is the same as the main analysis in Table 3. We find $\bar{C}$ based on

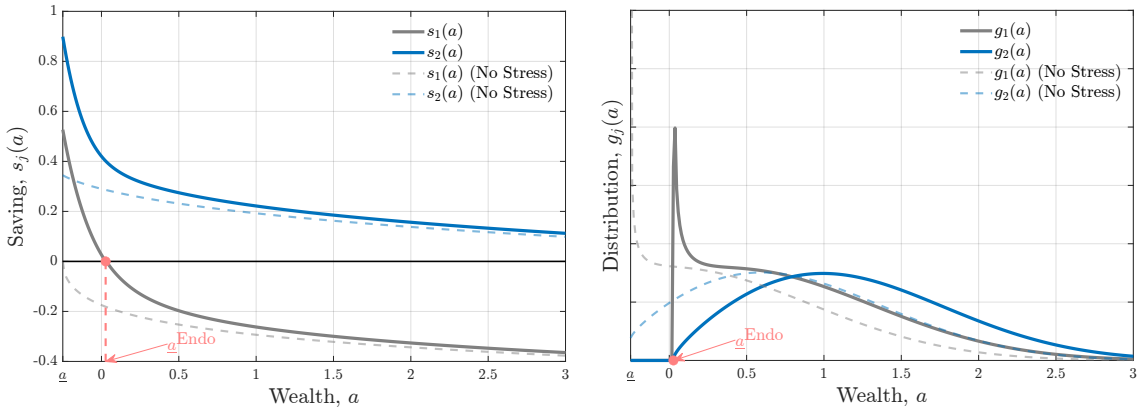
$$\frac{\bar{C}}{\text{avg } C^{\Theta}(Q20)} = \frac{\bar{\Theta}}{\text{avg } \Theta(Q17a)}$$

and $\bar{\Theta}$ is from the main analysis in Table 3. As explained in the main text, Figures C.8 and C.9 re-plot Figures 6 and 7. The main lessons that sophisticates save out of financial stress states and naifs fall into the poverty trap remain to be true.

C.7 Alternative Channels of Financial Stress: Transition Intensity between Individual Productivity States

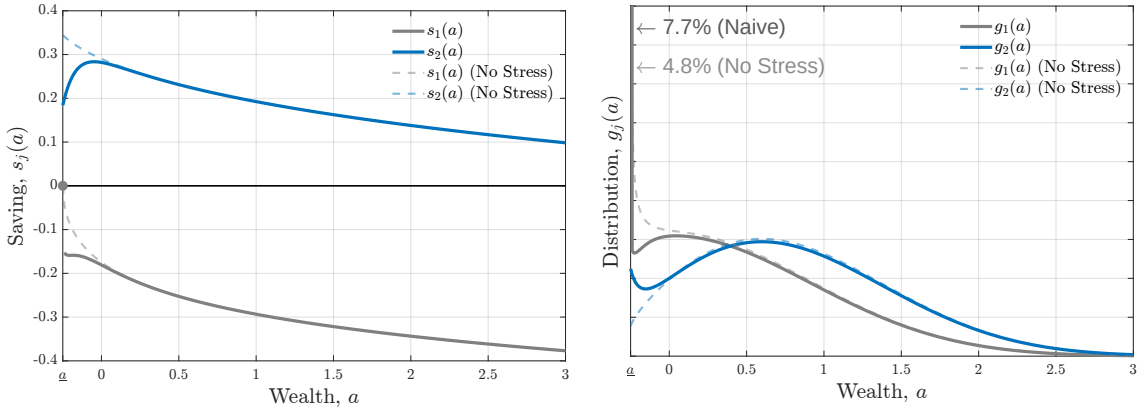
As explained in the main text, we study an alternative channel of the impact of financial stress through the impact on the transition intensity between different individual income states (z_1 and z_2). Figures C.10 and C.11 re-plot Figures 6 and 7. The main lessons that sophisticates save out of financial stress states and naifs fall into the poverty trap remain to be true.

Figure C.6: Different Disutility from Labor than from Financial Stress (Sophistication).



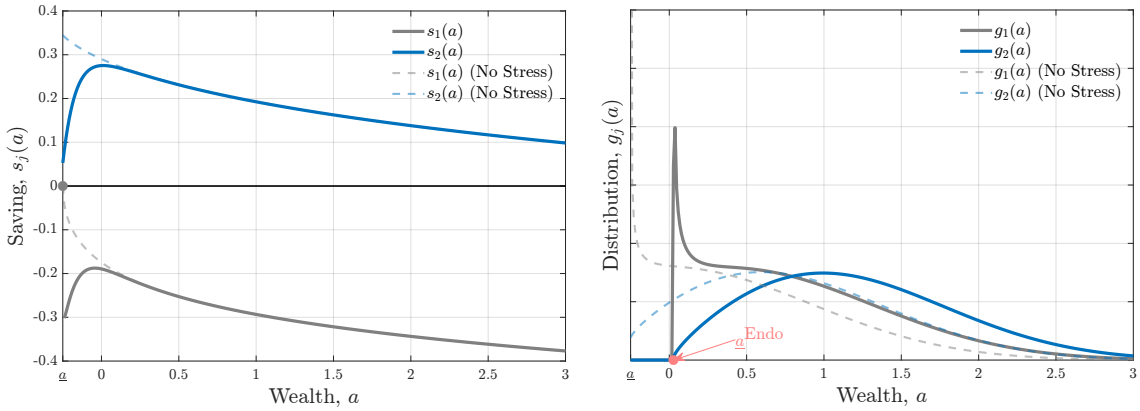
Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. The disutility from one unit of stress is assumed to be different than disutility from one unit of labor as in equation (19).

Figure C.7: Different Disutility from Labor than from Financial Stress (Naivete).



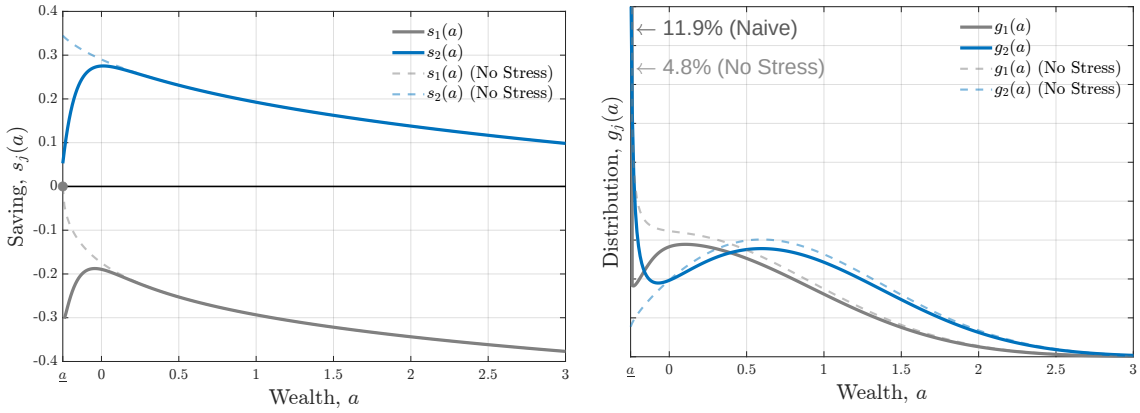
Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under naivete. The disutility from one unit of stress is assumed to be different than disutility from one unit of labor as in equation (19).

Figure C.8: Stressed Spending (Sophistication).



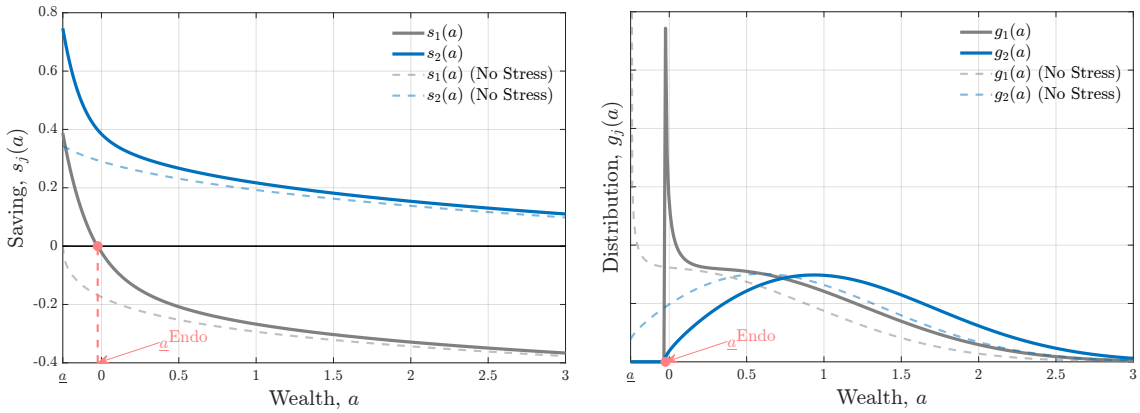
Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. Financial stress enters the budget constraint in the form of stressed spending as in equation (20).

Figure C.9: Stressed Spending (Naivete).



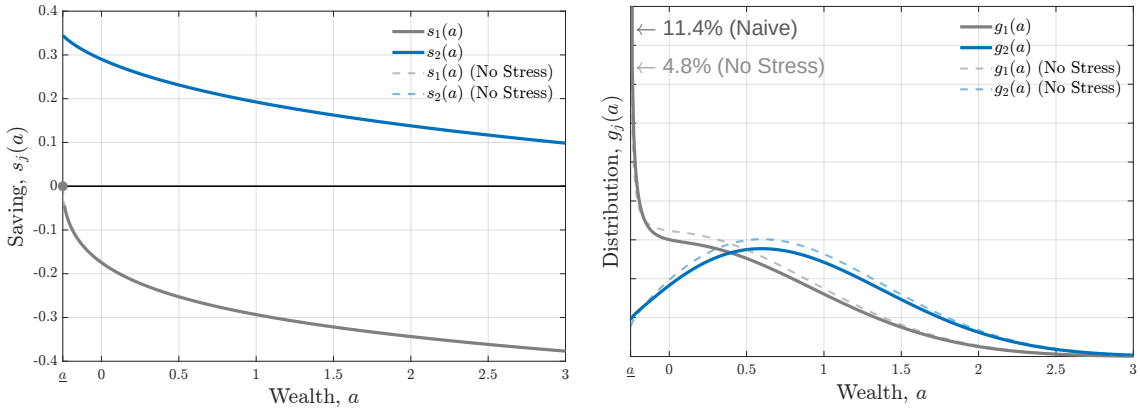
Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under naivete. Financial stress enters the budget constraint in the form of stressed spending as in equation (20).

Figure C.10: Stress Affects Transition Intensity (Sophistication).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under sophistication. In this scenario, the transition probability between income states λ depends on stress and, hence, net assets. Specifically, we assume that the transition intensity from z_1 to z_2 is given by $\lambda - \bar{\lambda}e^{-\alpha(a_t - \underline{a})}$, while the transition intensity from z_2 to z_1 is given by $\lambda + \bar{\lambda}e^{-\alpha(a_t - \underline{a})}$,.

Figure C.11: Stress Affects Transition Intensity (Naivete).



Notes: The left panel plots the net saving function $s_j(a)$ and the right panel plots the stationary wealth distribution $g_j(a)$ for both idiosyncratic income states. The dashed lines capture the case without financial stress and the solid lines capture the case with financial stress under naivete. In this scenario, the transition probability between income states λ depends on stress and, hence, net assets. Specifically, we assume that the transition intensity from z_1 to z_2 is given by $\lambda - \bar{\lambda}e^{-\alpha(a_t - \underline{a})}$, while the transition intensity from z_2 to z_1 is given by $\lambda + \bar{\lambda}e^{-\alpha(a_t - \underline{a})}$,.

D Survey Questionnaire

The text in ALL CAPS, square brackets, and section titles contains technical information that was not shown to participants.

[RANDOMLY SPLIT ALL PARTICIPANTS INTO THREE GROUPS AND DENOTE THEM: GROUP1 (MAX STRESS QUESTION), GROUP2 (GIFT QUESTION), GROUP3 (TOTAL HOURS QUESTION)]

University of California at Berkeley

Consent to Participate in Research

The Economics of Financial Stress

CPHS #2021-11-14868

Key Information

- You are being invited to participate in a research study. Participation in research is completely voluntary.
- The purpose of the study is to investigate how financial concerns affect work performance.
- The study will take a total of 6-12 minutes, and you will be asked a series of questions regarding your financial situation, the extent to which it worries you, and how your worries may change depending on hypothetical scenarios.
- Risks and/or discomforts may include thinking about imaginary scenarios that change your financial situation.

Introduction and Purpose My name is Chen Lian, and my research colleagues are Yuriy Gorodnichenko and Dmitriy Sergeyev. Yuriy Gorodnichenko and I are faculty members at the University of California, Berkeley in the Department of Economics, and Dmitriy Sergeyev is a faculty member at Bocconi University in the Department of Economics. We would like to invite you to participate in our research study, which concerns the effects of financial stress on work performance.

Procedures If you agree to participate in our research, we will ask you to complete the attached online survey. The survey will involve questions about individual characteristics (e.g., year of birth, household size, and marital status), financial situation (e.g., typical income, financial holdings), work performance (employment status, hours worked, hours distracted by financial concerns), as well as several hypothetical questions (e.g., whether and how additional liquid assets reduce hours distracted by financial stress), and should take about 6-12 minutes to complete.

Risks/Discomforts Some of the research questions may make you think about your concerns. You are free to decline to answer any questions you don't wish to, or to stop participating at any time.

As with all research, there is a chance that confidentiality could be compromised; however, we are taking precautions to minimize this risk.

Confidentiality Your study data will be handled as confidentially as possible. If the results of this study are published or presented, individual names and other personally identifiable information

- Sponsor: Chen Lian
- University of California

Rights ***Participation in research is completely voluntary.*** You are free to decline to take part in the project. You can decline to answer any questions and are free to stop taking part in the project at any time. Whether or not you choose to participate, answer any particular question, or continue participating in the project, there will be no penalty to you or loss of benefits to which you are otherwise entitled.

Questions If you have any questions about this research, please contact us. You can reach me, Chen Lian, at chenlianyy@gmail.com.

If you have any questions about your rights or treatment as a research participant in this study, please contact the University of California at Berkeley's Committee for Protection of Human Subjects at 510-642-7461 or by e-mail at subjects@berkeley.edu.

If you agree to participate in the research, please save a copy of this page for future reference, then click on the "Yes" button below. [ADD Yes/No BUTTONS]

D.1 Screeners

Please tell us about yourself.

S1. What is your current age? [ADD A DROP-DOWN MENU]

- Years old: 16,17,...,100.

S2. What best describes your current employment situation?

- Working full-time (for someone or self-employed)
- Working part-time (for someone or self-employed)
- Not working

D.2 Personal information questions

Q1. In which state is your primary residence?

- AL Alabama (1)
- AK Alaska (2)
- ...
- WI Wisconsin (50)
- WY Wyoming (51)
- I live outside the US (99)

Q2. What is the highest level of school you have completed, or the highest degree you have received? [RESPONDENTS CHOOSE ONE OF THE FOLLOWING OPTIONS]

- Some high school or less
- High school diploma (or equivalent)
- Some college but no degree (including academic, vocational, or occupational programs)
- Associate/Junior College degree (including academic, vocational, or occupational programs)
- Bachelor's degree (For example: BA, BS)
- Post-graduate degree (For example: MA, MS, PhD, MD, JD)

Q3. What is your gender?

- Male
- Female

D.2.1 Income

Q4. How much income does your household **normally** earn **in a year** (before tax)? If you do not know, please estimate and choose an appropriate range. [ADD A DROPDOWN MENU WITH THE FOLLOWING INTERVALS]

- [$0;$9,999]
- [$10,000;$19,999]
- ...
- [$90,000;$99,999]
- [$100,000;$124,999]
- [$125,000;$149,999]
- [$150,000;$174,999]
- [$175,000;$199,999]
- [$200,000;$299,999]
- [$300,000;$499,999]
- $500,000 or more

Q5. Over the past few months, was your household's income different from what your household normally earns?

- My household's income was **about normal**.
- My household's income was **higher than normal**.
- My household's income was **lower than normal**.

D.2.2 Family Situation

Q6. Are you currently married or living as a partner with someone?

- Yes
- No

Q7. Please tell us how many of the following people usually live in your current primary residence, other than yourself (including those who are temporarily away)?

- Children _____
- Your or your spouse/partner's parents _____
- Others _____

D.2.3 Debt

Q8. Does your household have debt?

- Yes
- No

Q8b. [ASK IF Q7 = Yes] What types of debt does your household owe? (select all that apply)

- mortgage
- student loan
- car loan
- credit card debt (that you do not expect to repay by the due date)
- loan from a friend or a family member
- other (please specify) [ADD A TEXTBOX]

D.2.4 Liquid Assets and the Interest Rate

Q9. If your household experienced an unexpected emergency, would you need to borrow money in order to pay for a $2,000 expense?

- No, I would not need to borrow money to cover a $2,000 expense
- Yes, I would need to borrow money to cover a $2,000 expense
- I could not pay for this expense, even by borrowing

Q10. [ASK IF Q9 != "I simply cannot pay for this expense, even by borrowing"] If your household had to borrow $2,000 in the case of an emergency, what interest rate do you expect to be charged?

[ADD A SLIDER WITH THE RANGE [0%;30%]]

D.2.5 Net Total Assets

Q11. What is the value of your household's **total financial investments** (checking and savings accounts, stocks, bonds, 401(k), real estate, etc.) minus **total financial liabilities** (credit card debt, mortgages, student loans, consumer loans, etc.)? If you are not sure, please estimate.

You should choose a negative range if the the value of your liabilities is greater than the value of your investments.

[ADD A DROPDOWN MENU]

- - $50,000 or less
- - ($49,999;$39,999)
- ...
- - ($9,999;$0)
- [$0;$9,999]
- [$10,000;$19,999]
- ...
- [$90,000;$99,999]
- [$100,000;$124,999]
- ...
- [$175,000;$199,999]
- [$200,000;$299,999]
- [$300,000;$499,999]
- [$500,000;$999,999]
- $1,000,000 or more

D.2.6 Financial Stress

Q12. On a scale from 1 to 10, how concerned are you about your household's current financial situation? 1 represents the lowest level of concern (or no concerns), and 10 represents the highest level of concern.

[ADD A SLIDER WITH THE VALUES (1,2,. . ., 10)]

D.3 Attention Check

Q14. The next question is about the following problem. In questionnaires like ours, sometimes there are participants who do not carefully read the questions and just quickly click through the survey. This means that there are a lot of random answers which compromise the results of research studies. To show that you read our questions carefully, please enter turquoise as your answer to the next question.

What is your favorite color? [ADD A TEXTBOX]

D.4 Labor-Assets Curve

Q15. Are you the primary or co-primary earner in your household?

- Yes
- No

Q16. How many hours do you typically work in a week these days? If you are not sure, please estimate. [ADD A SLIDER WITH THE RANGE [0;100] HOURS]

D.4.1 Max Stress

Q17a. [ASK IF GROUP1 = 1] Over the past week, how many working hours were you distracted by your financial stress?

[ADD A SLIDER WITH VALUES BETWEEN 0 AND 20 HOURS]

Q19a. [ASK IF GROUP1 = 1] You reported that you were distracted for [ANSWER TO Q17a] hours by your financial stress last week.

Now, I want you to imagine that your household's financial situation becomes worse, and you would struggle to quickly raise any additional money in the case of an emergency (for example, bank accounts have been depleted and credit cards are maxed out).

In this alternate scenario, how many working hours would you have been distracted by your financial stress over the course of a week?

[ADD A SLIDER WITH VALUES BETWEEN 0 AND Q17a HOURS]

D.4.2 Gift question about working hours distracted

Q17b. [ASK IF GROUP2 = 1] Over the past week, how many working hours were you distracted by your financial stress?

[ADD A SLIDER WITH VALUES BETWEEN 0 AND 20 HOURS]

Q18b. [ASK IF GROUP2 = 1] You reported that you were distracted for [ANSWER TO Q17b] hours by your financial stress last week. **Now, I want you to imagine that you were gifted $2,000** at the start of last week**.**

In this alternate scenario where you started the week with $2,000 **more money**, would you have been

- **less distracted** by your financial stress?
- **distracted by the same amount** by your financial stress?
- **more distracted by** your financial stress?

Q19b_1. [ASK IF GROUP2 = 1 AND Q18b = "less stressed"] In this alternate scenario where you started the week with $2,000 **more money**, how many working hours would you have been distracted by your financial stress? [ADD A SLIDER WITH VALUES BETWEEN 0 AND Q17b HOURS]

(Note that the slider allows you to choose a number between 0 and [ANSWER TO Q17b], highlighted in green, because you answered that you would have been less distracted with extra money compared to your current financial situation.)

Q19b_2. [ASK IF GROUP2 = 1 AND Q18b = "more stressed"] In this alternate scenario where you started the week with $2,000 **more money**, how many working hours would you have been distracted by your financial stress? [ADD A SLIDER WITH VALUES BETWEEN Q17B AND 20 HOURS]

(Note that the slider allows you to choose a number between [ANSWER TO Q17b] and 20, highlighted in green, because you answered that you would have been more distracted with extra money compared to your actual financial situation.)

Q19b_3. [ASK IF GROUP2 = 1 AND Q18b is not answered] In the same alternate scenario where you started the week with $2,000 **more money**, how many working hours would you have been distracted by your financial stress? [ADD A SLIDER WITH VALUES BETWEEN 0 AND 20 HOURS]

D.4.3 Total hours

Q17c. [ASK IF GROUP3 = 1] Over the past week, how many hours did you spend thinking about and dealing with issues related to your household's finances? If you are not sure, please estimate. [ADD A SLIDER WITH VALUES BETWEEN 0 AND 20 HOURS]

D.4.4 Stressed Consumption

Q20. How much money do you typically spend per week in order to alleviate the stress driven by your financial concerns, which you would not spend if you were not financially stressed? [RESTRICT ANSWERS TO $0-$1,000]

D.5 Transfers

Q21. Over the last few years, your household may have received stimulus checks from the U.S. government.

Please let us know if your household has received any of those checks.

- Yes, my household has received at least one of those checks.
- No, my household has not received any of those checks.

Q21b. [ASK IF Q23 = YES] On a scale from 1 to 10, how much did those checks alleviate your financial concerns?

1 represents that they had very little effect on your financial concerns, and 10 represents that they fully alleviated your financial concerns. [ADD A SLIDER WITH THE VALUES (1,2,. . ., 10)]