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The effect of health shocks on financial risk preferences differs by personality traits

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Abstract

We investigate whether personality traits influence the impact of health shocks on financial risk preferences using 11 waves (1998-2008) from the US Health and Retirement Study (HRS). We model stock market participation and the share of risky assets in portfolios and stratify our sample into single person households and couples. Our results indicate that personality traits play a more important role in the portfolio choices for couples than for single people. Moreover, there are differences between women and men within couples, and between chronic and acute health shocks.

Keywords: risk preference; health shocks; portfolio choice; personality traits; US Health and Retirement Study

JEL Codes: D14, D91, G41, I10

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1. Introduction

Risk preferences have often been regardedas exogenous and fixed in economic models. Despite this, based on results reported by psychologists, economists have relaxed these assumptions, for example, by investigating changes in risk preferences resulting from exogenous shocks due to *natural disasters* (Reynaud and Aubert 2013, Cameron and Shah 2015), *conflicts and violence* (Voors et al. 2012, Callen et al. 2014) or *severe financial shocks* during early life (Malmendier and Nagel 2011).

One strand of literature has focused on the effects of health on financial risk preferences, which have often been proxied by the share of financial wealth invested in risky assets (bonds and stocks). Rosen and Wu (2004), Edwards (2008), Bogan and Fertig (2013), Lindeboom and Melnychuk (2015) find that poor *general health* and *mental health* are associated with less risky portfolios, and therefore more financial risk aversion. More ambiguous results are reported by Fan and Zhao (2009), Love and Smith (2010) and Bressan et al. (2014). Coile and Milligan (2009) suggest that health shocks reduce the share of risky assets in portfolios, while Bertowitz and Qiu (2006) suggest that the effect is indirect and induced by a financial wealth effect.[1]

Another strand of literature has investigated the influence of personality traits on financial risk preferences, although such studies are scarce. In this paper we focus on personality traits proxied by the "Big 5" domains: *neuroticism*, *extraversion*, *conscientiousness*, *agreeableness* and *openness to experience* (Costa and McCrae 1992). Stock market participation and the percentage of risky assets in a portfolio appear to be increased by *conscientiousness* (Goldfain 2016) and *openness* to experience (Brown and Taylor 2014), while they are reduced by *agreeableness* (Bucciol and Zarri 2015, Goldfain 2016) and *extraversion* (Brown and Taylor 2014). Luik and Steinhardt (2016) suggest that *neuroticism* has a positive influence on the stock market participation of US residents. However, *neuroticism* appears to have a negative influence on the degree of risk tolerance, when risk preferences are measured *directly* by exploiting data from laboratory experiments or survey data (Borghans et al. 2008, Becker et al. 2012,Rustichini et al. 2012).

This paper combines these two strands to investigate whether health shocks have heterogeneous effects on financial risk preferences, according to personality traits. We distinguish between two sets of health conditions: *acute* and *chronic* (e.g., Fan and Zhao 2009, Coile and Milligan 2009, Love and Smith 2010). We use data from the US Health and Retirement Study (HRS), exploiting 11 waves (1998-2008). Understanding how health shocks affect financial risk

[1] Sahm (2012) and Decker and Schmitz (2016) consider a *direct* measure of financial risk, derived from hypothetical gambles over lifetime income. Decker and Schmitz (201) report that health shocks significantly increase individual risk aversion; a result that is not confirmed by Sahm (2012) when considering *acute* health shocks (heart disease, stroke, cancer or lung disease).

preference is particularly relevant from a policy perspective. Health tends to deteriorate with age withthe elderly more likely to experience health shocks (Lindeboom and Melnychuk 2015). In addition, elderly people control a "disproportionate amount of total wealth" (Rosen and Wu 2004). Therefore, health shocks which cause changes in financial risk preferences may induce people to revise portfolio decisions, and, as a consequence, influence financial markets.

2. Data and Empirical Methodology

The HRS provides longitudinal data on socio-demographic characteristics, health status and financial portfolios of individuals over age 50 and their spouse. The Participant Lifestyle ("Left Behind") module of the HRS, contains data on personality traits. We use years 2006-2008 of the Participant Lifestyle module and we assume that personality traits are fixed during the survey period. The HRS includes those aged 50+ and evidence suggests that personality traits are stable in later life (e.g., McCrae and Costa 2006, Borghans et al. 2008, Cobb-Clark and Schurer 2012).

Our outcome variables are "stock market participation" (a dummy equal to 1 if the household holds stocks or bonds and 0 otherwise), and "% of risky assets in the portfolio", defined as the ratio of stocks plus bonds to total financial wealth. We distinguish between *acute* health shocks (cancer, stroke, heart problems), and *chronic* health shocks (lung problems, diabetes, high blood pressure, arthritis, psychological problems) measured by dummy variables that equal 1 in all the waves following the shock and 0 before. Personality traits are measured in the HRS on the basis of 26 "personality facets" with a 4-point rating scale. We aggregate such items to attribute a continuous score to the "Big5" traits in the range [1,4], using the standard procedure of Smith et al. (2013), and reparameterize the scores by dividing by 4 to be in the range [0,1] (see Bucciol and Zarri 2015, and Rustichini et al. 2012).

We model "stock market participation" and "% of risky assets in the portfolio" by estimating pooled probit and pooled tobit models respectively. We stratify our sample into single person households (approximately 17,000) and couples (approximately 18,500). In the sample of couples, the unit of analysis remains the household, but we allow for the characteristics of each individual to have a separate influence on the portfolio choices of the household (Hurd et al. 2012, Gensowski 2014). The main variables of interest for our analysis are the health shocks, personality traits and their interaction terms and results are presented for coefficients and for the associated average

partial effects of the variables.[2] In addition, we include the following controls: age (in years divided by 100), education (dummy=1 if above the median number of years of schooling), retirement status (1 if retired, 0 otherwise), log wealth, and dummy variables for good health (t-1) and fair or poor health (t-1) (contrasted against excellent or very good health).

3. Results

Tables 1 and 2 present the main results for the two outcomes. Table 1 shows that for singles, for both outcomes, *openness to experience* is the only personality trait relevant for portfolio allocation. The main effects for *openness* and for experiencing a health shock are negatively related to risk tolerance. These effects are, however, partially offset by positive interaction terms, indicating the reduction in risk tolerance is marginally less for individuals scoring high on *openness* following a health shock.

Differences in personality traits appear to be more relevant for portfolio choices in couples rather than singles. For men in couples *neuroticism* has a positive influence on risk tolerance (a result also shown by Luik and Steinhardt 2016), although this effect is statistically significant only for stock market participation. At low levels of *neuroticism* risk tolerance increases following a health shock. Thereafter, risk tolerance decreases with increasing levels of *neuroticism*. The opposite appears to hold for *extroversion* (for % of risky assets) where men in couples experiencing an *acute* health shock tend to become more risk tolerant with increasing levels of *extroversion*.

Conscientiousness has a positive and statistically significant influence on risk tolerance for both men and women in couples for both outcomes. This is in line with previous literature (Goldfain 2016). For the % of risky assets in the portfolio, women in couples who experience an *acute* health shock tend to increase their risk tolerance where their *conscientiousness* is low. However, for women with high levels of *conscientiousness* the effect of the health shock becomes negative (the overall marginal effects for women with average *conscientiousness* is also negative).

For the % of risky assets *agreeableness* and *openness to experience* affect risk tolerance of men in couples negatively. The result for *agreeableness* is in line with previous literature (Bucciol and Zarri 2015, Golfain 2016); however, the result for *openness* is novel. Health shocks for women in couples with very low *agreeableness* have a small and positive effect on risk tolerance, but the

[2] We adopted this estimation strategy in order to be able to compare marginal effects computed with standard methods with those computed with the methodology proposed by Norton, Wang and Ai (2004), which has been proved to be "more reliable" when estimating interaction terms in non-linear models. In practice, the marginal effects computed with the two methods are extremely similar (results are available on request).

TABLE 1:Single households

	PANEL A				PANEL B			
	PROBIT MODEL (for the stock market participation)				**TOBIT MODEL (for the % of risky assets in the portfolio)**			
	COEFFICIENTS		**MARGINAL EFFECTS/AVERAGE PARTIAL EFFECTS**		**COEFFICIENTS**		**MARGINAL EFFECTS/AVERAGE PARTIAL EFFECTS**	
	CHRONIC health shocks *b/se*	***ACUTE health shocks*** *b/se*	***CHRONIC health shocks*** *b/se*	***ACUTE health shocks*** *b/se*	***CHRONIC health shocks*** *b/se*	***ACUTE health shocks*** *b/se*	***CHRONIC health shocks*** *b/se*	***ACUTE health shocks*** *b/se*
NEUROTICISM								
personality trait	0.312	0.279	0.094	0.084	0.149	0.151	0.039	0.040
	(0.247)	(0.204)	(0.074)	(0.061)	(0.129)	(0.108)	(0.034)	(0.029)
health shock	0.134	0.230	0.040	0.069	0.069	0.147	0.018	0.039
	(0.175)	(0.213)	(0.052)	(0.064)	(0.091)	(0.114)	(0.024)	(0.030)
personality trait*health shock	-0.250	-0.391	-0.075	-0.117	-0.118	-0.238	-0.031	-0.063
	(0.293)	(0.352)	(0.088)	(0.106)	(0.153)	(0.188)	(0.040)	(0.050)
EXTROVERSION								
personality trait	-0.331	-0.201	-0.099	-0.060	-0.119	-0.091	-0.031	-0.024
	(0.236)	(0.205)	(0.071)	(0.061)	(0.120)	(0.107)	(0.032)	(0.028)
health shock	-0.226	-0.089	-0.068	-0.027	-0.066	-0.050	-0.017	-0.013
	(0.193)	(0.216)	(0.058)	(0.065)	(0.099)	(0.114)	(0.026)	(0.030)
personality trait*health shock	0.269	0.111	0.081	0.033	0.082	0.072	0.022	0.019
	(0.239)	(0.267)	(0.072)	(0.080)	(0.122)	(0.141)	(0.032)	(0.037)
AGREEABLENESS								
personality trait	-0.388	-0.249	-0.116	-0.075	-0.026	0.071	-0.031	-0.024
	(0.267)	(0.232)	(0.080)	(0.070)	(0.123)	(0.109)	(0.032)	(0.028)
health shock	-0.160	0.144	-0.048	0.043	-0.107	0.071	-0.017	-0.013
	(0.255)	(0.274)	(0.077)	(0.082)	(0.121)	(0.135)	(0.026)	(0.030)
personality trait*health shock	0.167	-0.163	0.050	-0.049	0.127	-0.077	0.022	0.019
	(0.284)	(0.306)	(0.085)	(0.092)	(0.142)	(0.159)	(0.032)	(0.037)
CONTENTIOUSNESS								
personality trait	0.083	0.189	0.025	0.057	-0.026	0.071	-0.007	0.019
	(0.237)	(0.209)	(0.071)	(0.063)	(0.123)	(0.109)	(0.033)	(0.029)
health shock	-0.107	0.109	-0.032	0.033	-0.107	0.071	-0.028	0.019
	(0.230)	(0.253)	(0.069)	(0.076)	(0.121)	(0.135)	(0.032)	(0.036)
personality trait*health shock	0.113	-0.133	0.034	-0.040	0.127	-0.077	0.034	-0.020
	(0.270)	(0.299)	(0.081)	(0.090)	(0.142)	(0.159)	(0.037)	(0.042)
OPENESS TO EXPERIENCE								
personality trait	**-0.480***	-0.193	**-0.144***	-0.058	**-0.221+**	-0.103	**-0.058+**	-0.027
	(0.223)	(0.200)	**(0.067)**	(0.060)	**(0.118)**	(0.104)	**(0.031)**	(0.028)
health shock	**-0.380***	0.009	**-0.114***	0.003	-0.155	0.008	-0.041	0.002
	(0.182)	(0.201)	**(0.055)**	(0.060)	(0.094)	(0.105)	(0.025)	(0.028)
personality trait*health shock	**0.500***	-0.014	**0.150***	-0.004	**0.210+**	-0.002	**0.056+**	-0.001

Notes: All models are estimated including the within-individual means of the time-varying regressors (Mundlak,1978), year effects and robust standard errors clustered at the household level.

Marginal/average partial effects are computed at the mean values of the regressors.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

TABLE 2:Households consisting of couples

	PANEL A				PANEL B			
	PROBIT MODEL (for the stock market participation)				**TOBIT MODEL (for the % of risky assets in the portfolio)**			
	COEFFICIENTS		**MARGINAL EFFECTS/AVERAGE PARTIAL EFFECTS**		**COEFFICIENTS**		**MARGINAL EFFECTS/AVERAGE PARTIAL EFFECTS**	
	CHRONIC health shocks b/se	**ACUTE health shocks** b/se	**CHRONIC health shocks** b/se	**ACUTE health shocks** b/se	**CHRONIC health shocks** b/se	**ACUTE health shocks** b/se	**CHRONIC health shocks** b/se	**ACUTE health shocks** b/se
NEUROTICISM								
Men								
personality trait	0.092	**0.431***	0.028	**0.134***	0.015	0.128	0.004	0.033
	(0.237)	**(0.202)**	(0.074)	**(0.063)**	(0.103)	(0.088)	(0.027)	(0.023)
health shock	-0.073	**0.440***	-0.023	**0.137***	-0.008	**0.186***	-0.002	**0.048***
	(0.170)	**(0.186)**	(0.053)	**(0.058)**	(0.074)	**(0.082)**	(0.019)	**(0.021)**
personality trait*health shock	0.172	**-0.756***	0.053	**-0.235***	0.018	**-0.318***	0.005	**-0.082***
	(0.301)	**(0.329)**	(0.093)	**(0.102)**	(0.131)	**(0.146)**	(0.034)	**(0.038)**
Women								
personality trait	0.013	-0.078	0.004	-0.024	0.002	-0.014	0.000	-0.003
	(0.208)	(0.174)	(0.065)	(0.054)	(0.089)	(0.076)	(0.023)	(0.020)
health shock	0.079	-0.005	0.025	-0.001	0.032	0.035	0.008	0.009
	(0.162)	(0.223)	(0.050)	(0.069)	(0.070)	(0.095)	(0.018)	(0.025)
personality trait*health shock	-0.143	0.064	-0.044	0.020	-0.040	-0.027	-0.010	-0.007
	(0.266)	(0.364)	(0.083)	(0.113)	(0.115)	(0.157)	(0.030)	(0.041)
EXTROVERSION								
Men								
personality trait	-0.015	-0.139	-0.005	-0.043	0.091	-0.002	0.023	-0.000
	(0.202)	(0.188)	(0.063)	(0.058)	(0.088)	(0.082)	(0.023)	(0.021)
health shock	0.049	-0.216	0.015	-0.067	0.048	**-0.135+**	0.012	**-0.035+**
	(0.169)	(0.185)	(0.052)	(0.058)	(0.074)	**(0.081)**	(0.019)	**(0.021)**
personality trait*health shock	-0.034	0.298	-0.010	0.093	-0.059	**0.181+**	-0.015	**0.047+**
	(0.211)	(0.233)	(0.066)	(0.072)	(0.093)	**(0.102)**	(0.024)	**(0.026)**
Women								
personality trait	-0.165	-0.196	-0.051	-0.061	0.030	0.007	0.008	0.002
	(0.205)	(0.184)	(0.064)	(0.057)	(0.086)	(0.078)	(0.022)	(0.020)
health shock	0.058	0.083	0.018	0.026	0.062	0.074	0.016	0.019
	(0.178)	(0.235)	(0.055)	(0.073)	(0.077)	(0.104)	(0.020)	(0.027)
personality trait*health shock	-0.077	-0.061	-0.024	-0.019	-0.065	-0.068	-0.017	-0.017
	(0.215)	(0.284)	(0.067)	(0.088)	(0.092)	(0.126)	(0.024)	(0.033)
AGREEABLENESS								
Men								
personality trait	-0.325	-0.329	-0.101	-0.102	**-0.181+**	**-0.216***	**-0.047+**	**-0.056***
	(0.222)	(0.202)	(0.069)	(0.063)	**(0.096)**	**(0.087)**	**(0.025)**	**(0.023)**
health shock	0.016	-0.024	0.005	-0.008	0.014	-0.077	0.004	-0.020
	(0.206)	(0.222)	(0.064)	(0.069)	(0.091)	(0.097)	(0.024)	(0.025)
personality trait*health shock	0.007	0.051	0.002	0.016	-0.014	0.101	-0.004	0.026
	(0.242)	(0.261)	(0.075)	(0.081)	(0.107)	(0.114)	(0.028)	(0.030)
Women								
personality trait	0.283	0.151	0.088	0.047	0.136	0.104	0.035	0.027
	(0.271)	(0.241)	(0.084)	(0.075)	(0.116)	(0.103)	(0.030)	(0.027)
health shock	**0.461+**	0.556	**0.143+**	0.173	**0.203+**	**0.335***	**0.053+**	**0.087***
	(0.276)	(0.343)	**(0.086)**	(0.107)	**(0.119)**	**(0.146)**	**(0.031)**	**(0.038)**
personality trait*health shock	**-0.510+**	-0.572	**-0.158+**	-0.178	-0.213	**-0.347***	**-0.055+**	**-0.090***

TABLE 2: (CONT.)

	PANEL A				PANEL B			
	PROBIT MODEL (for the stock market participation)				**TOBIT MODEL (for the % of risky assets in the portfolio)**			
	COEFFICIENTS		**MARGINAL EFFECTS/AVERAGE PARTIAL EFFECTS**		**COEFFICIENTS**		**MARGINAL EFFECTS/AVERAGE PARTIAL EFFECTS**	
	CHRONIC health shocks b/se	**ACUTE health shocks** b/se	**CHRONIC health shocks** b/se	**ACUTE health shocks** b/se	**CHRONIC health shocks** b/se	**ACUTE health shocks** b/se	**CHRONIC health shocks** b/se	**ACUTE health shocks** b/se
CONTENTIOUSNESS								
Men								
personality trait	**0.372+**	**0.492***	**0.116+**	**0.153***	**0.196***	**0.204***	**0.051***	**0.053***
	(0.222)	**(0.198)**	**(0.069)**	**(0.061)**	**(0.095)**	**(0.088)**	**(0.025)**	**(0.023)**
health shock	-0.188	0.003	-0.058	0.001	-0.025	-0.008	-0.006	-0.002
	(0.220)	(0.241)	(0.068)	(0.075)	(0.099)	(0.107)	(0.026)	(0.028)
personality trait*health shock	0.253	0.020	0.078	0.006	0.032	0.019	0.008	0.005
	(0.261)	(0.287)	(0.081)	(0.089)	(0.116)	(0.126)	(0.030)	(0.033)
Women								
personality trait	**0.474***	**0.465***	**0.147***	**0.144***	**0.192+**	**0.204***	**0.050+**	**0.053***
	(0.237)	**(0.206)**	**(0.073)**	**(0.064)**	**(0.102)**	**(0.089)**	**(0.026)**	**(0.023)**
health shock	0.180	0.473	0.056	0.147	0.101	**0.292***	0.026	**0.076***
	(0.242)	(0.300)	(0.075)	(0.093)	(0.108)	**(0.135)**	(0.028)	**(0.035)**
personality trait*health shock	-0.214	-0.511	-0.066	-0.159	-0.106	**-0.318***	-0.027	**-0.082***
	(0.278)	(0.346)	(0.086)	(0.108)	(0.123)	**(0.155)**	(0.032)	**(0.040)**
OPENESS TO EXPERIENCE								
Men								
personality trait	-0.330	-0.168	-0.102	-0.052	**-0.227***	**-0.210***	**-0.059***	**-0.054***
	(0.211)	(0.197)	(0.066)	(0.061)	**(0.090)**	**(0.085)**	**(0.023)**	**(0.022)**
health shock	-0.095	0.191	-0.029	0.059	-0.018	0.016	-0.005	0.004
	(0.170)	(0.186)	(0.053)	(0.058)	(0.075)	(0.081)	(0.019)	(0.021)
personality trait*health shock	0.158	-0.233	0.049	-0.072	0.026	-0.011	0.007	-0.003
	(0.226)	(0.249)	(0.070)	(0.077)	(0.099)	(0.107)	(0.026)	(0.028)
Women								
personality trait	-0.074	-0.197	-0.023	-0.061	-0.074	-0.108	-0.019	-0.028
	(0.198)	(0.172)	(0.062)	(0.053)	(0.085)	(0.074)	(0.022)	(0.019)
health shock	0.229	0.190	0.071	0.059	0.100	0.133	0.026	0.034
	(0.166)	(0.226)	(0.052)	(0.070)	(0.073)	(0.102)	(0.019)	(0.026)
personality trait*health shock	-0.316	-0.212	-0.098	-0.066	-0.122	-0.155	-0.032	-0.040

Notes: All models are estimated including the within-individual means of the time-varying regressors (Mundlak,1978), year effects and robust standard errors clustered at the household level.

Marginal/average partial effects are computed at the mean values of the regressors.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

effect becomes increasingly negative with increasing levels of *agreeableness*. Effects for stock market participation are statistically significant only for *chronic* health shocks, while they are almost always statistically significant irrespective of type of shock for % of risky assets.

4. Discussion

Our results indicate that personality traits play a more important role in the portfolio choices for households consisting of couples than for single people. Moreover, there are different effects between women and men in couples, and between *chronic* and *acute* health shocks. Results concerning personality traits of men in couples on the % of risky assets in the portfolio fit well with the literature in neurobiology and psychology. Individuals may respond to experiencing fear and stress by adopting two different kinds of "coping mechanism": *engagement* (problem focused attitude) or *disengagement* (avoidance, denial and wishful thinking) coping mechanism (Carver and Connor-Smith 2010). The latter is generally ineffective in reducing stress over the long term and tends to be associated with individuals with high *neuroticism* (Connor-Smith &Flachsbart, 2007). The other Big 5 personality traits are associated with a greater use of *engagement* coping, aiding individuals to adapt to a potentially stressful health shock. The risk preferences of men in couples who score high on these personality traits do not appear to be influenced by a health shock. Extroverts are an exception and appear to become more risk tolerant following a shock. The relationship between personality traits and coping mechanism appears to be stronger in samples facing a high degree of stress (e.g. cancer) than in samples with little stress (Connor-Smith & Flachsbart 2007, Carver and Connor-Smith 2010). This provides some support to the finding that, for both men and women in couples, the majority of the effects of personality traits are observed when individuals experience *acute* rather than *chronic* health shocks.

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