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# FINANCIAL RISK AVERSION AND PERSONAL LIFE HISTORY\*

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## Abstract

Though risk attitude is central to economics and finance, relatively little is known about how it is formed and how it changes over time. Based on US data from a dedicated psycho-social module on lifestyle of the 2010 Health and Retirement Study (HRS), we provide new evidence on the correlation between financial risk attitude and life-history negative events out of an individual’s control. Using observed portfolio decisions to proxy for risk aversion, we find correlation with two of such events: having been in a natural disaster and (especially) the loss of a child. These effects survive after controlling for classic socio-demographic determinants of risk aversion.

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

**Keywords:** Risk Aversion; Financial Asset Ownership; Personal Life History; Behavioral Finance.

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## 1. Introduction

Risk aversion may well be the most fundamental pattern of preference that economists use 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 attitudes (see, e.g., Guiso and Paiella, 2008; Dohmen et al., 2011; 2012). However, despite the discovery of these and other variables significantly correlated with it, risk aversion still remains, to a large extent, a 'black box' in the sense that relatively little is known about its determinants, i.e., how it gets formed (see, e.g., Dohmen et al., 2012). Recent research shows 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 body of research by economists, which we review below, examining the impact of life experiences on risk attitudes. This research has generally investigated the impact 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 at shedding new light on the relation between life-course events and financial risk aversion. Drawing on research in psychology showing that traumatic events can have wide-ranging and long-lasting effects on an individual's dispositions, we hypothesize that individuals who have experienced negative past events out of their control – including events bearing no obvious connection to expectations regarding future economic conditions – will differ in their attitude toward risk taking. We provide evidence that risk aversion is correlated with only two types of prior life experience, that is having been in a natural disaster and, even more importantly, the loss of a child, while it is not correlated with other events such as having suffered for a serious illness, robbery, or the loss of a job.

Our analysis is based on the 2010 wave of the Health and Retirement Study, a survey collecting information on a sample of US citizens aged 50 or more. In addition to standard socio-demographic characteristics, the wave included a dedicated section regarding past life events and experiences. Focusing on this sample is ideal for our purpose, because adults not younger than 50 have a relevant life history that may have influenced their economic decisions. We proxy risk aversion with observations on the holdings of bonds and stocks in the financial portfolio; hence our focus is on *financial* risk aversion.

An already established strand of literature looks at portfolio decisions – mainly stocks – to infer risk attitude (since the seminal contributions of Cohn et al., 1975, and Friend and Blume, 1975) and connects it to macroeconomic events in life history, noticeably the recent financial crisis (e.g., Malmendier and Nagel, 2011, and Bucciol and Miniaci, 2012). The contribution of this paper is threefold: first, we focus on the relationship between risk aversion and idiosyncratic – rather than aggregate – shocks out of an individual’s control; second, we jointly analyze a large number of different shocks, which allows us to compare the relative strength of different effects; third, we consider the holdings of two different financial asset categories (bonds and stocks), which provides a simple though comprehensive and accurate proxy for financial risk aversion.

The remainder of the paper proceeds as follows. Section 2 provides a review of the literature focusing on the long-term effects of prior life experiences; Section 3 describes our data and methodology; Section 4 illustrates our main findings; finally, Section 5 concludes.

## **2. Prior life experiences and current decision-making**

In the last decades, several papers both within and outside the economics literature explored the effects of prior life experiences on current individual decisions. Among recent contributions in economics, the works closest to ours are Malmendier and Nagel (2011), Malmendier et al. (2011) and Cameron and Shah (2012), as they all concentrate on the impact of relevant past occurrences on risk attitude<sup>1</sup>. Malmendier and Nagel (2011) investigate whether the experience of a large macroeconomic shock such as the Great Depression shaped the risk attitude 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, measured as higher participation in the stock market and higher investment of their liquid assets in stocks (conditional on participating)<sup>2</sup>. Malmendier et al. (2011) conjecture that variation in managers’ personal histories might produce differences in their financial decision-making. In particular, the authors identify two shocks that are likely to be formative experiences and that affect a large portion of their sample early in life: growing up during the Great Depression and serving in the military. They show that ‘Depression managers’ lean excessively on internal financing and that military service (and in particular combat

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<sup>1</sup> However, it is worth noting that, compared to these papers, we consider a *larger* set of potentially meaningful events of people’s past life.

<sup>2</sup> In line with their paper, our analysis does not aim at disentangling whether negative past events influence risk attitudes via preferences or beliefs.

exposure) during early adulthood generate a lasting effect on veterans' life-choices and decision-making and make them more aggressive and willing to take risks<sup>3</sup>. A number of works in medicine and psychiatry document that exposure to trauma can produce complex and long-lasting consequences on mental and physical health (including the so called 'post-traumatic stress disorder'). In the psychology literature, Sacco et al. (2003) focus on the psychological effects of the 9/11 terrorist attack<sup>4</sup> on Italian subjects. Holman and Silver (1998) investigate the relations between temporal orientation and long-term psychological distress in three samples of traumatized individuals, such as adult victims of childhood incest, Vietnam war veterans, and residents of two southern California communities devastated by fire. Their findings indicate that a past temporal orientation – that is, a tendency to focus on prior life experiences – is correlated with high levels of distress long after the trauma had passed, even after controlling for the degree of rumination reported. Elder (1999) documents that individuals are most affected by seismic events early in life.

However, while most of the contributions cited above concentrate on *common* negative experiences (e.g. a recession, a terrorist attack, or a war) that people living in the same region or country passed through together in their past and that may be viewed as collective traumas that have become part of so called 'collective consciousness', a key feature of our paper is that we focus on *idiosyncratic* negative experiences characterizing one's personal life history and not necessarily having an economic nature, such as losing a child or having been in a natural disaster. As to the impact of natural disasters on risk attitudes, Cameron and Shah (2012) conduct incentivized risk game experiments in Indonesia and find that people who recently lived through natural disasters such as floods or earthquakes exhibit higher risk aversion than people living in otherwise like villages. They also interestingly show that the impact persists for many years, particularly if the disaster was severe. However, part of the documented effect is driven by income losses. Two major differences between their experimental work and our empirical analysis are the following. First, as to natural disasters, we consider not only earthquakes and floods, but also fires and other disasters. Second, as we anticipated above, we also focus on other negative events out of an individual's control, such as child death, having suffered for a serious illness, robbery, or the loss of a job.

Most of the aforementioned articles, together with other papers from psychology and neuroscience, suggest that risk aversion has an important *emotional* component. This

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<sup>3</sup> Similarly, Voors et al. (2012) show that violent trauma triggered by civil war increases risk tolerance in Burundi (see on this also Callen et al.'s (2013) experimental paper on Afghanistan).

<sup>4</sup> See on this also Updegraff et al. (2008).

contrasts with the view of ‘risk as analysis’ prevailing so far in the economics literature: the fact that variables such as age, wealth, education and cognitive ability negatively impact risk aversion suggests that risk aversion has a mainly cognitive and consequentialist nature. On the contrary, numerous articles in the psychology literature shed light on the affective nature of risk<sup>5</sup>. Loewenstein et al. (2001) advance a ‘risk-as-feelings’ hypothesis, emphasizing the central informational role that the so called ‘anticipatory emotions’ play in driving people’s choices under conditions of risk and uncertainty, whereas Slovic et al. (2004) propose an ‘affect heuristic’ hypothesis. Similarly, recent work in neuroscience sheds light on the neurological bases of risk aversion, finding that emotions are involved in risky decision-making in the financial domain (Kuhnen and Knutson, 2005; Knutson et al., 2008), with visual cues inducing anxiety making individuals less likely to invest in risky assets (Kuhnen and Knutson, 2011)<sup>6</sup>. It is interesting to note that in the last years also some economics studies point to a similar direction. Guiso et al. (2011) explore the relationship between a negative emotion like fear and risk attitudes by means of a laboratory experiment showing that a scary experience (such as watching a brief sequence from a horror movie) indeed induces an increase in risk aversion<sup>7</sup>. Cohn et al. (2012) examine experimentally whether financial markets trends produce a psychological impact on financial professionals’ risk tolerance. They manipulate the mental saliency of booms and busts and report that financial professionals exhibit higher risk aversion when they are primed with a financial crash compared to a boom<sup>8</sup>. However, it is important to observe that, while these economics papers look at the *short-run* impact of emotions on risk attitudes, our work investigates the *long-run* effects of meaningful events and experiences that are likely to be mediated by emotional factors through complex channels.

More broadly, our article connects to the growing economics literature investigating the impact of environmental factors on economic decision-making. 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 (see e.g. Guiso et al., 2006;

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<sup>5</sup> 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).

<sup>6</sup> See on this also De Martino et al. (2010).

<sup>7</sup> Similarly, Lerner and Keltner’s (2001) psychology experiment finds that self-reported fear correlates with risk averse choices. See on this also Lerner et al. (2003).

<sup>8</sup> For recent papers documenting the impact of emotionally charged experiences on stock market returns, see Kamstra et al. (2003), Edmans et al. (2007) and Kaplanski and Levy (2010).

Di Tella et al., 2007)<sup>9</sup>. As to redistribution, Alesina and Giuliano (2010) suggest that different preferences may arise from individual history, with a history of misfortune making people more risk averse and more favorable to redistributive policies<sup>10</sup>. Recent experimental work documents that a dramatic personal experience such as living through a natural disaster affects not only risk preferences, but also trust and time preferences (Cassar et al., 2011). Next, at the macro level, environmental factors can be important determinants of the economic success or failure of a nation (Knack and Keefer, 1997; Guiso et al., 2004) and critically influence groups' ability to provide public goods (Alesina and La Ferrara, 2000). With special regard to the effects of the environment on risk attitudes, Guiso et al. (2008) show 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. (2012) find that peers exert a relevant influence on risk attitudes. Marked cross-country differences in risk aversion measures suggest that history and culture do play a prominent role in shaping risk attitudes (see e.g. Fehr et al., 2006, comparing the US and Germany; and Dohmen et al., 2010).

### 3. Data and methodology

A meaningful analysis of the correlation between past life events and household risk attitude needs accurate data on financial decisions for a relatively large number of households whose head has already experienced a significant portion of life. An ideal 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<sup>11</sup>. 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 we are observing throughout the world. Every time the HRS interviews, mainly by telephone, a sample of around 10,000 households, representative of the US population over the age of 50. To allow independent analysis of some key subgroups of the

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<sup>9</sup> Indoctrination (for instance, in communist dictatorships) might shape citizens' view (Alesina and Fuchs-Schundeln, 2007).

<sup>10</sup> They also note that different historical experiences in different countries may lead to various 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 (2009).

<sup>11</sup> The dataset, along with all the survey questions and supporting documentation, is freely available at: [www.umich.edu/~hrswww/](http://www.umich.edu/~hrswww/).

population, the HRS sample design contains an oversample of African Americans, Hispanics, and Floridians, as well as the oldest old households over the age of 80. The analysis in this paper is corrected for the respondent-level sampling weights provided by the HRS, to make valid inference representative of the US population.

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 households. Of particular interest for this analysis is the psycho-social section on lifestyle, which was introduced in the 2004 wave. This section regards personality traits, the relationship with other people, as well as aspects of daily life and past events or situations in the life of the household head.

The dataset used in this analysis is made of 4,451 complete observations on households collected in year 2010, the latest available wave of the survey at the moment of this writing. For each of these households 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 the life history of the household head before the age of 18 (e.g., attention from the mother, parents addicted to drugs or alcohol), after the age of 18 (e.g., natural disasters, serious illnesses), and in the last five years (e.g., unemployment spells, fraud episodes)<sup>12</sup>.

In the analysis we do not consider *all* the events collected in the HRS, because some of these are clearly under individual control and may therefore reflect an inner predisposition to expose herself into a problematic situation (e.g., due to a neurotic personality). For this reason, we deliberately avoid to focus on variables such as the relationship with the parents, having been in trouble with the police or having to do one year of school over again, which may depend to a large extent on an individual's behavior. To support our decision on which variables to exclude from the analysis, we exploited further information from the lifestyle section of the HRS. Specifically, we looked at a set of questions meant to draw a broad picture of individual personality traits and designed in such a way to cover all the domains of the so

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<sup>12</sup> For these additional variables we also have information on the year when the event happened. In principle, this could help understand whether the effect of an event arisen a short time ago is larger than the effect of an event arisen a long time ago. Unfortunately, respondents frequently do not indicate a year, or they report a year unrealistically far in the past. It then seems that they remember whether an event happened, but not exactly when. For this reason, in the analysis we do not try to disentangle recent experiences from early-life ones.



called “big five” theory popular in psychology. We contrasted the occurrence of each life-course event with the personality traits in order to see whether systematically different traits emerge between those who experienced a given negative event and those who did not. The events we keep in the analysis are those that showed no systematic differences<sup>13</sup>.

The definition of the variables used in the analysis is reported in Table 1. Table 2 lists summary statistics on these variables. Notice that, while some events are rather common in the sample (e.g., ‘serious illness’ occurs in 28.1% of the cases), others are rare (e.g., ‘robbed or burglarized’ occurs in 4.1% of the cases).

#### TABLE 1 ABOUT HERE

Given the structure of the questionnaire, we choose to measure risk aversion by means of portfolio decisions. Beginning with the seminal contributions of Cohn et al. (1975) and Friend and Blume (1975) based on the mean-variance portfolio theory, the literature frequently takes the share of financial wealth invested in stocks as a proxy for risk aversion. There are three main shortcomings with this approach: first, there may be measurement error because respondents may not know the exact amount of their holdings and how they are allocated; second, agents may not adjust their portfolio frequently (Calvet et al., 2009), which implies that the observed portfolio share reflects the initial portfolio decision modified with the evolution of the market prices; third, other financial assets in addition to stocks carry some source of risk.

Due to the above concerns, rather than looking at the fraction of wealth invested in an asset, we focus our attention on asset participation, i.e., *whether* an individual holds or not a given asset. This approach is also popular in the literature (see, e.g., Malmendier and Nagel, 2011) as it should not suffer from the first and second shortcoming listed above (it does not involve amounts). To solve the remaining shortcoming, we make use of the HRS information on the holding and the amount invested on the most common asset categories. We aggregate this information to have only three main categories: risk free deposits (checking accounts, saving accounts, money market funds), bonds (corporate bonds, T-bills, CDS, government

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<sup>13</sup> From the HRS lifestyle questionnaire we extracted 58 variables, each referring to one specific facet and roughly equally distributed among the five personality traits at the heart of the “big five” theory: *conscientiousness* (e.g., being organized, hardworking), *openness* (e.g., being creative, curious), *extraversion* (e.g., being active, outgoing), *agreeableness* (e.g., being alone, sympathetic), and *neuroticism* (e.g., being upset, moody). For each life-course event we ran a probit regression whose specification consisted of the same socio-demographic variables as in Table 1, plus the 58 personality variables. The personality variables turned out to have limited predictive power on the occurrence of the events we consider in the analysis.

savings bonds), and stocks (directly held stocks). Composite assets (IRA, Keogh and other retirement assets) are split between the bond and stock categories depending on the declared composition of these composite assets<sup>14</sup>. In a fashion similar to Alessie et al. (2004), we then run a bivariate analysis jointly taking the holding of bonds and the holding of stocks as dependent variables. This allows us to identify four portfolio patterns carrying different sources of risk: holding of neither bonds nor stocks, holding of bonds only, holding of stocks only, holding of both bonds and stocks. We can see these four patterns as indicative of progressively lower risk aversion, because bonds are usually considered risky assets, albeit safer than stocks.

In Section 4 we also consider alternative cases where the dependent variable is the holding of stocks alone, and – following the prevailing literature – the portfolio share held in stocks. The bottom part of Table 2 informs on the distribution of the sample in terms of portfolio composition. We see that about 34% of the observations hold only risk free deposits, and a similar percentage hold all the asset types. This distribution is in line with official statistics for this age group and generally higher than for the whole of the US (Bricker et al., 2012).

TABLE 2 ABOUT HERE

We then look at the single events or experiences arisen in an individual's past life, and see how each is related to portfolio decisions. Table 3 reports the proportion of stock holders conditional on each life event or experience. In the latest column we report the outcome of a two-group test on the equality of proportions. The test suggests that stock holding is significantly different when only few of the events in one's personal life history happen. Specifically, stock holding is significantly less frequent at the 1% level when the mother did not watch over the child, when somebody in the household experienced unemployment spells in the last five years, or (especially) when the individual suffered for a child death.

TABLE 3 ABOUT HERE

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<sup>14</sup> Direct and indirect holdings of stocks are equally widespread in the sample, where we find 32.43% of direct holders and 32.51% of indirect holders. In contrast, most of the bond holding is indirect, as we find 28.66% of direct holders as opposed to 37.99% of indirect holders.

Figure 1 displays the proportion of bond and stock holders by the three events mentioned above, i.e, those reporting the highest values of the proportion test. It shows that, when we observe large variation in terms of stock holdings, there is large variation (and in the same direction) also in terms of bond holding.

FIGURE 1 ABOUT HERE

This preliminary analysis indicates that there is significant correlation between portfolio composition 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, education) that the literature finds to be important determinants of risk aversion. The analysis in Section 4 is meant to fill this gap.

#### 4. Results

Using data from the HRS 2010, 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 financial risk aversion of idiosyncratic life-time personal events out of an individual's control. In this Section we use different econometric models to shed light on this relationship. In all the cases, the specification includes the variables listed in Table 2: one group of socio-demographic variables, one group on life history before age 18, one group on life history after age 18, and finally one group on life history in the past five years. As a general rule, we will comment only on the effects that are significantly different from zero at least at a 5% level.

Following the standard literature, we first look at the investment in stocks only. The first column of Table 4 shows the average marginal effect of a probit model where the dependent variable is a dummy variable indicating whether the household owns stocks (either directly or indirectly through composite assets)<sup>15</sup>. Not surprisingly, several socio-demographic variables show significant effects: positive for college education, home ownership, financial wealth, financial sophistication (i.e., the household closely follows the financial market) and good health status; negative for age, non-white race, immigrant status,

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<sup>15</sup> As a robustness check, not reported here and available upon request, we repeated our analysis by focusing on directly held stocks only, rather than on stocks held directly and indirectly. Our results are confirmed.

widowed and never married, and when there are children in the household. All these effects have the expected sign, and they confirm previous findings from the literature (see, e.g., Barsky et al., 1997; Halek and Eisenhauer, 2001; Bucciol and Miniaci, 2011).

In addition to these standard variables, we consider further variables on past life history. It is interesting to notice that only one of the events highlighted in Figure 1 remains significantly related to stock holding, after controlling for the individual characteristics and all the other events: the loss of a child, which reduces by 10.3% the probability to own stocks. This effect is also quantitatively large, as it is roughly half the effect of following the financial market, and large enough to offset the effect of college education almost completely.

#### TABLE 4 ABOUT HERE

The proxy of risk aversion considered so far is qualitative in nature. We then consider a quantitative measure, namely the share of the financial portfolio held in stocks. Column (2) of Table 4 reports OLS estimates from this model. Nearly all the socio-demographic variables cited above are significant also with this regression. Experiencing the death of a child also preserves significant effects in this analysis. In addition, we now find positive effects on the stock share if the mother had not taught about life.

The stock share is a number constrained to be non-negative. For this reason we replicate the previous estimation with a tobit model; in Column (3) of Table 4 we report the average marginal effect on the stock share conditional on stock holdings. Our previous results are largely confirmed. In particular, we find that the stock share rises by 3.8% if the mother had not taught about life, while it falls by 6.3% if the individual experienced the death of a child. Once again, this latter effect is large enough to offset the effect of college education almost fully.

Estimates obtained with the stock share as dependent variable suffer from the severe bias mentioned above. That is, the stock share may simply reflect stock market prices if no portfolio adjustment is made, which implies that what we are measuring no longer reveals risk tolerance. It is reassuring that the findings obtained using stock ownership as dependent variable (Column (1) of Table 4) are in line with those obtained using the stock share (Columns (2) and (3) of the same table). However, due to the above shortcoming and the fact that stock shares are not the only risky asset in a financial portfolio, we run one further analysis: a bivariate probit regression where the two dependent variables inform on the holding of bonds and stocks at the same time. This analysis allows us to better distinguish

between different levels of risk attitude, because those who invest in bonds are likely to be less risk averse than those who invest in risk free assets only, but more risk averse than those who invest in stocks, separately or together with bonds.

Table 5 reports the results from this analysis. Residuals from the two regression equations show a significantly positive, though moderate, correlation (0.21). The table is made of four columns, corresponding to the average marginal effects on the probability of observing each of the four possible states of portfolio allocation (respectively neither bonds nor stocks, bonds only, stocks only, both bonds and stocks). Effects significant at least at a 5% level are found only in the two extreme situations (holding of no asset or holding of both assets), with a similar size but a different direction: we see that the probability to hold both assets is decreased by 8.7% if the individual experienced the death of a child, and by 3.2% if she experienced a natural disaster. Again, the effect of the loss of a child is quantitatively large and able to offset, among others, most of the effect of additional knowledge (college education, 11.6%, or familiarity with the current financial market situation, 13.8%). Similar effects, with the opposite sign, are found with respect to the probability to hold neither asset. None of the other events or situations in past life history seem to be significantly correlated with asset holdings. In particular, we no longer find significant effect of the lack of past mother teaching about life that was instead relevant on the stock share (see Table 4).

In summary, we find robust evidence of correlation between the ownership of risky assets and the occurrence of two life-course events: the loss of a child and having been in a natural disaster.

TABLE 5 ABOUT HERE

## **5. Concluding remarks**

This paper provides insight into the factors influencing risk attitude, indicating that some personal prior life events out of an individual's control have a significant correlation with her current willingness to undertake financial risky 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 a natural disaster. In contrast, other events, such as a serious illness, a robbery or the loss of a job, do not seem to affect investment behavior. In particular the correlation of risky investments with the loss of a child is quantitatively large, and it may balance almost completely the correlation

with college education or the practice to follow the financial market, that can be seen as an indication of financial sophistication.

The evidence we find on natural disasters supports findings in Cameron and Shah (2012), whose experimental work shows that such events determine a significantly higher risk aversion even after controlling for the mean occurrence of floods and earthquakes over the previous 30 years. Further, the authors find that the effects of particularly severe shocks are long lasting<sup>16</sup>. In line with their work, we document that natural disasters have long-term consequences on financial risk aversion. A possible channel driving this result is that, as suggested by Cameron and Shah (2012), a natural disaster is a shock that contains new information and induces individuals to update their estimates of background risk: people living through a large earthquake are likely to perceive the world as a riskier place than prior to the event. We take their interpretation and extend it to motivate our findings on the strong long-lasting effects of a tragic personal experience such as the loss of a child – though it is fair to say that, with the current data, it is impossible for us to rigorously establish whether the above relationship operates by affecting individual preferences or beliefs.

Our results are also consistent with recent economics papers such as Malmendier and Nagel (2011) and extend to idiosyncratic (economic and non-economic) experiences out of individual control the idea that what a person passes through over time may be significant for her risk-taking attitude in later life. These findings contribute to our understanding of the nature of financial risk aversion as they confirm that such economic attitude 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., 2012). We also connect to the strand of literature emphasizing the need to explore the non-cognitive, emotional component of risk attitudes (Guiso et al., 2011; Cohn et al., 2012). 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. Our analysis suggests that one's personal life experiences might be even more important, for her future risk taking, than factors typically associated with her cognitive system, such as historical facts learned from summary information in books and other sources.

A growing economics literature has been convincingly showing that the past (including distant past) matters for current economic outcomes at the macro level (see e.g. Guiso et al.,

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<sup>16</sup> Cassar et al.'s (2011) paper on Thailand reports similar findings. In contrast, Eckel et al.'s (2009) analysis of the short-term effects of Hurricane Katrina indicates that the evacuees exhibit risk-loving behavior. However, as Cameron and Shah (2012) observe, such behavior may be due to the emotional state of the evacuees short after the hurricane.

2004; 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 attitudes and behaviors. 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.

Some questions are left as interesting avenues for future research. First, it will be important to understand whether the new determinants that we identified with regard to financial risk aversion also play a role in other domains where risk taking is important (e.g. health, gambling, driving etc..) and even extend to economic attitudes other than risk (e.g. trust). Next, it will be natural to extend the empirical analysis to its longitudinal component, using data since the first available wave containing the life history module (2004). On the one hand, this will allow us to control for the individual-specific, time-invariant willingness to undertake financial risk; on the other hand, it will allow us to quantitatively compare within a unifying framework the effect on portfolio choice of idiosyncratic shocks, such as personal life events and experiences, and common shocks, such as the financial crisis. While the existing literature mainly concentrates on the latter issue, our results suggest that personal life history might play a more important role in shaping individual decisions.

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**Table 1. Variables' definition**

<b>Variable</b>	<b>Definition</b>
<i>Socio-demographic</i>	
Age	Age in years
Female	Female
Non-white	Non-white
Immigrate	Immigrate from outside the US
College	College graduate
Widowed	Widowed
Separated	Separated or divorced
Never married	Never married
Living with children	Living with children
Living with other household members	Living with others apart from children
Employee	Working as employee
Self-employed	Working as self-employed
Home-owner	Home-owner
Ln(financial wealth)	Logarithm of household financial wealth in USD
Following the financial market	Following the financial market closely
Self-assessed good health	Self-assessed good or very good health status
<i>Life history before age 18</i>	
Mother gave no time	Mother gave no or little time and attention when needed
Mother did not watch over	Mother put no or little effort into watching over her
Mother did not teach about life	Mother did not teach or taught little about life
Parent addicted	Either parent drank or used drugs often
Physically abused	Ever been physically abused by either parent
<i>Life history after age 18</i>	
Child death	A child of hers ever died
Natural disaster	Ever been in a natural disaster (e.g. fire, flood, earthquake)
Physical attack	Ever been victim of a serious physical attack or assault
Serious illness	Ever had a life-threatening illness or accident
Serious illness (partner or child)	Partner/child ever had a life-threatening illness or accident
<i>Life history in the past five years</i>	
Job loss	Involuntarily lost a job
Unemployment spells	Unemployed for more than three months
Unemployment spells (others in hh)	Anyone else in the household unemployed for more than three months
Robbed or burglarized	Robbed or with the home burglarized
Fraud	Victim of a fraud
<i>Financial risk indicators</i>	
Bond holding	Holds bonds in the financial portfolio
Stock holding	Holds stocks in the financial portfolio
Stock share	Stock share in the financial portfolio

Note: All the variables, apart from "Age", "Ln(financial wealth)" and "Stock share" are dummy variables equal to 1 if the condition in the "Definition" column is satisfied, and 0 otherwise.

**Table 2.** Summary statistics (4,451 observations)  
a. Variables used in the analysis

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Socio-demographic</i>				
Age	67.746	9.048	56	101
Female	0.537	0.499	0	1
Non-white	0.098	0.297	0	1
Immigrate	0.073	0.260	0	1
College	0.303	0.459	0	1
Widowed	0.158	0.364	0	1
Separated	0.144	0.351	0	1
Never married	0.038	0.191	0	1
Living with children	0.204	0.403	0	1
Living with other household members	0.146	0.353	0	1
Employee	0.315	0.465	0	1
Self-employed	0.083	0.276	0	1
Home-owner	0.830	0.375	0	1
Ln(financial wealth)	11.600	5.324	0	20.367
Following the financial market	0.599	0.499	0	1
Self-assessed good health	0.475	0.499	0	1
<i>Life history before age 18</i>				
Mother gave no time	0.148	0.355	0	1
Mother did not watch over	0.104	0.305	0	1
Mother did not teach about life	0.203	0.402	0	1
Parent addicted	0.183	0.386	0	1
Physically abused	0.078	0.268	0	1
<i>Life history after age 18</i>				
Child death	0.136	0.343	0	1
Natural disaster	0.176	0.380	0	1
Physical attack	0.066	0.249	0	1
Serious illness	0.281	0.449	0	1
Serious illness (partner or child)	0.271	0.444	0	1
<i>Life history in the past five years</i>				
Job loss	0.085	0.279	0	1
Unemployment spells	0.082	0.274	0	1
Unemployment spells (others in hh)	0.110	0.313	0	1
Robbed or burglarized	0.041	0.199	0	1
Fraud	0.058	0.233	0	1
<i>Financial risk indicators</i>				
Bond holding	0.508	0.500	0	1
Stock holding	0.493	0.500	0	1
Stock share	0.274	0.360	0	1

**b. Portfolio types**

		<b>Stock</b>	
		<b> Holders</b>	<b> Non-holders</b>
<b>Bond</b>	<b> Holders</b>	1,642 (34.33%)	593 (14.86%)
	<b> Non-holders</b>	809 (16.37%)	1,407 (34.43%)

Note: percentages reported in panel b. are corrected for sampling weights.

**Table 3.** Stock holders by individual type

Variable Event /Experience occurred?	No. observations		Stock holders		Proportion test
	No	Yes	No	Yes	
<i>Life history before age 18</i>					
Mother gave no time	3823	628	0.455	0.414	1.920*
Mother did not watch over	3998	453	0.458	0.375	3.344***
Mother did not teach about life	3580	871	0.451	0.441	0.560
Parent addicted	3712	739	0.445	0.472	-1.372
Physically abused	4141	310	0.450	0.435	0.508
<i>Life history after age 18</i>					
Child death	3711	740	0.479	0.301	8.863***
Natural disaster	3677	774	0.448	0.453	-0.255
Physical attack	4197	254	0.452	0.406	1.446
Serious illness	3224	1227	0.444	0.465	-1.256
Serious illness (partner or child)	3158	1293	0.449	0.449	-0.001
<i>Life history in the past five years</i>					
Job loss	4172	279	0.448	0.470	-0.701
Unemployment spells	4190	261	0.452	0.410	1.318
Unemployment spells (others in hh)	4046	405	0.457	0.368	3.456***
Robbed or burglarized	4275	176	0.452	0.381	1.868*
Fraud	4217	234	0.447	0.491	-1.331

Note: the last column reports the two-group test on the equality of proportions; the alternative hypothesis is that the two proportions are different from each other. The sample size is 4,451 observations. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 4.** Stock holdings and stock shares

<b>Dep. variable: Stock Model</b>	<b>(1) Holding Probit</b>	<b>(2) Share OLS</b>	<b>(3) Share Tobit</b>
<i>Socio-demographic</i>			
Age	-0.003*** (0.001)	-0.003*** (0.001)	-0.002*** (0.001)
Female	0.021 (0.016)	0.014 (0.013)	0.013 (0.009)
Non-white	-0.214*** (0.027)	-0.068*** (0.015)	-0.127*** (0.020)
Immigrate	-0.095*** (0.033)	-0.047** (0.019)	-0.054*** (0.020)
College	0.136*** (0.016)	0.095*** (0.015)	0.072*** (0.009)
Widowed	-0.108*** (0.021)	-0.062*** (0.015)	-0.069*** (0.013)
Separated	-0.038 (0.023)	-0.035* (0.019)	-0.026* (0.015)
Never married	-0.109** (0.044)	-0.017 (0.036)	-0.027 (0.029)
Living with children	-0.057*** (0.021)	-0.034** (0.016)	-0.034** (0.013)
Living with other household members	0.015 (0.022)	0.017 (0.017)	0.012 (0.014)
Employed	-0.002 (0.019)	-0.013 (0.016)	0.001 (0.011)
Self-employed	-0.024 (0.028)	-0.009 (0.024)	-0.004 (0.016)
Home-owner	0.118*** (0.022)	0.058*** (0.015)	0.082*** (0.016)
Ln(financial wealth)	0.030*** (0.001)	0.013*** (0.001)	0.017*** (0.001)
Following the financial market	0.205*** (0.013)	0.144*** (0.012)	0.130*** (0.010)
Self-assessed good health	0.045*** (0.015)	0.030** (0.013)	0.024*** (0.009)
<i>Life history before age 18</i>			
Mother gave no time	0.010 (0.029)	-0.006 (0.025)	0.000 (0.018)
Mother did not watch over	-0.052 (0.035)	-0.027 (0.029)	-0.027 (0.022)
Mother did not teach about life	0.035 (0.024)	0.056*** (0.020)	0.038*** (0.014)
Parent addicted	0.012 (0.020)	0.004 (0.017)	0.007 (0.012)
Physically abused	0.031 (0.029)	0.015 (0.026)	0.017 (0.019)

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<i>Life history after age 18</i>			
Child death	-0.103*** (0.023)	-0.057*** (0.015)	-0.063*** (0.015)
Natural disaster	-0.027 (0.020)	-0.027* (0.015)	-0.017 (0.012)
Physical attack	0.002 (0.032)	-0.000 (0.028)	0.003 (0.021)
Serious illness	0.005 (0.016)	-0.006 (0.013)	-0.003 (0.010)
Serious illness (partner or child)	0.008 (0.018)	-0.021 (0.014)	-0.006 (0.010)
<i>Life history in the past five years</i>			
Job loss	0.017 (0.035)	-0.007 (0.027)	0.007 (0.020)
Unemployment spells	-0.036 (0.035)	-0.046* (0.026)	-0.034 (0.021)
Unemployment spells (others in hh)	-0.014 (0.026)	-0.037* (0.020)	-0.021 (0.016)
Robbed or burglarized	-0.051 (0.039)	0.010 (0.030)	-0.005 (0.026)
Fraud	-0.020 (0.031)	-0.010 (0.027)	-0.011 (0.018)
Constant		0.203*** (0.062)	
<i>R<sup>2</sup> or pseudo-R<sup>2</sup></i>	0.304	0.210	0.227

Note: the table reports the results of several regression analyses. Column (1) shows the average marginal effects from a probit regression on the probability to hold stocks; Column (2) shows the estimates of an OLS regression on the stock share of the financial portfolio; Column (3) reports the average marginal effects on the stock share conditional on holding stocks, based on a tobit regression left-censored at 0. The sample size is 4,451 observations. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 5.** Bond and stock holdings: bivariate probit analysis

<b>Effect on the prob. to hold:</b>	<b>(1) None</b>	<b>(2) Bond only</b>	<b>(3) Stock only</b>	<b>(4) Both</b>
<i>Socio-demographic</i>				
Age	0.001 (0.001)	0.002*** (0.001)	-0.002*** (0.001)	-0.001 (0.001)
Female	-0.019* (0.011)	-0.003 (0.011)	0.000 (0.010)	0.021* (0.013)
Non-white	0.164*** (0.020)	0.049*** (0.018)	-0.029 (0.018)	-0.184*** (0.022)
Immigrate	0.046** (0.023)	0.050** (0.022)	-0.042** (0.021)	-0.054** (0.025)
College	-0.103*** (0.012)	-0.033*** (0.011)	0.020* (0.011)	0.116*** (0.013)
Widowed	0.069*** (0.015)	0.039*** (0.014)	-0.030** (0.014)	-0.078*** (0.017)
Separated	0.040** (0.017)	-0.003 (0.016)	0.007 (0.016)	-0.045** (0.019)
Never married	0.081** (0.032)	0.027 (0.031)	-0.017 (0.029)	-0.091*** (0.035)
Living with children	0.066*** (0.015)	-0.009 (0.014)	0.016 (0.014)	-0.073*** (0.017)
Living with other household members	0.006 (0.017)	-0.023 (0.014)	0.022 (0.014)	-0.005 (0.018)
Employed	0.000 (0.014)	-0.000 (0.013)	0.000 (0.012)	-0.000 (0.016)
Self-employed	0.013 (0.020)	0.009 (0.021)	-0.007 (0.020)	-0.014 (0.022)
Home-owner	-0.105*** (0.016)	-0.013 (0.016)	0.001 (0.015)	0.118*** (0.018)
Ln(financial wealth)	-0.033*** (0.001)	0.003*** (0.001)	-0.006*** (0.001)	0.036*** (0.001)
Following the financial market	-0.120*** (0.010)	-0.085*** (0.010)	0.067*** (0.010)	0.138*** (0.012)
Self-assessed good health	-0.039*** (0.011)	-0.006 (0.011)	0.001 (0.010)	0.043*** (0.012)
<i>Life history before age 18</i>				
Mother gave no time	-0.009 (0.021)	0.000 (0.022)	-0.001 (0.021)	0.010 (0.023)
Mother did not watch over	0.035 (0.025)	0.018 (0.024)	-0.013 (0.023)	-0.040 (0.028)
Mother did not teach about life	-0.005 (0.018)	-0.030* (0.016)	0.027* (0.015)	0.007 (0.020)
Parent addicted	0.002 (0.015)	-0.015 (0.013)	0.014 (0.013)	-0.001 (0.016)
Physically abused	-0.007 (0.022)	-0.025 (0.020)	0.023 (0.020)	0.009 (0.024)
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<i>Life history after age 18</i>				
Child death	0.077*** (0.016)	0.024* (0.015)	-0.015 (0.014)	-0.087*** (0.018)
Natural disaster	0.029** (0.015)	-0.003 (0.014)	0.006 (0.013)	-0.032** (0.016)
Physical attack	0.036 (0.023)	-0.039* (0.023)	0.041* (0.022)	-0.038 (0.025)
Serious illness	-0.001 (0.012)	-0.003 (0.011)	0.003 (0.011)	0.001 (0.014)
Serious illness (partner or child)	-0.017 (0.013)	0.009 (0.012)	-0.010 (0.011)	0.019 (0.014)
<i>Life history in the past five years</i>				
Job loss	-0.024 (0.027)	0.006 (0.021)	-0.008 (0.020)	0.026 (0.030)
Unemployment spells	0.030 (0.025)	0.006 (0.024)	-0.002 (0.022)	-0.034 (0.028)
Unemployment spells (others in hh)	-0.012 (0.020)	0.025 (0.018)	-0.025 (0.017)	0.012 (0.022)
Robbed or burglarized	0.052* (0.029)	-0.001 (0.027)	0.007 (0.026)	-0.058* (0.032)
Fraud	0.019 (0.022)	0.003 (0.022)	-0.000 (0.021)	-0.022 (0.025)

Note: the table reports average marginal effects from a bivariate probit regression, respectively the effects on the probability to hold neither bonds nor stocks (Column (1)), bonds only (Column (2)), stocks only (Column (3)), both bonds and stocks (Column (4)). The correlation between the residuals in the two regression equations is 0.221 (0.034). The sample size is 4,451 observations. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Figure 1.** Bond and stock holders for some key events and experiences

