

THE SHADOW OF THE PAST: FINANCIAL RISK TAKING AND NEGATIVE LIFE EVENTS

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Abstract

Based on data from the four 2004-2010 waves of the US Health and Retirement Study (HRS), we show that financial risk taking is significantly related to life-history negative events out of an individual's control. Using observed portfolio decisions to proxy for risk taking, we find correlation with two of such individual-specific events: having been victim of a physical attack and (especially) the loss of a child are associated with lower and less frequent investments in risky assets, with an intensity similar to that of the beginning, in 2008, of a collectively experienced event such as the recent financial crisis. We also find evidence that the correlation of risk taking with a child loss is long-lasting, as opposed to the correlation with a physical attack that disappears after few years. Our analysis is more in favor of a preference-based – rather than a belief-based – explanation of the observed change in risk taking. Overall our findings indicate that the past, especially through the loss of a child, casts a long shadow that extends over individuals' current decisions also within unrelated domains.

Keywords: Risk Taking; Financial Asset Ownership; Negative Life Events; Behavioral Finance.

JEL Classification: D03; D14; D81; G02; G11.

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1. Introduction

Risk taking may well be one of the most fundamental dimensions that economists investigate in order to explain individual differences in behavior. Empirical studies by economists have identified a wide range of individual characteristics, such as age, gender, education, wealth, parental education, cognitive ability and financial literacy that appear to be correlated with risk taking (see, e.g., Guiso and Paiella 2008 and Dohmen et al. 2011). However, despite these important discoveries, risk taking still remains, to a large extent, a ‘black box’ as relatively little is known about its determinants, i.e., how it gets formed (see, e.g., Dohmen et al. 2012). Recent studies show that genetic traits account for about 20 percent of the variation across individuals in financial risk aversion (Cesarini et al. 2010). Other work indicates that risk attitudes can vary in the short-term for the same person as a function of, e.g., identity priming (Benjamin et al. 2010). There is also a small but growing body of research by economists, which we review in the next section, examining the impact of life experiences on risk attitudes. Part of this research has investigated the role of prior experiences, such as financial busts, that could plausibly change people’s expectations of likely outcomes; that is, for example, living through the Great Depression could make people believe that depressions are more likely to occur or are likely to be more severe.

In this paper, we aim to contribute to this strand of literature by providing an empirical analysis focusing on the relationship between individual-specific *life-course negative events* and financial risk taking. Drawing on research in psychology showing that traumatic events can produce wide-ranging and long-lasting consequences on one’s dispositions, we hypothesize that individuals who have experienced negative past events out of their control will significantly differ in their willingness to take financial risks. In other words, one’s personal history might cast a long shadow extending to current decision-making also within unrelated domains.

We proxy financial risk taking with panel observations on the holdings of stocks in the financial portfolio taken from the 2004-2010 waves of the US *Health and Retirement Study*. An already established strand of literature looks at the financial decision to hold stocks to infer risk taking (since the seminal

contributions of Cohn et al. 1975, and Friend and Blume 1975) and connects it to macroeconomic events in life history, such as the recent financial crisis (Malmendier and Nagel 2011; Bucciol and Miniaci 2014). The contribution of this paper is fivefold: first, unlike most of prior economics work on the theme, we mainly focus on the relationship between risk taking and individual-specific, *idiosyncratic* – rather than collectively experienced – events out of an individual's control; second, we are able to compare the impact on portfolio choice of such personal events with the impact of a macroeconomic shock such as the recent financial crisis; third, we jointly consider different shocks, which allows us to compare the relative strength of different effects; fourth, we analyze the relationship between financial risk taking and the timing of the events that we examine; fifth, we seek to understand whether financial risk taking varies as a result of a shift in preferences or via a change in beliefs.

We provide evidence that risk taking is significantly correlated with two types of prior life experience, that is having been victim of a serious physical attack and the loss of a child. Specifically, we observe less frequent investment in stocks when any of these two events is present. These correlations survive after controlling for classic socio-demographic determinants of risk taking as well as for the impact of the recent financial crisis. The effects of the two personal events are quantitatively similar to that of the collectively experienced event of passing from year 2004 to year 2008, i.e., going through the first phase of the current crisis. Our analysis further suggests that the negative correlation of risk taking with child loss is long-lasting, as opposed to the correlation with a physical attack that disappears after few years. Next, we provide evidence that financial risk taking seems to vary as a result of a shift in preferences more than via a change in beliefs.

The remainder of the paper proceeds as follows. Section 2 provides a short and selective review of the streams of literature investigating the long-term effects of prior life experiences. Section 3 describes our data and methodology. Section 4 illustrates our core findings and Section 5 concludes.

2. Prior life experiences and current decision-making

In the last decades, several papers both within and outside of the economics literature explored the effects of prior life experiences on current individual decisions and well-being. Outside of the economics literature, a number of recent studies have shed light on the adverse (direct and indirect) *economic* consequences later in life of negative life events such as losing a child (e.g., Knodel and Im-em 2004), having a life-threatening illness (see, e.g., Sachs and Malaney 2002, on malaria; Yach et al. 2006, on obesity) and suffering a physical loss (e.g., Miller et al. 1993, on injuries from violent crime; Boden et al. 2001, on workplace illnesses and injuries). On top of economic consequences, several articles in medicine and psychiatry document that exposure to trauma can produce lasting consequences on *mental* and *physical health* (Carmil and Breznitz 1991), including the well-known ‘post-traumatic stress disorder’ (Yehuda 2002). In the psychology literature, Sacco et al. (2003) focus on the psychological impact of the 9/11 terrorist attack on Italian subjects’ risk aversion, offering evidence of an indirect effect of that traumatic event. Holman and Silver (1998) investigate the relation between temporal orientation and long-term psychological distress in three samples of traumatized individuals. Their findings indicate that a tendency to focus on prior life experiences is correlated with high levels of distress long after the trauma had passed. Elder (1999) documents that individuals are most affected by seismic events early in life.

In economics, the empirical literature examining the influence of negative past experiences on individuals’ preferences, beliefs and other economically relevant variables is relatively new. Some recent papers focus on the impact on individuals’ risk attitude of collectively experienced events such as natural disasters (e.g., floods, hurricanes and earthquakes), wars and economic crises. In particular, the works closest to ours are Eckel et al. (2009), Malmendier and Nagel (2011), Cassar et al. (2011), Voors et al. (2012), Callen et al. (2014), Cameron and Shah (forthcoming) and Kim and Lee (forthcoming).¹ Eckel et al. (2009) examine

¹ However, it is worth noting that, compared to these papers, we consider a larger set of potentially meaningful events characterizing people’s past life. Next, as we made clear in the Introduction, the life events we focus on are individual-specific, rather than collectively experienced.

the short-term effects of Hurricane Katrina and find that the evacuees exhibit risk-loving behavior. Malmendier and Nagel (2011) investigate whether the experience of a large macroeconomic shock such as the Great Depression shaped the willingness to take risks of so called 'Depression Babies' later in life. They find that households with higher experienced stock market returns exhibit higher willingness to take financial risk. Cassar et al.'s (2011) experimental study shows that individuals who experienced the 2004 Asian tsunami in Thailand exhibit higher risk aversion. Callen et al. (2014) experimentally explore the link between violence and risk preferences in Afghanistan and document that subjects exposed to violence, when primed to recall fear, reveal a stronger preference for certainty. Voors et al. (2012) analyze the causal effect of exposure to violence on behavior in a series of economic experiments in Burundi. Their findings indicate that individuals who have either experienced violence themselves, or who live in communities that have been violently attacked, are more willing to take risks. Cameron and Shah (forthcoming) conduct incentivized risk game experiments in Indonesia and show that people who recently lived through natural disasters such as floods or earthquakes exhibit higher risk aversion than people living in otherwise similar villages. They also interestingly find that the impact persists for many years, particularly if the disaster was severe. Finally, Kim and Lee (forthcoming) study the influence on risk attitude of an early childhood exposure to the Korean War and show that this traumatic event makes individuals more averse to risk even five decades later. They also offer evidence from 51 countries supporting the view that an early childhood exposure to a major civil war leads to higher aversion to risk.

With few notable exceptions (Eckel et al. 2009; Voors et al. 2012), this growing stream of literature suggests that people's willingness to take risks significantly *decreases* as a result of passing through negative experiences such as natural disasters, wars and economic crises. Therefore, we decided to test the hypothesis that also individual-specific negative life events might produce lasting consequences on individuals' decision-making processes and, more specifically, on their willingness to take risk. This would seem to be a promising hypothesis also in light of voluminous literature in psychology, medicine and psychiatry that speaks

to the importance of traumatic life events on one's present well-being and decision-making.

In particular, since we know today that individuals' willingness to take risk, far from being stable across decision contexts, is to a large extent domain-specific (Dohmen et al. 2011; Loomes and Pogrebna 2014), we concentrated on a relevant but specific decision context such as the financial domain. We aimed to address the following question: do potentially traumatic personal experiences shape individuals' willingness to take risk in an unrelated context such as the financial domain later in life?

As to the direction of this correlation, it is plausible to conjecture, based on the majority of the aforementioned studies, that negative life events lead individuals to be *less willing* to take financial risks later in life, with these consequences being likely to pass through psychological channels. Portfolio choices are risky and financial risk taking, far from being exclusively driven by rational, risk-return forward-looking considerations only, is likely shaped also by individuals' prior life experiences. In particular, living through a potentially traumatic event earlier in life may make people perceive that they now face a greater risk and/or greater severity of future negative events also in unrelated domains and, therefore, reduce their willingness to take risks in such domains as the financial one.²

A possible mechanism underlying the relationship between negative life events and financial risk taking later in life is the one described in prior work in psychology (Loewenstein et al. 2001; Lerner et al. 2004): negative events trigger a *negative emotion* such as fear which, in turn, together with the sense of uncertainty and lack of control associated to it, is likely to induce individuals to make more risk averse choices (Lerner and Keltner 2001; Callen et al. 2014). This impact might be long-lasting and carry over to unrelated risky decision contexts.

In a similar vein, most of the articles reviewed in this section, together with other papers from psychology and neuroscience, suggest that risk taking has an

² Insofar as the results of our analysis support this hypothesis, a subtler related question will be to disentangle preferences from beliefs. In Section 4.2, we carry out a specific analysis aimed at addressing this further relevant question.

important emotional component.³ This emphasis on the affective nature of risk (Loewenstein et al. 2001; Weber et al. 2013)⁴ contrasts with the consequentialist view of ‘risk as analysis’ prevailing so far in the economics literature and fueled by the fact that variables such as age, wealth, education and cognitive ability negatively impact risk attitude.⁵

Interestingly, in the last years mounting evidence from economics studies points to a similar direction. Guiso et al. (2014) explore the relationship between fear and risk attitudes by means of a laboratory experiment showing that a scary experience indeed induces an increase in risk aversion.⁶ In a similar vein, Cohn et al. (forthcoming) examine experimentally whether financial markets trends produce a psychological impact on financial professionals’ risk tolerance. They report that financial professionals exhibit higher risk aversion when they are primed with a financial crash compared to a boom. However, it is important to observe that, while these economics papers look at the *short-run* impact of emotions on risk attitudes, our work focuses on the *long-run* consequences of meaningful events that are likely to be mediated by emotional factors through complex intrapersonal channels.

More broadly, our article also connects to the growing economics literature investigating the impact of environmental factors on economic decision-making processes. Several papers have shown that the cultural, political and socio-economic environment in which individuals grow up may significantly affect their preference and/or belief formation (e.g., Di Tella et al. 2007). As to redistribution, Alesina and Giuliano (2010) suggest that different preferences may arise from individual history, with a history of misfortune making people more favorable to

³ Recent work in neuroscience explores the neurological bases of risk aversion, finding that emotions are involved in risky decision-making in the financial domain (Kuhnen and Knutson 2005).

⁴ Older work includes Weinstein (1989), showing that personal experience can alter people’s emotional reactions to risky situations in complex situation- and domain- specific ways – for example, increasing feelings of worry, resulting in an increase in self-protective behavior in some domains (Loewenstein et al. 2001).

⁵ As Loewenstein (2000) points out, “Although visceral factors also play an essential (probably the dominant) role in human behavior, people’s introspections about the causes of their own behavior lead them to underappreciate the influence of visceral factors and to exaggerate the importance of higher-level cognitive processes” (p. 427).

⁶ See on this also Lerner and Keltner’s (2001) psychology experiment.

redistributive policies.⁷ With special regard to the effects of the environment on risk attitudes, Guiso et al. (2008) find that trusting people are significantly more likely to buy stocks and risky assets and, conditional on investing in stock, they invest a larger share of their wealth in it. Ahern et al. (forthcoming) document that peers exert a relevant influence on risk attitudes. Next, marked cross-country differences in risk aversion measures suggest that history and culture do play a prominent role in shaping risk attitudes (e.g., Fehr et al. 2006; Dohmen et al. 2010).

3. Data and methodology

A meaningful analysis of the correlation between personal life events and financial risk taking calls for accurate data on financial decisions for a relatively large number of households whose head has already experienced a significant portion of life. A suitable candidate for this purpose is the *US Health and Retirement Study* (henceforth HRS), a large-scale longitudinal survey collected every two years since 1992 by the Institute for Social Research of the University of Michigan.⁸ Every time the HRS interviews, mainly by telephone, a sample of households representative of the US population aged 50 or more.

The HRS is primarily devoted to explore the health transitions of individuals during their retirement lives or at the end of their working lives. Such people are considered of crucial importance now, and plausibly even more in the future, due to the dramatic population aging observed throughout the world. Every HRS wave collects, among others, detailed information on income, work, financial assets, and standard demographic characteristics of the household and the head. The questionnaire is made of different sections, each concerning a general topic (e.g., health care, housing, assets, employment) plus a set of experimental modules on specific issues (e.g., use of technology, financial literacy) that may or may not be repeated in other waves and are implemented on a randomly selected part of the

⁷ They also note that different historical experiences in different countries may lead to different social norms about what is acceptable or not in terms of inequality. For an empirical analysis of the effect of recessions on beliefs, see Giuliano and Spilimbergo (2014).

⁸ The dataset, along with all the survey questions and supporting documentation, is freely available at: www.umich.edu/~hrswww/.

sample. Of particular interest for this analysis is the psycho-social section on lifestyle, which was introduced in the 2004 wave. This section regards the relationship with other people, as well as past events in the life of the household head. As we made clear in Section 1, information on individuals' life-history events is central for our analysis in this paper.

The dataset used in this analysis is made of 9,963 complete observations on 4,638 households collected in the four waves between 2004 and 2010. We therefore consider a panel dataset, which carries several advantages compared to a cross-sectional one. In particular: i) financial decisions are not biased by the contingent macroeconomic situation of a given year (e.g., the global financial crisis of 2010) or the behavior of a particular cohort of individuals (e.g., the Baby Boomers), since we can control for time and cohort effects; ii) the impact of personal life events can be compared to the impact of changes in economic conditions. It should be noticed, nevertheless, that the panel dimension of the dataset is limited, as only occasionally households are re-interviewed on life events and psychological aspects. Even though we consider in the sample households interviewed in at least two waves, on average we have just 2.15 observations per household. The limited availability of repeated observations on the same households gives rise to small variability within groups, which prevents us from applying fixed-effect estimation techniques and forces us to apply random-effect methods. A random-effect model recognizes that there may be correlation across observations on the same households, but – in contrast to a fixed-effect model – in general it is not robust to the potential omission from the specification of relevant time-invariant variables correlated with our explanatory variables.

For each household in the sample we have extensive information on its composition, its financial and non-financial wealth holdings, plus age, gender, race, nationality, marital status, education, occupational status and health status of the head. In addition, we have information on past negative life events of the household head. We focus on the following four events included in all the four waves: death of a child (whether a kid or an adult), having been victim of a serious physical attack or assault, having had a life-threatening illness or accident, and

having had a spouse/child with a life-threatening illness or accident.⁹ The exact wording of the questions on personal life events is reported in Table 1, together with the definition of the other variables used in the analysis. These include standard socio-demographic variables (age, gender, education, etc.) plus variables capturing macroeconomic events (year dummies) and cohort effects (cohort dummies)¹⁰ – including the experienced market return. Following Malmendier and Nagel (2011), this is constructed as the weighted average annual real return from the S&P500 stock market index since birth and up to the year before being interviewed.¹¹

TABLE 1 ABOUT HERE

To allow for a fair evaluation of the life events on the death of a child, our sample includes only households with at least one child (alive or dead). As a further sample restriction we focus on households whose head is not older than 80: the older elderly are oversampled in the HRS design, and in addition we believe they may find it difficult to recall past personal events, especially when such events occurred in their early life.

Given the structure of the questionnaire, we choose to measure financial risk taking by means of portfolio decisions. We make use of the HRS information on holdings of the most common asset categories, aggregating this information in three main categories: risk free deposits (checking accounts, saving accounts, money market funds), bonds (corporate bonds, CDS, T-bills, government savings

⁹ Five more variables on personal life events occurred in the last five years are present in all the four HRS waves. These concern spells of job loss, unemployment (of the respondent or anyone else in the household), robbery and movements to a worse neighborhood. In the analysis we neglect such events as they are – at least partly – under individual control and, therefore, their occurrence may to some extent reflect individual attitudes and specific personality traits, inducing self-selection in the sample.

¹⁰ Following HRS, we identify four cohorts: “Depression Babies” (born between 1924 and 1930), “HRS” (between 1931 and 1941, our baseline category), “War Babies” (between 1942 and 1947) and “Baby Boomers” (since 1948).

¹¹ For someone aged A in year t of the interview, our measure is $\sum_{k=1}^A w_k R_{t-k}$ with R_{t-k} annual return observed in year $t-k$ and $w_k = (A-k)^\lambda / \sum_{l=1}^A (A-l)^\lambda$. The parameter λ is set to 1.325 for the stock holding and to 1.166 for the stock share, following Malmendier and Nagel (2011). When the dependent variable is the expected probability that the market will go up in the next year (Table 5, Column (1)) we consider $\lambda=1.166$. Results are unchanged if we instead take $\lambda=1.325$.

bonds, bond mutual funds), and stocks (directly held stocks, stock mutual funds). Retirement assets (such as IRA or Keogh accounts), which are important in the US and especially among retirees or people close to retiring, are split between the bond and stock categories depending on their declared composition.¹² The sum of deposit, bond and stock holdings defines household financial wealth.

Beginning with the seminal contributions of Cohn et al. (1975) and Friend and Blume (1975), based on mean-variance portfolio theory, the literature frequently takes the share of financial wealth invested in stocks as a proxy for financial risk taking. Following this approach, we also consider the stock share as a key indicator. In addition, we focus our attention on stock market participation, i.e., on *whether* an individual holds stocks or not (either directly or indirectly). This approach is also popular in the literature (see, e.g., Malmendier and Nagel 2011) because it does not suffer from two shortcomings of the stock share measure. First, the stock share can carry some measurement error because respondents may not know the exact amount of their holdings and how these are allocated. Second, agents may not adjust their portfolio frequently (Calvet et al. 2009), which implies that observed changes in the portfolio shares may merely reflect the evolution of market prices. By contrast, since it is independent of monetary amounts, the stock holding indicator does not raise this concern.

Table 2 lists summary statistics on the variables used in the analysis. Notice that, while some life events are relatively rare in the sample (e.g., physical attacks occur in 4.9% of the cases), others are rather common (e.g., a life-threatening illness or accident occurs in 24% of the observations; a child death in 15% of the observations). These figures are in line with those from external sources.¹³ In

¹² Information on the composition of retirement assets is not present in wave 2004. We therefore assume that retirement assets in 2004 are invested equally in bonds and stocks. This assumption notwithstanding, the aggregate bond and stock shares exhibit a roughly similar size in 2004 and 2006 (respectively 29.86 and 30.88%), which is in line with the aggregate stock shares excluding retirement assets and with statistics from other sources, such as Bucciol and Miniaci (2014) who use data from the US Survey of Consumer Finances. As a robustness check, for 2004 we arbitrarily split retirement assets between bonds and stocks in a proportion close to that reported in aggregate for year 2006 (1/3 in bonds and 2/3 in stocks). This way the stock share is higher in aggregate. The analysis performed on this new variable, however, provides the same conclusions as on our benchmark measure. The output of this robustness check is available upon request.

¹³ For instance a survey commissioned in 1999 by the organization “The Compassionate Friends” reports that 19% of the US adult population has experienced the death of a child:

general, events are relatively frequent in this sample because, as we pointed out above, respondents have already experienced a significant portion of their lives. The bottom part of Table 2 informs that about 57% of the observations hold stock assets, and the average stock share in the financial portfolios is nearly 30%. These figures are generally higher than for the whole of the US (see, e.g., Bricker et al. 2012), mainly because the elderly own more financial wealth on average.

TABLE 2 ABOUT HERE

The sample period we analyze includes phases of both economic growth and recession in the US (as in many other parts of the world). Figure 1 shows the time trend of real per capita GDP and the S&P500 stock market index; values are normalized to 100 in year 2004. The figure also depicts the percentage of days in the year when the S&P500 index went down. During the period under investigation, the economy underwent a recession starting with the GDP contraction of 2008 and followed by a stock market crash. In aggregate in our sample, fewer household portfolios invested in stocks during the 2008-2010 period (around 54% as opposed to 58% of the 2004-2006 period), and the aggregate stock share also declined.

FIGURE 1 ABOUT HERE

As a preliminary analysis, we look at the single events occurred in an individual's past life, and see how each is related to portfolio holdings. Figure 2 displays the proportion of stock holders conditional on each of the four life events. Within parentheses we report the outcome of a two-group test on the equality of proportions for each event. The test suggests that stock holding is less frequent among households who experienced a life-threatening illness or accident and (especially) among those who suffered from the death of a child or a physical

https://www.compassionatefriends.org/pdf/When_a_Child_Dies_-_1999_Survey.pdf (accessed October 8 2014.)

attack. In contrast, no statistical difference is found among households who experienced a life-threatening illness or accident on their spouse or children.

FIGURE 2 ABOUT HERE

This first analysis suggests that there is significant correlation between financial risk taking and some occurrences characterizing the respondent's personal life history. This analysis, however, may be misleading because it neglects potential interplays between the various events, as well as the role of standard observable variables (e.g., wealth and education) that the literature identifies as important determinants of financial risk taking. The analysis in Section 4 is meant to fill this gap.

4. Results

Using data from HRS, we test whether individuals who lived through negative events in the past display a lower willingness to take financial risk. That is, we explore the predictive power on stock investment of life-time individual-specific events. In this section we use different econometric models for panel data to shed light on this relationship. All the specifications include the socio-demographic, cohort and collectively experienced event variables summarized in Table 2. As a general rule, we will comment only on the correlations that are significantly different from zero at least at a 5% level.

Column (1) of Table 3 shows the average marginal effect of a random-effect probit model where the dependent variable is a dummy variable indicating whether the household owns stocks (either directly or indirectly through composite assets) or not. This variable is regressed over the standard socio-demographic variables, excluding variables on personal negative life events. In the specification we also control for cohort and time effects.

Not surprisingly, several socio-demographic variables show significant correlations with our dependent variable: positive for high school and college education, home ownership, financial wealth, marital status and good health

status; negative for non-white race and the presence of children. All these correlations have the expected sign, and confirm previous findings from the literature (e.g., Barsky et al. 1997; Halek and Eisenhauer 2001; Bucciol and Miniaci 2011). We also observe sizable time effects with a large fall in the probability to hold stocks in year 2008 (-8.9%), together with the beginning of the financial crisis. As regards the cohort effects, we find positive correlation between stock holding and the War Babies (+4.5%).¹⁴

In addition to these standard variables, in Column (2) of Table 3 we consider dummy variables on past life history. Previous results are preserved both qualitatively and quantitatively. Moreover, we now find significant correlations for two out of the four variables capturing personal life events: having been victim of a physical attack is associated with a 5.2% reduction in the probability to own stocks, while having suffered for the loss of a child is related to a 7.2% reduction. Both effects are relatively large, and especially the latter has a magnitude similar to that of year 2008 as opposed to 2004, or to college rather than high school education. The impact of a child loss is then similar to that of the financial crisis (that began in 2008) and it is large enough to offset the effect of having received college rather than high school education. In light of the stream of literature that we reviewed in Section 2, documenting the adverse economic consequences of negative life events, it is important to notice that our results on individuals' past history survive after controlling for household financial wealth.

In Column (1) of Appendix Table A1 we report regression estimates based on a pooled probit regression with standard errors clustered at the household level. All the findings are preserved except for the physical attack, which in that case is not significant. However, statistical tests support our use of the model in Table 3.¹⁵

¹⁴ These individuals, who, together with the Depression Babies, form the so-called "Silent Generation", grew up during a time of upheaval and uncertainty. Sociologists view them as more resilient, ambitious and with a need for achievement, power and status. For details on this see Oworm (1997).

¹⁵ In the model of Column (2) in Table 3, the proportion of total variance contributed by the panel-level variance is 0.724 (standard error: 0.017). A likelihood-ratio test rejects the hypothesis that this proportion is null (Chi squared statistic: 924.76; p-value <0.001).

The proxy of risk taking considered so far is qualitative in nature. We then decide to enrich our analysis by integrating it with a quantitative measure, namely the share of the financial portfolio held in stocks. This variable is also popular in the literature, although it carries the shortcomings mentioned in Section 3. One further problem with this variable is that it is a fraction, and therefore takes values in the 0-1 range – and with many values at the 0 boundary. Standard econometric models are not suited for this type of variable. We deal with this issue adopting the Fractional Response Model (henceforth FRM) first proposed in Papke and Wooldridge (1996), in the variant for panel data introduced in Papke and Wooldridge (2008).

The model applies a quasi-maximum likelihood estimation of a Bernoulli likelihood where the conditional mean of the fraction is described as a cumulative normal distribution. Compared to alternative estimation methods, the FRM: i) is suited to treat dependent variables in the 0-1 range, possibly with a mass of observations concentrated at the boundaries; ii) does not need ad hoc adjustments to treat values at the boundaries; iii) does not require assumptions on the underlying distribution of the fraction to retrieve the conditional mean; i) allows for non-linear marginal effects of the explanatory variables.

Papke and Wooldridge (1996, 2008) show that the FRM estimator is consistent provided that the conditional mean is correctly specified. Although in the paper we comment only on estimates obtained from the FRM, it should be noticed that our findings are preserved when using alternative estimation methods (pooled OLS with household-clustered standard errors, random-effect panel and panel tobit models); the output of these models is shown in Columns (2)-(4) of the Appendix Table A1.

Columns (3) and (4) of Table 3 report average marginal effects estimated from the FRM, using the specifications with and without negative life events. All the socio-demographic coefficients cited above regarding the stock holding dummy variable are significant also in these regressions. In addition we observe a negative correlation of the immigrant status. Among our personal life history variables, only experiencing the death of a child preserves significant correlations in this analysis: this event is associated to a 5.4% fall in the stock share on average, which more

than balances the positive effect of having received college rather than high school education. The size of this correlation is slightly larger than that of the 2008 crisis, where the stock share fell on average by 3.4% compared to year 2004.

TABLE 3 ABOUT HERE

Estimates obtained with the stock share as dependent variable suffer from the severe bias mentioned in Section 3. That is, the stock share may simply reflect stock market prices if no portfolio adjustment is made, which would imply that what we are measuring no longer reveals risk taking. It is reassuring that the findings obtained on stock shares are in line with those obtained using stock holdings. However, stocks are not the only asset. In Appendix Table A2 we replace the dependent variable with the holding or the share of risky assets meant as either stocks or bonds. Our findings are preserved for both the holding and the share. Moreover, in Appendix Table A3 we replicate the analysis using as dependent variable the holding or the share of stocks excluding those in pension funds – which may have different (long-term) drivers than other financial assets. That is, we focus only on stocks held directly or indirectly through mutual funds. Again, our previous results are confirmed.

4.1. Timing of the events

The occurrence of a negative event may have different implications on stock holding depending on when the event happened. In Table 4 we exploit information from the HRS questionnaire on the year when the event arose.¹⁶ The analysis is performed in two ways for the stock holding and the stock share. In Columns (1) and (3) we add to the benchmark specification the years elapsed since the occurrence of the personal event. As in the benchmark regression, we find a negative correlation of child death and physical attacks (the latter on the stock holding only.) However, the timing of the event does not seem to matter. It should

¹⁶ Some respondents fail to indicate a year, or they report an unrealistic year (e.g., before they were born.) Throughout our analysis we ignore these observations (about 300), and consider only individuals who either did not experience the event or experienced the event reporting a year in which they were no younger than 16 years old.

be noticed, though, that with this specification we are forcing the data to exhibit (if any) a linear pattern in the correlation between risk taking and the timing of the event.

In Columns (2) and (4) we instead model the personal events through a set of dummy variables. For each of the four events, we create dummy variables equal to 1 if the event has arisen within the last 5 years, between 6 and 20 years, or more than 20 years earlier. The distinction is made in such a way to evaluate the impact of events arisen a short, medium or long time ago. The output for both dependent variables indicates that child death is negatively correlated with stock holdings and shares, always and at the same rate regardless of the time when the event happened.¹⁷ As to physical attacks, we find that their influence is relevant only insofar as the event occurred relatively recently (i.e., no more than 5 years before.) This implies that, for experiences such as going through a physical attack, the link with risk taking is highly significant only when it is a recent, rather than a distant, personal experience, i.e., it has a relevant impact in the short-term, but dissipates as time unfolds. By contrast, for stronger life experiences such as the loss of a child, the link persists over time, as the event shapes one's willingness to take risk even a long time after its occurrence. In a similar vein, related studies in economics document a persistent long-run impact on risk taking of traumatic experiences such as early childhood exposure to the Korean War (Kim and Lee forthcoming) and particularly severe natural disasters (Cameron and Shah forthcoming).

TABLE 4 ABOUT HERE

4.2. *Preferences or beliefs?*

After establishing that a link exists between negative life events and financial risk taking, and that it is arguably mediated by emotional reactions, it would also be interesting to shed further light on the mechanism that drives this relevant connection: does it mostly pass through a *beliefs* channel or a *preferences*

¹⁷ Joint Chi-squared test on the equality of the three coefficients: 0.08; p-value: 0.96 (Column (2)); 0.05; p-value: 0.97 (Column (4)). In both cases we accept the null hypothesis and conclude that the three coefficients are statistically identical.

channel? In other words, do traumatic life experiences mainly shape risk preferences or risk beliefs, later in life? To gain insights in this direction we perform the analysis of Table 5, where Column (1) runs another FRM on our benchmark specification. In this case, however, the dependent variable is the self-assessed probability that the stock market will go up in the next 12 months.¹⁸ This check is similar to one in Malmendier and Nagel (2011)¹⁹, and is meant to understand whether negative life events correlate with beliefs over the stock market return in the next future.

The analysis reveals that the belief correlates with demographic characteristics (primarily gender and education) and other self-assessed dimensions (health status). However, while expectations are lower in year 2010 – in the midst of the financial crisis –, they seem not to be influenced by the occurrence of personal negative events (only child death is significant at the 10% level.) Our results thus indicate that there is no correlation between negative past events and beliefs about future market returns.

The answer to the expectation variable, however, is missing for about 15% of the sample observations. To make a fair comparison with our key portfolio indicators, Columns (2) and (3) of Table 5 replicate our benchmark analysis of Table 3 (on stock holding and stock share) in the same subsample of observations as in Column (1). Our benchmark results are confirmed, which supports the existence of a correlation between risk taking and personal events. Though caution is in order, it is plausible to read the three columns in Table 5 as suggesting that the documented correlation between negative life events and current risk taking in the financial domain passes mainly through preferences – rather than beliefs.

In this regard, our analysis leads to a different conclusion compared to prior work such as Malmendier and Nagel (2011), Weber et al. (2013) and Cameron and Shah (forthcoming), as in these papers a belief-based story seems more consistent

¹⁸ The exact wording of the question is the following: “We are interested in how well you think the economy will do in the future. By next year at this time, what is the percent chance that mutual fund shares invested in blue chip stocks like those in the Dow Jones Industrial Average will be worth more than they are today?” The possible answer is any integer number between 0 and 100, that we rescale to a fraction between 0 and 1.

¹⁹ They consider two types of self-assessed expectations over the next 12 months: the stock market return and the return on the respondent’s own portfolio.

with the data. In contrast, other papers shed light on the importance of the preferences channel, as we do: for example, Voors et al.'s (2012), Callen et al.'s (2014) and Kim and Lee's (forthcoming) findings on exposure to conflict seem more in line with a preference-based story.

We view this result as shedding further light on the nature of the mechanism underlying the relationship between personal life events and financial risk taking that lies at the heart of our paper. A growing stream of literature deals with the consequences of rare (low probability) events, with some studies specifically investigating the impact of experienced rare events on subsequent probability estimations by the individuals who went through those events. In this regard, recent work shows that individuals who experience rare events tend to underweight the probability of future events (see, e.g., Ungemach et al. 2009; Barron and Yechiam 2009). In contrast, we claim that when experienced rare events are also potentially traumatic, like the ones we examine in this paper, it is the intensity of the experience that plays a key role in influencing future decision-making and, in particular, decision-making within a risky unrelated domain such as the financial one. This view of the relationship between negative events and financial risk taking is consistent with our emphasis on the non-cognitive, emotional mechanism illustrated in Section 2. In this regard, we add that the finding concerning the distinction between preferences and beliefs, shedding light on the role of the preferences – rather than the beliefs – channel in driving our main result, corroborates this idea: far from occurring via a cognitive process of belief updating, the (emotional) mechanism we focus on is likely to pass through the preferences channel.²⁰

TABLE 5 ABOUT HERE

²⁰ Relatedly, a further key difference between the two mechanisms is that the rare event-probability estimation mechanism seems to occur in the short run, affecting individuals' subsequent weighting of the probability of future events; in contrast, the psychological process we emphasize in this work also produces its effects in an unrelated domain (such as the financial one) in the medium-long run, as confirmed by our results on the timing of the impact of a traumatic event such as the loss of a child, that, as we make clear in Section 4.1, influences financial risk taking also some decades after its actual occurrence.

5. Discussion

This paper provides insight into the factors influencing risk taking, indicating that some prior negative life events out of an individual's control have a significant correlation with her current willingness to undertake risky financial investments. Specifically, after controlling for the classic socio-demographic characteristics, we find that risky investments are less likely to be undertaken if the individual experienced a child death or has been victim of a serious personal attack. The correlation of risky investments with both negative life events is quantitatively large, and it may balance almost completely the correlation with well-known determinants of risk taking such as high school or college education. Therefore, our analysis suggests that the 'shadow of the past' might be even more important, for an individual's current risk taking, than factors typically associated with her cognitive system. Moreover, the impact of these two personal events is similar to that of a collectively experienced event: the beginning in 2008 of the current financial crisis.

Our results are also consistent with recent economics papers on the theme and extend to some idiosyncratic experiences out of individual control the idea that what a person passes through over time may be significant for her willingness to take risks in later life. These findings contribute to our understanding of the nature of financial risk taking, as they confirm that it is not as rigid as traditionally believed, but instead malleable and shaped by several life occurrences, including social interactions (Hong et al. 2004; Ahern et al. forthcoming). We also connect to the strand of literature emphasizing the need to explore the non-cognitive, emotional component of risk taking (Weber et al. 2013; Guiso et al. 2014; Cohn et al. forthcoming). As Loewenstein et al. (2001) point out, emotional reactions guide responses not only at their first occurrence, but also through conditioning and memory at later points in time (also see Loewenstein 2000). When we consider the time when the negative event occurred, we find that the impact on financial risk taking of a major traumatic event such as losing a child is strong regardless of the year it occurred, whereas for physical attacks the influence is strong only insofar as the event occurred relatively recently (i.e., no more than 5 years before).

A further relevant open question is whether passing through negative life

experiences shapes current risk taking via preferences or beliefs. As we pointed out in Section 4, in the economics literature some studies point to the beliefs channel, whereas others are more consistent with a preference-based story. In this regard, our analysis indicates that the beliefs channel does not seem to play a relevant role in affecting financial risk taking, suggesting that the documented impact of negative life events is mediated by a shift in individuals' risk preferences. Future research should aim to identify the exact mechanisms linking different potentially traumatic events to behavioral changes.

A growing economics literature has been convincingly showing that the past (including distant past) matters for current economic outcomes at the macro level (e.g., Tabellini 2010). Our results complement previous work, as we find that also at the micro level the past matters for current economic outcomes: not only a country's history, but also individual histories play an important role in influencing economic behavior today. This indicates that adverse consequences of traumatic life experiences stretch well beyond the immediate material and psychological effects they determine and may have a long-term impact on individual behavior.

Our findings further imply that psychology-informed empirical research may foster a more comprehensive theory of individual decision-making under risk than the rational actor model and thus may ultimately yield new insights relevant to economic policy and institutional design. Since, as we observed in Section 2, we know today that individuals' willingness to take risk, far from being stable across decision contexts, is to a large extent domain-specific, it will be interesting to see whether the shadow that negative past events cast on financial risk taking also extends to other risky domains (such as, e.g., the decision to enter into and to persist in entrepreneurship). These questions are left as interesting avenues for future research.

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Fig. 1. Time trend of macroeconomic variables

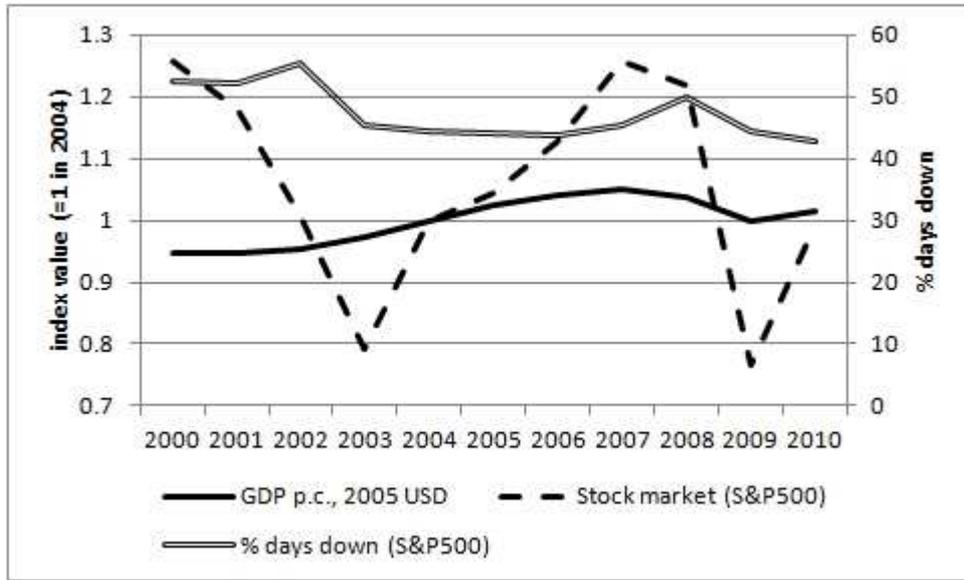
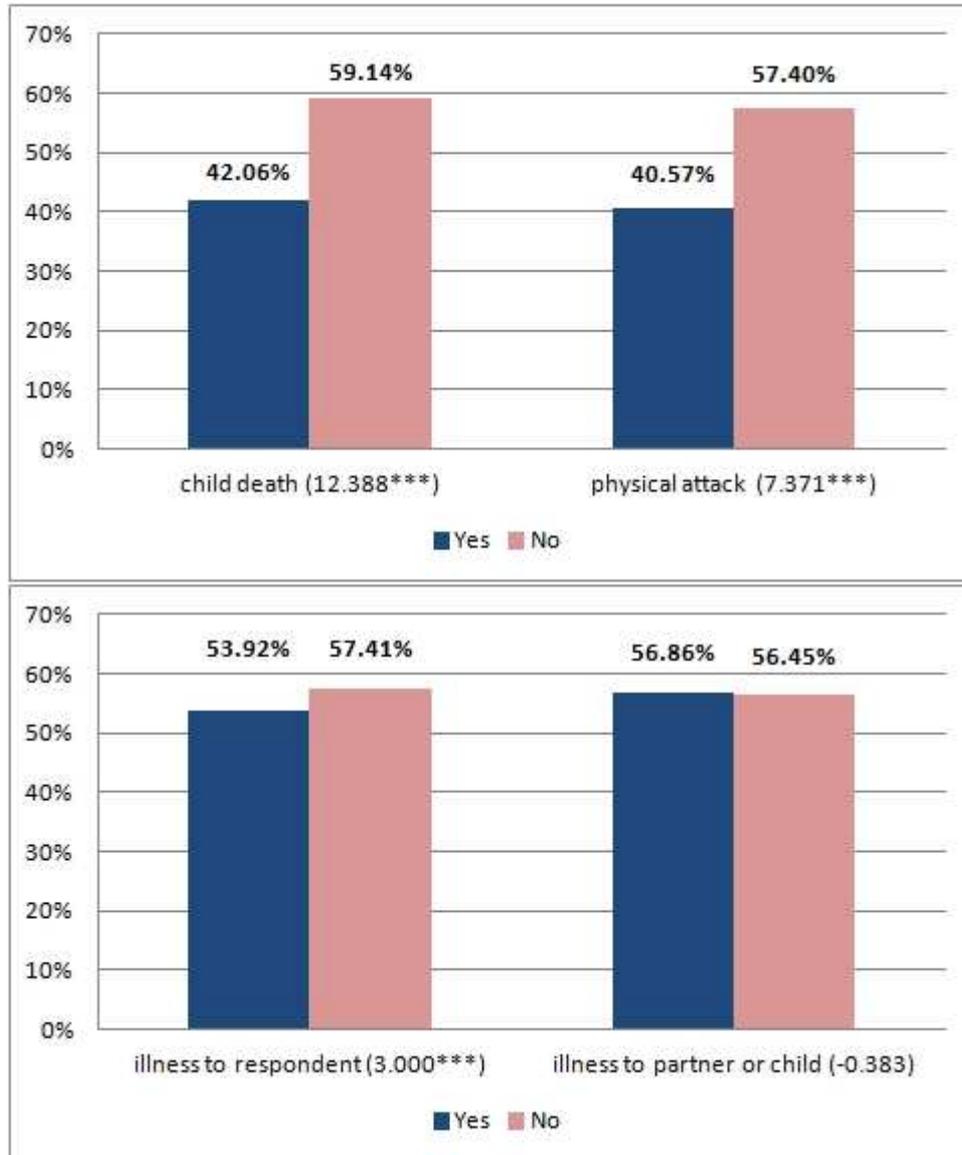


Fig. 2. Percentage of stock holders conditional on life history



Note: Two-group test on the equality of proportions is reported with parentheses; the alternative hypothesis is that the two proportions are different from each other. The sample size is 9,963 observations. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1. Variables used in the analysis**a) Questions on personal negative life events**

"For each of the following events, please indicate whether the event occurred AT ANY POINT IN YOUR LIFE. If the event did happen, please indicate the year in which it happened MOST RECENTLY."

(Q1) *"Has a child of yours ever died?"*

Possible answers: Yes, No

(Q2) *"Were you the victim of a serious physical attack or assault?"*

Possible answers: Yes, No

(Q3) *"Did you ever have a life-threatening illness or accident?"*

Possible answers: Yes, No

(Q4) *"Did your spouse or a child of yours ever have a life-threatening illness or accident?"*

Possible answers: Yes, No

For each question, if the answer is "yes", one further question asks "If Yes, what year?".

b) Variables' definition

Variable	Dummy	Definition
<i>Socio-demographic variables</i>		
Age/10	No	Age in years divided by 10
Female	Yes	Female
Non-white	Yes	Non-white
Immigrate	Yes	Immigrate from outside the US
Married	Yes	Married
High school	Yes	High school graduate
College	Yes	College graduate
Living with children	Yes	Living with children
Living with other household members	Yes	Living with others apart from children
Employee	Yes	Working as employee
Self-employed	Yes	Working as self-employed
Home-owner	Yes	Home-owner
Ln(financial wealth)	No	Log. of household financial wealth in constant 2010 USD
Self-assessed good health	Yes	Self-assessed good or very good health status
<i>Cohort and collectively experienced events</i>		
Experienced market return	No	Average S&P500 % real return since birth, weighted as in Malmendier and Nagel (2011)
Depression Babies cohort	Yes	Cohort born between 1924 and 1930
War Babies cohort	Yes	Cohort born between 1942 and 1947
Baby Boomers cohort	Yes	Cohort born in 1948 or later
Year 2006	Yes	Year of data collection is 2006
Year 2008	Yes	Year of data collection is 2008
Year 2010	Yes	Year of data collection is 2010
<i>Personal events</i>		
Child death	Yes	Answered "Yes" in (Q1)
Physical attack	Yes	Answered "Yes" in (Q2)
Illness or accident (respondent)	Yes	Answered "Yes" in (Q3)
Illness or accident (partner or child)	Yes	Answered "Yes" in (Q4)
Elapsed years/10	No	Years elapsed since the personal event arose
Within 5 years	Yes	Personal event arisen within 0-5 years
Within 6-20 years	Yes	Personal event arisen within 6-20 years
Since more than 20 years	Yes	Personal event arisen since more than 20 years
<i>Financial risk indicators</i>		
Stock holding	Yes	Stock holding in the financial portfolio
Stock share	No	Stock share in the financial portfolio
Bond + stock holding	Yes	Bond and stock holding in the financial portfolio
Bond + stock share	No	Bond and stock share in the financial portfolio
Stock holding (no pension funds)	Yes	Stock holding (excluding pension funds) in the financial portfolio
Stock share (no pension funds)	No	Stock share (excluding pension funds) in the financial portfolio
Market up	No	Self-assessed probability stock market goes up in the next 12 months

Table 2. Summary statistics (9,963 observations)

Variable	Mean	Std. Dev.	Min.	Max.
<i>Socio-demographic variables</i>				
Age/10	6.579	0.737	5	8
Female	0.587	0.492	0	1
Non-white	0.151	0.358	0	1
Immigrate	0.076	0.265	0	1
Married	0.724	0.447	0	1
High school	0.188	0.391	0	1
College	0.096	0.295	0	1
Living with children	0.217	0.412	0	1
Living with other household members	0.105	0.306	0	1
Employee	0.322	0.467	0	1
Self-employed	0.093	0.290	0	1
Home-owner	0.859	0.348	0	1
Ln(financial wealth)	11.463	5.603	0	20.367
Self-assessed good health	0.465	0.499	0	1
<i>Cohort and collectively experienced events</i>				
Experienced market return (holding)	4.242	0.015	4.096	4.985
Experienced market return (share)	8.184	0.016	8.017	8.954
Depression Babies cohort	0.039	0.194	0	1
War Babies cohort	0.206	0.405	0	1
Baby Boomers cohort	0.255	0.436	0	1
Year 2006	0.371	0.483	0	1
Year 2008	0.087	0.282	0	1
Year 2010	0.364	0.481	0	1
<i>Personal events</i>				
Child death	0.150	0.357	0	1
Elapsed years/10	0.333	1.035	0	6
Within 5 years	0.037	0.190	0	1
Within 6-20 years	0.041	0.199	0	1
Since more than 20 years	0.072	0.258	0	1
Physical attack	0.049	0.217	0	1
Elapsed years/10	0.105	0.581	0	5.8
Within 5 years	0.014	0.119	0	1
Within 6-20 years	0.009	0.097	0	1
Since more than 20 years	0.026	0.159	0	1
Illness or accident (respondent)	0.240	0.427	0	1
Elapsed years/10	0.329	0.902	0	6.1
Within 5 years	0.100	0.300	0	1
Within 6-20 years	0.077	0.267	0	1
Since more than 20 years	0.064	0.244	0	1
Illness or accident (partner or child)	0.299	0.458	0	1
Elapsed years/10	0.385	0.916	0	6.1
Within 5 years	0.125	0.331	0	1
Within 6-20 years	0.101	0.301	0	1
Since more than 20 years	0.074	0.262	0	1
<i>Financial risk indicators</i>				
Stock holding	0.566	0.496	0	1
Stock share	0.297	0.344	0	1
Bond + stock holding	0.621	0.485	0	1
Bond + stock share	0.407	0.421	0	1
Stock holding (no pension funds)	0.312	0.463	0	1
Stock share (no pension funds)	0.129	0.265	0	1
Market up	0.485	0.256	0	1

Note: Statistics for the last variable ("market up") are based on fewer observations (8,446).

Table 3. Benchmark analysis

	Holding		Share	
	(1)	(2)	(3)	(4)
Age/10	-0.015 (0.022)	-0.013 (0.022)	-0.029* (0.017)	-0.026 (0.017)
Female	-0.009 (0.013)	-0.010 (0.013)	-0.007 (0.010)	-0.005 (0.010)
Non-white	-0.278*** (0.019)	-0.268*** (0.018)	-0.220*** (0.019)	-0.214*** (0.019)
Immigrate	-0.040 (0.025)	-0.041* (0.024)	-0.053*** (0.020)	-0.055*** (0.020)
Married	0.062*** (0.014)	0.062*** (0.014)	0.057*** (0.012)	0.056*** (0.012)
High school	0.173*** (0.016)	0.170*** (0.016)	0.121*** (0.011)	0.119*** (0.011)
College	0.233*** (0.022)	0.232*** (0.022)	0.142*** (0.014)	0.141*** (0.014)
Living with children	-0.079*** (0.013)	-0.080*** (0.013)	-0.055*** (0.012)	-0.056*** (0.012)
Living with other household members	-0.021 (0.018)	-0.020 (0.018)	-0.015 (0.016)	-0.015 (0.016)
Employed	-0.012 (0.013)	-0.013 (0.013)	-0.010 (0.010)	-0.012 (0.010)
Self-employed	-0.001 (0.019)	-0.002 (0.019)	-0.005 (0.015)	-0.005 (0.015)
Home-owner	0.147*** (0.017)	0.140*** (0.017)	0.138*** (0.017)	0.133*** (0.017)
Ln(financial wealth)	0.041*** (0.001)	0.040*** (0.001)	0.022*** (0.001)	0.022*** (0.001)
Self-assessed good health	0.078*** (0.010)	0.074*** (0.010)	0.052*** (0.008)	0.049*** (0.008)
Experienced market return	0.056 (0.385)	0.063 (0.386)	0.344 (0.311)	0.349 (0.310)
Depression Babies cohort	0.028 (0.034)	0.027 (0.034)	0.001 (0.024)	0.002 (0.024)
War Babies cohort	0.046** (0.023)	0.045* (0.023)	0.023 (0.017)	0.022 (0.017)
Baby Boomers cohort	0.001 (0.035)	0.001 (0.035)	-0.017 (0.027)	-0.016 (0.027)
Year 2006	-0.037*** (0.013)	-0.036*** (0.013)	0.007 (0.010)	0.007 (0.010)
Year 2008	-0.089*** (0.018)	-0.088*** (0.018)	-0.033** (0.014)	-0.034** (0.014)
Year 2010	-0.023 (0.018)	-0.021 (0.018)	0.013 (0.0014)	0.012 (0.014)
Child death		-0.072*** (0.016)		-0.054*** (0.013)
Physical attack		-0.052** (0.024)		-0.041* (0.021)
Illness or accident (respondent)		-0.010 (0.012)		-0.003 (0.010)
Illness or accident (partner or child)		0.018 (0.011)		-0.004 (0.009)
N. observations	9,963	9,963	9,963	9,963
N. households	4,638	4,638	4,638	4,638

Note: Columns (1)-(2) are based on a random-effect probit regression on the probability to hold stocks; Columns (3)-(4) are based on a panel fractional response model on the stock share of the financial portfolio. The table reports average marginal effects. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Timing of the events

	Holding		Share	
	(1)	(2)	(3)	(4)
Age/10	-0.013 (0.022)	-0.013 (0.022)	-0.027 (0.017)	-0.027 (0.017)
Female	-0.010 (0.013)	-0.010 (0.013)	-0.005 (0.010)	-0.005 (0.010)
Non-white	-0.267*** (0.019)	-0.266*** (0.018)	-0.213*** (0.019)	-0.213*** (0.019)
Immigrate	-0.041* (0.024)	-0.042* (0.024)	-0.055*** (0.020)	-0.055*** (0.020)
Married	0.062*** (0.014)	0.062*** (0.014)	0.056*** (0.012)	0.056*** (0.012)
High school	0.169*** (0.016)	0.169*** (0.016)	0.119*** (0.011)	0.119*** (0.011)
College	0.232*** (0.022)	0.231*** (0.022)	.0140*** (0.014)	0.140*** (0.014)
Living with children	-0.080*** (0.013)	-0.081*** (0.013)	-0.056*** (0.012)	-0.056*** (0.012)
Living with other household members	-0.020 (0.018)	-0.020 (0.018)	-0.015 (0.016)	-0.015 (0.016)
Employed	-0.013 (0.013)	-0.013 (0.013)	-0.011 (0.010)	-0.012 (0.010)
Self-employed	-0.002 (0.019)	-0.002 (0.019)	-0.005 (0.015)	-0.005 (0.015)
Home-owner	0.141*** (0.017)	0.140*** (0.017)	0.134*** (0.017)	0.134*** (0.017)
Ln(financial wealth)	0.040*** (0.001)	0.040*** (0.001)	0.022*** (0.001)	0.022*** (0.001)
Self-assessed good health	0.074*** (0.010)	0.074*** (0.010)	0.049*** (0.008)	0.049*** (0.008)
Experienced market return	0.073 (0.386)	0.066 (0.385)	0.352 (0.310)	0.348 (0.313)
Depression Babies cohort	0.027 (0.034)	0.028 (0.034)	0.002 (0.024)	0.002 (0.024)
War Babies cohort	0.044* (0.023)	0.044* (0.023)	0.022 (0.017)	0.022 (0.017)
Baby Boomers cohort	0.001 (0.035)	0.001 (0.035)	-0.017 (0.027)	-0.017 (0.027)
Year 2006	-0.037*** (0.013)	-0.037*** (0.013)	0.006 (0.010)	0.006 (0.010)
Year 2008	-0.088*** (0.018)	-0.089*** (0.018)	-0.034** (0.014)	-0.034** (0.014)
Year 2010	-0.022 (0.018)	-0.022 (0.018)	0.012 (0.014)	0.012 (0.014)

(Continues in the next page)

Table 4. (Continues from the previous page)

	Holding		Share	
	(1)	(2)	(3)	(4)
Child death	-0.071*** (0.024)		-0.056*** (0.020)	
Elapsed years/10	-0.001 (0.008)		0.001 (0.007)	
Within past 5 years		-0.067** (0.026)		-0.055*** (0.021)
Within 6-20 years		-0.074*** (0.028)		-0.059** (0.024)
Since more than 20 years		-0.076*** (0.022)		-0.053*** (0.017)
Physical attack	-0.093** (0.039)		-0.065* (0.035)	
Elapsed years/10	0.019 (0.014)		0.011 (0.012)	
Within past 5 years		-0.106** (0.043)		-0.088** (0.040)
Within 6-20 years		-0.032 (0.054)		-0.012 (0.047)
Since more than 20 years		-0.026 (0.031)		-0.030 (0.027)
Illness or accident (respondent)	-0.009 (0.016)		0.001 (0.012)	
Elapsed years/10	-0.001 (0.007)		-0.003 (0.005)	
Within past 5 years		-0.011 (0.016)		-0.005 (0.013)
Within 6-20 years		-0.001 (0.019)		0.003 (0.014)
Since more than 20 years		-0.019 (0.021)		-0.006 (0.016)
Illness or accident (partner or child)	0.011 (0.014)		-0.014 (0.011)	
Elapsed years/10	0.007 (0.007)		0.008 (0.005)	
Within past 5 years		0.001 (0.015)		-0.016 (0.011)
Within 6-20 years		0.030* (0.016)		0.002 (0.012)
Since more than 20 years		0.032* (0.019)		0.010 (0.014)
N. observations	9,963	9,963	9,963	9,963
N. households	4,638	4,638	4,638	4,638

Note: Columns (1)-(2) are based on a random-effect probit regression on the probability to hold stocks; Columns (3)-(4) are based on a panel fractional response model on the stock share of the financial portfolio. The table reports average marginal effects. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Preferences or beliefs?

	Market up (1)	Holding (2)	Share (3)
Age/10	-0.043** (0.019)	0.006 (0.023)	-0.011 (0.019)
Female	-0.086*** (0.010)	-0.003 (0.013)	0.001 (0.011)
Non-white	-0.034** (0.016)	-0.250*** (0.019)	-0.221*** (0.021)
Immigrate	-0.028 (0.021)	-0.034 (0.026)	-0.048** (0.023)
Married	-0.003 (0.012)	0.048*** (0.014)	0.056*** (0.013)
High school	0.095*** (0.012)	0.156*** (0.016)	0.122*** (0.012)
College	0.093*** (0.015)	0.202*** (0.022)	0.139*** (0.016)
Living with children	0.004 (0.012)	-0.070*** (0.014)	-0.054*** (0.013)
Living with other household members	-0.016 (0.017)	-0.019 (0.019)	-0.012 (0.018)
Employed	0.015 (0.011)	-0.017 (0.013)	-0.012 (0.011)
Self-employed	0.028* (0.016)	-0.012 (0.020)	-0.012 (0.017)
Home-owner	0.011 (0.017)	0.136*** (0.018)	0.142*** (0.020)
Ln(financial wealth)	0.004*** (0.001)	0.042*** (0.001)	0.025*** (0.001)
Self-assessed good health	0.050*** (0.010)	0.071*** (0.011)	0.051*** (0.009)
Experienced market return	0.077 (0.224)	0.232 (0.418)	0.466 (0.331)
Depression Babies cohort	0.048 (0.032)	0.025 (0.036)	-0.001 (0.028)
War Babies cohort	-0.002 (0.019)	0.063*** (0.023)	0.039** (0.019)
Baby Boomers cohort	-0.016 (0.029)	0.026 (0.036)	0.005 (0.030)
Year 2006	-0.003 (0.012)	-0.021 (0.014)	0.016 (0.011)
Year 2008	-0.025 (0.018)	-0.084*** (0.020)	-0.025 (0.017)
Year 2010	-0.032** (0.016)	-0.029 (0.019)	0.007 (0.015)
Child death	-0.024* (0.014)	-0.069*** (0.017)	-0.057*** (0.015)
Physical attack	-0.014 (0.023)	-0.039 (0.025)	-0.044* (0.026)
Illness or accident (respondent)	0.016 (0.011)	-0.011 (0.013)	-0.003 (0.011)
Illness or accident (partner or child)	-0.000 (0.010)	0.019 (0.012)	-0.006 (0.010)
N. observations	8,446	8,446	8,446
N. households	4,397	4,397	4,397

Note: Columns (1) and (3) are based on a panel fractional response model, respectively on the probability that the stock market will go up in the next 12 months and on the stock share of the financial portfolio; Column (2) is based on a random-effect probit regression on the probability to hold stocks. The table reports average marginal effects. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table A1. Robustness: regression model

	Holding		Share	
	Pooled (1)	Pooled (2)	RE (3)	Tobit (4)
Age/10	-0.017 (0.018)	-0.027* (0.014)	-0.021 (0.014)	-0.019 (0.012)
Female	-0.010 (0.010)	-0.004 (0.008)	-0.003 (0.008)	-0.006 (0.007)
Non-white	-0.205*** (0.015)	-0.105*** (0.009)	-0.114*** (0.009)	-0.172*** (0.011)
Immigrate	-0.022 (0.020)	-0.022* (0.012)	-0.028** (0.012)	-0.037*** (0.014)
Married	0.046*** (0.011)	0.038*** (0.009)	0.042*** (0.009)	0.042*** (0.008)
High school	0.119*** (0.012)	0.099*** (0.011)	0.108*** (0.011)	0.095*** (0.008)
College	0.158*** (0.017)	0.118*** (0.014)	0.131*** (0.014)	0.113*** (0.011)
Living with children	-0.073*** (0.011)	-0.041*** (0.009)	-0.040*** (0.008)	-0.049*** (0.008)
Living with other household members	-0.023 (0.016)	-0.003 (0.010)	-0.003 (0.010)	-0.015 (0.010)
Employed	-0.006 (0.011)	-0.026*** (0.008)	-0.018** (0.008)	-0.003 (0.007)
Self-employed	-0.006 (0.016)	-0.012 (0.014)	-0.009 (0.013)	0.001 (0.010)
Home-owner	0.130*** (0.015)	0.068*** (0.009)	0.066*** (0.009)	0.104*** (0.011)
Ln(financial wealth)	0.036*** (0.001)	0.018*** (0.001)	0.015*** (0.001)	0.020*** (0.001)
Self-assessed good health	0.066*** (0.009)	0.053*** (0.007)	0.043*** (0.007)	0.038*** (0.006)
Experienced market return	0.156 (0.315)	0.191 (0.233)	0.291 (0.276)	0.197 (0.164)
Depression Babies cohort	0.028 (0.027)	0.010 (0.020)	0.004 (0.020)	0.003 (0.018)
War Babies cohort	0.030 (0.018)	0.013 (0.015)	0.017 (0.014)	0.019 (0.012)
Baby Boomers cohort	-0.002 (0.029)	-0.014 (0.022)	-0.013 (0.022)	-0.010 (0.019)
Year 2006	-0.019* (0.011)	0.010 (0.008)	0.007 (0.008)	-0.001 (0.007)
Year 2008	-0.061*** (0.015)	-0.021* (0.012)	-0.026** (0.011)	-0.028*** (0.010)
Year 2010	-0.000 (0.015)	0.018 (0.012)	0.010 (0.011)	0.005 (0.010)
Child death	-0.055*** (0.013)	-0.036*** (0.010)	-0.037*** (0.009)	-0.044*** (0.009)
Physical attack	-0.034 (0.022)	-0.028* (0.015)	-0.028** (0.014)	-0.032** (0.014)
Illness or accident (respondent)	-0.009 (0.010)	-0.002 (0.008)	-0.004 (0.008)	-0.006 (0.007)
Illness or accident (partner or child)	0.018* (0.010)	-0.000 (0.008)	-0.004 (0.007)	0.001 (0.006)
N. observations	9,963	9,963	9,963	9,963
N. households	4,638	4,638	4,638	4,638

Note: Column (1) is based on a pooled probit regression on the probability to hold stocks; Column (2) is based on a pooled OLS regression on the stock share of the financial portfolio; Column (3) is based on a random-effect GLS regression on the stock share; Column (4) is based on a panel tobit regression left-censored at 0. The table reports average marginal effects. Standard errors in parentheses; standard errors in Columns (1)-(2) are clustered at the household level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table A2. Robustness: bonds and stocks

	Holding		Share	
	(1)	(2)	(3)	(4)
Age/10	0.019 (0.020)	0.020 (0.020)	-0.048* (0.029)	-0.044 (0.029)
Female	0.001 (0.011)	0.000 (0.011)	-0.011 (0.016)	-0.009 (0.016)
Non-white	-0.227*** (0.015)	-0.220*** (0.016)	-0.374*** (0.029)	-0.362*** (0.029)
Immigrate	-0.057*** (0.021)	-0.059*** (0.021)	-0.093*** (0.032)	-0.097*** (0.032)
Married	0.054*** (0.012)	0.054*** (0.012)	0.084*** (0.019)	0.084*** (0.019)
High school	0.139*** (0.015)	0.138*** (0.015)	0.220*** (0.020)	0.218*** (0.020)
College	0.195*** (0.021)	0.196*** (0.021)	0.261*** (0.024)	0.259*** (0.024)
Living with children	-0.071*** (0.012)	-0.072*** (0.012)	-0.088*** (0.019)	-0.089*** (0.019)
Living with other household members	-0.017 (0.015)	-0.016 (0.015)	-0.033 (0.025)	-0.033 (0.025)
Employed	-0.006 (0.011)	-0.008 (0.011)	-0.009 (0.017)	-0.010 (0.017)
Self-employed	-0.001 (0.017)	-0.002 (0.017)	-0.021 (0.024)	-0.021 (0.024)
Home-owner	0.122*** (0.015)	0.116*** (0.015)	0.225*** (0.025)	0.219*** (0.025)
Ln(financial wealth)	0.038*** (0.001)	0.037*** (0.001)	0.045*** (0.001)	0.044*** (0.001)
Self-assessed good health	0.064*** (0.009)	0.060*** (0.009)	0.090*** (0.013)	0.087*** (0.013)
Experienced market returns	0.140 (0.362)	0.144 (0.361)	0.559 (0.561)	0.569 (0.564)
Depression Babies cohort	0.033 (0.031)	0.033 (0.030)	0.025 (0.039)	0.025 (0.039)
War Babies cohort	0.053*** (0.020)	0.053*** (0.020)	0.054* (0.029)	0.053* (0.030)
Baby Boomers cohort	0.026 (0.031)	0.025 (0.031)	-0.037 (0.046)	-0.036 (0.046)
Year 2006	-0.018 (0.012)	-0.018 (0.012)	-0.102*** (0.016)	-0.102*** (0.016)
Year 2008	-0.035** (0.017)	-0.035** (0.017)	-0.155*** (0.024)	-0.156*** (0.024)
Year 2010	-0.019 (0.016)	-0.019 (0.016)	-0.059** (0.023)	-0.059** (0.023)
Child death		-0.054*** (0.014)		-0.102*** (0.022)
Physical attack		-0.049** (0.021)		-0.067* (0.035)
Illness or accident (respondent)		-0.019* (0.011)		0.003 (0.016)
Illness or accident (partner or child)		0.006 (0.010)		0.002 (0.014)
N. observations	9,963	9,963	9,963	9,963
N. households	4,638	4,638	4,638	4,638

Note: Columns (1)-(2) are based on a random-effect probit regression on the probability to hold stocks; Columns (3)-(4) are based on a panel fractional response model on the stock share of the financial portfolio. The table reports average marginal effects. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table A3. Robustness: stocks excluding pension funds

	Holding		Share	
	Baseline (1)	Events (2)	Baseline (3)	Events (4)
Age/10	0.020 (0.025)	0.022 (0.025)	0.005 (0.004)	0.006 (0.004)
Female	0.008 (0.014)	0.009 (0.014)	0.001 (0.002)	0.002 (0.002)
Non-white	-0.236*** (0.025)	-0.227*** (0.025)	-0.028*** (0.005)	-0.027*** (0.005)
Immigrate	-0.072** (0.029)	-0.074** (0.029)	-0.009* (0.005)	-0.010* (0.005)
Married	0.046*** (0.016)	0.045*** (0.016)	-0.000 (0.003)	-0.000 (0.003)
High school	0.160*** (0.016)	0.158*** (0.016)	0.013*** (0.003)	0.013*** (0.003)
College	0.263*** (0.020)	0.262*** (0.020)	0.019*** (0.003)	0.019*** (0.003)
Living with children	-0.059*** (0.016)	-0.060*** (0.016)	-0.008*** (0.003)	-0.008*** (0.003)
Living with other household members	-0.072*** (0.023)	-0.072*** (0.023)	-0.010** (0.004)	-0.010** (0.004)
Employed	-0.025* (0.014)	-0.026* (0.014)	-0.004 (0.002)	-0.004 (0.002)
Self-employed	0.001 (0.021)	0.001 (0.021)	0.002 (0.003)	0.002 (0.003)
Home-owner	0.151*** (0.023)	0.145*** (0.023)	0.020*** (0.004)	0.019*** (0.004)
Ln(financial wealth)	0.030*** (0.001)	0.030*** (0.001)	0.004*** (0.000)	0.004*** (0.000)
Self-assessed good health	0.073*** (0.011)	0.071*** (0.011)	0.009*** (0.002)	0.009*** (0.002)
Experienced market returns	-0.304 (0.364)	-0.299 (0.360)	-0.060 (0.060)	-0.057 (0.060)
Depression Babies cohort	0.014 (0.037)	0.014 (0.036)	-0.001 (0.005)	-0.000 (0.005)
War Babies cohort	0.033 (0.025)	0.032 (0.025)	0.008** (0.004)	0.008** (0.004)
Baby Boomers cohort	0.001 (0.039)	0.002 (0.039)	0.005 (0.006)	0.005 (0.006)
Year 2006	-0.072*** (0.014)	-0.071*** (0.014)	-0.012*** (0.002)	-0.012*** (0.002)
Year 2008	-0.148*** (0.021)	-0.148*** (0.021)	-0.020*** (0.003)	-0.020*** (0.003)
Year 2010	-0.091*** (0.020)	-0.090*** (0.020)	-0.017*** (0.003)	-0.017*** (0.003)
Child death		-0.067*** (0.019)		-0.009*** (0.003)
Physical attack		-0.077*** (0.029)		-0.006 (0.005)
Illness or accident (respondent)		0.007 (0.014)		-0.001 (0.002)
Illness or accident (partner or child)		0.010 (0.012)		-0.002 (0.002)
N. observations	9,963	9,963	9,963	9,963
N. households	4,638	4,638	4,638	4,638

Note: Columns (1)-(2) are based on a random-effect probit regression on the probability to hold stocks; Columns (3)-(4) are based on a panel fractional response model on the stock share of the financial portfolio. The table reports average marginal effects. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.