Financial stress by design: examining barriers to social welfare take-up

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Chapter 3

Economic predictors of the subjective experience of financial stress

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ABSTRACT

The subjective experience of financial stress has profound implications for well-being, health, cognitive performance, and decision-making. We conceptualized financial stress as a psychological construct comprising four components: 1) an appraisal of insufficient financial resources, 2) an appraisal of lack of control over one´s financial situation, 3) financial worries and rumination, and 4) a short-term focus. In empirical studies, financial stress is often associated with isolated economic correlates such as low income, savings, or debt. The current study examined the association of financial stress with five objective aspects of households´ economic situation: income, saving, debts, income volatility, and employment. This enabled us to examine these economic factors' relative contributions to predicting financial stress. We used a probability sample of the Dutch population (N = 1,114). Income and buffer savings had the largest contributions to predicting financial stress. The number of debts had a smaller relative contribution to predicting financial stress, whereas we did not find support for debt amount as a predictor of financial stress. Employment predicted financial stress, but only for households at the lowest end of the income spectrum. We found no support for income volatility predicting financial stress. These results imply that research and policy on financial stress should have a broader scope than income alone and should take a more integrative approach to households' financial situation, considering savings, number of debts, and unemployment.

INTRODUCTION

In financially challenging circumstances, people often experience financial stress[1]. The notion of financial stress is not limited to lower-income countries. In the third quarter of 2022, most Americans (56%) indicated that price increases were causing financial hardship for their household[2]. In the UK, 7.8 million people were finding it a heavy burden to keep up with their bills, and 37% of Dutch households had difficulty making ends meet[3,4].

We define financial stress as a psychological construct reflecting a state where pressing financial concerns surpass available resources, endangering well-being[5]. Financial stress includes subjective appraisals of the situation and affective and cognitive responses. We incorporate two appraisals: insufficient financial resources and lack of control over one's financial situation. The first appraisal captures the (potential) harmfulness of the situation, whereas the second refers to coping potential - the perceived ability to adequately deal with the (potentially) harmful situation. We also include affective and cognitive responses, namely financial worries and rumination, and short-term focus.

Our definition of financial stress is based on existing psychological stress frameworks[6,7]. In these frameworks, a threat is defined as a state where an individual anticipates a confrontation with a stimulus they appraise as endangering essential values and goals. Research shows that a situation appraised as a strain on one's resources predicts psychological symptoms, such as anxiety and depression[8], and that a perceived lack of coping ability increases appraised threat[7]. Our definition of financial stress is consistent with psychological stress, an adaptive physiological response to a real or perceived threat[9–12]. Financial stress is the psychological stress resulting from one's financial situation.

We now describe how financial stress, as defined above, complements other concepts used in the literature, particularly financial well-being, subjective wealth, financial vulnerability, financial fragility, and financial worry.

Financial stress is a narrower concept than financial well-being, defined by Brüggen et al.[13] as "the perception of being able to sustain current and anticipated desired living standards and financial freedom." (p. 229). Financial stress focuses on people's current financial situation, whereas financial well-being includes the current and anticipated financial situation. Also, financial stress is understood as the inability to meet financial demands, whereas financial well-

being is understood as the ability to meet such demands. Netemeyer et al.[14] define financial well-being as current money stress and future financial security. Current money stress involves being behind with one's finances, feeling that one's finances control one's life, and being obsessed with money. The second aspect of Netemeyer's definition - future financial security - resembles Hoffmann et al.'s[15] definition of financial well-being as expected financial security. Our definition of financial stress resembles Netemeyer's current money stress but adds the two components of affective and cognitive responses consistent with psychological stress frameworks.

Financial stress also differs from financial vulnerability, defined by Salisbury et al.[16] as "the risk of incurring future harm, given the consumer's current access to various financial resources." (p. 1). Financial vulnerability resembles financial fragility, defined as "the sensitivity of household arrears and insolvencies to macroeconomic shocks"[17]. Clark and Mitchell[18] developed a resilience index that reflects a household's capacity to respond to economic shocks, namely how able it is to respond to an unexpected loss of earnings, whether it has developed retirement and spending plans and tracks spending, how it perceives the impact of current debt on spending, and its level of concern regarding finances. Lusardi et al.[19] proxied financial vulnerability with debt-to-income ratio. Hoffmann and McNair[20] developed a measure of financial vulnerability based on risk factors that may threaten financial stability, such as age, education level, health, income, debt, and financial literacy. Thus, financial stress focuses on one's experienced inability to meet current financial requirements, whereas financial vulnerability involves the risk of being unable to meet financial demands in the future.

Finally, our conceptualization of financial stress encompasses financial worry, defined as "repeated and negative thinking about the uncertainty of one's (future) financial situation," and financial rumination, defined as "repetitive, passive, and pessimistic thinking about the possible causes and consequences of one's financial concerns"[21]. This definition resembles Xiao and Kim's[22] definition of financial stress as a "psychological state worrying about personal finance." It is similar to financial anxiety[23], defined as worrying and anxiety about current and future financial situations.

Financial stress can profoundly impact people's lives, affecting their well-being, health, cognitive performance, and behavior. The literature shows that financial stress has adverse consequences for overall well-being and mental health outcomes such as anxiety and depression[14,24–29]. Financial stress also

affects cognitive processes by shifting the attentional focus toward the most pressing needs and away from less urgent ones[1,30,31]. Moreover, financial stress has positive and negative consequences for cognitive performance. On the positive side, people lacking financial resources perform better on selective attention, vigilance, detecting imminent dangers and opportunities, tracking conditions that change rapidly, persisting when procuring an immediate reward, and valuing money[32,33]. Although the narrowed focus that results from financial stress is arguably a necessary response to urgent economic challenges, it comes at a cost. There is increasing evidence that financial stress is negatively related to various executive functions, such as self-control, planning, working memory, and cognitive flexibility[1,5,34–41]. A growing body of literature shows that financial stress elicits behaviors that sustain or even exacerbate economic hardship, such as impulse buying, gambling, overspending, suboptimal investing, decreased job search effectiveness, the use of alternative financial services, the use of buy now pay later services, and overborrowing[23,28,42–46].

Understanding the economic predictors of financial stress is crucial to reducing financial stress and improving downstream cognitive, affective, and behavioral outcomes, well-being, and health. The literature examining the economic predictors of financial stress has primarily focused on income as the explanatory variable. Since income substantially influences the availability of financial resources, it is an intuitive predictor of financial stress. As we will discuss later, the literature about the relationship between income and financial stress is ambiguous, suggesting that other economic factors may also play a role. Research in mental health psychology and other fields, for example, indicates that mental well-being and stress are not only associated with income but also with economic factors such as savings, debts, income volatility, and employment. Well-being has a positive relation with savings[47,48] and employment[49,50] and a negative relation with debts[51–53] and income volatility[54,55]. Yet, studies on the relationship between one's economic situation and stress have typically focused on one or two economic predictors in isolation without considering other economic predictors. These studies, therefore, do not reveal the relative contributions of different aspects of one's economic situation in predicting financial stress. Also, in these studies, an observed relationship between financial stress and an isolated economic predictor (e.g., income) may partly reflect a relation with an unmeasured predictor (e.g., savings or debt). Finally, it stands to reason that savings, debts, income volatility, and employment are more strongly related to financial stress for lower-income households. Although some studies corroborate this notion[56,57], the literature on interactions between income and other aspects of one's economic situation in predicting financial stress is scarce.

We need to take a more integrative approach to provide a better and more comprehensive account of the factors predicting financial stress. The current research examines the relative importance of five aspects of one's economic situation - income, savings, debts, income volatility, and employment status - in predicting financial stress. Also, it examines whether the associations differ between lower- and higher-income households. Finally, we statistically control for well-established confounders, such as age, education level, gender, and personality traits.

CONCEPTUAL FRAMEWORK

In this paragraph, we explore which objective aspects of households' objective economic situation may be associated with financial stress. Below, we provide theoretical arguments and empirical evidence on associations of income, savings, debts, income volatility, and employment with elements of financial stress (the appraisals of having too few financial resources and lacking financial control and the accompanying affective and cognitive responses). Also, we provide theoretical arguments for income as a moderator of the association between the other four aspects of households' economic situation (debt, savings, income volatility, and employment) and financial stress. We present our conceptual framework based on the findings from theory and literature.

Income. Low-income households often juggle paying the bills and providing for their families. The literature shows that this may trigger feelings of financial stress, an increased focus on the present, and a decreased perception of control. For example, Johar et al.[58] concluded that "the poor, both when classified as having incomes below 40,000 and on a continuous scale, discounted the future more" (p. 209). Sheehy-Skeffington[41] argued that a low income increases perceived resource scarcity, which, in turn, hampers executive functioning and decreases self-regulation. Other studies have cast some doubt on the importance of income in predicting adverse mental states and behavior. For example, De Bruijn and Antonides[59] concluded that income had limited direct effects on financial worries and rumination. Beenackers et al.[60] found that financial strain and self-control were associated with health behaviors but found no support for an association between income and health behavior. In sum, the evidence of the relationship between income and different aspects of financial stress (lack of control, financial worries and rumination, and short-term focus) is mixed. Some studies find a negative association, whereas others find limited or no support for an association.

Savings. Savings may serve as buffers against unexpected expenditures and income shocks, and this could protect against financial stress. Scholars have long recognized the importance of assets for household well-being, although there is some debate on the effect size[47,61]. Bernheim et al.[62] found that having low initial assets made exercising self-control difficult, resulting in poverty-aggravating behavior. Ruberton et al.[48] found that having a financial buffer contributed to financial well-being. They noted "the importance of holding minimal financial savings, but also the relative unimportance of having wealth above sufficiency levels" (p. 579).

Conversely, financial stress may inhibit savings. Financial stress increases a short-term focus and may result in avoiding financial decisions[26,30,63]. Alsemgeest[64] found a negative association between stress and retirement savings. It is plausible that this association is stronger as income decreases, although there is no empirical support for this presumption. First, the higher a household's income, the more flexibility they may have in dealing with unexpected expenditures. Thus, lacking savings may have less impact on the stress levels of higher-income households. Second, when income is higher, it may be less challenging to make ends meet and set money aside from what is left at the end of the previous month.

Debts. Debts may result in financial stress for at least three reasons. First, debts can indicate short-term or long-term financial difficulties: When people have insufficient income or savings to make ends meet or pay the bills, they may borrow money[52]. Second, debt repayments and interest decrease disposable income, potentially making it more challenging to make ends meet. Third, the thought that one needs to repay debts in the future may cause worries and rumination. If debts are out of control, consumers will face financial strains such as high debt payment-to-income ratio, debt payment delinquency, and even bankruptcy[65]. From a review of debt literature, Tay et al.[66] concluded that debt may affect well-being through two channels. First, debt affects financial well-being, a component of overall well-being. Second, debts pose a strain on financial resources, which, in turn, lowers well-being. Results from previous studies indicated that debts have a small negative association with happiness[67] and that debt delinquency is associated with financial stress[22].

Yet, the association between debt and financial stress may be more complex than that. First, a higher debt may also go hand in hand with lower financial stress since higher debts usually coincide with higher incomes; in many countries, the amount of credit allowed depends on income. Debts may provide access to credit, convenience, liquidity, and even leverage consumers would not otherwise have[65]. Also, debt may enable purchasing goods and services that increase life satisfaction, which is a (negative) correlate of financial stress[5]. Second, the financial burden associated with debts may depend on the type of debt. Previous studies have found that mortgage debts, student loans, credit card debts, and vehicle debts have different associations with financial burdens[65,67]. Third, the causality may run in the opposite direction. Financial stress causes cognitive impairment and short-term focus[26,38,63]. To make ends meet today, households with financial stress may underestimate the cost of borrowing and be inclined to overborrow[42]. Fourth, previous studies have revealed that the number of debts

is more predictive of financial stress than the total debt amount[68,69]. It is argued that people keep each loan in a separate "mental account," and each debt's first few dollars create the most significant mental load[70].

In sum, the association between debts and financial stress is complex. The literature tends towards a positive association between debts and financial stress. The association may be stronger for lower-income households[66]. For them, having debts may trigger more worries about being unable to repay the loan or pay the interest.

Income volatility. If one's income changes from month to month, this may increase feelings of lack of control and financial stress. Fluctuating income can evoke financial stress due to worry over difficulty paying bills or providing for one's family. Sudden large financial shocks may also result in decreased buffers and increased debts, increasing financial stress. Also, unexpected financial shocks may result in feeling less in control of one's finances. Both experimental and longitudinal studies find that income volatility increases financial stress, especially for lower-income households. For example, Lichand and Mani[71] conducted a lab-in-the-field experiment using rainfall variations as natural income shocks with Brazilian farmers. They concluded that "the cognitive burden imposed by income uncertainty makes farmers 'penny wise and pound foolish'" (p. 4). Other studies have confirmed that income volatility positively relates to financial stress, especially for lower-income households[72,73]. Empirical evidence suggests a positive association between financial shocks and subjective financial well-being. In a study among US households, the Consumer Financial Protection Bureau[74] found that the financial well-being score of households that experienced a financial shock in the past 12 months is significantly lower than that of households that did not experience a shock. Codagnone et al.[75], for example, found that during COVID-19, 42.8% of the respondents had a high risk of stress, anxiety, and depression based on their level of economic vulnerability and their exposure to a negative economic shock. Bufe et al.[76] found that the experience of an income shock was associated with a large decline in subjective financial well-being.

In contrast, the experience of an expense shock was associated with a more modest decline. We argue that income volatility may have a stronger association with financial stress for lower-income households. An income shock more likely results in an inability to make ends meet as income decreases. In contrast, an income shock may be easier to deal with as income increases. Thus, households with fluctuating incomes may experience less control of their finances as income decreases.

Employment. Losing one's job may result in worries about being able to provide for one's family and pay the bills, especially because households' expenses are fixed to a large extent (housing, utilities, insurance, etc.). Indeed, several studies have found higher financial stress among the unemployed[47,77]. Another study found that labor income (vs. nonlabor) income contributes more to financial satisfaction[78]. Again, the causal relation may also run in the other direction:

Increased stress levels may result in more difficulty finding a job. For example, Gerards and Welters[44,79] found that financial strains resulted in less effective job search and labor market outcomes. We argue that unemployment may have a stronger association with financial stress as income decreases. Higher-income unemployed may have other income sources, such as investments. Also, in the Dutch context, unemployment benefits drop as time passes. The lower the income, the longer unemployment likely lasts, which may increase financial worries and rumination.

The current study. The theoretical arguments and empirical evidence summarized above suggest that different aspects of one's economic situation may correlate with financial stress, a psychological construct reflecting a state where pressing financial concerns surpass available resources. Studies of the economic correlates of financial stress often consider one or two aspects of households' financial situation in isolation. The associations found in these studies may, therefore, be overestimated. Other variables not included in these studies may partly explain the associations found. There is no coherent picture of how different elements - in conjunction - correlate with financial stress. The current research, therefore, takes a more integrative perspective on households' economic situation by including five aspects: income, savings, debts, income volatility, and employment. We hypothesize that a low income, insufficient savings, more debts, income volatility, and unemployment all contribute to predicting more financial stress (see Figure 1). Moreover, we hypothesize that income moderates the relationships of savings, debts, income volatility, and employment on the one hand and financial stress on the other; we hypothesize the associations will become stronger as income decreases.

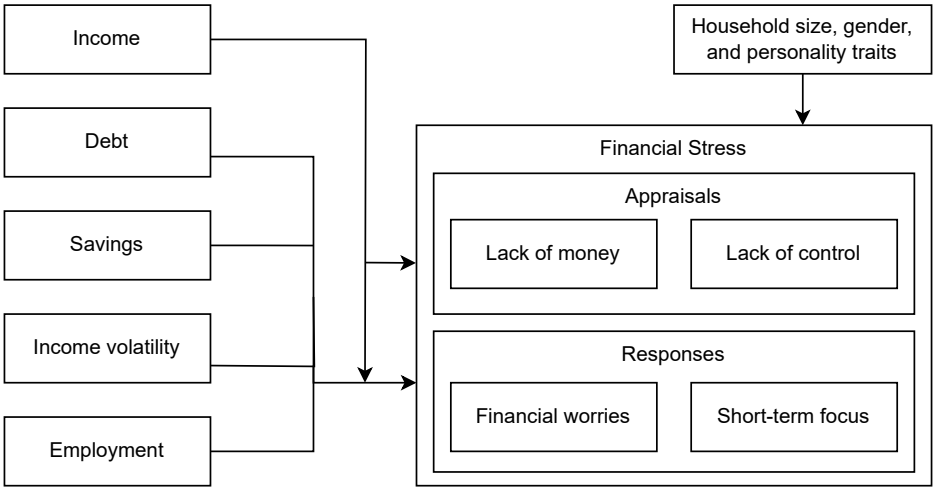

Figure 1. Conceptual framework. Objective aspects of households' economic situation (income, debt, savings, income volatility, and employment) are associated with financial stress. Income moderates the association between the other objective aspects and financial stress. Financial stress is a psychological construct involving the subjective experience of lacking financial resources to cope with demands. It consists of two appraisals (lack of money and control) and two responses (financial worries and rumination and short-term focus). The directions of the arrows indicate that economic aspects predict financial stress; they do not suggest causation.

METHODS

Data

We employed cross-sectional data administered by Centerdata[80]. The panel is based on a probability sample of households drawn from the population register by Statistics Netherlands. We linked survey data on financial stress with economic, demographic, and psychological variables. While we were thus able to establish correlations, the cross-sectional data did not allow us to make causal claims. Table 1 contains an overview of the variables relevant to our study. Our sample consisted of respondents to a questionnaire in April 2018 that included a measure of financial stress. After removing eight empty surveys, the sample contained 1,114 respondents. Detailed steps needed to obtain the data and perform the analyses and the accompanying R-scripts used to create the dataset, perform the analyses, and produce the output are available in the online supplemental materials.

Dependent variable

We used the 12-item Psychological Inventory of Financial Scarcity (PIFS) developed by Van Dijk et al.[5] to measure financial stress (M = 1.96, SD = 1.12, Cronbach's α = .93). Their psychometric evaluation shows that the PIFS is a reliable and valid measure. It combines scarcity theory with frameworks of financial stress. The PIFS consists of four components (Table 2). The first two components capture appraisals of insufficient financial resources and lack of control over one's financial situation. The third component captures financial worries and rumination, whereas the fourth component captures a focus on the short term. The appraisal of insufficient resources represents a perceived threat. The lack of control over one's financial situation represents the inability to deal with such a perceived threat adequately. Financial worries and rumination, and short-term focus are affective and cognitive responses to the perceived threat.

The PIFS is consistent with psychological stress research, showing that the appraisal of lacking financial resources predicts psychological symptoms, such as anxiety and depression[8], and research showing that a perceived lack of control increases experienced financial threat[82]. Results of exploratory and confirmatory factor analyses of the PIFS based on five studies indicated that the PIFS has a high internal consistency and captures a construct that fits both a one-factor structure and a four-factor (sub)structure[5]. In our study, the correlations between the subscales of the PIFS were high (between .61 and .78; Table 3), in line with previous findings that they form a coherent overall scale.

Independent variables

Income. Centerdata measures net monthly household income in euros. We corrected for household size because the needs of a household grow with each additional member. To consider economies of scale, we adjusted household income by dividing it by the square root of household size, according to OECD guidelines[83]. One respondent had an extraordinarily high net monthly income of € 231,262, which we replaced with a missing value.

Savings may serve as buffers against unexpected expenditures and income shocks. Ruberton et al.[48] stressed the importance of a minimal buffer in the form of liquid wealth for well-being. We defined buffer as a dichotomous variable equaling one if a household's liquid assets exceeded a threshold depending on income and household size and zero otherwise. We argue that higher-income families need a higher buffer because they have more fixed expenditures and own more property. Based on the Buffer Calculator provided by Nibud[84], we used the following formula to define the threshold for having sufficient buffer: € 600 + [monthly income] + € 400 * [household size]. We included the amount of household liquid savings in our analyses and excluded other types of wealth, such as real estate and long-term investments. Respondents were asked: "What was the total balance of your banking account, savings accounts, term deposit accounts, savings bonds or savings certificates, and bank savings schemes on 31 December 2018?". If they responded, "I don't know," the questionnaire asked, "To what category did the total balance (total value) belong on 31 December 2018 (positive or negative)?" and given 15 categories (less than € 50 to € 25.000 or more). We used the category midpoints to calculate savings. We performed a robustness check with the amount of liquid savings instead of buffer as an independent variable.

Table 1. Operationalizations and descriptive statistics of the variables in our model. The numbers (N) and percentages (%) are provided for the categorical variables. For the numerical variables, means, standard deviations (SD), minimum (Min), and maximum (Max) values are provided.

Variable	***Operationalization***
Dependent variable	
Financial stress	The subjective experience of lacking financial resources to cope with demands (Table 2).
Independent variables	
Net income	Net monthly household income (€).
Income	Adjusted income: net income divided by the square root of household size.
Savings	The total balance of banking accounts, savings accounts, term deposit accounts, savings bonds or savings certificates, and bank savings schemes on 31 December 2018.
Buffer	A dichotomous variable equaling one if a household's liquid assets exceeded a threshold depending on income and household size and zero otherwise. The threshold was calculated as follows: € 600 + monthly income + € 400 * household size. (based on the Buffer Calculator provided by the National Institute for Family Financial Information (Nibud)).
Number of debts	The number of positive responses to the question whether respondents had (a) one or more personal loans, revolving credit arrangement(s), or financing credit(s) based on a hire-purchase or installment plan, (b) a loan or credit arrangement based on a pledge, (c) overdue payments on one or more credit cards (d) money loaned from family, friends, or acquaintances, and (e) any other credits, loans, or debts.
Debt Amount	The total amount of loans, credits, and debts on 31 December 2017.
Income volatility	Number of months in which net income was lower than in the previous month, calculated of the last twelve months.
Employed	A dichotomous variable that equaled zero if the responded "Job seeker following job loss," "First-time job seeker," "Has (partial) work disability," or "Performs unpaid work while retaining unemployment benefit," and one otherwise.

	Categorical			*Numerical*		
Category	***N***	**%**	***Mean***	***SD***	***Min***	***Max***
			1.96	1.12	1.00	7.00
			3,048	1,645	0	12,114
			2,051	916	0	6,994
			30,458	67,978	-8,000	662,957
No	131	26%				
Yes	369	74%				
0	872	89%				
1	99	10%				
2	8	1%				
3	1	0%				
5	2	0%				
			2,213.59	18,100.36	0	320,000
0	921	83%				
1	156	14%				
2	28	3%				
3	7	1%				
4	1	0%				
6	1	0%				
No	73	7%				
Yes	1,042	93%				

Table 1. Continued

Variable	***Operationalization***
Control variables	
Gender	
Age	Calculated from the date of birth.
Household size	Number of members in the household.
Education level	As defined by Statistics Netherlands.
Openness to experience	Measured with Goldberg's [80] Big-Five index on a 7-point Likert Scale (50 items in total).
Conscientiousness	
Agreeableness	
Extraversion	
Emotional stability	

Debts. Given that the number of debts is more predictive of financial stress than the total debt amount[68,69], we included the number of debts as an independent variable in our analysis. We also argue that, for most households, having a mortgage contributes less to financial stress than other types of debt since the home's value usually amply compensates the mortgage loan's value. Student loans in the Netherlands have favorable conditions and are waived if one has difficulties repaying them. We, therefore, excluded mortgages and student loans from our analyses. The survey asked respondents to indicate whether they had (a) one or more personal loans, revolving credit arrangement(s), or financing credit(s) based on a hire-purchase or installment plan, (b) a loan or credit arrangement based on a pledge, (c) overdue payments on one or more credit cards (d) money loaned from family, friends, or acquaintances, and (e) any other credits, loans, or debts. We expect these types of debts to predict financial stress, although they are not necessarily problematic. We regard debts as problematic when people fail to repay them or for which people default (see, e.g., Roos et al., 2021). We performed two robustness checks with alternative operationalizations of debt, namely debt

Categorical			*Numerical*			
Category	***N***	**%**	***Mean***	***SD***	***Min***	***Max***
Male	495	45%				
Female	607	55%				
			53.26	17.78	18	92
			2.33	1.25	1	9
primary school	62	6%				
vmbo	218	20%				
havo/vwo	130	12%				
mbo	267	24%				
hbo	281	26%				
wo	143	13%				
			4.23	0.47	3.20	5.20
			4.54	0.49	2.80	5.70
			4.65	0.55	3.10	5.80
			3,80	0.62	2.10	5.50
			5.03	0.62	3.60	6.60

amount and debt-to-income ratio, defined as the debt amount divided by adjusted monthly income - as an alternative measure of debt. Respondents with one or more of the types of debt above were asked: “What was the total amount of the loans, credits, and debts that you had on 31 December 2017?” This survey item excluded mortgages and student loans. If they responded, “I don’t know,” they were asked, “To what category did the loans, credits, and debts belong on 31 December 2017?” and given 14 categories (less than € 500 to € 100.000 or more). We used the category midpoints in our calculations.

Income volatility. Two possible indices of income volatility are the relative size and the number of adverse income shocks in a given period. Prause et al.[85] found that the latter was a better predictor of psychological depression than the former; an income loss results in the need to cut expenditures and may cause difficulty paying the bills. When income in one month was lower than income in the previous month, we regarded that as an adverse income shock. We used the number of adverse income shocks in the twelve months preceding the financial

stress measurement as the primary measure of income volatility. We performed a robustness check with the relative size of income shocks as a measure of income volatility. For this measure, we calculated the absolute differences in income changes from one month to the other, added them together, and divided the outcome by income.

Table 2. Items of the Psychological Inventory of Financial Scarcity (PIFS) and its subscales

Participants indicated to what extent they disagreed or agreed with each statement (1 = *totally disagree*; 7 = *totally agree*).
Subscale 1 (Lack of money, α = .82) • I am often short of money. • It's common for me not to be able to pay my bills on time. • I often don't have money for the things I really need.
Subscale 2 (Lack of control, α = .88) • I feel like I have little control over my financial situation. • I am not able to manage my financial affairs myself. • When I think about my financial situation, I feel powerless.
Subscale 3 (Financial worries and rumination, α = .73) • I wonder all the time if I have enough money. • I often find it difficult to think about anything other than my financial situation. • I often worry about money.
Subscale 4 (Short-term focus, α = .79) • I'm only concerned with what I have to pay now. I'll see the rest later. • Because of my financial situation, I live from day to day. • I don't consider things I'll have to pay for in a while.

Table 3. Spearman's correlations between the four subscales of the PIFS.

Subscales	2	3	4
1. Money shortage	.78	.67	.70
2. Lack of control		.61	.71
3. Financial worries and rumination			.65
4. Short-term focus			

Employment. Centerdata asks respondents to select their primary occupation from 14 options. We defined employment as a dichotomous variable that equaled zero if they responded "Job seeker following job loss," "First-time job seeker," "Has (partial) work disability," or "Performs unpaid work while retaining unemployment benefit," and one otherwise.

Control variables

We included several control variables: gender, age, education level, household size, and personality traits. Previous studies show that financial well-being differs between men and women[86]. Income tends to have an inverse-U relationship with age and rise with education level. Therefore, age and education may confound the association between income and financial stress. Likewise, having a larger household may affect the association between one's economic situation and financial stress; being responsible for a spouse and children may increase worries about being able to provide for them. Several studies indicate that personality traits may be associated with financial behavior and financial stress. For example, Gerhard et al.[87] found a negative association between agreeableness, conscientiousness, and extraversion on the one hand and liquid savings on the other. They also found that openness to experience was negatively associated with liquid savings for some but not for other groups. Brown and Taylor[88] found that conscientiousness positively predicted savings and negatively predicted debts. Donnelly et al.[89] found a negative association between extraversion and debt. Higher levels of conscientiousness, higher levels of emotional stability, and lower levels of extraversion make it more likely to pursue a healthy lifestyle and financially responsible behavior simultaneously[90]. Emotional stability and conscientiousness are negatively associated with financial stress[5]. To measure Goldberg's Big Five personality traits[81]: openness to experience, conscientiousness, agreeableness, extraversion, and emotional stability (α = .78, .78, .81, .88, and .89, respectively). We included nine control variables (gender, age, education level, household size, openness to experience, conscientiousness, agreeableness, extraversion, and emotional stability) in our models.

Multiple regression

To examine the contribution of different aspects of one's economic situation in predicting financial stress, we performed a multiple regression analysis with income, savings, debts, income volatility, and employment as predictors and financial stress as independent variables. Our model included the interactions between income and other economic predictors (savings, debts, income volatility, and employment). The demographic variables age, education level, household size, and the personality traits openness to experience, conscientiousness, agreeableness, extraversion, and emotional stability served as control variables. Following Friedrich's[91] and Aiken's[92] guidance, we standardized the numerical variables before calculating the interaction terms: For each observation, we subtracted the mean and divided the result by the standard deviation. As a result, the regressions gave us standardized coefficients, enabling us to compare the relative contributions of each independent variable to predicting financial stress.

The data set presented us with two challenges. First, an inspection of diagnostics from the OLS regression showed that they contained a considerable proportion of influential observations (see Appendix, Tables A1 and A2, Figure A1). Second, as indicated above, many observations had missing data on one or more variables. We addressed the challenges by performing multiple imputations and choosing a robust regression method for influential observations. We found no multicollinearity between the independent variables in our model (see Appendix, Tables A3 and A4).

Multiple imputation

Deleting observations with missing values on one or more variables would leave 49% of the data unused, resulting in inflated standard errors[93]. The preferred methods for dealing with missing data fall into two broad groups: maximum likelihood estimation and multiple imputation[93]. Maximum likelihood estimation has the disadvantage of requiring the estimation of a model for the joint distribution of all the variables, and results may not be robust to model choice. A downside of multiple imputation is that the imputation model must be congenial with the analysis. In the case of our study, the assumption is that the imputation model poses a lighter restriction than the assumption of a joint (normal) distribution of all variables. We, therefore, chose to proceed with multiple imputation. We used multiple imputation to address missing values. We applied multivariate imputation by chained equations (*mice*) because, unlike other available techniques, this method does not require a joint distribution of all the variables in the model[95]. We used Van Buuren and Groothuis-Oudhoorn's[96] *mice* package in R, which iteratively imputes values for all variables with missing data and uses the imputed values to estimate a posterior distribution for the model parameters. The mechanism randomly draws parameters to generate predictions. It uses these predictions to impute values in the next iteration. To increase the plausibility of missingness at random, we included the control variables (gender, age, education level, household size, and personality traits) in the imputation process[95]. We used *mice* combined with a random forest mechanism, a prediction method from machine learning constructed by recursively partitioning a data set and fitting a simple model to each partition[97]. Random forests can retain interactions between variables with missing values and are, therefore, well suited for our model and reduce the possibility of erroneous results[95,98].

The fraction of missing information, *lambda*, represents the proportion of the total variance in the parameter estimates due to missingness[99]. *Lambda* can be calculated as $(1+m) * VB / VT$, where m is the number of imputed datasets, and VB and VT are the between and total variance, respectively. A test run with

20 imputations resulted in a maximum *lambda* of .64. Based on Von Hippel's guidance[100], we set the number of imputations at 93, corresponding with *lambda* = .05. We, therefore, created 93 imputed data sets, each representing a plausible completion of the missing values. These 93 imputed data sets gave us 93 different versions of the complete data, accounting for uncertainty in the missing data.

Robust regression

It is well established that ordinary least squares (OLS) estimation can give highly unreliable outcomes in the presence of influential observations. OLS minimizes the sum of the squared residuals, which gives "unusual" observations an unduly large weight. Because our data contained many outliers and heavy tails, we applied the MM-estimator developed by Yohai[101], which goes through three stages to estimate a regression model. The first stage uses an S-estimator to minimize the percentage bend midvariance of the residuals. The percentage bend midvariance is less sensitive to outliers than the variance; it gives robust but not necessarily efficient estimates. The second stage calculates an M-estimate of the errors. The third stage computes M-estimates of the regression parameters based on the outcomes of the first two stages. This process gives regression estimates that compare well with other estimators in terms of robustness while maintaining efficiency[102,103]. We used the *lmrob* function in the R-package *robustbase* to perform the calculations, with parameters proposed by Koller and Stahel[104].

We performed robust regression for each imputed dataset, resulting in 93 regression analyses. Next, we applied Rubin's rules[105] to pool the results of these individual regressions. We averaged the estimates of the 93 individual regressions to obtain the parameter estimates. The pooled standard errors are derived from two distinct components: the within imputation variance and the between imputation variance. Within imputation variance represents the precision of the parameter of interest within each imputed dataset.

On the other hand, between imputation variance reflects the additional variance arising due to missing data. It is estimated by considering the variance of the parameter of interest across all imputed datasets. The pooled standard errors are calculated as the square root of the sum of the within-imputation variance and the between-imputation variance.

RESULTS

Descriptive statistics and correlations

Of the 1,114 respondents, 55% were female (see Table 1). Their ages were between 18 and 92 (M = 53.26 years, SD = 17.78). Their mean net monthly income was 2,800 euros (*Median* = 2,258, SD = 7,226). Inspection revealed considerable numbers of outliers, skewness, and heavy tails (Appendix, Tables A1 and A2, and Figure A1). We also observed a relatively large proportion of missing data for some variables, with a maximum of 41% missing values for savings. Although the total percentage of missing values was moderate (9%), 550 (49%) respondents had missing values on at least one variable.

We calculated Spearman's correlations between the continuous variables in our model and point-biserial correlations for dichotomous variables (Appendix Table A5). Financial stress moderately correlated with buffer savings (r_{PB} = -.37) and income (r_S = -.30). The negative signs indicated that insufficient savings and lower incomes were associated with more financial stress. The number of debts (r_S = .25) and employment (r_{PB} = -.18) weakly correlated with financial stress. More debts and unemployment were associated with more financial stress. We found a very weak correlation between income volatility (r_S = .05) and financial stress. Of the control variables, age (r_S = -.17), conscientiousness (r_S = -.20), and emotional stability (r_S = -.20) had weak negative correlations with financial stress. The other control variables had very weak or no correlation with financial stress. We found that income correlated weakly with buffer (r_{PB} = -.26) and employment (r_{PB} = .17) and very weakly with number of debts (r_S = -.06) and income volatility (r_S = .08).

Main analysis

We ran the robust MM-regression analyses for the 93 imputed data sets in three steps. First, we specified a model with only the economic predictors: income, savings, debts, income volatility, and employment (Model 1). Next, we added the control variables: the five personality traits, education level, age, gender, and household size (Model 2). Finally, we added the interactions of income with the other economic predictors (Model 3). Table 4 contains the results for the three models.

Results from Model 1 (R^2 = .29) showed that income, buffer savings, number of debts, and employment predicted financial stress. In all cases, signs of the associations were as expected, indicating that lower income, insufficient buffer savings, more debts, and unemployment were associated with more financial stress. We found no support for income volatility being a predictor of financial stress. A comparison of

the standardized regression parameters shows that buffer savings had the largest relative contribution to explaining financial stress (β = 0.709, $p < .001$), followed by employment (β = -0.506, $p < .001$), number of debts (β = 0.238, $p < .001$), and income (β = -0.154, $p < .001$). We used the *pool.compare* function that is part of the R *mice* package to compare model fits. This function is based on the method proposed by Meng and Rubin[105] and uses an adapted version of the Wald statistic (W). The fit for Model 2 ($R^2 = .34$) was significantly higher compared to Model 1 ($W = 4.90$, $p < .001$). The conclusions did not change compared to Model 1. From both models, therefore, we conclude that sufficient buffer savings, employment, and number of debts had stronger associations with financial stress than income.

The fit for Model 3 ($R^2 = .36$) was significantly higher compared to Model 2 ($W = 2.97$, $p = .019$). In this model, the relative contribution of buffer savings and income was comparable (β = -0.653, $p < .001$ and β = -0.612, $p < .001$, respectively). The number of debts had a smaller but significant contribution to predicting financial stress (β = 0.224, $p < .001$). On average, the results did not show employment to contribute to financial stress (β = -0.230, $p = .097$). However, we did find an interaction between income and employment. We estimated the marginal effects of different income levels, from two standard deviations below the mean to two standard deviations above the mean (Appendix, Table A6). Results showed a negative association between employment and financial stress for an income level two standard deviations below the mean (β = -0.895, $p = .006$); for all other income levels, results did not show an association between employment and financial stress. We found no significant interaction between income on the one hand and buffer and the number of debts on the other. This finding indicates that having sufficient buffer savings and having fewer debts was associated with less financial stress, independent of household income.

The control variables education level, age, gender, and household size were significant covariates, whereas psychological traits were not. In line with previous findings, age and education level had a negative association with financial stress. Other things being equal, males experienced more financial stress than females, contrasting with earlier findings. Household size was negatively associated with financial stress.

Additional analyses

We tested how our model performed compared to a model with only income as an independent variable. Moreover, we tested our findings' robustness to how financial stress, savings, debts, and income volatility were operationalized (see Appendix). Also, we examined how economic predictors were associated with the four different subscales of financial stress.

*Table 4. Results of the pooled robust regressions for the base model (including only the predictor variables, Model 1), the model with control variables (Model 2), and the model with control variables and interactions (Model 3). For each model, the standardized regression parameters (β), standard errors (σ), t-statistic (t), and p-value (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

	Model 1: Base (R^2 = .29)				
	β	**σ**	***t***	***p***	
Intercept	0.915	0.112	8.206	< .001	***
Income	-0.154	0.026	-5.858	< .001	***
Buffer	-0.709	0.077	-9.216	< .001	***
Number of debts	0.238	0.029	8.332	< .001	***
Income volatility	0.010	0.025	0.394	.694	
Employed	-0.506	0.104	-4.852	< .001	***
Openness to experience					
Conscientiousness					
Agreeableness					
Emotional stability					
Extraversion					
Education level 1					
Education level 2					
Education level 3					
Education level 4					
Education level 5					
Age					
Gender					
Household size					
Income * savings					
Income * debt amount					
Income * income volatility					
Income * employed					

Results from the model with only income as an independent variable showed that income predicted financial stress (β = -0.219, p < .001, see Table A7), but explanatory power was much lower compared to the model that included buffer savings, debts, income volatility, and employment (R^2 = .06 and .29, respectively). A model with the logarithm of financial stress (R^2 = .33) showed similar results as the main model: Buffer had the largest standardized coefficient (β = -0.704, p < .001), followed by income (β = -0.542, p = .003)

Model 2: Control variables (R^2 = .34)					Model 3: Control variables + interactions (R^2 = .35)				
β	σ	*t*	*p*		β	σ	*t*	*p*	
1.236	0.150	8.254	< .001	***	0.962	0.185	5.204	< .001	***
-0.150	0.028	-5.367	< .001	***	-0.612	0.168	-3.636	< .001	***
-0.682	0.076	-8.920	< .001	***	-0.653	0.077	-8.476	< .001	***
0.232	0.028	8.190	< .001	***	0.224	0.030	7.572	< .001	***
-0.018	0.025	-0.700	0.484		-0.013	0.025	-0.511	.609	
-0.431	0.103	-4.202	< .001	***	-0.230	0.138	-1.663	.097	.
0.045	0.035	1.264	.208		0.045	0.035	1.267	.207	
-0.064	0.036	-1.796	.074	.	-0.063	0.035	-1.773	.078	
-0.018	0.035	-0.502	.616		-0.018	0.035	-0.503	.615	
-0.051	0.037	-1.384	.168		-0.051	0.037	-1.397	.164	
0.025	0.035	0.708	.48		0.024	0.035	0.666	.506	
-0.377	0.121	-3.123	.002	**	-0.345	0.122	-2.836	.005	**
-0.385	0.130	-2.951	.003	**	-0.340	0.131	-2.588	.01	**
-0.290	0.120	-2.424	.016	*	-0.264	0.120	-2.191	.029	*
-0.370	0.120	-3.098	.002	**	-0.339	0.120	-2.814	.005	**
-0.345	0.132	-2.605	.009	**	-0.309	0.133	-2.320	.021	*
-0.127	0.028	-4.515	< .001	***	-0.120	0.028	-4.286	< .001	***
-0.137	0.055	-2.503	.013	*	-0.125	0.054	-2.311	.021	*
-0.056	0.026	-2.155	.031	*	-0.052	0.026	-2.000	.046	*
					0.127	0.076	1.666	.097	.
					-0.009	0.034	-0.258	.797	
					0.051	0.026	1.959	.05	.
					0.370	0.162	2.288	.023	*

and debts (β = 0.199, p < .001) (see Table A8). In contrast to the main model, employment was not a predictor in the model, with the logarithm of financial stress as the dependent variable.

Next, we repeated the main analysis with different operationalizations of some independent variables. First, we estimated a model with the amount of liquid savings instead of buffer as an independent variable (Table A9, R^2 = .29). Results

showed that savings were a significant predictor of financial stress in this model (β = -0.199, $p < .001$). In this case, we did find a significant interaction between income and savings (β = 0.092, $p = .002$). The interaction's positive sign indicates that the negative association between financial stress and income was weaker as income increased. Put differently, there was a stronger negative association between financial stress and savings when income was lower. This finding was in line with our hypotheses. Second, we replaced the number of debts with two alternative operationalizations of debt: total debt amount (Table A10, $R^2 = .30$) and debt-to-income ratio (Table A11, $R^2 = .30$). In both cases, results showed that debts did not significantly predict financial stress (β = 0.047, $p = .080$ and β = 0.054, $p = .083$). Third, replacing the number of adverse income shocks with the relative size of negative income shocks (Table A12, $R^2 = .35$) did not change the results; we found no support for an association between income volatility and financial stress (β = 0.002, $p = .946$). However, the results did show that income positively moderated the association between employment and financial stress (β = 0.414, $p = .014$). There was a negative association between employment and financial stress for lower-income households (income one standard deviation below the mean). The robustness check largely confirmed our main analysis: Savings and income consistently predicted financial stress. For debts, the picture was more complex. The number of debts predicted financial stress, whereas debt amount and debt-to-income ratio did not.

Finally, we explored how the five aspects of one's economic situation predicted each of the four aspects of financial stress (the appraisal of money shortage and lack of control, financial worries and rumination, and short-term focus, Table A13). The first three aspects of financial stress (appraisal of money shortage, lack of control, and financial worries and rumination) were consistently predicted by income, buffer, and debts ($R^2 = .34$, .29, and .27, respectively). The relative contributions of the independent variables differed. For the appraisal of money shortage, income had the highest standardized coefficient (β = -0.628, $p < .001$), followed by buffer (β = -0. 598, $p < .001$) and debts (β = 0.218, $p < .001$ and β = 0.145, $p < .001$). For lack of control and financial worries and rumination, buffer had the highest standardized coefficient (β = -0.695, $p < .001$ and β = -0.619, $p < .001$, respectively), followed by income (β = -0.578, $p < .001$ and β = -0.376, $p < .001$, respectively) and debts (β = 0.223, $p < .001$ and β = 0.111, $p < .001$, respectively). Income moderated the association between buffer and the independent variable for money shortage (β = 0.202, $p = .007$) and financial worries and rumination (β = 0.160, $p = .004$), but not for lack of control (β = 0.054, $p = .498$). Income moderated the association between employment and the independent variable

for money shortage (β = 0.342, p = .026) but not for lack of control (β = 0.232, p < .158) and financial worries and rumination (β = 0.302, p = .063). The fourth aspect of financial stress (short-term focus) was only predicted by the number of debts (β = -0.305, p = .006). The short-term focus model had considerably less explanatory power (R^2 = .05) than the other models. Income moderated the association between employment and short-term focus (β = 0.548, p = .039).

DISCUSSION

The present research examined the relationship between households' economic situation and financial stress. We took an integrative perspective of households' economic situation by including five aspects: (adjusted) income, savings, debts, income volatility, and employment. We hypothesized that - besides income - savings, debts, income volatility, and employment contribute to predicting financial stress. We also hypothesized that these associations are stronger as income decreased. We tested our hypotheses with a probability sample of the Dutch population (N = 1,114). We adjusted net monthly income for household size to account for larger households having more expenses. The data partially supported the hypothesized relations. Results confirmed that adjusted income, buffer savings, and the number of debts predicted financial stress. Lower income, insufficient buffer savings, and more debts were associated with more financial stress. We found that employment only predicted financial stress for the lowest end of the income spectrum. The results did not support the hypotheses that income volatility and debt amounts predict financial stress.

Income. We found adjusted income to be a predictor of financial stress. This finding aligns with previous research indicating that lower-income households are more likely to experience fewer resources than they feel they need. This appraisal may cause them to worry and ruminate, feel less in control, and focus more on the present, all aspects of financial stress. We observed that adjusted income correlated strongly with all four components of financial stress (money shortage, lack of control, financial worries and rumination, and short-term focus). Future studies might incorporate discretionary income, defined as net income minus fixed expenses, as a predictor. Disposable income may have a stronger correlation with financial stress because it considers the amount of "slack" households experience[1].

Savings. We found that insufficient buffer savings was associated with more financial stress. This finding was expected; households can use buffer savings to overcome unexpected expenditures and income shocks. Also, households with savings in the bank need to worry less about making ends meet until the next paycheck. We did not find income to moderate the association between buffer savings and financial stress. This finding suggests a buffer is essential for lower- and higher-income households to prevent financial stress. A model with savings amount instead of buffer showed that savings amount also predicted financial stress. In this case, we did find income to be a moderator of the association

between savings and financial stress. A potential explanation for this finding is that higher-income households often have higher fixed expenditures, requiring a higher buffer. Income shocks and unexpected expenditures are also likely to increase as income increases.

Debts. We found that the number of debts predicted financial stress. This finding confirms that the number of debt accounts impacts psychological outcomes more than debt amounts per se[68–70]. We did not find support for income moderating the association between the number of debts and financial stress, suggesting that a higher number of debts is stressful regardless of income level. We found no support for an association between debt amounts and financial stress. These results indicated a complex relationship between debt and financial stress. A post hoc explanation for the absence of an association between total debt amount and financial stress could be that higher debts may not necessarily increase financial stress as long as one can pay the interest and repayment (measures not available in the current data). Future studies could incorporate interest payments and redemption in their analyses to address this possibility. Also, future research could examine how different types of debts affect financial stress. Most studies focused on one type of debt (particularly credit card debt). Few studies have examined the distinctive influence of different kinds of debt on stress or mental health, and their findings are inconclusive. In a review of the literature on the health effects of indebtedness, Turunen and Miilamo[107], for example, found that "The source of debt had little effect on the prevalence of common mental disorders, though some types of debt were reported more often than others among people with a mental disorder" (p. 6). Other studies have found that different types of debts had different associations with financial burdens[65,67].

Income Volatility. In contrast to previous findings[57], we found no support for an association between income volatility and financial stress for two different measures of income volatility. Our data did not enable us to distinguish anticipated income changes - such as the receipt of employee holiday allowances or regular volatility of turnover for entrepreneurs - from unanticipated income changes - such as the loss of income due to sickness or becoming unemployed. The specifics of the income volatility may determine the strength of its association with financial stress; predictable income shocks may have a weaker association with financial stress than unpredictable income shocks. There is ample evidence that unforeseen life events are associated with stress and mental well-being[24,108]. Future studies could examine if different types of income shocks have different associations with financial stress.

Employment. We found that employment only predicted financial stress for the lowest-income groups. This result partly corroborates earlier studies that have found negative associations between unemployment and psychological well-being[49,50]. Being unemployed may be associated with insecurity and worrying about being able to pay the bills and provide for one's family, only for lower-income households.

Strengths and limitations

We examined how five aspects of one's economic situation (income, savings, debts, income volatility, and employment) predicted financial stress in one empirical model. We assessed the relative contribution of each aspect to predicting financial stress. We also examined if income moderated the association of financial stress with the other four aspects of one's economic situation. To our knowledge, our study is the first to examine these aspects in predicting financial stress. This approach allowed the examination of the relative contributions of economic factors in predicting financial stress. We studied the relationships of economic correlates with financial stress using different operationalizations of the predictor variables, enabling us to test our findings' robustness. Also, we used state-of-the-art multiple imputation methods to deal with missing data and robust estimation techniques to overcome influential observations. This further enhanced our confidence in the results.

Our study focused on the economic predictors of financial stress. We included several demographic variables (age, gender, education level, and household size) and psychological traits as control variables. However, other factors may contribute to financial stress, such as financial literacy, financial attitudes, and self-efficacy[108,109]. It would be worthwhile to examine how these factors, in combination with economic factors, predict financial stress.

Because we used cross-sectional data, one evident limitation of the current study is that we could not draw causal inferences. Experiments or quasi-experimental longitudinal studies could increase confidence in causal relationships. Experiments require developing paradigms to manipulate income, savings, debts, and income volatility in a laboratory environment. As an alternative, longitudinal studies may provide a viable route. A second limitation is that we used self-reported economic data. Future research could include administrative data instead.

Financial stress is relevant in a developed country such as the Netherlands because financial stress can have profound consequences for people's well-being, health, cognitive performance, and behavior. It is, therefore, important to

understand the association between households' objective economic situation and subjective financial stress in the Dutch context. Future studies could examine the associations between economic factors and financial stress in other economic and cultural contexts.

Our findings also provide some suggestions for (additional) conceptualizations of several aspects of households' economic situation when studying their association with stress and well-being. Discretionary income may be a stronger predictor of financial stress than net income. Likewise, future studies could look at the effects of interest and repayment of debts in addition to the debt amount. Finally, future studies could use a more fine-grained distinction between different types of (un)employment, such as being unemployed, working for an employer, being self-employed, and being retired.

Implications for research and policy

This study's central message is that income is too narrow to conceptualize one's economic situation to predict financial stress. Other indicators, like savings, (number of) debts, and employment, should also be part of the equation. Also, we encourage examining the impact of different types of debts on financial stress. Furthermore, future studies should be aware that the association between savings and employment status, on the one hand, and financial stress, on the other, may be stronger as income decreases. We also suggest examining whether unexpected income shocks resulting from life events - as opposed to monthly income volatility - predict financial stress.

Furthermore, we encourage examining the associations between economic variables and financial stress in other countries. Finally, examining if there is a temporal association between one's current economic situation and future financial stress is worthwhile, especially in the aftermath of COVID-19.

In policy, it is vital to consider that financial stress and its potential cognitive, affective, and behavioral consequences are not limited to lower-income households. Having a low income is an important source of financial stress. However, including other economic aspects than income, such as the availability of rainy-day savings, the number of different debts, and employment status in social policy design, can provide a sharper picture of the target audience. This enables better tailoring of interventions to specific (sub)groups. Our research provides potential avenues for interventions to counter financial stress.

Providing income support to low-income households security is an important way to counter financial stress. Social welfare systems aim to provide a basic standard of living[111]. The effectiveness of social welfare systems relies on eligible households participating[112]. Many households do not take up the social welfare for which they are eligible[113,114]. Effective ways to promote welfare participation include providing personalized information to eligible households[115–117], decreasing the complexity of application procedures[118–120], and engaging in active outreach and assistance[121,122]. Behaviorally informed interventions or "nudges" have had limited effects[123–125].

Ensuring that households have a financial buffer by promoting rainy-day savings may be another effective way to reduce financial stress. Previous studies have found that effective ways to promote buffer savings include automatically enrolling workers into an employer-sponsored savings account funded by payroll deduction[126], commitment accounts with withdrawal restrictions[127], promoting savings habits[128], stimulating them to think about their savings goal[129], sending reminders to make deposits, prompting to save a portion of their tax return[130], and prize-linked saving, which offers lottery-like payouts to instead of interest[131].

Promoting savings can also reduce the need for debt[132]. Our research suggests that consolidating multiple small debts into one larger debt may reduce financial stress. This is in line with previous findings from a debt relief program in Singapore. Waiving multiple debts positively affected cognitive performance, including short-term focus, rather than waiving a single large debt[69]. Another study suggests that paying off the smallest debt first and then paying off the rest of their debts from smallest to largest may be beneficial despite being economically suboptimal[133].

To conclude, the present research took a more integrative approach to predicting the psychological construct of financial stress than previous studies. The results showed that buffer savings, number of debts, and employment also contributed to predicting financial stress. Taking a more holistic view of households' economic situation opens new routes for future research. It also provides opportunities for developing policy interventions to reduce financial stress and increase financial well-being.

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CHAPTER 3. APPENDIX
DIAGNOSTICS

Table A1. Outliers, normality test, skewness, and kurtosis of the continuous variables. We calculated the number of outliers as proposed by D'Orazio (2020). For the variables without a clear skewness (i.e., the control variables), the outlying observations are those outside the interval $[Q_1 - k*IQR; Q_1 + k*IQR]$, *where* Q_1 *and* Q_3 *are respectively the 1st and the 3rd quartile, while* $IQR = (Q_3 - Q_1)$ *is the Inter-Quartile Range. We used the value* $k = 1.5$. *For variables with strong skewness (i.e., the independent and dependent variables), the outlying observations were identified using the method proposed by Hubert and Vandervieren (2008) and based on the Medcouple measure of skewness; in practice, the bounds are*$[Q_1 - 1.5exp(aM)IQR; Q_3 + 1.5exp(bM)IQR]$, *where* M *is the medcouple; when* $M > 0$ *(positive skewness) then* $a = -4$ *and* $b = 3$; *for negative skewness (*$M < 0$*),* $a = -3$ *and* $b = 4$.

Variable	Outliers	Shapiro-Wilk	p-value	Skewness	Kurtosis
Financial stress	0	.820	< .001	1.415	4.658
Income	31	.960	< .001	0.937	5.022
Debts	110	.330	< .001	5.082	44.039
Income fluctuation	193	.450	< .001	3.460	21.319
Age	0	.970	< .001	-0.166	2.028
Household size	0	.840	< .001	1.050	3.933
Openness	5	.980	.214	-0.055	2.644
Conscientiousness	2	.980	.129	-0.337	3.500
Agreeableness	2	.970	.041	-0.515	2.947
Extraversion	0	.980	.232	-0.290	2.938
Emotional stability	4	.990	.311	-0.155	2.768

Table A2. Influential Observations. Number of influential observations for different measures of influential observations: DFFIT, COVRATIO, Cook's distance

Test	#
DFFIT	31
COVRATIO	77
Cook's d	3

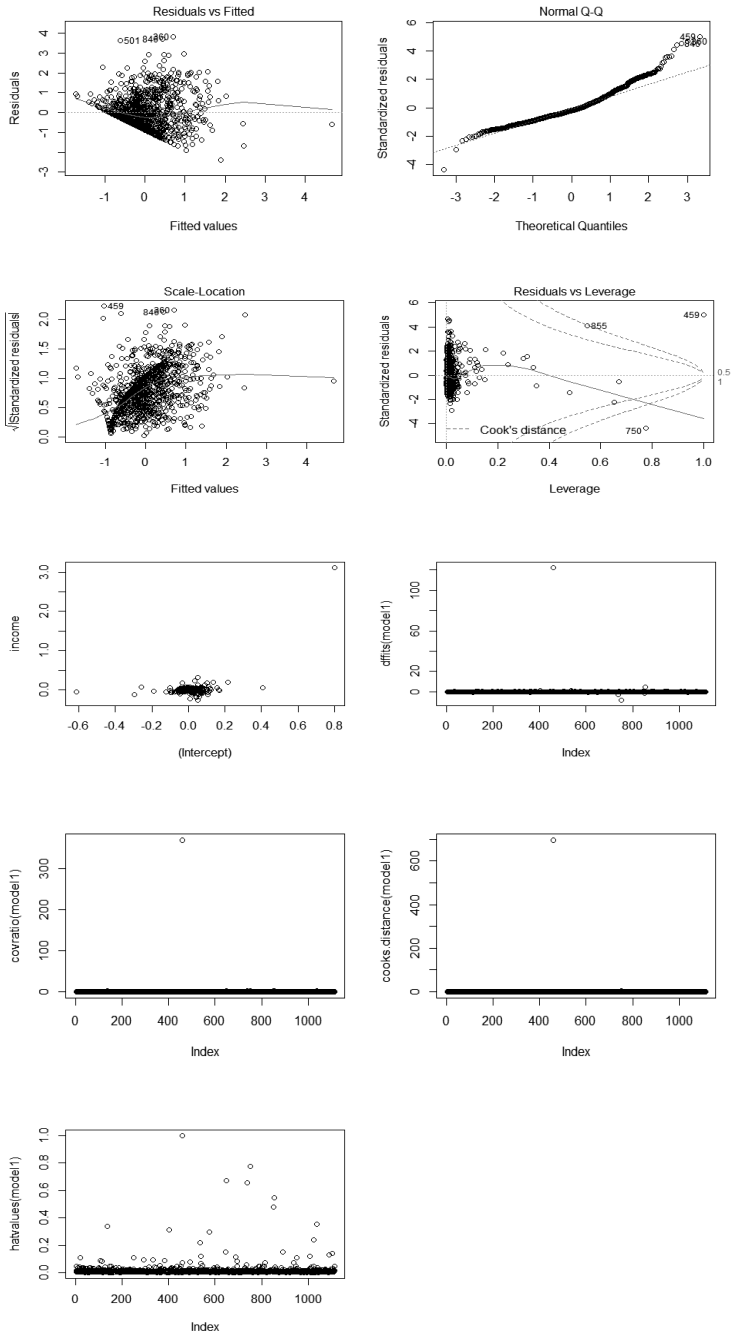

Figure A1. Influential observations. DFBETAS for each model variable, DFFITS, covariance ratios, Cook's distances, and the diagonal elements of the hat matrix. It is safe to say that the model has a considerable number of influential observations.

MULTICOLLINEARITY

Table A3. Multicollinearity Tests. Cooley and Lohnes' Determinant of the correlation matrix, Farrar's test of chi-square for the presence of multicollinearity, Kovacs et al.s' Red Indicator, Chatterjee and Price's Sum of lambda inverse, Theil's indicator and Belsey's condition number (Imdad et al., 2019; Imdad & Aslam, 2020; Imdadullah et al., 2016).

Test	**Result**
Determinant |X'X|	0.47
Farrar Chi-Square	827.48
Red Indicator	0.12
Sum of Lambda Inverse	11.69
Theil's Method	-1.30
Condition Number	2.00

Table A4. Variance Inflation Factors (VIF) for Model 2 (independent variables + control variables). We took the results of the regression for the first imputed dataset.

Variable	**VIF**
Income	1.24
Buffer	1.10
Number of debts	1.06
Income volatility	1.03
Employed	1.05
Openness	1.07
Conscientiousness	1.05
Agreeableness	1.16
Extraversion	1.03
Emotional stability	1.05
Extraversion	1.03
Education	1.44
Age	1.30
Gender	1.15
Household size	1.13

CORRELATIONS

Table A5. Correlation coefficients between our main model's continuous and dichotomous variables. When at least one dichotomous variable (buffer, gender, or employed) is involved, the point-biserial point correlation r_{PB} is used. For pairs of continuous variables, Spearman´s correlation r_S is used. Moderate correlations are ***bold and underlined****; weak correlations are underlined; very weak or no correlations are displayed in normal font. Following Dancey and Reidy's (2007) guidance, we used the following cut-off points: |r| = 1 indicates perfect correlation; .6 ≤ |r| < 1: strong correlation; .3 ≤ |r| < .6: moderate correlation; .1 ≤ |r| < .3: weak correlation; |r|< .1: no or very weak correlation.*

	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Financial Stress	**-.31**	**-.37**	.25	.05	-.18	-.02	-.17	-.03	-.20	-.20	.08	-.09	.02
2. Income		.26	-.06	.08	.19	-.12	-.02	.14	.11	.12	-.06	-.07	.22
3. Buffer			-.21	-.03	.14	-.11	.08	-.09	.12	.09	.14	-.16	.05
4. Number of debts				.08	-.04	.01	-.11	.03	-.07	-.08	.05	-.10	-.11
5. Income volatility					.01	-.05	-.12	.01	-.04	-.05	.08	-.08	.10
6. Employed						.02	.06	.04	.10	.21	.01	.05	-.03
7. Gender							-.07	-.04	.16	-.14	-.07	.45	-.03
8. Age								-.27	.06	.23	-.11	.02	-.07
9. Household Size									.05	-.03	-.14	.15	-.12
10. Conscientiousness										.21	-.05	.24	.23
11. Emotional Stability											-.14	.08	.13
12. Extraversion												-.21	-.12
13. Agreeableness													.20
14. Openness													

REGRESSIONS

*Table A6. Marginal effects at various levels of income for the other independent variables. The income column contains the number of standard deviations away from the mean (-2, -1, 0, 1, or 2). The standardized regression parameters (β), standard errors (σ), t-statistics (t), and p-values (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

	Income	**β**	**σ**	***df***	***p***	
Buffer	-2	-0.878	0.167	317.140	< .001	***
Buffer	-1	-0.661	0.194	154.805	< .001	***
Buffer	0	-0.625	0.121	218.656	< .001	***
Buffer	1	-0.547	0.146	254.809	< .001	***
Buffer	2	-0.690	0.217	136.847	.002	**
Debts	-2	0.240	0.063	1,338.086	< .001	***
Debts	-1	0.225	0.054	1,277.340	< .001	***
Debts	0	0.220	0.040	1,396.308	< .001	***
Debts	1	0.218	0.052	1,913.095	< .001	***
Debts	2	0.223	0.052	1,534.532	< .001	***
Employed	-2	-0.895	0.321	268.139	.006	**
Employed	-1	-0.250	0.525	126.591	.635	
Employed	0	-0.142	0.312	174.282	.648	
Employed	1	0.065	0.398	200.864	.870	
Employed	2	-0.339	0.539	122.333	.531	
Income fluctuation	-2	-0.104	0.063	1,014.287	.097	.
Income fluctuation	-1	-0.016	0.079	163.939	.841	
Income fluctuation	0	-0.001	0.044	279.047	.979	
Income fluctuation	1	0.028	0.055	287.804	.619	
Income fluctuation	2	-0.030	0.077	170.050	.701	

*Table A7. Results of the pooled robust regressions for the model with only income as an independent variable. The standardized regression parameters (β), standard errors (σ), t-statistics (t), and p-values (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

	β	**σ**	***t***	***df***	***p***	
Intercept	-0.139	0.025	-5.594	1,107.681	< .001	***
Income	-0.219	0.026	-8.461	963.510	< .001	***

*Table A8. Results of the pooled robust regressions for the model with log(pifs) as the dependent variable. The standardized regression parameters (β), standard errors (σ), t-statistics (t), and p-values (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

	β	σ	t	df	p	
Intercept	1.040	0.207	5.018	554.761	< .001	***
Income	-0.542	0.184	-2.950	450.399	.003	**
Buffer	-0.704	0.087	-8.104	269.797	< .001	***
Debts	0.199	0.033	6.090	692.428	< .001	***
Income fluctuation	0.004	0.028	0.150	868.450	.881	
Employed	-0.203	0.157	-1.297	603.396	.195	
Openness	0.053	0.041	1.295	191.797	.197	
Conscientiousness	-0.072	0.041	-1.753	180.482	.081	.
Agreeableness	-0.024	0.040	-0.600	205.658	.549	
Emotional stability	-0.064	0.043	-1.500	161.871	.136	
Extraversion	0.019	0.042	0.463	165.384	.644	
Education level 1	-0.327	0.136	-2.411	821.562	.016	*
Education level 2	-0.341	0.146	-2.329	865.203	0.02	*
Education level 3	-0.252	0.134	-1.881	821.878	0.06	.
Education level 4	-0.339	0.135	-2.517	830.635	.012	*
Education level 5	-0.307	0.149	-2.060	835.518	0.04	*
Age	-0.142	0.032	-4.463	836.178	< .001	***
Gender	-0.143	0.062	-2.308	706.259	.021	*
Household size	-0.045	0.030	-1.523	880.937	.128	
Income * buffer	0.066	0.083	0.794	342.703	.427	
Income * debts	0.034	0.038	0.890	520.569	.374	
Income * income volatility	0.050	0.030	1.669	954.141	.096	.
Income * employed	0.311	0.177	1.760	501.999	.079	.

*Table A9. Results of the pooled robust regressions for the model with savings amount instead of buffer as an independent variable. The standardized regression parameters (β), standard errors (σ), t-statistics (t), and p-values (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

	β	**σ**	***t***	***df***	***p***	
Intercept	0.571	0.178	3.203	641.116	.001	**
Income	-0.587	0.163	-3.601	414.958	< .001	***
Savings	-0.199	0.042	-4.750	316.924	< .001	***
Debts	0.260	0.030	8.563	668.440	< .001	***
Income fluctuation	-0.013	0.025	-0.527	996.123	.598	
Employed	-0.286	0.141	-2.030	565.918	.043	*
Openness	0.051	0.036	1.415	196.834	.159	
Conscientiousness	-0.081	0.037	-2.171	175.772	.031	*
Agreeableness	-0.025	0.036	-0.680	205.626	.497	
Emotional stability	-0.059	0.039	-1.528	158.193	.129	
Extraversion	0.024	0.037	0.654	165.881	.514	
Education level 1	-0.429	0.120	-3.575	917.396	< .001	***
Education level 2	-0.425	0.130	-3.257	918.958	.001	**
Education level 3	-0.343	0.120	-2.857	869.772	.004	**
Education level 4	-0.436	0.119	-3.653	906.181	< .001	***
Education level 5	-0.416	0.133	-3.135	884.860	.002	**
Age	-0.102	0.028	-3.597	922.440	< .001	***
Gender	-0.101	0.055	-1.831	719.593	.067	.
Household size	-0.036	0.026	-1.355	948.807	.176	
Income * savings	0.092	0.029	3.119	321.997	.002	**
Income * debts	-0.031	0.034	-0.911	548.025	.363	
Income * income volatility	0.054	0.027	2.041	964.537	.042	*
Income * employed	0.436	0.165	2.646	422.985	.008	**

*Table A10. Results of the pooled robust regressions for the model with debt amount instead of number of debts as an independent variable. The standardized regression parameters (β), standard errors (σ), t-statistics (t), and p-values (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

	β	σ	t	df	p	
Intercept	0.923	0.192	4.818	447.383	< .001	***
Income	-0.688	0.173	-3.976	334.011	< .001	***
Buffer	-0.695	0.077	-8.981	261.117	< .001	***
Debt amount	0.047	0.027	1.753	557.630	.080	.
Income fluctuation	-0.008	0.025	-0.315	841.743	.753	
Employed	-0.224	0.143	-1.559	487.299	.120	
Openness	0.040	0.036	1.104	189.347	.271	
Conscientiousness	-0.064	0.036	-1.774	181.117	.078	
Agreeableness	-0.024	0.035	-0.680	222.063	.497	
Extraversion	0.023	0.037	0.641	170.031	.522	
Emotional stability	-0.055	0.037	-1.477	170.631	.141	
Education level 1	-0.311	0.125	-2.489	703.386	.013	*
Education level 2	-0.306	0.135	-2.262	714.033	.024	*
Education level 3	-0.217	0.124	-1.753	690.543	.080	.
Education level 4	-0.281	0.124	-2.268	710.863	.024	*
Education level 5	-0.256	0.136	-1.881	729.880	.060	.
Age	-0.125	0.029	-4.374	786.081	< .001	***
Gender	-0.113	0.055	-2.051	688.246	.041	*
Household size	-0.055	0.027	-2.040	840.221	.042	*
Income * buffer	0.148	0.075	1.963	302.134	.051	.
Income * debt amount	-0.010	0.036	-0.271	425.543	.786	
Income * income volatility	0.041	0.026	1.533	918.759	.126	
Income * employed	0.423	0.166	2.541	372.191	.011	*

*Table A11. Results of the pooled robust regressions for the model with debt-to-income ratio amount instead of number of debts as an independent variable. The standardized regression parameters (β), standard errors (σ), t-statistics (t), and p-values (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

	β	**σ**	***t***	***df***	***p***	
Intercept	0.926	0.192	4.837	447.616	< .001	***
Income	-0.678	0.175	-3.874	324.999	< .001	***
Buffer	-0.695	0.077	-8.980	261.601	< .001	***
Debt-to-Income	0.054	0.031	1.738	613.191	.083	.
Income fluctuation	-0.010	0.026	-0.370	789.748	.712	
Employed	-0.225	0.143	-1.579	497.803	.115	
Openness	0.040	0.036	1.107	189.602	.270	
Conscientiousness	-0.064	0.036	-1.778	181.907	.077	.
Agreeableness	-0.024	0.035	-0.676	223.269	.500	
Emotional stability	-0.055	0.037	-1.475	170.696	.142	
Extraversion	0.024	0.037	0.641	168.659	.522	
Education level 1	-0.312	0.125	-2.493	695.771	.013	*
Education level 2	-0.306	0.135	-2.261	710.426	.024	*
Education level 3	-0.218	0.124	-1.758	677.140	.079	.
Education level 4	-0.281	0.124	-2.268	701.078	.024	*
Education level 5	-0.258	0.137	-1.885	709.730	.060	.
Age	-0.125	0.029	-4.373	779.741	< .001	***
Gender	-0.113	0.055	-2.067	697.073	.039	*
Household size	-0.055	0.027	-2.044	831.938	.041	*
Income * buffer	0.148	0.076	1.957	298.121	.051	.
Income * Debt-to-Income	0.006	0.041	0.142	393.536	.888	
Income * income volatility	0.042	0.027	1.581	908.925	.114	
Income * employed	0.414	0.167	2.479	370.622	.014	*

*Table A12. Results of the pooled robust regressions for the model with the relative size of income shocks as a measure of income volatility. The standardized regression parameters (β), standard errors (σ), t-statistics (t), and p-values (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

	β	**σ**	***t***	***df***	***p***	
Intercept	0.961	0.185	5.198	487.291	< .001	***
Income	-0.618	0.168	-3.674	360.414	< .001	***
Buffer	-0.657	0.077	-8.509	255.229	< .001	***
Debts	0.222	0.030	7.485	623.690	< .001	***
Income volatility	0.002	0.024	0.067	922.414	.946	
Employed	-0.228	0.138	-1.650	538.539	.099	.
Conscientiousness	-0.063	0.035	-1.780	186.898	.077	.
Emotional stability	-0.051	0.037	-1.384	168.649	.168	
Extraversion	0.024	0.036	0.668	175.761	.505	
Openness	0.045	0.035	1.265	192.945	.207	
Agreeableness	-0.018	0.035	-0.507	213.865	.613	
Education level 1	-0.338	0.121	-2.780	735.198	.006	**
Education level 2	-0.342	0.131	-2.606	761.849	.009	**
Education level 3	-0.260	0.120	-2.160	724.533	.031	*
Education level 4	-0.336	0.120	-2.791	745.363	.005	**
Education level 5	-0.310	0.133	-2.328	747.325	.02	*
Age	-0.122	0.028	-4.319	805.022	< .001	***
Gender	-0.121	0.054	-2.231	680.986	.026	*
Household size	-0.053	0.026	-2.029	865.471	.043	*
Income * buffer	0.130	0.076	1.718	292.773	.087	.
Income * debts	-0.005	0.034	-0.154	479.361	.878	
Income * income volatility	0.033	0.022	1.522	815.120	.128	
Income * employed	0.370	0.162	2.282	399.438	.023	*

*Table A13. Results of the pooled robust regressions for the models with the different aspects of financial stress as the independent variable. For each model, the standardized regression parameters (β), standard errors (σ), t-statistics (t), and p-values (p) are provided. Significance is indicated with *** (p < .001), ** (p < .005), * (p < .05), and . (p < .10).*

Independent variable:	**1. Money shortage (R^2 = .34)**					**2. Lack of control (R^2 = .29)**				
	β	**σ**	***t***	***p***		**β**	**σ**	***t***	***P***	
Intercept	0.675	0.171	3.946	< .001	***	0.868	0.191	4.535	< .001	***
Income	-0.628	0.157	-3.997	< .001	***	-0.376	0.171	-2.201	.028	*
Buffer	-0.598	0.071	-8.401	< .001	***	-0.596	0.080	-7.445	< .001	***
Debts	0.218	0.029	7.487	< .001	***	0.223	0.030	7.525	< .001	***
Income fluctuation	-0.042	0.023	-1.787	.074	.	-0.003	0.026	-0.121	.904	
Employed	-0.160	0.129	-1.245	.214		-0.222	0.142	-1.567	.118	
Openness	0.036	0.033	1.104	.271		0.031	0.036	0.856	.393	
Conscientiousness	-0.045	0.032	-1.398	.164		-0.031	0.035	-0.881	.379	
Agreeableness	-0.009	0.033	-0.262	.794		-0.033	0.035	-0.924	.356	
Emotional stability	-0.031	0.033	-0.932	.353		-0.049	0.037	-1.345	.18	
Extraversion	0.018	0.032	0.548	.584		0.048	0.037	1.313	.191	
Education level 1	-0.234	0.115	-2.032	.043	*	-0.432	0.127	-3.413	< .001	***
Education level 2	-0.201	0.124	-1.623	.105		-0.361	0.137	-2.647	.008	**
Education level 3	-0.144	0.114	-1.261	.208		-0.209	0.125	-1.671	.095	.
Education level 4	-0.204	0.114	-1.781	.075	.	-0.313	0.125	-2.505	.012	*
Education level 5	-0.194	0.125	-1.550	.122		-0.308	0.138	-2.239	.025	*
Age	-0.140	0.026	-5.284	< .001	***	-0.113	0.029	-3.911	< .001	***
Gender	-0.064	0.051	-1.255	.21		-0.050	0.056	-0.892	.373	
Household size	-0.043	0.025	-1.749	.081	.	-0.020	0.027	-0.761	.447	
Income * buffer	0.202	0.075	2.699	.007	**	0.054	0.080	0.678	.498	
Income * debts	0	0.033	0.008	.994		-0.004	0.035	-0.119	.906	
Income * income volatility	0.037	0.025	1.474	.141		0.048	0.027	1.768	.077	.
Income * employed	0.342	0.153	2.235	.026	*	0.232	0.164	1.413	.158	

	3. Worries (R^2 = .27)				4. Short- focus (R^2 = .05)				
β	**σ**	***t***	***p***		**β**	**σ**	***t***	***p***	
0.893	0.192	4.641	< .001	***	2.303	17.988	0.128	.898	
-0.578	0.169	-3.416	< .001	***	-1.794	11.494	-0.156	.876	
-0.619	0.081	-7.663	< .001	***	-0.305	0.109	-2.787	.006	**
0.111	0.029	3.862	< .001	***	6.671	61.398	0.109	.914	
-0.008	0.026	-0.319	.75		-0.023	0.031	-0.732	.464	
-0.170	0.143	-1.190	.234		-0.272	0.188	-1.448	.149	
0.049	0.038	1.287	.2		0.025	0.037	0.669	.504	
-0.084	0.040	-2.076	.04	*	-0.033	0.037	-0.895	.372	
-0.007	0.036	-0.195	.845		-0.015	0.036	-0.425	.671	
-0.036	0.039	-0.925	.356		-0.038	0.037	-1.047	.296	
-0.020	0.038	-0.515	.607		0.013	0.036	0.363	.717	
-0.235	0.129	-1.818	.07	.	-0.235	0.158	-1.488	.138	
-0.327	0.139	-2.353	.019	*	-0.199	0.187	-1.064	.288	
-0.319	0.128	-2.495	.013	*	-0.144	0.149	-0.971	.332	
-0.347	0.127	-2.725	.007	**	-0.182	0.160	-1.136	.257	
-0.326	0.141	-2.315	.021	*	-0.236	0.180	-1.308	.192	
-0.070	0.029	-2.381	.017	*	-0.066	0.034	-1.982	.048	*
-0.174	0.056	-3.099	.002	**	-0.064	0.060	-1.054	.292	
-0.059	0.027	-2.153	.032	*	-0.027	0.033	-0.809	.419	
0.160	0.077	2.066	.04	*	0.030	0.086	0.347	.729	
-0.006	0.034	-0.162	.872		-3.999	39.192	-0.102	.919	
0.044	0.028	1.603	.109		0.028	0.034	0.807	.420	
0.302	0.162	.861	.063	.	0.548	0.264	2.075	.039	*