

Determinants of financial worry and rumination

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ABSTRACT

Significant parts of populations in developed countries frequently worry and ruminate about their finances. Financial worry and rumination can have serious psychological consequences, resulting in lower psychological well-being, mental-health problems, and impaired cognitive functioning. The literature lacks studies investigating the socio-demographic antecedents of and the financial processes underlying financial worry and rumination.

The purpose of our study was to investigate the socio-demographic and financial antecedents of financial worry and rumination (FWR) and the financial factors mediating these relationships. We collected online self-administered survey data from a sample of the Dutch population ($N = 1040$). Using confirmatory factor analysis, we found that a bifactor model, including a strong and reliable general factor, provided the best explanation of the structure underlying FWR.

We developed a parallel mediation model and investigated its structural relationships using structural equation modeling. After controlling for multiple hypotheses testing, our results show that income, past positive changes in one's finances, and age are negatively related to FWR. We found no support for education level and only weak support for expected changes in one's finances as antecedents. Furthermore, the explained variance in FWR substantially improved after adding the mediators of making ends meet, financial buffer, and perceived debts. Among these mediators, making ends meet played a key role explaining respectively half and two-thirds of the total effects of income and past changes in one's finances on FWR. These results were robust under several specifications and were generalizable to the Dutch population. We discuss the implications of our results for future research and government policy.

1. Introduction

Significant parts of populations in developed countries are concerned about and preoccupied with their finances. According to the Gallup-Sharecare Index, daily surveyed in the period 2013–2017, 32–40 percent of US-citizens worried about their finances in the last seven days (Gallup, 2018). In the UK, one in five adults report they are drowning in worries about money and debts (Money Advice Services, 2017). Low-income individuals worry and ruminate more about their finances than higher income people (Gallup, 2017; Johar, Meng, & Wilcox, 2015). For example, while respectively 34 and 14 percent of middle- and high-income American households reported being moderately or very worried about not having enough money to pay monthly bills, these rates were strikingly higher (63 percent) for low-income families (Gallup, 2017).

Financial worry and financial rumination are the target constructs of interest in this paper. We define financial worry as repeated and negative thinking about the uncertainty of one's (future) financial situation, while financial rumination refers to repetitive, passive, and pessimistic thinking about the possible causes and consequences of one's financial concerns. These constructs belong to a

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group of conceptually similar constructs, including financial threat (Marjanovic, Greenglass, Fiksenbaum, & Bell, 2013), debt stress (Drentea, 2000), and money management stress (Netemeyer, Warmath, Fernandes, & Lynch, 2018), each capturing a specific aspect of the financial well-being domain. Where the latter constructs focus on fear, uncertainty, and stress concerning one's personal finances, financial worry and financial rumination are different from these constructs in focusing on the negative, repetitive mental processes underlying one's financial concerns.

Although consequences of financial worry and rumination have not been investigated earlier, related studies suggest that financial worry and rumination affect mental health, psychological well-being, and cognitive functioning. First, a growing body of correlational studies has indicated that current money management stress, debt-related stress, and financial threat are negatively associated with subjective well-being (Netemeyer et al., 2018) and mental health (Drentea, 2000; Marjanovic et al., 2015). Furthermore, financial worry and rumination may mediate the effects of income and debt on these psychological outcomes. Several studies have shown that income has a positive causal effect and having debts a negative effect on mental health (Gathergood, 2012), psychological well-being (Haushofer & Shapiro, 2016), and cognitive functioning (Mani, Mullainathan, Shafir, & Zhao, 2013). Additionally, some recent studies have found that constructs similar to financial worry and rumination mediate these relationships (Johar et al., 2015; Marjanovic et al., 2013; Marjanovic et al., 2015; Netemeyer et al., 2018). Altogether, these findings suggest that financial worry and rumination may also affect these psychological outcomes.

Although several studies have investigated the psychological consequences of financial worry and rumination and the role of income as an antecedent, the literature lacks studies on the specific financial mechanisms underlying financial worry and rumination and the role of socio-demographic antecedents.

The purpose of our study is to gain insight into the primary financial and socio-demographic antecedents and the financial drivers underlying the effects of the financial antecedents on financial worry and rumination. To this end, we developed a theoretical framework in which we structure the relationships between the socio-demographic antecedents (age and education level), financial antecedents (previous and expected changes in one's finances, income), financial mediators (making ends meet, financial buffer, and perceived debt), and financial worry and rumination (outcome). Furthermore, we constructed a financial worry scale combined with a financial rumination scale (Johar et al., 2015), and collected Dutch household survey data on financial worry and rumination, and several financial and socio-demographic variables, to study these relationships. We investigated the dimensionality of both scales together using confirmatory factor analysis and used structural equation modeling to investigate the significance and magnitude of the structural relationships between the antecedents, mediators, and the outcome variable. Additionally, we investigated the robustness and generalizability of the results.

This paper is outlined as follows. First, we will discuss the literature concerning financial worry and rumination and provide a framework explaining the relationships to be investigated. Next, we report on the methods and results of the empirical part of our study. We end with a discussion and conclusion.

2. Literature overview and conceptual framework

2.1. Literature overview: Significance of financial worry and rumination

Several studies have investigated the role of financial determinants, such as over-indebtedness and low income, in explaining mental-health problems, including anxiety or depression, and psychological well-being. Most of these studies confirm that lower income and over-indebtedness are associated with impaired mental health and psychological well-being (e.g., Fitch, Hamilton, Bassett, & Davey, 2011; Kahneman & Deaton, 2010; Turunen et al., 2014). Results of (quasi-)experimental studies confirm the causal direction from financial indicators to mental health and psychological well-being, showing positive effects of income (Gardner & Oswald, 2007; Haushofer & Shapiro, 2016) and wealth (McInerney, Mellor, & Nicholas, 2013; Schwandt, 2018), and negative effects of debts (Gathergood, 2012) on mental health and/or psychological well-being. Additionally, Mani et al. (2013) found a negative causal impact of poverty on cognitive functioning.

Financial worry and rumination may play a significant role in mediating the relationship between financial determinants and mental health, psychological well-being, and cognitive functioning. First, low-income individuals are more likely to ruminate and worry, both in general terms (Johar et al., 2015; Kahneman & Deaton, 2010) and specifically about one's finances (Gallup, 2017; Johar et al., 2015), than higher-income people.

Second, the mental health literature finds that worry and rumination (in general) play a crucial role in the rise and aggravation of mental-health problems, such as anxiety and depression (see Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008, for an overview). Furthermore, worry and rumination are associated with impaired cognitive functioning resulting in cognitive inflexibility (Nolen-Hoeksema & Davis, 2000), poor problem-solving, and inadequate solution implementation (e.g., Lyubomirsky, Tucker, Caldwell, & Berg, 1999; see Nolen-Hoeksema et al., 2008, for an overview).

Third, some recent studies provide direct evidence for the mediating role of financial worry and rumination in the relationships between financial antecedents and mental health, psychological well-being, and cognitive functioning. Marjanovic et al. (2013, 2015) find that financial threat, which is conceptually closely linked to financial worry and rumination¹, partially mediates the negative relationship between economic hardship and mental health, after correcting for several alternative explanations. Netemeyer et al.

¹ Financial threat is defined as "a mixture of fear, uncertainty, and cognitive preoccupation about the security and stability of their personal finance" (Marjanovic et al., 2013, p.2).

(2018) find a negative effect of facing current money-management stress, including feelings of being worried about one's finances, on well-being. This effect was stronger for lower-income individuals than for people with higher incomes. Mani et al. (2013) find evidence for a negative causal effect of poverty on cognitive functioning operating via financial concerns. In addition, recent studies suggest that worry and rumination may drive the impact of (financial) scarcity on cognitive functioning (Johar et al., 2015; Lichand & Mani, 2016).

2.2. Financial worry and rumination: Conceptualization

Financial rumination and worry, the key concepts of interest of this paper, are derivatives of the broader constructs of "rumination" and "worry." These concepts are broadly discussed in the mental health literature (see Nolen-Hoeksema et al., 2008, for an overview). Rumination refers to a mode of mental response to experienced distress (Nolen-Hoeksema et al., 2008). Following this explanation, financial rumination involves mental fixation on the symptoms of a specific form of distress (finance-related). Based on the definition of Johar et al. (2015), we define financial rumination as repetitive, passive, and pessimistic thinking about the possible causes and consequences of one's financial concerns. Worry refers to a chain of persistent and negative affect-laden thoughts and images engaging in mental problem-solving on an issue with uncertain and possibly negative consequences (Borkovec, Robinson, Pruzinsky, & DePree, 1983). We define financial worry as repeated and negative thinking about the uncertainty of one's (future) financial situation.

Both rumination and worry are negative thinking styles that share some characteristics and can operate interactively. Both are forms of repetitive, pessimistic, self-focused thoughts, are associated with mental health-problems such as anxiety and depression, and are found to impair cognitive functions (see Nolen-Hoeksema et al., 2008, for an extensive discussion of the similarities and differences between rumination and worry). Worry occurs when a future event is perceived as controllable but comes along with uncertainty. Worry can shift into rumination when this same event is perceived as inevitable and uncontrollable.

Despite their shared characteristics, rumination and worry are conceptually and empirically distinct concepts. While both rumination and worry involve repetitive thinking patterns accompanied by negative emotions, the characteristics of these thinking patterns and the type of emotions differ. The thinking styles (or cognitions) differ conceptually in terms of orientation (rumination involves focusing on the past and present, worry focuses on the present and future), central theme (dealing with a loss vs. a threat), conscious motive (understanding the meaning of events vs. anticipation of a threat), and unconscious motive (avoiding aversive situations vs. negative affect) (Nolen-Hoeksema et al., 2008). Several studies found that worry and rumination are empirically distinguishable because items of worry- and rumination measures load on different factors (e.g., Muris, Roelofs, Meesters, & Boomsma, 2004). Furthermore, both worry and rumination involve negative emotions, but the type of emotions may differ. Worry is associated with negative emotions related to fear (Borkovec et al., 1983), while rumination involves anger- and sadness-related emotions. For these reasons, we propose the following hypothesis:

H1. Financial worry and rumination have four underlying factors: Rumination-related cognitions, worry-related cognitions, rumination-related emotions, and worry-related emotions.

We will use the overarching term financial worry and rumination (FWR) if we mean all four dimensions.

2.3. Conceptual framework

The primary purpose of our study is to empirically investigate the role of socio-demographic and financial antecedents and of financial drivers in explaining financial worry and rumination. Because worry and rumination differ in terms of time orientation, we distinguish three time dimensions in the financial antecedents: (1) the past, referring to already occurred *changes in* one's financial situation, (2) the future, referring to future *changes in* one's financial position, and (3) the present, referring to one's current financial situation. As argued before, rumination involves a focus on past events with negative consequences and involves negative thinking patterns concentrating on the reason and meaning of an adverse (financial) situation or event. For these reasons, we expect that a deterioration in one's past (previous) financial situation will be accompanied by higher levels of financial rumination-related emotions and cognitions. This expectation reflects the finding of Araya, Lewis, Rojas, and Fritsch (2003) that past negative income shocks were associated with increased prevalence of common mental disorders. Financial worry involves mental fixation on threats related to one's future financial situation or to already occurred finance-related events that might have detrimental implications in the future. Thus, we specify the following hypothesis:

H2. Positive changes in one's past financial situation are associated with lower scores on financial rumination. Positive changes in one's future financial situation are associated with lower scores on financial worry.

We distinguish four financial indicators (financial buffer, perceived debts, income, and making ends meet) reflecting three dimensions (wealth, income, and expenditures relative to income) of one's current financial situation. These financial indicators have in common that the cause of an adverse condition is situated in the past, which might evoke rumination-related thoughts and emotions, and that the condition may have negative consequences for the future, potentially evoking worry-related thoughts and emotions. Next, we discuss the role of each indicator in explaining FWR in more detail.

Making ends meet can be defined as having enough income to meet expenses and pay all bills in a particular period; facing difficulties with making ends meet means that one has to juggle with expenses and has to solve day-to-day financial challenges. Financial buffer refers to liquid assets or buffer stock savings that can directly be used for consumption. The magnitude of one's financial buffer provides information about the susceptibility of a household's finances to financial shocks (Lusardi, Schneider, &

Tufano, 2011). A lower financial buffer means that one has fewer resources to cope with a detrimental financial event. As a consequence, households become more vulnerable to shocks in income or consumption which might evoke feelings of uncertainty and repetitive, negative thoughts about one's finances. Perceived debt refers to an individual's perception regarding one's overall debt position. Debts that are perceived as too high could be accompanied by fear of the consequences of one's inability to repay debts (e.g., by experiencing significant welfare losses due to potential bankruptcy or seizure of collateral). For these reasons, we expect that making ends meet and financial buffer are both negatively related and perceived debt is positively related to FWR.

Income plays a central role in our study. Previous studies have shown that having a lower income is associated with facing more financial rumination (Johar et al., 2015) and money-management stress levels (Netemeyer et al., 2018). We expect that income is both directly and indirectly negatively related to FWR. Low income is associated with having more difficulties making ends meet (Lin, Bumcrot, Ulicny, Lusardi, Mottola, Kieffer, & Walsh, 2016), a lower financial buffer (Lusardi et al., 2011), and higher (perceived) over-indebtedness (Gathergood, 2012), suggesting that these variables might mediate the relationship between income and FWR. Having a lower income limits the budget for consumption, thus making it harder to make ends meet. Furthermore, having a lower income makes it harder to build a financial buffer, because there is less budget available for monthly savings. In determining whether one's debts are too high, individuals presumably weigh their debts against their ability to repay their debts, which might be a function of income. A higher income means that one has more (future) resources to repay the debts, resulting in lower perceived debts. Summarizing our expectations regarding the role of income and the financial mediators, we specify the following hypothesis:

H3. Making ends meet, financial buffer, and perceived debts mediate the negative relationship between income and FWR.

We include hypotheses for two socio-demographic antecedents of FWR: age and education level. Sütterlin (2012) finds that higher age is associated with lower general rumination levels, probably because higher age is accompanied with increased emotional control and psychological immunization to stressful experiences. In line with these results, other studies have found that higher age is accompanied with lower levels of debt stress and anxiety levels (Drentea, 2000) and with lower money-management stress levels (Netemeyer et al., 2018). Furthermore, relevant to the context of FWR, becoming older is likely to be accompanied by having more experience with financial management. This experience could help to cope with financial problems, and thus age might have a decreasing effect on FWR. For these reasons, we propose the following hypothesis:

H4a. Age is negatively related to FWR.

In the literature, education serves conceptually as protection to mental-health problems. Higher education might increase an individual's psychological capital (e.g., cognitive skills) subsequently lowering one's probability of facing mental-health problems. Evidence for this relationship has been found in both correlational studies (Araya et al., 2003; Bjelland et al., 2008) and a quasi-experimental study (Crespo, López-Naval, & Mira, 2014). Additionally, cognitive skills developed through education might help people to cope with financial problems resulting in lower levels of FWR. Thus, we specify the following hypothesis:

H4b. Education level is negatively related to FWR.

Fig. 1 provides a summary of the theory reflecting the relationships between the financial and socio-demographic determinants and financial worry and rumination.

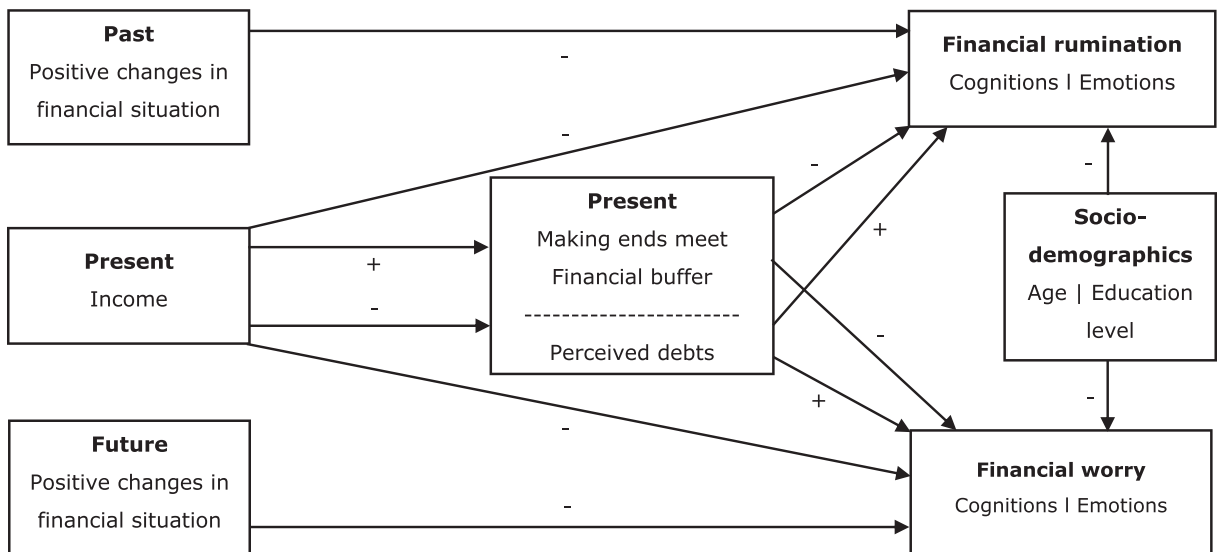


Fig. 1. A conceptual framework of the financial and socio-demographic antecedents of financial rumination and worry. + indicates a positive effect, - indicates a negative effect. Paths and signs reflect our a-priori expectations. Potential correlations between the independent variables are not reflected in the framework but are included in the analysis.

Table 1
Items of financial worry and rumination questionnaires.

Item	Statement	<i>M</i>	<i>SD</i>
<i>Financial rumination-related emotions</i>			
1	I rarely get upset with myself about my finances*	2.323	1.094
2	When I think about my finances, it makes me feel sad	2.219	1.080
3	I become angry when I think about my finances	2.108	.997
4	Memories about my finances have limited my enjoyment of life	2.228	1.062
<i>Financial rumination-related cognitions</i>			
5	I can't stop thinking about my finances	2.124	1.029
6	I have a hard time getting thoughts about my finances out of my head	2.346	1.090
7	My finances are never far from my mind	2.608	1.085
8	I rarely become 'lost in thought' about my finances*	2.741	1.107
9	I find myself replacing events related to my finances over and over in my mind	2.397	1.088
10	I try to figure out the reasons for my financial situation	2.754	1.172
11	I often get distracted from what I'm doing by thoughts about finances	2.674	1.254
12	I seldom have difficulty concentrating on a current task due to finances*	2.032	.947
<i>Financial worry-related emotions</i>			
13	When I think about my financial situation, I feel carefree*	2.856	1.097
14	I feel insecure when I think about my financial future	2.422	1.077
15	When I think about my finances, I feel relaxed*	2.854	1.038
16	I feel anxious when I think about my finances	2.131	1.035
<i>Financial worry-related cognitions</i>			
17	I never wonder whether I can pay my bills*	2.858	1.218
18	I constantly think about the uncertainty of my financial future	2.352	1.109
19	I often wonder whether I have enough money to make ends meet	2.384	1.133
20	I think a lot about how to solve financial problems	2.462	1.120

* Reverse coded. Means and standard deviations based on full sample ($n = 1040$).

3. Method

3.1. Sample

We conducted this study in collaboration with the Dutch organization MoneyWise (Wijzer in Geldzaken) as part of the annual study Monitor Financial Behavior 2017 ((Wijzer in geldzaken, 2017)). Participants in this study were selected from a survey agency's research panel. 5000 Members of this panel, selected to get a representative sample of the Dutch population, received an email with a notification to participate in the online self-administered survey. Data were collected during the period 8–11 June 2017. The survey closed after the preferred number of participants (about 1000) was reached. A total of 1040 participants completed the survey (overall response rate of 20.8%) after which they received credits for the research agency's saving program, exchangeable for products. The sample size was about the same as (Drentea, 2000) or substantially larger (Gasiorowska, 2014; Netemeyer et al., 2018) than that of similar studies.

The sample included nearly as many women (49.7%) as men. More than half (58.2%) of the sample was between 35 and 64 years old, 16.8% between 18 and 34 years, and 25% between 65 and 80 years. More than one-fifth (21.3%) were lower educated, 50.6% had intermediate education, and 28.2% were higher educated. Nearly half of the sample (46.2%) were employed, 23.5% were retired, and 30.4% were not employed for other reasons (e.g., students, job-seekers, and caretakers).

3.2. Measures: Financial rumination and financial worry

The survey contained items about financial worry and rumination, and items related to the respondent's financial situation (in Dutch). Apart from the measurement instruments of this study, the survey also included several questions about financial management, financial planning, and choosing financial products.

Financial rumination. We used the 12-item financial rumination scale developed by Johar et al. (2015) and separately presented the items for emotion-related and cognition-related items in the questionnaire (see Table 1). An experienced translator translated the items into Dutch, after which another translator back-translated the items. We solved differences in translation in collaboration with the translators.

Financial worry. As far as we know, a financial worry scale distinguishing between worry-related cognitions and worry-related emotions does not exist.² To fill this gap, we constructed an 8-item financial worry scale in a similar style as the financial rumination

² Closely related constructs for which validated measures have been developed are Financial Threat (Marjanovic et al., 2013) and Money Anxiety (Gasiorowska, 2014). We did not use these instruments as a measure of financial worry, because the first involves a broader domain than financial worry and the latter focuses on attitudes toward money rather than a psychological state due to one's finances.

scale. The scale included four items about both worry-related emotions and worry-related cognitions (see Table 1). All financial rumination and financial worry items were answered on a 5-point Likert-type scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). The items were presented to the respondents within four blocks and were randomly ordered within these blocks.

3.3. Measures: Financial situation and socio-demographics

Two items were included to measure changes in one's past and future financial situation and four items reflecting different aspects of one's current personal financial situation (net income, financial buffer, making ends meet, and perceived debts).

Past and future changes in one's financial situation. We used single items from the Michigan Index of Consumer Sentiment (ICS) to measure both past and expected changes in the household's financial situation. For changes in the past, we used the item "The financial situation of my household has in the last 12 months ... (1 = *clearly worsened* and 5 = *clearly improved*)" and for future changes "I expect that my household's financial situation will ... (1 = *clearly worsen* and 5 = *clearly improve*) in the next 12 months." These items, psychometrically assessed by Kellstedt, Linn, and Hannah (2015), are widely used as measures of past and expected changes in the consumer's financial situation.

Income. Net income was measured using the following question: "At the moment, what is the net monthly income of your household?" In answering this question, respondents could choose between five income categories in euros (≤ 1000 , 1001–1350, 1350–1800, 1800–2150, and ≥ 2151). The data set did not include an exact income measure. Instead of using dummy variables for each of the income categories (which would decrease the degrees of freedom in our estimations considerably), we estimated the log of the mathematical income expectation per bracket and used this number in our analyses.³

Financial buffer. Household financial buffer was measured using a slightly adapted single item proposed by the OECD (2015) and widely used in financial literacy surveys: "If you lost your main source of household income, how long could your household continue to cover living expenses, without borrowing any money or moving house?" Respondents could choose between four categories: (1) less than one month, (2) at least one month, but not three months, (3) at least three months, but not six months and (4) six months or more. All the above personal finance measures included the answer option "I do not know." The answers to net income and perceived debt position also included "I prefer not to answer."

Making ends meet. People's ability to make ends meet was measured using an item derived from the EU-SILC questionnaire (Eurostat, 2014): "In an average month, how easy or difficult is it for you to make ends meet and pay all your bills?" Respondents could rate their ability to make ends meet on a 5-point scale ranging from 1 (*very difficult*) to 5 (*very easy*).

Perceived debts. We measured participants' perceptions of their debt position using a single item proposed by Lusardi et al. (2018): "To what extent do you agree or disagree with the next statement? I have too much debt right now." Respondents could answer this question using a 5-point Likert-type scale ranging from 1 (*completely disagree*) to 5 (*completely agree*).

Socio-demographics. We used age (18–34, 35–64, and 65–80 years) and education level (categories: low, middle, and high) as socio-demographic variables. Furthermore, we included gender and employment status (employed, retired, not employed for other reasons) for exploratory analyses. We did not specify hypotheses for these antecedents, because (i) previous studies have found mixed evidence for the role of gender as antecedent⁴ and (ii) because our data only included one broad category for being not employed.⁵ Socio-demographics were not questioned in the survey, because the survey agency had already collected these data.

4. Results

4.1. Data cleaning

The items of the financial worry and rumination scales did not contain any missing values. In cleaning the data, we discovered

³ Following the procedure used by Antonides (1990, pp. 160–162), we assumed that income was lognormally distributed and estimated the following regression:

$$\ln M_i = \alpha_0 + \alpha_1 \varnothing^{-1}(u_i) + \varepsilon_i \quad (1)$$

M_i is the upper bound of the i -th income bracket, u_i the proportion of respondents with a household income in the i -th income bracket, \varnothing^{-1} the inverse of the standard normal distribution, ε_i is an independently and identically distributed normal error term, and i an index for income intervals ($i = 1 \dots 5$). α_0 was estimated at 0.556 (s.e. = 0.019) and α_1 at 7.609 (s.e. = 0.014). R^2 of the regression was .998. The mathematical expectation of the income categories was calculated as follows:

$$E(M) = \exp\left(\alpha_0 + \frac{\alpha_1^2}{2}\right) * \frac{[\Lambda(A_1; \alpha_0 + \alpha_1^2, \alpha_1^2) - \Lambda(A_2; \alpha_0 + \alpha_1^2, \alpha_1^2)]}{\Lambda(A_1; \alpha_0, \alpha_1^2) - \Lambda(A_2; \alpha_0, \alpha_1^2)} \quad (2)$$

in which A_1 and A_2 represent the upper and lower boundaries of an income interval. Λ refers to the cumulative log-normal distribution (see Aitchison & Brown, 1960).

⁴ It is well-known from the mental-health literature that women worry and ruminate more than men (see e.g., Johnson & Whisman, 2013). However, Miller, Kemmelmeier, and Dupey (2013) found higher levels of worry about finances among men than among women. And recently, Netemeyer et al. (2018) did not find a significant effect for gender as an antecedent of money-management stress.

⁵ From the mental-health literature, it is known that being unemployed is associated with poorer mental health compared to being employed (see e.g., M. Perreault, Touré, Perreault, & Caron, 2017). However, our data did not allow to distinguish between reasons for not being employed (e.g., being student or caretaker).

Table 2
Satorra-Bentler's Chi-square Scaled Difference Tests.

Models compared	SB-corrected χ^2	df	p
1-factor vs 2-factor W/R	6.39	1	.012
1-factor vs 2-factor E/C	223.84	1	.000
1-factor vs 4-factor	283.64	6	.000
2-factor W/R vs 4-factor	273.91	5	.000
2-factor E/C vs 4-factor	37.63	5	.000

Note. SB-corrected χ^2 statistic reports the scaled difference test.

inconsistency patterns in the responses to the reverse-worded items of these scales. The mean for the reverse-worded items (6 items, mean = 2.72 after reverse coding) was substantially higher than that of the normally-worded questions (14 items, mean = 2.33). Furthermore, we detected 173 participants who used more than 14 times the same answer which is remarkable because this exceeds the number of normally-worded items. These responses may contain invalid data due to insufficient effort or incompetence in answering negatively-worded items with serious psychometric implications as a consequence (see e.g., Huang, Curran, Keeney, Poposki, & DeShon, 2012). To solve this problem, we applied a stringent exclusion criterion and excluded all these 173 participants, thus leaving 867 participants for further analyses. Additionally, we performed a robustness check including all participants to study the implications of applying this criterion.

We used two-step Structural Equation Modeling (SEM) to analyze the data. In step 1, we conducted a Confirmatory Factor Analysis (CFA) to assess the measurement-model fit of financial worry and rumination. We used CFA (and not an explorative factorization) because the rumination scale had already been developed and tested by Johar et al. (2015). Furthermore, we started with a clear measurement model indicating which items should load on which of the four factors. In these cases, CFA is more appropriate than an explorative factorization (Henson & Roberts, 2006). In step 2, we estimated the structural model to assess the significance and magnitude of the relationships between antecedents, mediators, and the outcomes (FWR). We conducted all analyses using Stata 15 unless otherwise reported.

4.2. Measurement model: Financial worry and rumination

We assessed the multivariate normality of the data to decide which CFA estimation method would be appropriate. The variables showed small skewness ($< .86$) and modest kurtosis (< 3.3); Mardia's multivariate kurtosis and skewness tests (Mardia, 1970) were significant ($p < .001$). Because the observed variables did not appear to be multivariate-normally distributed, these results indicated that the latent variables (factors) were not normally distributed. Therefore, we decided to use Maximum Likelihood estimation with Satorra-Bentler adjusted standard error estimation (ML-SB). This method provides nonnormality-adjusted standard errors and corrected Goodness-of-Fit statistics (GoFs) (Satorra & Bentler, 1994), is appropriate for similar datasets (Finney & DiStefano, 2006), and performs better than alternative methods for sample sizes comparable to ours (Curran, West, & Finch, 1996; Satorra & Bentler, 2001).

Initially, we compared four a-priori specified models: 1-factor model (a unidimensional model), 2-factor model R/W (rumination vs. worry), 2-factor model E/C (emotions vs. cognitions), and the 4-factor model (both rumination- and worry-related emotions and cognitions). All restricted models were nested within the full (4-factor) model.

First, we investigated the item reliability to assess whether we should drop particular items. Following the guidelines of Pituch and Stevens (2016), we used a standardized loading of .4 as a threshold. We found one item (item 11 in Table 1) with a loading below this threshold in all models and dropped this item from further analyses. Second, we compared the GoFs of the models using a Satorra-Bentler scaled Chi-square difference test (Satorra & Bentler, 2010) indicating that the 4-factor model had a significantly better fit than all other models (see Table 2). This result was in line with the scores on Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC), yielding lowest AIC and BIC for the 4-factor model. These results indicated that the 4-factor model performed better than both the 2- and 1-factor solution.

However, we found no support for discriminant validity of the 4-factor model. The factors of the 4-factor model correlated strongly (all between .908 and .996) implying that the four factors did not differ enough from each other to interpret them as separate constructs, thus rejecting Hypothesis 1. Furthermore, this result strongly suggested that a general underlying factor (g) explaining large parts of the common variance. We decided to examine this solution post-hoc. To obtain a proper estimate of g, two methods (bi-factor and higher-order factor model) can be used (Murray & Johnson, 2013). We used the bi-factor model, including a general factor and four group factors, to obtain an estimate of g. Furthermore, we decided to compare the GoFs of the bi-factor model with the 4-factor model and to investigate both the Explained Common Variance (ECV), the percentage of common variance explained by g, and the percentage of uncontaminated correlations (PUC), as an index of the factor structure. If both $ECV > .7$ and $PUC > .7$, our instrument of FWR could be primarily seen as unidimensional (Rodriguez, Reise, & Haviland, 2016a).

In estimating the bi-factor model, we needed a minor extra restriction (loading of the group factor on item 2 was restricted to 0) to achieve convergence. The GoFs of the bi-factor model are provided in Table 3 and the factor loadings in Table 4. Even while the included restriction might backfire AIC and BIC, the results yielded better AIC and BIC than the 4-factor model suggesting that the restricted bi-factor model performed best.

We assessed the measurement-model validity of the bi-factor model as follows (see Hair, Black, Babin, & Anderson, 2014). We found a significant Chi-square statistic ($\chi^2(134) = 756.78$; $p < .001$), acceptable scores on SRMR (.044) and CFI (.933), and close-

Table 3

CFA for financial worry and rumination models: Model fit indices.

Model	χ^2	df	CFI*	TLI*	RMSEA* (90% CI)	SRMR	AIC	BIC
1-factor model	1162.88	152	.891	.878	.088	.048	39,140	39,411
2-factor model W/R	1156.64	151	.892	.877	.088	.048	39,132	39,409
2-factor model E/C	869.02	151	.923	.912	.074	.045	38,757	39,034
4-factor model	829.77	146	.926	.914	.073	.044	38,710	39,010
Bi-factor model (restricted)	756.78	134	.933	.914	.073	.044	38,645	39,002

* Satorra-Bentler adjusted GoF estimates.

Table 4

Estimation of the bi-factor model: Standardized factor loadings.

Item number	General factor (g)	Group factor			
		RE	RC	WE	WC
1	.437	0 (restriction)	.259		
2	.863				
3	.784		.109		
4	.828		-.228		
5	.710		.476		
6	.743		.418		
7	.677		.356		
8	.511		.189		
9	.767		.305		
10	.341		.215		
11 (removed)					
12	.784		.029		
13	.633			.409	
14	.813			.114	
15	.715			.480	
16	.883			-.073	
17	.461				.194
18	.760				.187
19	.809				.256
20	.760				.383
ECV	.863	.012	.063	.037	.025
ETV	.511	.007	.037	.022	.015
Omega Hierarchical (Subscale)	.928	.002	.142	.076	.099
PUC	.772				

Note. Item numbers refer to Table 1. RE = Rumination-related emotions; RC = rumination-related cognitions; WE = worry-related emotions; WC = worry-related cognitions.

to-acceptable scores on RMSEA (.073) and TLI (.914) (see Table 3).

Using Watson's Omega program⁶, we calculated Omega Hierarchical (ω_H) and Omega Hierarchical Subscale (ω_{HS}) to assess the reliability of the g factor and the group factors in the bi-factor model (Rodriguez, Reise, & Haviland, 2016b). The results indicated good reliability for the g factor ($\omega_H = .928$) and poor reliability for the group factors (ω_{HS} ranged from .002 to .142). These results could be explained by the fact that the group factors were residual factors and that the items loaded higher on the general factor than on the group factors (see Table 4). Furthermore, the g -factor explained more than half the total variance (ETV = 51.1%) and large parts of the common variance (ECV = 86.3%), indicating a strong general factor (Rodriguez et al., 2016b). Because both ECV and PUC (.772) exceeded .7, the common variance could be regarded as essentially unidimensional. Due to these results and because group factors generally tend to capture unwanted noise and are difficult to interpret (Bonifay, Lane, & Reise, 2017), we decided to neglect the group factors and use g as the indicator of FWR for the analysis of the structural relationships. For the rest of the analyses, we will refer to g as our measure of financial worry and rumination.

4.3. Structural relationships

Below, we first explain the specification of the structural model. Next, we report the results of the financial determinants, financial mediators, and socio-demographic determinants. Then, we report the modification of the model and the results of the additional robustness analyses.

⁶ <http://edpsychassociates.com/Watkins3.html>.

4.3.1. Model specification

We specified the structural model (model 1) in Fig. 1 with some adjustments. First, using confirmatory factor analysis, we calculated g-factor scores of the bi-factor model and used these scores as an observable variable of FWR. As a consequence, we added paths from past and future changes in one's financial situation toward FWR instead of toward financial rumination or financial worry.⁷ Second, we used dummy variables for education levels, age categories, and employment status. Third, because the variables age 65–80 and being retired were strongly correlated ($r = .95$), we only included the variable age 65–80 to avoid multicollinearity problems. Fourth, we assumed that some of the unexplained variance in each mediator correlated with parts of the unexplained variance in another mediator. For this reason, we added correlated error terms between the mediators of making ends meet, financial buffer, and perceived debt in line with the [Acock's recommendation \(2013\)](#). Furthermore, we allowed covariance between each pair of independent variables. The descriptive statistics of the antecedents, mediators, and FWR are shown in Table 5.

We observed two problems in estimating the structural model using standard ML: (1) FWR-data violated the normal-distribution assumption (as noted before) and (2) some of the financial variables contained missing values (see Table 5). To solve these problems, we decided to use two methods for estimating the structural model. As primary estimation method, we chose ML-SB (same as for the measurement model) with the key advantage that it allowed to assess and compare models using several GoFs. However, ML-SB may result in biased estimates of our effect sizes, because it uses listwise deletion of missing values ([Hair et al., 2014](#)). To solve this problem, we used Full Information Maximum Likelihood including the “robust” technique for estimation of standard errors (FIML-robust) as a robustness check for the effect estimates. FIML-robust uses all available values in estimating the structural model and performs well under nonnormality ([Hair et al., 2014](#)). In case of meaningful differences in effect sizes or p -values between these estimation methods, we will report both effects (β_{1a} : coefficient in the main analyses; β_{1b} : coefficient robustness check). Otherwise, we only report the results of the primary analyses (ML-SB). For model estimation, we fixed the variance of the independent variables to 1.

Because we performed tests for several model relationships, we controlled for multiplicity to prevent inflated familywise Type I error rates. To this end, we used an adjusted Bonferroni procedure proposed by [Smith and Cribbie \(2013\)](#).⁸ This procedure is specifically designed for SEM-analyses and incorporates both the number of parameters estimated and the degree of correlations between parameters. Furthermore, this procedure results in larger power than the traditional Bonferroni and liberal-alternative Bonferroni procedures (e.g., Holm) without exceeding the familywise Type I error rate ([Smith & Cribbie, 2013](#)).

4.3.2. Financial determinants

Model 1 fitted the data acceptably (see Table 6 for the number of observations included and for the results); all GoFs met their thresholds, except for TLI (SB-correction = 1.09, $\chi^2(24) = 90.8$, $p < .001$; RMSEA = .070, CFI = .924, TLI = .864, SRMR = .042). Regarding the structural relationships (see Fig. 2 for an overview of the findings, see Tables 6 and 7 for the primary analyses, see Tables 8 and 9 for the robustness analyses), we found no support for a significant negative effect of positive past changes in one's finances on FWR ($\beta_{1a} = -.062$, $p = .380$). The negative relationship between positive future changes in one's financial situation and FWR was only significant in model 1b ($\beta_{1a} = -.082$, $p = .153$; $\beta_{1b} = -.090$, $p < .05$), providing only weak support for this part of Hypothesis 2.

We found strong support for income being negatively related to FWR ($\beta_{1a} = -.381$, $p < .001$). Furthermore, income was positively related to financial buffer ($\beta_{1a} = .341$, $p < .001$) and making ends meet ($\beta_{1a} = .437$, $p < .001$) and negatively related to perceived debt ($\beta_{1a} = -.202$, $p < .001$). However, income could only explain a small part of the variance in the mediators (corresponding R^2 were .117, .191, and .041).

4.3.3. Financial mediators

Regarding the relationships between the mediators and FWR, perceived debt was significantly positively related to FWR ($\beta_{1a} = .188$, $p < .001$). Both financial buffer and making ends meet were negatively associated with FWR (Financial buffer: $\beta_{1a} = -.160$, $p < .001$; Making ends meet: $\beta_{1a} = -.466$, $p < .001$). These results were consistent across methods.

A deeper investigation showed that the mediators, especially making ends meet, played a key role in explaining FWR. First, to get insight into the contribution of the mediators in explaining the variance of FWR, we compared model 1 to a baseline model, in which we restricted all paths from and toward the mediators to zero. Adding the mediators resulted in a substantial increase in the explained variance in FWR (Baseline model: $R^2 = .220$; Model 1: $R^2 = .546$). This result underpinned the importance of the mediators and showed that elementary financial (e.g., income) and socio-demographic indicators (e.g., age) only explained a small part of the variance in FWR. Second, we found moderate covariances between the error terms of the mediators suggesting that the mediators share some variance not accounted for by income (these correlations were .414, $-.333$, and $-.432$). Third, we found that the total effect size between income and FWR was for nearly 80 percent driven by the mediators (Direct effects: $\beta_{1a} = -.083$, $p = .214$; $\beta_{1b} = -.0113$, $p < .05$; indirect effect: $\beta_{1a} = -.298$, $p < .001$ explaining $-.298/-.381 \times 100 = 78.2\%$ of the total effect). Among the mediators, making ends meet played a key role in driving the relationship of income with FWR explaining more than half of the total association (Model 1a: $-.205/.381 \times 100 = 53.8\%$; Model 1b: 50.1%) and two-thirds of the indirect relationship ($-.205/-.298 \times 100 = 68.8\%$).

⁷ We adjusted Hypothesis 2 slightly: Positive changes in one's past and future financial situation are associated with lower scores on FWR.

⁸ To get the corrected or adjusted p -values, the unadjusted p -values are multiplied with the factor $k^{1-\sqrt{|r_j|}}$ where $|r_j|$ is the average absolute correlation of parameter j with other parameters in the model and k is the number of parameters estimated. Because the indirect and total effects are deduced from the direct effects, k includes only the number of direct effects estimated.

Table 5
Descriptive statistics of the measurement instruments.

Measurement Instrument	<i>n</i>	<i>M</i>	<i>SD</i>	Min	Max
Financial worry and rumination (FWR)	867	0	.98	−1.48	2.86
Income (log)	668	7.65	.52	6.67	8.15
Perceived debts	853	1.63	1.02	1	5
Making ends meet	852	3.48	1.03	1	5
Financial buffer	704	3.26	1.04	1	4
Past changes in financial situation	867	3.03	.93	1	5
Future changes in financial situation	867	3.08	.81	1	5
Education level (low)	867	.19	.39	0	1
Education level (middle)	867	.51	.5	0	1
Education level (high)	867	.3	.46	0	1
Age 18–34	867	.17	.37	0	1
Age 35–64	867	.59	.49	0	1
Age 65–80	867	.24	.43	0	1
Gender (Female)	867	.49	.5	0	1
Employed	867	.48	.5	0	1
Retired	867	.23	.42	0	1
Not employed	867	.29	.45	0	1

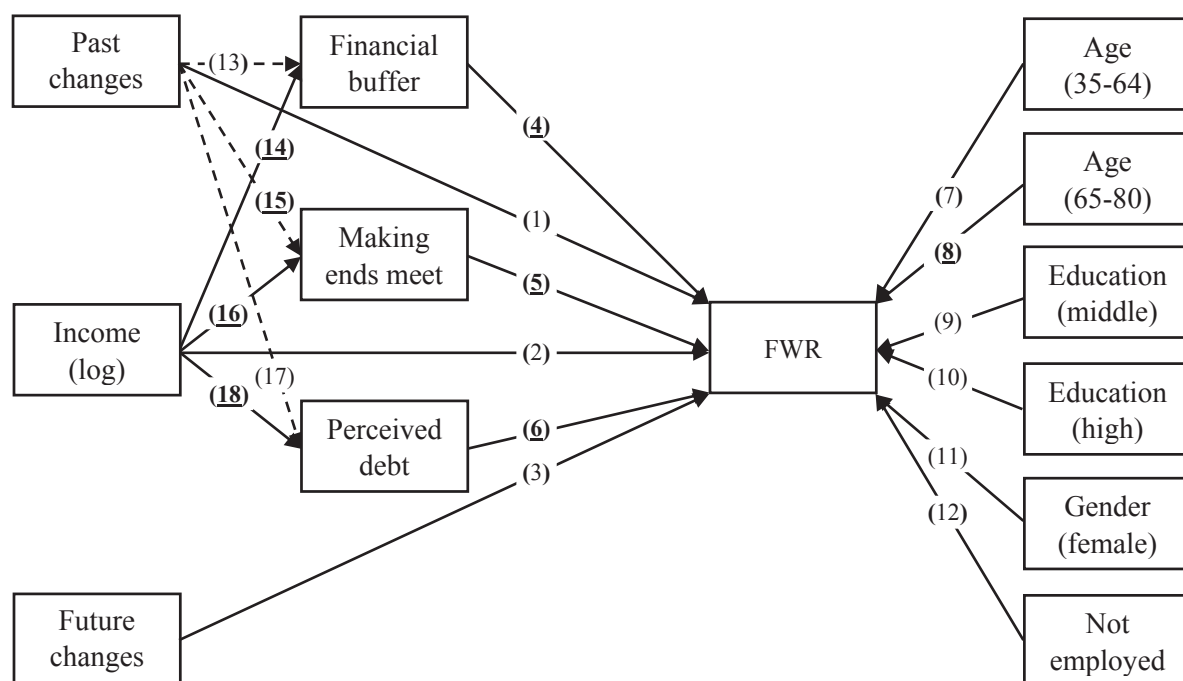


Fig. 2. Structural relationships between the antecedents, mediators, and FWR. Numbers correspond with the estimates provided in Tables 6 and 8. Dotted lines were only included in the revised model (model 2). For model 2a: Relationships with bold and underlined numbers were significant at the .001 level; other relationships were not significant at the .05 level. Correlations between the independent variables and correlations between the error terms of the mediating variables were included in the analysis, but are not indicated in the figure.

4.3.4. Socio-demographic determinants

Regarding the socio-demographic antecedents, we found support for a negative association between age and FWR ($H4a$), although the relationship with the category 35–64 was not significant in the main model (Age 35–64: $\beta_{1a} = -.111$, $p = .07$, $\beta_{1b} = -.123$, $p < .01$; Age 65–80: $\beta_{1a} = -.173$, $p = .001$). The effect size was larger for the highest age category suggesting that the effect of age on FWR existed across the life span. We did not find support for a direct negative relationship between education and FWR ($H4b$) (Middle: $\beta_{1a} = -.002$, $p = .961$; High: $\beta_{1a} = -.020$, $p = .665$).

We report the results for gender and employment status as antecedents of FWR as explorative findings. We found no significant effect of gender on FWR ($\beta_{1a} = .011$, $p > .05$). Remarkably, being not employed was negatively, but insignificantly, related to FWR ($\beta_{1a} = -.085$, $p = .08$). Because being not employed comprised several sub-categories (e.g., job seekers and students), we cannot provide substantial meaning to this finding.

Table 6

Main analyses for the direct effect sizes and model fit.

	Pre-specified model Model 1a (ML-SB)					Revised model Model 2a (ML-SB)				
	β	se	b	un <i>p</i>	adj <i>p</i>	β	se	b	un <i>p</i>	adj <i>p</i>
Dependent: FWR										
(1) Past changes in fin. situation	-.062	.033	-.063	.063	.380	-.062	.034	-.063	.067	.477
(2) Income (log)	-.083	.039	-.160	.035	.214	-.082	.038	-.160	.029	.204
(3) Future changes in fin. situation	-.082	.037	-.096	.025	.153	-.081	.036	-.096	.025	.181
(4) Financial buffer	-.161***	.040	-.152	.000	.000	-.160***	.040	-.152	.000	.000
(5) Making ends meet	-.470***	.040	-.470	.000	.000	-.466***	.039	-.448	.000	.000
(6) Perceived debt	.188***	.037	.176	.000	.000	.187***	.037	.176	.000	.000
(7) Age 35–64	-.111	.044	-.223	.012	.070	-.110	.044	-.223	.012	.084
(8) Age 65–80	-.173***	.044	-.402	.000	.001	-.172***	.044	-.402	.000	.001
(9) Education level (middle)	-.002	.045	-.004	.961	1.000	-.002	.045	-.004	.961	1.000
(10) Education level (high)	-.020	.047	-.043	.665	1.000	-.020	.047	-.043	.665	1.000
(11) Gender	.011	.030	.022	.706	1.000	.011	.030	.022	.706	1.000
(12) Not employed	-.085	.034	-.195	.013	.080	-.085	.034	-.195	.013	.094
Dependent: Financial buffer										
(13) Past changes in fin. situation						.022	.041	.023	.596	1.000
(14) Income (log)	.341***	.040	.697	.000	.000	.336***	.041	.686	.000	.000
Dependent: Making ends meet										
(15) Past changes in fin. situation						.257***	.039	.274	.000	.000
(16) Income (log)	.437***	.036	.884	.000	.000	.373***	.037	.755	.000	.000
Dependent: Perceived debt										
(17) Past changes in fin. situation						.031	.046	.034	.502	1.000
(18) Income (log)	-.202***	.044	-.418	.000	.000	-.210***	.046	-.434	.000	.000
<i>n</i> – included/total <i>N</i>	566/867					566/867				
$\chi^2(p$ – value)	90.8 (.000)					39.1 (.010)				
Degrees of freedom	24					21				
SB – correction	1.09					1.08				
BIC	13,050					13,012				
RMSEA	.070					.039				
CFI	.924					.979				
TLI	.864					.959				
SRMR	.042					.028				
R^2 FWR	.546					.553				
R^2 Financial buffer	.117					.117				
R^2 Making ends meet	.191					.253				
R^2 Perceived debt	.041					.042				

Note. The number in front of each independent variable corresponds with the numbered relationship in Fig. 2; GoFs are SB – corrected. Defaults for the dummy variables: Age 18–34 for age, education level (low) for education level, and employed for employment status. β = standardized direct effect sizes, se = standard errors for the standardized direct effect sizes, b = unstandardized direct effect sizes; un *p* = unadjusted *p* – value; adj *p* = adjusted *p* – value. Correction factors for adjusting *p* – values Model 1a: 6.036; model 2a: 7.119; *adj *p* < .05, **adj *p* < .01, ***adj *p* < .001.

4.3.5. Model modification

Using modification indices, we found that we could improve the model fit by adding a path from past changes in financial situation toward making ends meet (MI = 52.5).⁹ We theoretically justify this model revision as follows: A recent deterioration in one's financial situation (e.g., a drop in income) may make it more difficult to make ends meet because it takes time to adapt income or expenditures to the new financial situation. Because a similar justification could also be applied to the other mediators¹⁰, we decided to add paths from past changes in one's financial situation toward all mediators. We expected that positive past changes in one's financial situation would be negatively related to perceived debt and positively associated with making ends meet and financial buffer. Results for the revised structural model (model 2) are presented in Tables 6–9. Similar to model 1, we estimated the model using both ML-SB (model 2a) and FIML-robust (model 2b).

Comparing model 2 with model 1, we found a better fit ($BIC_{1a} = 13,050$, $BIC_{1b} = 13,012$) and a small increase in explained variance of FWR ($R^2_{1a} = .546$, $R^2_{2a} = .553$). Moreover, model 2 fits the data well (SB-correction = 1.08, $\chi^2(21) = 39.01$, $p < .05$; RMSEA = .039, CFI = .979, TLI = .959, SRMR = .028). Regarding the structural relationships, most of the effect sizes did not change in model 2 compared to model 1. Here, we only report the relationships that did change meaningfully.

Adding paths between past changes in the financial situation and mediators tripled the total association of this antecedent with

⁹ Because Stata does not provide modification indices when ML-SB is used, here we report MI using standard ML as a proxy for model improvement.

¹⁰ Individuals may consume their buffer stock savings or may take loans to deal with recent impairments in their financial situation resulting in lower financial buffers and higher perceived debts in the present.

Table 7
Main analyses for the structural relationships: Standardized direct, indirect, and total effects.

	Pre-specified model Model 1a: ML-SB						Revised model Model 2a: ML-SB					
	Direct effect			Indirect effect			Total effect			Direct effect		
	β	se	adj <i>p</i>	β	se	adj <i>p</i>	β	se	adj <i>p</i>	β	se	adj <i>p</i>
Dependent: FWR												
Past changes in fin. situation	-.062	.033	.380				-.062	.033	.380	-.062	.034	.477
Via financial buffer										-.118***	.029	.000
Via making ends meet										-.003	.007	1.000
Via perceived debts										-.120***	.021	.000
Income (log)	-.083	.039	.214	-.298***	.027	.000	-.381***	.041	.000	.006	.009	1.000
Via financial buffer				-.055**	.015	.002				-.267***	.027	.000
Via making ends meet				-.205***	.025	.000				-.054**	.015	.003
Via perceived debts				-.038**	.012	.006				-.174***	.023	.000
										-.039**	.012	.008

Note. Indirect and total effects were estimated using the Delta method (Acock, 2013). Correction factor for adjusting *p*-values: see note Table 6; *adj *p* < .05, **adj *p* < .01, ***adj *p* < .001.

Table 8

Robustness analyses for the standardized direct effect sizes and model fit.

	Pre-specified model		Revised model					
	Model 1b (FIML) ^a		Model 2b (FIML) ^a		Model 2c (FIML) ^b		Model 2d (FIML-weighted) ^c	
	β	se	β	se	β	se	β	se
Dependent: FWR								
(1) Past changes in fin. situation	-.071	.030	-.072	.029	-.045	.026	-.058	.029
(2) Income (log)	-.113*	.036	-.110*	.035	-.119**	.033	-.087	.039
(3) Future changes in fin. situation	-.090*	.031	-.089*	.030	-.091**	.028	-.090*	.030
(4) Financial buffer	-.146***	.035	-.145***	.035	-.147***	.032	-.128**	.038
(5) Making ends meet	-.447***	.034	-.444***	.034	-.437***	.031	-.479***	.035
(6) Perceived debt	.177***	.032	.176***	.032	.196***	.029	.174***	.033
(7) Age 35–64	-.123**	.035	-.123**	.035	-.104**	.032	-.100*	.036
(8) Age 65–80	-.189***	.037	-.187***	.036	-.179***	.034	-.122**	.034
(9) Education level (middle)	.043	.034	.044	.034	.005	.030	.040	.034
(10) Education level (high)	.023	.035	.023	.035	-.008	.031	.025	.036
(11) Gender	-.001	.025	-.002	.025	-.006	.022	.003	.027
(12) Not employed	-.052	.029	-.052	.029	-.049	.026	-.005	.032
Dependent: Financial buffer								
(13) Past changes in fin. situation			.050	.035	.038	.033	.057	.040
(14) Income (log)	.355***	.038	.342***	.038	.354***	.036	.367***	.048
Dependent: Making ends meet								
(15) Past changes in fin. situation			.261***	.032	.240***	.030	.237***	.042
(16) Income (log)	.438***	.032	.365***	.033	.367***	.030	.331***	.039
Dependent: Perceived debt								
(17) Past changes in fin. situation			-.048	.039	-.047	.036	-.052	.040
(18) Income (log)	-.170***	.038	-.152**	.040	-.156***	.037	-.164**	.044
<i>n</i> – included/total <i>N</i>	867/867 ^a		867/867 ^a		1040/1040 ^b		1040/1040 ^c	
<i>R</i> ² FWR	.528		.537		.537		.545	
<i>R</i> ² Financial buffer	.126		.128		.133		.147	
<i>R</i> ² Making ends meet	.192		.247		.232		.199	
<i>R</i> ² Perceived debt	.029		.029		.030		.033	

Note. The number in front of the independent variables corresponds with the numbered relationship in Fig. 2. Correction factors for adjusting *p* – values model 1b: 6.371; model 2b: 7.420; model 2c: 7.527; model 2d: 7.055; *adj *p* < .05, **adj *p* < .01, ***adj *p* < .001.

^a Model 1b and 2b are robustness analyses including 867 respondents.

^b Model 2c is a robustness analysis based on the full sample (1040).

^c Model 2d is similar to model 2c and includes sampling weights.

FWR, resulting in a significant effect and providing support for this part of hypothesis 2 ($\beta_{1a} = -.062$, $p = .380$; $\beta_{2a} = -.179$, $p < .001$). This relationship was largely driven by the mediator making ends meet, explaining two-third of the total effect ($-.120 / -.179 \times 100 = 67.0\%$). Moreover, the indirect effects of past changes in one's finances on FWR operating via financial buffer and perceived debts were very small and insignificant (Financial buffer: $\beta_{2a} = -.003$, $p = 1$; Perceived debts: $\beta_{2a} = .006$, $p = 1$). Because both the relationships of income and of past changes in one's financial situation with FWR were largely driven by making ends meet, these results showed that making ends meet played a key role in explaining FWR.

Inspecting the correlations between the independent variables of model 2a reveals a strong positive association between past and future changes in one's financial situation ($r = .499$, s.e. = .043, $p < .001$). We found weaker but still significant associations between income and past and future changes in one's finances (respectively $r = .249$, s.e. = .043, $p < .001$; $r = .144$, s.e. = .047, $p < .001$). These results suggest that past and future changes in one's finances should be interpreted in relationship to each other.

4.3.6. Additional robustness analyses

We performed additional robustness analyses to get insight into the implications of the exclusion of 173 participants at the stage of data cleaning. For all respondents, we estimated FWR-scores using the bi-factor model provided in Section 4.2. Next, we estimated the coefficients for the revised model using FIML-unweighted (model 2c). Additionally, we estimated this model including sampling weights, which weighted for a number of common socio-demographics, to investigate the generalizability of the results to the Dutch population (model 2d). Results are provided in Tables 8 and 9. For model 2c in comparison to the main model, we found similar effect sizes and *p*-values for nearly all estimated relationships providing more confidence in the robustness of our results. For past changes in one's financial situation and income as antecedents of FWR, we found respectively slightly smaller and larger indirect and total effect sizes. These effects still remained significant at the .01 or .001 level. For model 2d, we found similar effect sizes and *p*-values for nearly all coefficients suggesting that our results are generalizable to the Dutch population.

Table 9
Robustness analyses for the structural relationships: Standardized direct, indirect, and total effects.

	Pre-specified model						Revised model					
	Model 1b (FIML) n = 867/867			Model 2b (FIML) n = 867/867			Model 2c (FIML) n = 1040/1040			Model 2d (FIML – weighted) n = 1040/1040		
	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect
Dependent: FWR												
Past changes in financial situation	-.071		-.071	-.072	-.131***	-.204***	-.045	-.120***	-.165***	-.058	-.130***	-.188***
Via financial buffer					-.007			-.006			-.007	
Via making ends meet					-.116***			-.105***			-.114***	
Via perceived debts					-.008			-.009			-.009	
Income (log)	-.113*	-.278***	-.391***	-.110*	-.238***	-.348***	-.119**	-.243***	-.362***	-.087	-.234***	-.321***
Via financial buffer		-.052**			-.050**			-.052***			-.047*	
Via making ends meet		-.196***			-.162***			-.161***			-.158***	
Via perceived debts		-.030**			-.027*			-.031**			-.029*	

Note. For an explanation of the models: see notes Table 8. For all models, indirect and total effects were estimated using the Delta method (Acock, 2013). *adj $p < .05$, **adj $p < .01$, ***adj $p < .001$.

5. Discussion and conclusion

This study aimed to investigate the role of financial and socio-demographic antecedents of financial worry and rumination and the financial mediators underlying these relationships. Below, we discuss the main findings, implications, and limitations of our study.

5.1. Overview and findings

Regarding the measurement model, we did not find support for a 4-factor model underlying FWR (*H1*). We found a better fit for a bi-factor model including a reliable general factor that explained a substantial part of the common variance. This result contradicts both our hypothesis and the traditional view in the mental health literature in which worry and rumination are regarded as conceptually and empirically distinct constructs. The poor discriminant validity of the factors of the 4-factor model might be a result of the equivalent wording of the survey items for the financial worry and financial rumination. However, several recent studies find that a bi-factor model fits better than models with distinct factors for rumination and worry (Hur, Heller, Kern, & Berenbaum, 2017; Topper, Molenaar, Emmelkamp, & Ehring, 2014). Our results are in line with these findings and suggest that financial worry and rumination share the same process, namely repetitive negative thinking about one's finances. Taking into account that financial worry and financial rumination are conceptually closely related and can act interactively (as discussed in Section 2), the bi-factor model may also make sense from a theoretical point of perspective. More research is necessary to get a final answer about the dimensionality of FWR.

The results of the structural model partly confirmed our expectation that three financial factors are essential in explaining financial worry and rumination. First, we found only weak support that future positive changes in one's financial situation are negatively related to FWR (*H2*). This relationship was only significant in the robustness analyses, not in the main analyses, probably due to sample size differences. Only after allowing for indirect effects operating via the mediators, we found support for a negative association between positive past changes in one's finances and FWR. We found no significant evidence for a direct relationship. These results suggest that people may tend to neglect unfavorable past changes in one's finances unless it affects one's current financial situation. We note that past and future changes in one's finances strongly correlated with each other. A potential explanation is that a third factor (e.g., stability in one's financial situation) might affect both past and future changes in one's finances. For example, individuals with a fixed job and a yearly fixed increase in their wage might face improvements in both their past and future financial situation. Because this is more likely for individuals with higher incomes than individuals with lower incomes, the positive associations between income and past and future changes in one's finances can be interpreted in this light. This explanation seems to be more reasonable than an alternative explanation in which past changes in one's financial situation causally affect future changes in one's finances. Because our study cannot provide a final answer, future research needs to address the structural relationships between the independent variables and the role of stability in one's financial situation.

Second, lower income was associated with higher FWR-scores implying that people worry and ruminate more about their finances, the lower their income is. This effect was moderate in magnitude, significant in all estimation models, and operated largely via higher perceived debts, lower financial buffer, and more difficulties with making ends meet. In sum, these findings provide strong support for all aspects of our hypothesis (*H3*) and underpin the role of income in explaining psychological outcomes, in line with Kahneman and Deaton (2010). We note that our income measure was less precise for higher incomes. Similar to Netemeyer et al. (2018), the positive marginal effect of income on FWR might become smaller for higher incomes.

The mediating variables played an important role in explaining FWR. First, we found consistent evidence that perceived debt is positively related, and making ends meet and financial buffer are negatively related, to FWR. Second, the explained variance in FWR increased substantially after adding the mediators of making ends meet, financial buffer, and perceived debt. Furthermore, both the effect of income and past changes in one's financial situation on FWR mainly operated via the mediators, especially via making ends meet. These findings suggest that not only low-income individuals worry and ruminate about their finances, but also people facing difficulties with making ends meet, having low financial buffers or perceiving too many debts. What factors determine the mediators remains largely unclear in our model. Income and past changes in one's finances could only explain about a quarter of the variance in the mediators. Furthermore, we found moderately-sized covariances between the error terms of the mediators suggesting that the mediators share some variance not explained by these determinants.

Regarding the socio-demographic antecedents, we found overall support for a negative association between age and FWR (*H4a*), implying that people worry and ruminate less about their finances when they are getting older. This result is in line with findings of Drentea (2000) and Netemeyer et al. (2018). Potential explanations for this finding are that older people are more financially knowledgeable, have more experience with financial management, and have more stable financial lives compared to younger ones. Because we were not able to control for these explanations, new research to the underlying mechanisms is recommended. Contrary to our hypothesis, we did not find support for a negative relationship between education level and FWR (*H4b*) suggesting that education does not protect individuals from worrying and ruminating about one's finances. A robust finding from the literature is that both age and education level are positively related to income. While our model included all these variables, education level seems to act as the least accurate predictor of FWR. We note that education level might have indirect effects on FWR, for example, operating via income.

5.2. Implications and limitations

Our work contributes to the growing body of literature addressing financial well-being. While previous research mainly investigated potential consequences of aspects of impaired financial well-being on psychological well-being, cognitive functioning, and

mental health (Johar et al., 2015; Marjanovic et al., 2015; Marjanovic et al., 2013; Netemeyer et al., 2018), we investigated the potential socio-demographic and financial determinants of financial worry and rumination. Our paper contributes to the literature by showing that, besides income, making ends meet is also an important determinant of this construct. Furthermore, we find that the effects of income and past changes in one's financial situation on FWR would be strongly underrated when the mediators were excluded. This underpins the importance to test for several mechanisms underlying the relationship between income and psychological outcomes.

We address a potential point of criticism regarding our findings. Holding the financial circumstances constant, people facing psychological-health problems may provide lower scores to subjective financial measures compared to their healthier equals (see e.g., Bridges & Disney, 2010). Applied to our model, a third factor (e.g., psychological-health problems) might explain scores for both financial mediators (e.g., perceived debt) and FWR suggesting that the real effect sizes are smaller between these variables than found in our study. However, Gathergood (2012) did not find support for the idea that self-reported measures on debt problems are severely affected by a perception-bias instigated by one's psychological health state. Although we cannot exclude the existence of a perception bias in our self-reported measures, we think that these effects are limited.

Our study comes with some limitations. First, we notice the (usual) limitations regarding the causal interpretation of our findings. Because we used cross-sectional data, it is possible that we did not include all relevant covariates of FWR in our models. Furthermore, the effect of the financial indicators on FWR may operate in the opposite direction. Future research should test whether the financial and socio-demographic antecedents causally affect financial worry and rumination, for example using natural shocks in income, wealth, or education level.

Second, we did not examine the role of personality traits in explaining FWR-scores. It is likely that, given the same financial circumstances, not all people worry and ruminate equally (see e.g., Marjanovic et al., 2013, for a discussion of this issue). A commonly-used distinction in the mental health literature is that of trait-based—referring to an individual's tendency to ruminate or worry following a stressor—and state-based rumination and worry, which refers to the act of ruminating and worrying following a stressor (Key, Campbell, Bacon, & Gerin, 2008). Because the financial and socio-demographic variables only explained slightly more than half the variance in FWR, including personality traits (e.g., emotional stability) as a predictor variable may potentially increase the explained variance. Future research should address this issue.

Our results provide useful insights for policymakers and practitioners who are increasingly concerned about improving the mental health and well-being of citizens. As discussed in Section 2.1, the literature shows that financial problems (e.g., due to over-indebtedness) play an essential role in explaining these constructs (Fitch et al., 2011; Gathergood, 2012; Turunen et al., 2014) and that financial worry and rumination may serve as an important mediator (e.g., Johar et al., 2015; Marjanovic et al., 2013). Given the substantial societal costs of mental health problems and the limited budgets of the state and non-profit organizations to target these problems, it is vital to know which indicators should be targeted to decrease levels of financial worry and rumination. Our findings suggest that increasing income and especially improving people's ability to make ends meet may contribute to lower FWR-scores. When increasing income is out of range, policymakers and practitioners might focus on ways to improve an individual's ability to make ends meet, for example by encouraging the use of budgeting tools building on commitment strategies and mental accounting (Dolan, Elliott, Metcalfe, & Vlaev, 2012).

In conclusion, this paper provides insights into the role of financial and socio-demographic determinants in explaining financial worry and rumination. Our main finding is that income and making ends meet are the main determinants of financial worry and rumination. We note that making ends meet seems to contain not only an economic but also a behavioral component. This suggests that, besides providing more money, also changing people's financial behavior may help to improve people's financial well-being. In this respect, our findings may provide a promising perspective for policy-making and a fruitful perspective for future behavioral-economic research.

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Declaration of Competing Interest

None.

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