Childhood Determinants of Risk Aversion: The Long Shadow of Compulsory Education

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Abstract

We examine the determinants of individual attitudes towards risk and, in particular, why some individuals exhibit extremely high risk aversion. Using data from the Panel Study of Income Dynamics we find that individuals' risk aversion is strongly influenced by the educational accomplishments of their parents. Other significant determinants of risk aversion are age, sex, and parents' risk aversion. We verify that risk aversion matters for economic behavior: it predicts individuals' volatility of income, and how likely households are to own businesses.

JEL Classification: E21, I29.

1 Introduction

Preferences vary across individuals—for potential implications, see Becker and Mulligan (1997)—and the transmission of preferences may be an important factor behind correlations in income and wealth across generations, but there is little evidence on the intergenerational evolution of preferences. Charles and Hurst (2003) show, using the Panel Study of Income Dynamic (PSID), that risk preferences of parents are positively correlated with those of their offspring, especially for very risk averse individuals, but they do not study the determinants of risk preferences in detail—a task which we take up in the present paper.[1]

The transmission of preferences across generations may be part of the explanation for family correlations in economic outcomes—possibly, this is more important for disadvantaged individuals. The possibility that severe poverty is self-perpetuating across generations has received much academic and political attention—often under the heading of "poverty traps." Bowles and Gintis (2002) survey the economic research on the inheritance of income status and it appears that the intergenerational transmission of income is strongest for the most and the least well off. The PSID, which follows individuals and their children over time, is particularly well suited for studying intergenerational correlations of income and wealth. Using paired offspring-parent data from the PSID, Solon (1992) finds an elasticity of income with respect to parental income of about 0.5 while Charles and Hurst (2003) find a slightly lower elasticity of wealth with respect to parental wealth.

Our study sheds light on one potential source of generational transmission by documenting that a large group of—typically disadvantaged—individuals are extremely risk averse and that the probability of being very risk averse is significantly impacted by parental variables, in particular schooling. The pattern we model is readily visible in the raw data where 43 percent of respondents who have parents without high school degrees are extremely risk averse—a number which drops to 35 percent if one parent graduated from high school, and to 24 percent if both parents graduated. This pattern may not reflect any causal relation and the main contribution of our study is to trace the effect from exogenous changes in schooling laws to the probability of extreme risk aversion of the children of parents whose educational levels were elevated by those laws.

[1] In the PSID risk aversion is measured by asking participants about their willingness to participate in a hypothetical lottery as suggested by Barsky, Juster, Kimball, and Shapiro (1997).

It is hard to make normative statements about preferences but the authors of the present paper consider the high level of risk aversion revealed by many of the poorer PSID-participants to be excessive and likely to be a contributing factor in perpetuating poverty within families. This, however, is one channel of transmission where policy has made headway. We find that changes in compulsory schooling laws that increased parental education lowered the risk aversion of offspring. Many participants in the PSID are middle-aged (or older) in 1996 when risk aversion is measured, and their parents' schooling, therefore, is many years in the past—compulsory schooling laws "cast a long shadow."

"Culture," defined as typical preferences in a population, may well affect macroeconomic outcomes—see Fernández (2007) for a survey. This begs the question of how coordinated preferences may appear or, put differently, how culture is formed and transmitted across generations. According to Bisin and Verdier (2006) "...the empirical evidence aiming at distinguishing the different cultural transmission models of fundamental preference traits is almost non-existent." Our results provide one such mechanism: compulsory schooling laws affect a large number of residents in a state and, thereby, impact the preferences of residents in a coordinated fashion (i.e., schooling laws increase the educational level of residents and affect the culture of future generations by changing average risk tolerance which then may affect macroeconomic outcomes). For example, starting a business is a risky venture, investing for retirement involves the balancing of risk with expected returns, and high paying occupations may have less predictable income streams. Consequently, economic outcomes are dependent on attitudes towards risk taking.

Why does parental schooling have an impact on children's risk attitudes? We can provide a partial answer to this question using matched children-parents pairs from the PSID. Children of parents with high education tend to also have high education but our evidence suggests that the effect of parental education on children's risk aversion is not mainly caused by more educated children having lower risk aversion. Parents with low risk aversion tend to have children with low risk aversion—possibly due to children directly learning about financial risk taking from their parents ("mimicking") or possibly due to a genetic component—but parental education influences children's risk aversion beyond what is explained by parental risk aversion. We also find that parents who "want their children to be leaders" have less risk averse children. Overall, it appears that parental attitudes, some of which are affected by compulsory schooling laws, determine the risk aversion of offspring while it is less clear if there is a transmission channel

working through children's own schooling.

Psychologists have studied risk attitudes extensively. In the early literature, risk-taking is seen as a personality trait.[2] Recent papers suggest that risk should be regarded as a "multi-dimensional construct." For example, Trimpop, Kerr, and Kirkcaldy (1999) differentiate between planned, reckless, or assertive forms of risky behavior. Zaleskiewicz (2001) distinguishes between risk-taking behavior related to achievement motivation (instrumental risk) and risk-taking behavior caused by the need of stimulation (stimulating risk). In the first case—which is more related to risk aversion as economists measure it—risk is taken to achieve an economic goal in the future, while the second case relates to whether an individual is looking for immediate excitement. Zaleskiewicz (2001) finds that the two measures are only moderately correlated: some people are risk takers, some people avoid all risks but many individuals clearly distinguish both types of risks. He also finds a correlation between instrumental risk-taking and rational thinking and future orientation. Thus, more analytical individuals would be more risk tolerant when facing instrumental risk. This finding relates to Benjamin, Brown, and Shapiro (2005) who find that more cognitively able individuals (particularly in the math sphere) tend to be less risk averse.[3] Loewenstein, Weber, Hsee, and Welch (2001) suggest that people evaluate risks cognitively but also react to risks emotionally. They show that emotional reactions to risky situations in many cases differ from cognitive assessments and often drive behavior. Shiv, Loewenstein, Bechara, Damasio, and Damasio (2005), in a fascinating paper using subjects with brain damage in areas that affect emotions, show that individuals who are less emotional tend to be less risk averse.

Our reading of the literature, combined with our findings, is that risk attitudes are determined by many channels, likely involving cognitive abilities, emotions, and mimicking of parental behavior. Our results provide support for some of these channels but stop short of providing a complete map of the determinants of risk aversion.

Our secondary results are as follows. We find, using OLS-regressions, that risk aversion is lower for individuals growing up in "good" counties which indicates that the environment (culture) is important in shaping risk aversion. Using IV-regressions, the county variables are not significant. Our interpretation is that risk aversion is shaped partly by the environment and

[2]Bromiley and Curley (1992) provide an extensive summary of this literature.

[3]The PSID is not well suited to address this question. A measure of IQ is available, but we find that it is not a robust predictor of risk aversion, since the PSID's IQ-measure is not intended to measure "mathematical intelligence."

partly by parental education and that the compulsory schooling variables capture both effects. Other significant determinants of risk aversion are age and sex, with females being more risk averse. Similar results were found by Dohmen, Falk, Huffman, Schupp, Sunde, and Wagner (2006) using German data. These authors perform OLS estimations and, in particular, do not explore the effects of changes in compulsory schooling laws.

Finally, we ask if risk aversion as measured by the PSID predicts economic behavior.[4] In the absence of instruments for risk aversion, we present OLS regressions of economic behavior on measured risk aversion.[5] While these estimates may be biased, we argue that in our regressions this bias would tend to make us underestimate the impact of risk aversion. For example, business holdings may induce higher risk aversion, which would tend to cause a positive relation between risk aversion and the incidence of business holdings; however, we find a negative significant relation using OLS. We also verify that risk aversion predicts the volatility of income in the direction expected from a priori reasoning, which confirms that people who express less appetite for risk in the 1996 questionnaire tend to avoid risk in the real settings.

In Section 2, we describe our data and discuss the measure of risk aversion. In Section 3, we explain our econometric methods and analyze the determinants of risk aversion and, in Section 4, we examine the role of risk aversion in explaining the volatility of income, the composition of household portfolios, as well as the decision to become a business owner.

2 Data

We use data from the PSID which is a large panel of individuals and their offspring. This survey started in 1968, interviewing about $4,800$ households. 60 percent of the initial households belong to a cross-national sample from the 48 contiguous states, while the other portion is a national sample of low-income families from the Survey of Economic Opportunity. The PSID follows these original households and households initiated by their offspring over time, conducting annual interviews (biennial since 1997), thereby creating a panel dataset on income, demographic information, food consumption, etc. At irregular intervals, the panel participants are interviewed

[4] Guiso and Paiella (2004) examine a related measure of risk aversion for Italy and find that it predicts choices such as portfolio selection and occupation.

[5] Many variables, such as parental education, are exogenous to children's behavior and are likely to affect children's risk aversion. However, for the measures of economic behavior we have access to, it is hard to rule out a direct impact of parental education on children's behavior, invalidating the exclusion restriction needed for an instrument. Therefore we control for parental education in OLS regressions, and present a separate set of estimates in which parental education is instrumented with schooling laws.

about wealth and savings and the panel members are at times asked supplementary questions of interest. A series of questions asked to elicit attitudes towards economic risk in 1996 are of central relevance for this study. We describe the questions and how we construct a measure of risk aversion next.

2.1 Measuring risk aversion

In 1996 respondents in households with employed heads were asked about their willingness to take jobs with different income prospects.[6] The questions are very similar to those introduced and analyzed by Barsky, Juster, Kimball, and Shapiro (1997).[7] The first question reads as follows:

> "Now I have another kind of question. Suppose you had a job that guaranteed you income for life equal to your current, total income. And that job was [your/your family's] only source of income. Then you are given the opportunity to take a new, and equally good job, with a 50-50 chance that it will double your income and spending power. But there is a 50-50 chance that it will cut your income and spending power by a third. Would you take the new job?"

Depending on the answer, the respondent is asked similar questions with job prospects that always double income with a 50 percent probability and cut income by a changing fraction $1-\lambda$ (with $1-\lambda$ equal to 10, 20, 50 or 75 percent, respectively). For example, if a participant answers "yes" to the first question (with an income loss of one third), the next question presents a scenario with a possible 50 percent cut in income. However, if the participant answers "no" to the first question, the income loss is reduced to just 20 percent in the next lottery question. Figure 1 summarizes the sequencing of all questions.[8]

According to expected utility theory, if a respondent answers "yes" to a particular lottery question, then:

$$\frac{1}{2}U(2c) + \frac{1}{2}U(\lambda c) \geq U(c).$$

[6] The respondent to the survey is not necessarily the head of household, although typically the head of household or the spouse answer the questions. We track who the respondent to the risk aversion question is to make sure that other variables, such as parental education, refer to the actual respondent.

[7] With the exception that in the PSID, the question indicates that the new job will be equally good—having the same non-monetary attributes—as their current job.

[8] In our analysis, we only keep respondents with a complete answer record to the series of questions.

Assuming agents rank outcomes according to a Constant Relative Risk Aversion (CRRA) utility function, $U(c) = \frac{c^{1-\rho}}{1-\rho}$, there is a relationship between the Arrow-Pratt coefficient of relative risk aversion ρ and λ; for the indifferent individual $\lambda = (2 - 2^{1-\rho})^{\frac{1}{1-\rho}}$. By changing the cut-off point $(1 - \lambda)$, one can bracket the respondent's willingness to take risk measured by the coefficient of relative risk aversion. We calculate the conditional mean of ρ in each group following the methodology described in Barsky, Juster, Kimball, and Shapiro (1997) and in the PSID documentation.

The five questions allow us to classify respondents into six distinct risk aversion groups. Table 1 presents a mapping of the respondents' answers to the implied lower and upper bounds for relative risk aversion in each group, as well as the conditional mean that we compute. Respondents in the same group are assigned the (corresponding) conditional mean as their coefficient of relative risk aversion. Thus, our measure of risk aversion will only take 6 different values. Table 1 shows that the coefficient varies from 0.18 to 33.9, with 50 percent of respondents having a coefficient of relative risk aversion above 5. A frequency plot of the responses appears non-normal and we transform the responses by taking the logarithm and obtaining a much less skewed distribution.

These questions have only been asked once in the PSID. This limits our sample size to approximately 5,000 individuals to begin with. Moreover, unlike Barsky, Juster, Kimball, and Shapiro (1997), we cannot correct for possible measurement error by studying answers by the same individual at different points in time.

2.2 Environmental variables

We use a series of retrospective questions about the respondent's background to construct variables that capture the environment in which the respondent grew up. Particularly relevant for our analysis are variables relating to parental education and the county where the individual grew up, which we describe next. Appendix A provides a brief description of all regressors.

Respondents are asked how much education their parents (or "substitute parents") had. The responses are classified into 8 different categories ranging from "0-5 grades" of schooling to "graduate work/professional degree." We create college and high school dummies for each parent. The father high school dummy takes the value 1 if the respondent reports a father with a high school degree or more education. The father college dummy is 1 if the respondent reports

a father with some college education or more. The dummies for the mother are constructed analogously.

Up to 1993, respondents were asked to provide information about the county where they grew up. We also know the age of the individual at the time of the 1996 interview. This information, combined with county-level data, allows us to construct a series of variables to measure the "quality" of the county where the respondent grew up when the respondent was a child. We obtain county-level information from Haines (2004) who compiled county-level data for 1790-2000 from historical decennial census and county data books (for the more recent years). The county-level data is not annual but decennial. In the construction of our individual-specific county variables, we find the closest county-level data point to the year when the respondent was 10 years of age. For example, if the respondent was 40 years at the time of the 1996 interview, he/she was 10 in 1966 so we use county-level information for 1970. For each county, we collect median income, the percentage of urban population, the median house value, and the percentage of population 25 and older with a college degree.

We further construct variables that summarize state-level compulsory schooling laws that may have affected the education level of the respondent's parents. Acemoglu and Angrist (2000) compile information on compulsory schooling laws. In particular, they produce a variable summarizing compulsory attendance laws, "CA" (the minimum years in school required before leaving school, taking into account certain age requirements), and a variable summarizing child labor laws "CL" (the minimum years in school required before work is permitted). The CA variable is concentrated in the 8-12 range, and the CL variable in the 6-9 range. Acemoglu and Angrist use 4 dummies for each variable to capture their respective distributions.[9] These authors document that the compulsory schooling and child labor variables vary greatly by state and over time, and correlate with individual educational attainment—in particular, they find that the compulsory schooling laws explain high school graduation rates well while having low explanatory power for college graduation (see, e.g., their Table 5 columns (3)-(5)). We match their variables to our PSID respondents, which is possible because the PSID contains information on the state where the respondent's parents grew up and the age of the parents.[10] The

[9]For the compulsory attendance laws: CA8=1 if CA $\leq$ 8, CA9=1 if CA = 9, CA10=1 if CA=10, CA11=1 if CA$\geq$ 11. For the child labor laws: CL6=1 if CL$\leq$ 6, CL7=1 if CL=7, CL8=1 if CL=8, CL9 if CL$\geq$9.

[10]For parents whose age is not collected in the survey, we assume parental age equals the respondent's age plus 25. The fraction imputed is 57 percent for fathers and 37 percent for mothers. For parents with age available, we can also impute parents' age by our method. If we do so, the imputed age has a correlation of 0.80 with the actual age.

compulsory schooling/child labor variables refer to the state where the respondent's father (or mother) grew up and we use the status of the laws at the time the respondent's parent was 15 years of age.

Other variables used are race, age, sex, whether the respondent grew up in a city, if he/she lived with both parents, if the respondent recalls his/her parents being rich while growing up, and dummies for region or state of residence while growing up.

The sample size of our cross-section is bounded by the number of people who gave complete answers to the risk aversion questions in 1996. Moreover, since some individuals choose not to answer other questions required for the construction of regressors (e.g., the parental education questions), the sample size is further reduced. A large number of observations is lost because in 1993 the PSID stopped reporting the county where the individual grew up, and because information on spouses (who may answer the risk aversion question) is collected less often than information on heads.

3 Estimation: Determinants of Risk Aversion

3.1 Instruments

Parents choose their own education and this choice is a function of unmeasured attitudes and abilities that may directly affect children's risk aversion. Therefore, a relation between parental education and children's risk aversion does not necessarily imply a causal effect. Or, to put it differently, various parental traits that we do not observe—such as parental intelligence—may affect the attitudes of offspring as well as parental educational choices. However, in the past there have been significant changes in educational policy that may help us identify the impact of policy induced changes in schooling: U.S. states implemented child labor laws and school attendance laws—which we collectively refer to as "compulsory schooling laws"—as part of the "high school movement" in the early 20th century. These changes can be considered a "natural experiment" providing exogenous, policy driven variation in parental education. The potential effects of compulsory schooling on economic outcomes are first studied by Acemoglu and Angrist (2000) who estimate the monetary return to schooling in the United States. Other researchers study the econometric validity and the economic implications of these laws: Lleras-Muney (2002) and Goldin and Katz (2003) find that these laws indeed raised educational levels. Oreopoulos

(2006) finds similar effects from changes in compulsory schooling in the United Kingdom, while Lleras-Muney (2002) concludes that the U.S. law changes were implemented as responses to exogenous political pressures. Oreopoulos, Page, and Stevens (2006) seem to be the first to examine the intergenerational effects of the changes in compulsory schooling, finding an effect of parental education on children's grade retention and dropping-out rates.[11]

3.2 Econometric Implementation

Our first set of estimations apply simple OLS, allowing for clustering and heteroskedasticity of unknown form when calculating standard errors. In the OLS regressions, we allow for clustering related to the state or the region where the individual grew up, while in the IV regressions we cluster based on the state in which the father grew up because the instruments are related to the father. Our preferred specification involves variables that are exogenous to risk aversion, namely, age, sex, race, and parental variables including compulsory schooling and labor laws in the state where and when the parents grew up. We will verify that our results are robust to the inclusion of potentially endogenous variables. For example, an individual may have high education due to, say, parents' high education. If individuals with high education have low risk aversion, we would find that parents' education appeared to directly explain offspring's risk aversion while the true effect is indirect—through children's education. Results that are robust to inclusion of such variables are likely to capture direct effects. The reason we do not include such variables in our main regressions is that we do not know the direction of causality if own education is correlated with risk aversion. Other potentially endogenous variables are the respondent's income and wealth.

The risk aversion measure is constructed under the assumption that the utility function is of the CRRA variety. This maintained assumption may be questionable—however, the risk aversion measure takes six values that are ordered in terms of risk aversion, independent of functional form, and we can estimate the model with ordered logit methods that depend only on the ordering and not on functional form assumptions for utility.[12] It turns out that higher parental education particularly lowers the probability that offspring are extremely risk averse and we, therefore, focus on modeling the probability of falling in the highest category of risk

[11] Black, Devereux, and Salvanes (2005) find no intergenerational effect of compulsory schooling laws on children's education in Norway.

[12] Such results were reported in a previous version of this paper but are not reported here because they are quite similar to the linear model results.

aversion using linear, probit, and IV-probit estimators.

3.3 Descriptive statistics

Table 2 displays descriptive statistics for our main variables. The risk aversion measure has a mean of 12.5 with a large standard deviation of 14.7. The average age of the PSID participants in our sample is about 41 years in 1996 with the oldest being 87 and the youngest 20 years old. In general, the table speaks for itself but one may notice that blacks are over-sampled at 30 percent. Females represent 45 percent of the sample making females slightly underrepresented.[13]

To measure the "quality" of the county where respondents grew up, we compute a county principal component, a linear combination of four county-level variables—median income, education, percent of urban population, and median house value. These "components" all contribute positively to the principal component.

Compulsory schooling laws are important determinants of how many individuals in a state finish high school but have less or no explanatory power for college education and we define "parents' edu/HS sum" to be the sum of the two dummy variables for mother's high school and father's high school. One may wonder, if laws that impose, say, 9 years of compulsory schooling are well suited to explain high school graduation. We find that they are but, in order to verify robustness, we also report results that use a "continuous" variable for parental education. The variable denoted "parents' college" is the sum of the college dummies for the two parents.

Table 3 shows the correlation matrix for risk aversion, the variables included in our regressions, and the state-level instrumental variables. We see that risk aversion is positively correlated with age, dummies for being a female, black, and growing in the Midwest/South while it is negatively correlated with parents' education, the county principal component, dummies for whether the head lived with both parents, had rich parents, grew up in a city, grew up in the West, compulsory schooling laws in states where parents grew up, and labor laws. Roughly, it seems that risk aversion declines with indicators of wealth and education. Importantly, the schooling laws and labor laws are positively correlated with parental education which is a necessary condition for these variables to be useful instruments. Many regressors display non-negligible correlations implying a role for multiple regression in sorting out the relative effects.

[13] About 23 percent of households have a female head. However, the PSID reports the risk aversion of the individual filling out the questionnaire which in many instances is not the head. This explains why our sample includes a fraction of female respondents higher than the fraction of female heads.

3.4 Results from OLS regressions

In Table 4, we show linear OLS results for the probability of being highly risk averse in columns (1)-(3). We include dummy variables for either the state or the region in which the respondent grew up in order to verify that the results are robust to including dummies only for regions (in later tables, we include dummy variables for the state in which the father grew up, and these are quite collinear with the state dummies for where the respondent grew up). Column (1) shows that parental education has a strong impact on offspring's risk aversion—the higher parental education the lower risk aversion—a result also found by Dohmen, Falk, Huffman, Schupp, Sunde, and Wagner (2006). We find that both high school and college education of parents are significant with the expected sign: children of parents with higher education are less likely to be extremely risk averse.

We also find that risk aversion initially declines with age and then increases. Females are more risk averse while race does not have a significant effect on risk aversion. Barsky, Juster, Kimball, and Shapiro (1997) and Dohmen, Falk, Huffman, Schupp, Sunde, and Wagner (2006) also find that women are more risk averse.[14] We include a principal component for the quality of the county where the respondent grew up, and find that the principal component negatively predicts risk aversion. Growing up with wealthy parents (as recalled by the subject) or in a city seem not to matter.[15]

In column (2) we drop parents' college (for which we have no instrument). There is a slight drop in the adjusted R-square, while the coefficient on the parental high school variable becomes larger and more significant. Column (3) verifies that using dummies for the state where the respondent grew up instead of regional dummies does not change the results.

We display the results of OLS regressions using the logarithm of risk aversion as the dependent variable in columns (4)-(6). We see a much larger effect of parents' college education here—apparently college education is more important for predicting changes in risk aversion outside the level of extreme risk aversion, which is the focus of our paper. While these regressions are not the focus of our paper it is interesting to observe that the county quality has more

[14]The PSID survey is not designed such that the selection of female respondents is necessarily representative for the total population, so our results regarding sex should be interpreted with care.

[15]The magnitudes of the coefficients on these variables are very small and their absolute t-statistics are below one. We do not report these results for brevity. In a previous version of this paper, we also found that individuals who profess either the Lutheran or Baptist religion are more risk averse. We leave out these results because we do not have have a clear interpretation of why risk aversion is higher for this, very non-homogenous, group. The conclusions of the paper are not affected by this choice.

significant coefficients in these regressions.

3.5 Results from instrumental variables regressions

Table 5 reports the first stage regressions of the parental high school dummies' sum on compulsory schooling attendance laws (CA) and child labor laws (CL).[16] We include age, sex, whether the respondent lived with both parents, skin color, and the county principal component as controls, and we include dummies for the region where the respondent grew up and for the state where the respondent's father grew up.

Importantly, we find that the CA variables are all significant with reasonable coefficients with the CA11 variable having the largest and most significant coefficient.[17] In the second column, we include the CL dummies which add little to the explanatory power and are only marginally significant. The inclusion of these dummies does not change the coefficients to the attendance dummies.[18]

In Table 6, we turn to the second stage IV estimation results. OLS results are presented in the first column for easy reference. In column (2), we instrument parental education with the compulsory attendance laws in the state where and when the parents grew up. The point estimate for the impact of parents' high school education on the probability of being extremely risk averse is now much larger than the OLS-estimate indicating that a policy induced change in schooling has a much stronger impact on risk aversion of offspring than the actual parental schooling level. This may be due to an effect of "culture" where schooling has a larger effect when peers also have higher schooling or it may be an effect of parents' education being affected by unobserved parental features that are less important for children's risk aversion.[19]

The marginal effect is such that the predicted probability of being highly risk averse decreases by 0.9 if parents switch from no high school to both graduating from high school! In the

[16]The instruments refer to the father when he was 15 years old. If the father is absent the instruments correspond to the mother. The correlation for fathers' and mothers' CA is 0.7, while the correlation for mothers' and fathers' CL is 0.75.

[17]We found that the CL dummies on their own had little explanatory power. Acemoglu and Angrist (2000) found significant effects of both CA and CL dummies in a much larger data set. We find it intuitive that the CA dummies have better explanatory power for high school graduation because they are focussed on years of schooling closer to the 12 years typically needed for high school graduation. Lochner and Moretti (2004) also find an effect of the CA dummies on high school graduation rates. Consistent with Acemoglu and Angrist (2000) and Lochner and Moretti (2004), we find that the CA dummies do not affect college graduation rates in our sample.

[18]The magnitudes of the CL coefficients are also hard to interpret relative to the left-out dummy CL7.

[19]Technically, this is equivalent to measurement error and it is well-known that measurement error biases coefficients towards zero.

instrumented regressions, the county principal component is now estimated to have a much lower impact and is far from significant. This variable appears to capture some of the effect of schooling laws in the non-instrumented regressions which also partly explains the larger coefficient to schooling when using instruments. In column (3), estimates using both CA and CL instruments are presented. The estimated coefficient to parents' high school education becomes somewhat smaller and more precisely estimated but otherwise the results have similar implications.

In the three right-most columns of Table 6, we consider linear regressions using the logarithm of risk aversion as the dependent variable. The results are quantitatively similar to the probability regressions except that the sex of the respondent is now significant in the IV-case while the "lived with both parents" variable is not as significant. It appears that growing up with two parents is more important for extreme risk aversion. The estimated coefficient on parental education in column (5) implies that, holding everything else constant, an individual with both parents being high school graduates has a log-risk aversion which is 2.32 log-points lower than an individual whose parents did not finish high school. That is, an extremely risk averse individual whose parents did not graduate from high school would have a log-risk aversion of 3.52, while his log-risk aversion would fall to 1.2 if both parents graduated from high school (a fall from 33.9 to 3.3 in levels).

One might worry that the coefficients found are somewhat spurious due to the linear probability model not restricting predicted probabilities to be between 0 and 1. We therefore, in Table 7, estimate the probability of being extremely risk averse using a probit model. For easier interpretation we display the implied marginal probabilities (the change in the probability from a unit change in the relevant variable). The two left-most columns show the results of a specification similar to the linear probability estimates of the previous table. The results are easily summarized: the implied probabilities and t-statistics are very similar to those obtained from the linear probability regressions. The two right-most columns of Table 7 address a separate issue, namely whether the effects of education may be indirect—through educated parents having children who themselves are better educated, have higher income, or are wealthier. We do not include variables for education, income, and wealth in most of our regressions because they are likely to be endogenous to risk aversion, so the results including these variables are best considered robustness tests. Fortunately, the results are very robust to the inclusion of these variables. In the OLS regressions, high own education implies lower risk aversion but there is

no effect in the instrumented regressions. There is a significant positive relation between wealth and risk aversion which we do not attempt to interpret—our main concern is if the impact of parental education on risk aversion works primarily through these variables and it seems clear from Table 7 that this is not the case.

We further explore robustness using a continuous measure of parental education rather than the sum of high school dummies. We impute the number of years of completed parental education using the responses of their children. For example, if the respondent indicates that his father/mother finished 0-5 grades of schooling we assign 2.5 years of completed education to the parent; 6-8 grades—7 years, etc.[20] The imputed measure of parental education (for one parent) varies from 2.5 to 17 years of schooling. In column (1) of Table 8, we show that one more year of combined parental education lowers the probability that a child is extremely risk averse by 1 percent with high statistical significance. In the linear probability IV model of column (2), where we use the CA dummies as instruments for parental education, the coefficient on parental education is six times larger and still significant at the 1 percent level. For the sample used for the IV regression, the average combined education of parents who did not complete high school is about 15 years, while the average education of those with two high school diplomas is 27 years. Thus, the IV coefficient on parental education implies that an individual whose parents finished 12 or more years of schooling has about 72 percent lower probability of being extremely risk averse than an otherwise identical individual whose parents did not finish high school. This effect is somewhat lower than the effect we found in Table 6, column (2), but it is comparable to the probit estimate in Table 7, column (2). In the model of column (3), where both CA and CL dummies are used as instruments for parental education, the effect of parental education is estimated at about the same magnitude as in column (2) with significance at the 1 percent level.

To address the potential problem of weak instruments, we calculate p-values for the IV estimates of the effect of parental education using the method proposed by Moreira (2003). The method only applies to linear models. When instruments are weak, typical asymptotic tests may have severe size distortions, while the conditional test proposed by Moreira (2003) has the correct size and good power. Using Moreira's method, we find p-values for the null hypothesis of no effect of parental eduction of about 0.9 percent and 1.3 percent for the linear probability models in Table 6 columns (2) and (3), respectively; about 12 percent and 7 percent for the

[20] See the notes to Table 8 for the full details of imputation.

models in Table 6 columns (5) and (6); and 1.8 percent and 2.4 percent for the models in Table 8 columns (2) and (3), respectively. It appears that the potential problem of weak instruments is not important for our results.

3.6 Results from matched samples

The particular structure of the PSID, which follows households and their offspring, allows us to create a small matched sample with observations on risk aversion for an individual and that individual's father or mother (about 800 pairs). This matched sample can be used to examine which parental attitudes determine the risk aversion of children in more detail. For example, well-educated parents may try to deliberately influence their offspring's risk tolerance, but children may also become more risk tolerant by interacting with risk tolerant parents. Our matched sample is comparatively small and includes mainly the youngest respondents to the risk aversion question (the average age is 30 with a standard deviation of 7).

In Table 9, we estimate the marginal probabilities of being very risk averse (falling within the two highest risk aversion categories) or extremely risk averse (within the highest risk aversion category). We present non-instrumented regressions. In IV regressions, the parental education variable has the same sign but is far from significant (results not tabulated here for brevity), because the sample is smaller than that of our previous regressions and because compulsory schooling laws have less of an effect on the younger parents in this sample. While the interpretation of parental education in the non-instrumented regressions is subject to the caveats discussed earlier, the child-parent paired regressions will be informative about whether parental education might be capturing other parental characteristics. In particular, we would like to know if parental risk aversion affects the risk aversion of children and whether its inclusion makes the educational variable insignificant.

Column (1) of Table 9 confirms the role of parents' education and shows that parents' risk tolerance has a highly significant impact on whether children have high risk aversion as also found by Charles and Hurst (2003). Due to the smaller sample of about 600 observations, the only other significant variable is the sex of the respondent, where we still find that females are more risk averse. Column (2) focuses on extreme risk aversion. Parental education is highly significant but the impact of parental risk aversion is much lower and not significant in this case. All in all, Table 9 provides at least tentative evidence that parental risk attitudes matter for

children's risk attitudes and that this effect is not highly correlated with parental education—it appears that the effect of parental education is particularly important for the determination of whether risk aversion is extreme, while parental risk attitudes affect the level or risk aversion in the less extreme range.

In Table 10, we analyze the effect of family business ownership when the respondent was a child. Because business ownership involves risk, a negative effect of business ownership on risk aversion indicates that children's risk attitudes depend on parental risk taking behavior. Having no instruments for business ownership, the results are only indicative but these regressions also serve to establish robustness of the role of parental education. In Table 10, we drop parental risk aversion in order to get a larger sample size of about 1,000. We construct a variable that counts the number of years the respondent's parents report owning a business when the respondent was 7 to 13 years of age (i.e., the variable takes values from 0 to 7). In columns (1)-(2), we see that parents' business ownership has an effect on risk aversion—the impact is significant at the 5 percent level for "very high risk aversion" and at the 10 percent level for "extreme risk aversion". Table 10, columns (3)-(4), shows that parental income when the respondent was a child does not predict risk aversion once we control for parental education. The results of Table 10 confirm that the impact of parental education is very robust.

In our final set of paired regressions, we explore a series of questions in the 1972 wave of the PSID regarding parental attitudes—we match parents with valid answers to these questions to children with responses to the risk aversion supplement. We do not include parental risk attitudes or business ownership and have available about 1,400 observations. The variables we consider are: (1) a parental planning score, which measures parents' future orientation; (2) a trust/hostility score; (3) a dummy variable equal to 1 if parents report that they would prefer their children to be leaders as opposed to being popular with their classmates; (4) a measure of parental educational aspirations for their children (a dummy variable equal to one if parents hope all their children will finish college). Exact variable definitions are provided in Appendix A.[21]

Table 11 presents these results. The leader dummy clearly has significant effects on children's risk aversion. The parents' planning score is significant at the 5 percent level for "very risk averse" and not significant for extreme risk aversion. The educational aspirations variable

[21]The PSID also reports a "risk avoidance" score, which is based on a variety of answers such as whether the parent has medical and auto insurance, wears seat belts and is a smoker. This measure, which is quite different from our measure of risk aversion, does not explain the risk aversion of children.

and the trust/hostility score are insignificant while the parental education variable is clearly significant.[22]

Overall, the results of the matched regressions indicate that parental attitudes—in particular parents' own risk attitude—matter for children's risk aversion. Nonetheless, the attitudes measured by the PSID do not appear to be the main channel of transmission from parental schooling to offspring's risk attitudes. Likely, parental education affects children's behavior in a multitude of different ways and we leave it to future research to explore this issue further.

4 Risk Aversion Matters

In this section, we relate risk aversion to household choices that, in theory, should be affected by risk attitudes. First, we examine the impact of risk aversion on head's income volatility; second, we examine the impact of risk aversion on the composition of household portfolios; third, we analyze the relation between risk aversion and business ownership.[23]

4.1 Risk aversion and income volatility

The economic literature emphasizes the importance of income volatility for household choices regarding consumption, savings, and wealth (e.g., Caballero 1990, Hubbard, Skinner, and Zeldes 1994). Households, when facing relatively high future income risk, reduce their current consumption and save more to prepare for possible bad income realizations. This type of savings is known as "precautionary savings." Carroll and Samwick (1997) and Skinner (1988) find that precautionary savings are substantial. Other researchers find a small precautionary motive (e.g., Guiso, Jappelli, and Terlizzese 1992, Dynan 1993). The latter finding is often attributed to the fact that one cannot control for risk aversion (e.g., Fuchs-Schündeln and Schündeln 2005).

Risk aversion can be negatively correlated with household income volatility due to self-selection of risk tolerant households into occupations with more volatile incomes. For example, Skinner (1988) finds, in a regression framework, that savings of salesmen and the self-employed are lower than savings of craftsmen. The former professions are typically thought to have more volatile income paths and, therefore, in accordance with the precautionary savings paradigm,

[22] We also directly verified through regressions that parental attitudes to some extent are determined by parental schooling, as captured by the exogenous changes in schooling laws. However, the R-squares in these regressions were very low at less than 0.01 making it unlikely that these variables correspond to major channels of transmission from parental education to children's risk aversion.

[23] In this section, we utilize data only for the households whose heads have records on risk aversion.

should save more. Skinner accepts the possibility that salesmen and the self-employed are more tolerant towards risks and that self-selection bias might lead to the finding of lower average savings for professions with larger income volatility.[24] IV regressions will only correct for such bias if the instruments are not subject to self-selection, but Carroll, Dynan, and Krane (2003), in the context of precautionary wealth regressions, argue that (usually unobserved) risk aversion can be correlated both with conventional instruments for income volatility—educational attainment, industrial affiliation, or occupation—and with household wealth accumulation. This implies that instrumental variables regressions of household wealth holdings on income volatility may not be robust to self-selection.

We analyze the effect of risk aversion on the volatility of the shocks to idiosyncratic head-of-household labor income. Our measure of idiosyncratic head's labor income growth is defined, as is typical in the literature, as the residual from a cross sectional regression of log head's labor income change on a third polynomial in head's age, education dummies, and the interactions of education dummies with the age polynomial. For these regressions, we use data from the 1969–1997 annual family files of the PSID.

Table 12 presents OLS regressions of the volatility of the shocks to idiosyncratic head-of-household labor income on risk aversion and demographic controls.[25] As can be seen from column (1), risk aversion is significantly negatively related to the volatility of head's labor income. Although the risk aversion coefficient may be potentially biased due to reverse causality, the bias would move the coefficient closer towards zero and tend to make it statistically insignificant. Thus, the significance of the OLS coefficient signal an important effect of risk aversion on head's income volatility.

We find that male heads have more volatile incomes, while married, high earnings, and wealthy heads have less volatile income streams. In the PSID, heads are females predominantly when they are unmarried; thus, the result of less volatile income for female heads may reflect the fact that they choose careers taking into account that they are largely devoid of the type of insurance married couples have—the income of the spouse. In column (2) of Table 12, we present results instrumenting parental education with compulsory schooling laws. Risk aversion

[24] Fuchs-Schündeln and Schündeln (2005) find important self-selection of more risk averse households into less risky occupations.

[25] Parental education is not a satisfactory instrument in this regression since it may directly affect the head's income volatility through different channels, invalidating the exclusion restriction for instrumental variables regressions. Based on these considerations, we included parental education as a separate control into OLS regressions with head's income volatility, stock shares, and the incidence of a business ownership as dependent variables.

retains its significance and importance, indicating that it has an effect on the head's income volatility beyond that induced by parental education.[26]

Household income and individual income are typically modeled as the sum of a persistent or permanent component and a transitory component. It has been argued that the volatility of transitory shocks to household income is not as important for household welfare as the volatility of permanent shocks, presumably because transitory shocks can be better insured through credit markets (e.g., Carroll and Samwick 1997, Kazarosian 1997). Therefore, we analyze the magnitude of the volatility of permanent shocks to idiosyncratic head's labor income for households with heads of different risk aversion. In order to identify the volatility of permanent shocks to log-idiosyncratic head's income, we use a procedure proposed by Meghir and Pistaferri (2004) described in Appendix B. Essentially, the method uses a moment condition to identify the (unconditional) long-run variance of the first difference in idiosyncratic income under the assumption that the income process contains a random walk and a stationary component modeled as a moving average process.

We estimate the volatility of permanent income shocks for households with very risk averse heads and risk tolerant heads separately. Our first sub-sample comprises households whose values of risk aversion are higher than or equal to 5.44—i.e., households in the two highest categories of risk aversion. We label these households "very risk averse" households. The second sub-sample consists of households whose values of risk aversion are below 1. We label them "risk tolerant" households. Following Meghir and Pistaferri (2004), we estimate the volatility of permanent shocks to head's income assuming that the transitory component is a moving average process of order one.[27] The results are presented in columns (1)-(2) of Table 13.

Less risk averse households have larger volatility of permanent shocks to income. In other words, less risk averse individuals choose careers with more volatile income paths. The hypothesis that the volatility of permanent shocks is the same for heads with different degrees of risk aversion can be rejected at about 3% for head's idiosyncratic labor income.

Further, we performed the same analysis for *household* idiosyncratic income—see columns (3) and (4) of Table 13. The results are very similar: the hypothesis that permanent idiosyncratic shocks to household income have the same variance for heads with different degrees of risk

[26]This result is unaffected if we exclude endogenous variables in the OLS and IV regressions. The same note applies to our results in Tables 15 and 16.

[27]See Abowd and Card (1989) and Meghir and Pistaferri (2004) for empirical evidence in favor of this specification.

aversion can be rejected at any conventional level of significance.

We conclude that risk aversion is negatively correlated with the volatility of the shocks to idiosyncratic incomes and that the self-selection phenomenon emphasized in the precautionary savings literature is empirically relevant.

4.2 Risk aversion and business ownership

To further explore the relation between risky career choices and risk aversion, we analyze the incidence of business ownership, arguably a very risky household endeavor. Kihlstrom and Laffont (1979), in a general equilibrium model of firm formation, show that risk aversion determines an individual's choice between wage employment and entrepreneurship. In their model, entrepreneurs are less risk averse. Cramer, Hartog, Jonker, and Van Praag (2002) find that risk aversion is significantly negatively related to individual choices of self-employment—they use responses to a hypothetical lottery for a sample of Dutch households to construct a measure of risk aversion. We examine the effect of risk aversion on the incidence of business ownership. In the PSID, starting in 1969, heads report whether their household owns a business or not. Column (1) in Table 15 presents results for a cross-sectional probit regression of business incidence on risk aversion, parental education, income, wealth, and household demographic controls. The dependent variable of the regression is equal to 1 if a household owns a business in any year during the 1969–1996 period and equal to 0 otherwise. In column (2), we instrument parental education with compulsory schooling laws. The effect of risk aversion on business incidence is negative and statistically significant in all specifications and it is robust to the inclusion of household wealth, which is likely to be an endogenous variable. Thus, less risk averse households are more likely to start up their own businesses and tolerate substantial entrepreneurial risks. Other significant variables are race, age, family size, education and sex of the head. Black and female headed households are, on average, less likely to own a business. When instrumented, parental education loses its significance. Perhaps, in the non-IV probit regression, parental education is a proxy for the effect of some unmeasured skills relevant for running a business or knowledge of business opportunities.

4.3 Risk aversion and household portfolio composition

Standard portfolio composition models predict that higher risk aversion leads to a relatively lower demand for risky assets (e.g., Gollier 2004). To validate this prediction, we use household wealth data from the 1984, 1989, 1994 and 1999 wealth supplements of the PSID, and we analyze the effect of risk aversion on the share of stocks in households' portfolios.[28]

For each year—1984, 1989, 1994, or 1999—the value of financial assets is calculated as the sum of the value of shares in stocks, mutual funds, or investment trusts, money in checking and savings accounts, money market funds, certificates of deposit, government savings bonds, treasury bills, other savings or assets, such as bonds, rights in a trust or estate, the cash value in a life insurance policy, and valuable collections for investment purposes. Business wealth is excluded. Further, we exclude business owners from the sample. We do this because business owners predominantly hold assets related to their own enterprises (e.g., Gentry and Hubbard 2004) and, therefore, the study of business owners' portfolio choices requires a more careful modeling beyond the scope of this paper.

We regress household portfolio shares of risky assets on risk aversion, parental education, household income and wealth, and demographic controls. Panel Tobit regression results are shown in Table 16. The results are estimated for a sample of PSID households with stable family composition between 1984–1999 and heads 24 years and older. It is likely that a household that holds a large fraction of wealth in stock one year also holds a large fraction 5 years later. In other words, there may be persistence in portfolio composition that makes it tenuous to assume that observations of the same household at different time periods are independent random variables (conditional on the regressors). The effect of such auto-correlation would be to bias the estimated standard errors if not taken into account. We, therefore, allow for lagged endogenous variables as regressors in Table 16.

Risk aversion is negatively associated with household holdings of stocks—as also found by Barsky, Juster, Kimball, and Shapiro (1997). The risk aversion coefficient is significant at the 5 percent level. Households with more educated heads hold larger shares in stocks. The coefficients on net worth and average income indicate that wealthier and high earnings households have a larger proclivity to hold their wealth in stocks as has been found by others (e.g., Campbell 2006).

[28]For robustness, we used three different measures for the size of a household portfolio: financial assets, gross assets, and net worth exclusive of net business wealth. Because the results for gross assets and net worth are very similar to those for financial assets, we do not report the details.

The results of the same regression instrumenting parental education with compulsory schooling laws, presented in column (2) of Table 16, are largely the same.

In conclusion, we find that more risk tolerant households are more likely to choose careers with more volatile income streams, to own businesses, and to have higher shares of stocks in financial portfolios.

5 Conclusion

We examined determinants of risk aversion for households in the PSID. Growing up with more educated parents matters: children of educated parents are less risk averse in adulthood. Using compulsory schooling laws as instruments we showed that the effect of parental education is not just capturing attitudes and abilities of parents: policies that increase schooling will tend to make future generations less risk averse. In particular, they will lower significantly the probability of having extremely risk averse individuals.

We arrived at some other clear conclusions: older individuals and females are more risk averse, and more risk averse parents have more risk averse children. We found that risk aversion matters for observed economic behavior. Individuals with high risk aversion are less likely to choose careers with more volatile income streams, and less likely to own businesses.

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Appendix A: List of Regressors

Age: age of the respondent at the time of the 1996 interview.

Black: dummy variable. 1 if the respondent reports being African-American.

Female: dummy variable. 1 if the respondent is female.

Father high school: dummy variable. 1 if the respondent's father has a high school degree or more education.

Mother high school: dummy variable. 1 if the respondent's mother has a high school degree or more education.

Father college: dummy variable. 1 if the respondent's father has some college or more education.

Mother college: dummy variable. 1 if the respondent's mother has some college or more education.

Parents' edu/HS sum: sum of the father and mother high school dummies.

Lived with both parents: dummy variable. 1 if the respondent reports he or she lived with both natural parents most of the time until age 16.

City: dummy variable. 1 if the respondent reports growing up in a large city as opposed to a farm, a small town or other location.

Rich parents: dummy variable. 1 if the respondent reports parents were pretty well off while growing up, as opposed to poor or of average well-being.

Log county med. income: the log of median income in 1982 dollars in the county where the respondent grew up, when the respondent was 10.

County urb. pop %: urban population percentage in the county where the respondent grew up, when the respondent was 10.

% County college grads: percentage of the population 25 or older with college degrees in the county where the respondent grew up, when the respondent was 10.

Log county med. house val.: the log of the median house value in 1982 dollars in the county where the respondent grew up, when the respondent was 10.

County principal component: the principal component of the four previous variables.

Grew up in Midwest/South: dummy variable. 1 if the respondent grew up in either the Midwest or the South census regions.

Grew up in West: dummy variable. 1 if the respondent grew up in the West census region.

CA: the minimum years in school required before leaving school, in the state where the respondent's father grew up, when the respondent's father was 15 years.

CL: the minimum years in school required before work is permitted in the state where the respondent's father grew up, when the respondent's father was 15 years.

CA8: dummy variable. 1 if CA $\leq$ 8.

CA9: dummy variable. 1 if CA=9.

CA10: dummy variable. 1 if CA=10.

CA11: dummy variable. 1 if CA $\geq$ 11.

CL6: dummy variable. 1 if CL $\leq$ 6.

CL7: dummy variable. 1 if CL=7.

CL8: dummy variable. 1 if CL=8.

CL9: dummy variable. 1 if CL $\geq$ 9.

Own education (no. years): number of years of education of the respondent.

Log income (avg. 1984-1996): mean of the respondent's log of real family income for the years 1984-1996 in 1982 dollars.

Log wealth (avg. 1984-1994): mean of household 'log' wealth for the periods 1984, 1989, and 1994 (the PSID does not collect wealth annually). The measure includes housing wealth. By "Log," we actually mean the following transformation: sign(wealth)$\times$ log(1+abs(wealth)). This transformation allows us to keep negative values of wealth.

Parents' risk tolerance: dummy variable. 1 if either the respondent's father or the respondent's mother have risk aversion smaller than 1.5, and 0 otherwise. Thus, the dummy equals 1 if either parent's risk aversion corresponds to one of the three lowest values for risk aversion: 0.18, 0.43 and 1.46.

Yrs fam. owned business (7-13): the number of years the respondent's parents report owning a business while the respondent was 7 to 13 years of age.

Log fam. income (avg. 7-13): mean of the respondent's log of real family income when the respondent was 7 to 13 years of age in 1982 dollars.

Region dummies/grew up: 8 regional dummies identifying the region where the respondent grew up as reported in retrospective questions.

State dummies/grew up: state dummies identifying the state where the respondent grew up as reported in retrospective questions.

Planning score: 1972 reported efficacy and planning. Variable V2939. It is a score from 0 to 6 constructed from the following questions:

- Sure life would work out (V2743 = 1)
- Plans life ahead (V2744 = 1)
- Gets to carry out things (V2745 = 1)

- Finishes things (V2746 = 1)
- Rather save for future (V2748 = 5)
- Thinks about things that might happen in future (V2755 = 1)

Parents' trust/hostility score: reported trust or hostility in 1972. Variable V2940. Score 0-5. Constructed from the following variables:

- Does not get angry easily (V2751 = 5)
- Matters what others think (V2752 = 1, 2)
- Trusts most other people (V2753 = 1)
- Believes life of average man getting better (V2756 = 1)
- Believes there are not a lot of people who have good things they don't deserve (V2757 = 5)

Leader: dummy variable. 1 if the parents report they would prefer to their child to be a leader vs. being popular with classmates. Variable V2760 in the 1972 interview.

Parents hope college for kids: dummy variable. 1 if the parents report they think all children will go to college in the 1972 interview. Answers 1 and 2 to question V2549, "About how much education do you think the children will have when they stop going to school?"

Appendix B: Estimating the volatility of permanent shocks

In order to identify the volatility of permanent shocks to log-idiosyncratic head's income, we use a procedure proposed by Meghir and Pistaferri (2004). It can be described as follows. Assume that log-idiosyncratic income, $\widetilde{y}_{it}$, consists of a permanent random walk component, τ_{it}, and a transitory moving average component, c_{it} (see Guiso, Pistaferri, and Schivardi (2005), Carroll and Samwick (1997), Hryshko (2007), Meghir and Pistaferri (2004) for empirical analysis of this income process on micro data and its empirical validation):

$$\widetilde{y}_{it} = \tau_{it} + c_{it}; \text{ with } \quad \tau_{it} = \tau_{it-1} + \epsilon^P_{it}, \quad c_{it} = \theta_q(L)\epsilon^T_{it}. \tag{1}$$

ϵ^P_{it} is a permanent shock to log-idiosyncratic income for head i at time t; ϵ^T_{it} is a transitory shock to log-idiosyncratic income for head i at time t; $\theta_q(L)$ is a polynomial in L of order q, with $\theta_0 = 1$. We assume that $\epsilon^P_{it} \sim iid(0, \sigma^2_P)$ and $\epsilon^T_{it} \sim iid(0, \sigma^2_T)$.

The unobserved components model described in equation (1) implies that the first difference in log-idiosyncratic head's income is $\Delta\tilde{y}_{it} = \epsilon^P_{it} + (1-L)\theta_q(L)\epsilon^T_{it}$. Meghir and Pistaferri (2004) propose the following identifying condition for estimation of the volatility of permanent shocks to log-idiosyncratic income:

$$E\left[\Delta\tilde{y}_{it} \sum_{k=-(1+q)}^{(1+q)} \Delta\tilde{y}_{it+k}\right] = \sigma^2_P. \tag{2}$$

Essentially, this moment condition identifies the (unconditional) long-run variance of the first difference in income. It can be shown that the long-run variance is equal to the volatility

of the permanent shock, σ_P^2, if the income process contains a random walk and a stationary component modeled as a moving average process. We estimate the volatility of permanent shocks to idiosyncratic head's income by the equally weighted minimum distance (EWMD) method, assuming that the transitory component of idiosyncratic income is a moving average process of order one. The details of our sample selection are as follows. We select households with heads aged 24–65 and drop observations if labor income growth is above 700% or below –90%. Additionally, we drop observations with head's labor income below 1,000 (1982–1984) dollars. Households with female and single heads are included in the sample. A household is present in the final sample if it has at least one non-missing log-income difference.

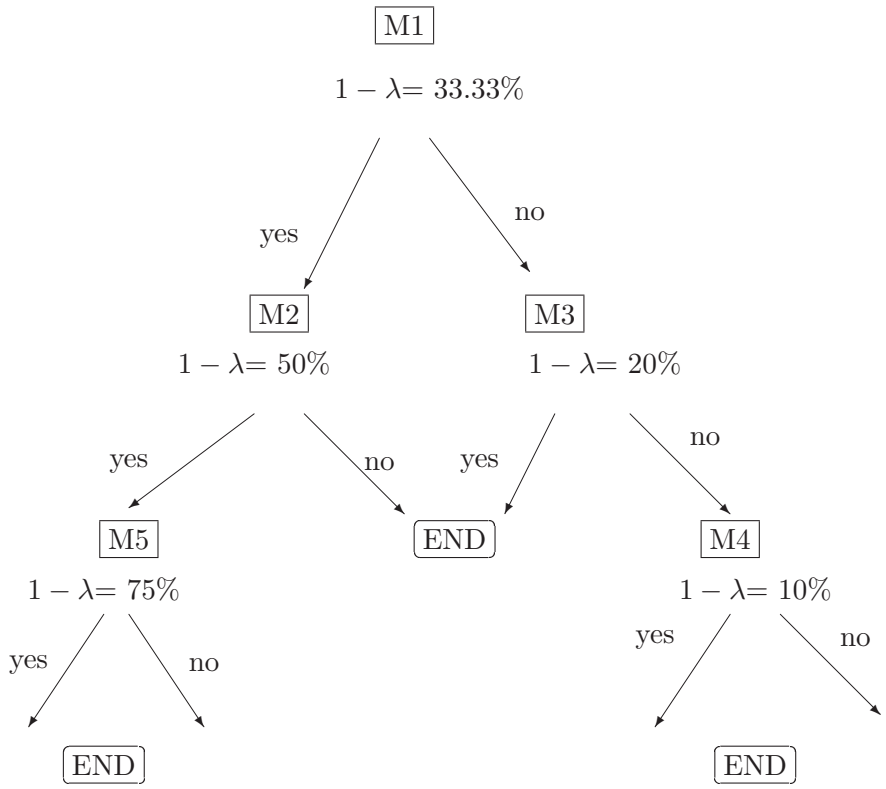

FIGURE 1: SEQUENCING OF QUESTIONS FROM THE 1996 PSID SUPPLEMENT ON RISK AVERSION

(Note: in all questions, the proposed job doubles income with 50 percent probability and cuts income by the varying fraction 1-λ.)

Table 1: Risk Aversion Mapping from the Survey Questions

Group	Answers	Relative Risk Aversion			N	Percent
		lower bound	upper bound	mean		
11	Yes/Yes/Yes	0	0.31	0.18	365	6.56
22	Yes/Yes/No	0.31	1	0.63	756	13.60
33	Yes/No/-	1	2	1.46	828	14.89
44	No/Yes/-	2	3.76	2.83	861	15.49
55	No/No/Yes	3.76	7.53	5.44	1,009	18.15
66	No/No/No	7.53	∞	33.9	1,741	31.31

Table 2: Summary statistics

Variable Name	Mean	Std. Dev.	Min.	Max.	N
Risk aversion	12.48	14.68	0.18	33.91	3390
Log–Risk aversion	1.46	1.65	–1.73	3.52	3390
Age	41.4	10.53	20	87	3390
Black	0.3	0.46	0	1	3390
Female	0.45	0.5	0	1	3390
Mother high school	0.69	0.46	0	1	3390
Father high school	0.6	0.49	0	1	3390
Mother college	0.27	0.45	0	1	3390
Father college	0.27	0.45	0	1	3390
Parents' edu./HS sum	1.29	0.83	0	2	3390
Parents' college	0.55	0.76	0	2	3390
Lived with both parents	0.78	0.42	0	1	3349
County principal component	0.18	1.61	–5.12	5.29	3390
City	0.38	0.49	0	1	3338
Rich parents	0.26	0.44	0	1	3282
County med. income	19,669	6,973	1,954	43,062	3390
County urb. pop %	0.65	0.32	0	1	3390
% County college grad.	0.12	0.05	0.03	0.43	3390
County med. house value	39,412	18,089	3,614	151,340	3390
County principal component	0.18	1.61	–5.12	5.29	3390
Grew up in Midwest/South	0.71	0.46	0	1	3390
Grew up in West	0.12	0.33	0	1	3390
One's education (no. years)	13.31	2.22	2	17	3372
Log income (avg. 1984–1996)	10.03	0.86	2.59	12.79	3384
Log wealth (avg. 1984–1994)	4.43	3.06	–7.33	10.72	3312
Very risk tolerant parent	0.24	0.43	0	1	954
Yrs fam. owned business (7-13)	0.61	1.51	0	7	1833
Log fam. income (avg. 7-13)	10	0.76	5.16	12.61	1567
Parents' planning score	3.16	1.56	0	6	1896
Parents' trust/hostility score	2.45	1.3	0	5	1896
Leader	0.61	0.49	0	1	1896
Parents hope college for kids	0.42	0.49	0	1	1896

Notes: Amounts in 1982-1984 dollars. Variable definitions in Appendix A.

Table 3: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(15)
(1) Log–Risk aversion	1.00													
(2) Parents' HS sum	–0.17	1.00												
(3) Parents' college sum	–0.16	0.52	1.00											
(4) Age	0.20	–0.28	–0.20	1.00										
(5) Black	0.08	–0.31	–0.23	–0.07	1.00									
(6) Female	0.12	–0.16	–0.07	0.06	0.19	1.00								
(8) County prin.comp.	–0.18	0.34	0.27	–0.41	–0.07	–0.10	1.00							
(9) Lived with both parents	–0.03	0.02	0.03	0.08	–0.21	–0.04	–0.05	1.00						
(10) Rich parents	–0.06	0.21	0.18	–0.16	–0.05	–0.05	0.13	0.03	1.00					
(11) Grew up in city	–0.03	0.11	0.05	–0.07	0.18	0.03	0.45	–0.12	0.01	1.00				
(12) Grew up in West	–0.07	0.13	0.12	–0.04	–0.16	–0.05	0.25	–0.06	0.02	0.10	1.00			
(13) Grew up Midwest/South	0.06	–0.19	–0.12	–0.02	0.28	0.08	–0.34	–0.02	–0.03	–0.07	–0.59	1.00		
(14) Compulsory attendance law	–0.12	0.23	0.14	–0.29	–0.21	–0.06	0.23	0.05	0.06	0.05	0.03	–0.17	1.00	
(15) Child labor law	–0.09	0.17	0.08	–0.28	–0.09	–0.05	0.19	0.02	0.05	0.05	–0.01	0.03	0.66	1.00

Table 4: Explaining Risk Aversion. Linear Probability and OLS Regressions

	Linear Prob. Regressions			Linear Regressions		
	(1)	(2)	(3)	(4)	(5)	(6)
Parents' edu./HS sum	–0.03**	–0.05***	–0.05***	–0.07*	–0.15***	–0.15***
	(–3.02)	(–4.89)	(–4.41)	(–2.14)	(–5.02)	(–4.16)
Parents' college	–0.04**			–0.18***		
	(–2.89)			(–6.73)		
Age	–0.02*	–0.01*	–0.01***	–0.03	–0.03	–0.02
	(–2.05)	(–2.00)	(–2.82)	(–1.11)	(–0.98)	(–1.29)
Age sq./100	0.02**	0.02**	0.02***	0.06*	0.06*	0.05***
	(3.03)	(3.01)	(4.43)	(2.01)	(1.91)	(2.86)
Black	0.03	0.03	0.02	0.08	0.11	0.09
	(1.36)	(1.64)	(0.92)	(1.06)	(1.40)	(1.28)
Female	0.07***	0.06***	0.06***	0.30***	0.29***	0.28***
	(8.85)	(8.61)	(4.46)	(8.13)	(8.24)	(6.15)
Lived with both parents	–0.05	–0.05	–0.05**	–0.11	–0.12	–0.11*
	(–1.80)	(–1.87)	(–2.57)	(–1.04)	(–1.11)	(–1.77)
County principal component	–0.01	–0.02*	–0.01**	–0.06**	–0.07***	–0.07***
	(–1.67)	(–2.07)	(–2.60)	(–2.94)	(–3.84)	(–2.82)
Constant	0.56***	0.53**	0.47***	1.77**	1.67**	1.45***
	(3.53)	(3.48)	(4.57)	(3.07)	(2.93)	(3.55)
Regions dummies/grew up	Yes	Yes	No	Yes	Yes	No
State dummies/grew up	No	No	Yes	No	No	Yes
Adj. R sq.	0.081	0.079	0.082	0.078	0.074	0.072
N	3349	3349	3349	3349	3349	3349

Notes: In the linear probability regressions, the left-hand side variable is 1 if the respondent's risk aversion is the highest possible value and 0 otherwise. In the OLS regressions, the left-hand side variable is the logarithm of the computed coefficient of relative risk aversion. Robust standard errors in the regressions, clustered by the region where the respondent grew up in columns (1)-(2) and (4)-(5), and by the state where the respondent grew up in columns (3) and (6). t-statistics in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 5: First Stage Regressions for IV-Estimation

	(1)	(2)
CA9	0.13**	0.13**
	(2.50)	(2.59)
CA10	0.10**	0.10*
	(2.16)	(1.92)
CA11	0.20***	0.21***
	(3.46)	(2.72)
CL6		0.12*
		(1.75)
CL8		0.09**
		(2.09)
CL9		0.08
		(1.62)
Age	–0.02	–0.01
	(–1.58)	(–1.59)
Age sq./100	0.00	–0.00
	(0.06)	(–0.12)
Black	–0.36***	–0.36***
	(–6.40)	(–6.47)
Female	–0.09***	–0.08***
	(–3.20)	(–3.05)
County principal component	0.08***	0.08***
	(5.45)	(5.53)
Lived with both parents	–0.01	–0.01
	(–0.29)	(–0.18)
Constant	1.89***	1.74***
	(6.80)	(6.58)
States dummies/father grew up	Yes	Yes
Region dummies/grew up	Yes	Yes
Adj. R sq.	0.276	0.277
F(instruments)	4.78***	3.73***
N	3349	3349

Notes: The left-hand side variable is parents' education (sum of high school dummies). CA9, CA10, CA11, CL6, CL8, CL9 are the dummies that capture compulsory schooling laws as proposed by Acemoglu and Angrist (2000) and defined in Appendix A. t-statistics in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 6: Explaining Risk Aversion. Instrumenting for Parents' Education

	Linear Prob. Regressions			Linear Regressions		
	(1) OLS	(2) IV-1	(3) IV-2	(4) OLS	(5) IV-1	(6) IV-2
Parents' edu./HS sum	–0.05***	–0.45***	–0.36***	–0.14***	–1.16**	–0.79*
	(–3.84)	(–2.89)	(–3.59)	(–3.46)	(–2.12)	(–1.95)
Age	–0.01***	–0.02***	–0.02***	–0.03*	–0.04**	–0.04**
	(–3.71)	(–3.16)	(–3.88)	(–1.75)	(–2.24)	(–2.41)
Age sq./100	0.02***	0.02***	0.02***	0.05***	0.05***	0.05***
	(5.85)	(4.34)	(4.88)	(3.58)	(3.54)	(3.81)
Black	0.03	–0.12	–0.09	0.11	–0.26	–0.13
	(1.08)	(–1.49)	(–1.50)	(1.27)	(–1.04)	(–0.66)
Lived with both parents	–0.05***	–0.06**	–0.06**	–0.13*	–0.14*	–0.14*
	(–2.73)	(–2.31)	(–2.48)	(–1.96)	(–1.69)	(–1.81)
Female	0.06***	0.02	0.03	0.28***	0.19**	0.22***
	(4.03)	(0.97)	(1.58)	(5.77)	(2.27)	(3.15)
County principal component	–0.02***	0.02	0.01	–0.08***	0.00	–0.03
	(–2.79)	(1.33)	(0.78)	(–3.06)	(0.07)	(–0.66)
Constant	0.48***	1.30***	1.12***	1.56***	3.66**	2.90***
	(3.88)	(3.09)	(4.12)	(3.09)	(2.63)	(2.92)
States dummies/father grew up	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies/grew up	Yes	Yes	Yes	Yes	Yes	Yes
N	3349	3349	3349	3349	3349	3349

Notes: The left-hand side variable is the logarithm of the computed coefficient of relative risk aversion in the linear regressions. In the linear probability regressions, the left-hand side variable is 1 if the respondent's risk aversion is the highest possible value and 0 otherwise. The parental education variable is equal to 0 if neither parent completed high school, 1 if either the father or mother completed high school and 2 if they both did. Instruments: dummies for compulsory attendance laws (when the respondents' father was 15 years old) for IV-1 and both compulsory attendance and child labor laws for IV-2. Definitions in Appendix A. Robust standard errors in the regressions, clustered by the state where the respondent's father grew up. t-statistics in parentheses.

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 7: Explaining Risk Aversion. Probit Results (marginal effects)

	(1) Probit	(2) IV-Probit	(3) Probit	(4) IV-Probit
Parents' edu./HS sum	–0.05***	–0.37***	–0.04***	–0.37***
	(–3.89)	(–4.33)	(–3.86)	(–4.15)
Age	–0.01***	–0.02***	–0.01**	–0.02***
	(–2.83)	(–3.53)	(–2.16)	(–3.47)
Age sq./100	0.02***	0.02***	0.02***	0.02***
	(4.63)	(3.58)	(3.64)	(4.34)
Black	0.03	–0.10*	0.03	–0.07
	(1.07)	(–1.71)	(0.94)	(–1.42)
Female	0.06***	0.02	0.07***	0.04*
	(4.12)	(0.87)	(4.55)	(1.69)
County principal component	–0.02***	0.01	–0.01*	0.01
	(–2.72)	(1.33)	(–1.94)	(1.39)
Lived with both parents	–0.06***	–0.05***	–0.05***	–0.05***
	(–2.79)	(–2.59)	(–2.73)	(–2.58)
One's education (no. years)			–0.01***	0.01
			(–3.23)	(1.34)
Log wealth (avg. 1984-1994)			0.01**	0.01***
			(2.26)	(2.96)
Log income (avg. 1984-1996)			–0.01	0.01
			(–0.47)	(0.68)
State dummies/father grew up	Yes	Yes	Yes	Yes
Region dummies/grew up	Yes	Yes	Yes	Yes
Pseudo R sq.	0.078	0.075	0.080	0.079
N	3344	3344	3253	3253

Notes: Instruments: dummies for compulsory attendance laws (when the respondents' father was 15 years old). The left-hand side variable is 1 if the respondent's risk aversion is the highest value and 0 otherwise. Robust standard errors in the regressions, clustered by the state where the respondent's father grew up. t-statistics in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 8: Explaining Risk Aversion. Imputed Parental Education. Linear Probability Regressions

	(1) OLS	(2) IV-1	(3) IV-2
Parental education (imputed)	–0.01***	–0.06***	–0.05***
	(–6.19)	(–3.12)	(–3.89)
County principal component	–0.01**	0.02*	0.01
	(–2.27)	(1.68)	(0.95)
Age	–0.01***	–0.02***	–0.02***
	(–3.22)	(–3.84)	(–4.95)
Age sq./100	0.02***	0.03***	0.03***
	(4.88)	(5.50)	(6.11)
Black	0.03	–0.10	–0.07
	(1.44)	(–1.48)	(–1.60)
Female	0.06***	0.04*	0.05**
	(4.38)	(1.89)	(2.64)
Lived with both parents	–0.05**	–0.04*	–0.04**
	(–2.42)	(–1.88)	(–2.10)
Constant	0.69***	2.12***	1.76***
	(5.87)	(3.34)	(4.87)
State dummies/father grew up	No	Yes	Yes
Region dummies/grew up	Yes	Yes	Yes
N	3349	3349	3349

Notes: The left-hand side variable is 1 if the respondent's risk aversion is the highest value and 0 otherwise. Parental education is imputed as follows: if the respondent indicates his mother or father finished 0-5 grades of schooling, we assign 2.5 years of education to the parent; if 6-8 grades—7 years; if 9-11 grades—10 years; if 12 grades, or 12 grades plus non-academic training—12 years; if college, no degree—14 years; if college degree, no advanced degree mentioned—16 years; if college, advanced or professional degree, or some graduate work; close to receiving degree—17 years. Robust standard errors in the regressions, clustered by the region where the respondent grew up in column (1), and by the state where the respondent's father grew up in columns (2)-(3). In column (1), the estimated first stage coefficients on compulsory schooling dummies are: CA9—0.425 (1.45), CA10—0.435 (1.07), CA11—1.451***(3.64); the F-statistics for the null hypothesis of joint insignificance of the instruments is 4.49***. In column (2), the estimated first stage coefficients on compulsory schooling dummies are: CA9—0.55* (1.69), CA10—0.53 (1.18), CA11—1.67***(3.58), CL6—1.02***(2.78), CL8—0.52* (1.75), CL9—0.46 (1.36); the F-statistics for the null hypothesis of joint insignificance of the instruments is 3.78***. t-statistics in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 9: Explaining Risk Aversion, Probit Regressions. Parents' Risk Tolerance in a Matched Sample (Marginal Effects)

	(1) Very Risk Averse	(2) Extremely Risk Averse
Parents' edu./HS sum	–0.04**	–0.05***
	(–2.05)	(–2.62)
Very risk tolerant parent	–0.14***	–0.06
	(–3.46)	(–1.44)
Age	–0.00	0.00
	(–0.07)	(0.43)
Black	0.02	0.02
	(0.26)	(0.85)
Female	0.10***	0.10***
	(3.00)	(2.74)
Lived with both parents	–0.06	–0.07
	(–0.91)	(–1.62)
Region dummies/grew up	Yes	Yes
Pseudo R sq.	0.036	0.038
N	599	599

Notes: 'Very risk tolerant parent' is a dummy variable equal to 1 if either the father of the mother reports a risk aversion lower than 1.5. 'Very risk averse' is a dummy variable equal to 1 if the respondent's risk aversion is one of the two highest values and 0 otherwise (roughly a 40-60 split of the sample). 'Extremely risk averse' is a dummy variable equal to 1 if the respondent's risk aversion is the highest value and 0 otherwise (roughly a 21-79 split of the sample). Robust standard errors in the regressions, clustered by the region where the respondent grew up. t-statistics in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 10: Explaining Risk Aversion. Probit Regressions. Business Ownership and Family Income in a Matched Sample (Marginal Effects)

	(1) Very Risk Averse	(2) Extremely Risk Averse	(3) Very Risk Averse	(4) Extremely Risk Averse
Parents' edu./HS sum	–0.06**	–0.06***	–0.07**	–0.06**
	(–2.47)	(–2.74)	(–2.47)	(–2.43)
Yrs fam. owned business (7-13)	–0.02**	–0.02*		
	(–2.24)	(–1.81)		
Log fam. income (avg. 7-13)			–0.01	–0.01
			(–0.30)	(–0.57)
Age	0.00	0.00	0.00	0.00
	(1.45)	(1.47)	(0.65)	(0.73)
Black	0.01	0.01	0.04	0.02
	(0.38)	(0.22)	(1.30)	(0.77)
Female	0.07*	0.06*	0.07*	0.06*
	(1.84)	(1.80)	(1.96)	(1.75)
Lived with both parents	–0.04	–0.06	–0.05	–0.05
	(–0.98)	(–1.36)	(–1.23)	(–1.00)
Region dummies/grew up	Yes	Yes	Yes	Yes
Pseudo R sq.	0.029	0.033	0.031	0.034
N	1087	1087	932	932

Notes: The two family-level variables refer to the period when the risk aversion respondent was 7 to 13 years of age. 'Very risk averse' is a dummy variable equal to 1 if the respondent's risk aversion is one of the two highest values and 0 otherwise (roughly a 50-50 split of the sample). 'Extremely risk averse' is a dummy variable equal to 1 if the respondent's risk aversion is the highest value and 0 otherwise (roughly a 31-69 split of the sample). Robust standard errors in the regressions, clustered by the region where the respondent grew up. t-statistics in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 11: Explaining Risk Aversion. Probit Regressions. Parents' Attitudes in a Matched Sample (Marginal Effects)

	(1) Very Risk Averse	(2) Extremely Risk Averse
Parents' edu./HS sum	–0.12***	–0.10**
	(–3.07)	(–2.35)
Parents' planning score	–0.06**	–0.05
	(–2.29)	(–1.61)
Parents' trust/hostility score	–0.03	0.01
	(–1.28)	(0.33)
Leader	–0.12**	–0.15***
	(–2.57)	(–3.17)
Parents hope college for kids	–0.14	–0.17
	(–1.30)	(–1.57)
Age	0.01**	0.01**
	(2.12)	(2.29)
Black	0.09	0.10
	(0.84)	(1.61)
Female	0.17**	0.13**
	(2.51)	(2.53)
Lived with both parents	–0.10	0.04
	(–0.85)	(0.39)
Region dummies/grew up	Yes	Yes
Pseudo R sq.	0.043	0.031
N	1432	1432

Notes: 'Very risk averse' is a dummy variable equal to 1 if the respondent's risk aversion is one of the two highest values and 0 otherwise (roughly a 43-57 split of the sample). 'Extremely risk averse' is a dummy variable equal to 1 if the respondent's risk aversion is the highest value and 0 otherwise (roughly a 26-74 split of the sample). Robust standard errors in the regressions, clustered by the region where the respondent grew up. t-statistics in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 12: Regressions of Volatility of the Shocks to Head's Idiosyncratic Labor Income on Risk Aversion and Demographic Controls

	(1) (OLS)	(2) (IV)
Log-risk aversion/10	–0.10***	–0.10***
	(–3.25)	(–2.78)
Black	0.01	0.01
	(0.82)	(0.50)
Female	–0.11***	–0.11***
	(–6.90)	(–6.76)
Age	0.00	0.00
	(0.08)	(0.42)
Age Sq./100	0.00	–0.00
	(0.28)	(–0.16)
Parents' edu./HS sum	0.02**	0.02
	(2.32)	(0.46)
One's education (no. years)/10	0.04*	0.03
	(1.75)	(0.80)
Married	–0.03*	–0.03*
	(–1.74)	(–1.70)
Family size	0.00	0.00
	(0.73)	(0.58)
Log net worth (avg. 1984-1994)/10	–0.03	–0.03
	(–1.37)	(–1.31)
Log income (avg. 1980-1995)	–0.13***	–0.13***
	(–9.45)	(–7.03)
Constant	1.64***	1.62***
	(12.49)	(12.04)
Adj. R sq.	0.100	0.102
N	2094	1991

Notes: Income and demographic data are drawn from the 1969–1997 annual family files of the PSID. Idiosyncratic head's income growth is the residual from the cross sectional regression of household head's log-labor income change on a third polynomial in age, education dummies (for high school dropouts, high school (but not college) graduates, college graduates), and the interaction of education dummies with the age polynomial. The sample is restricted to households with heads of ages 24–65. Female and single heads are included. We drop observations if head's labor income growth is above 700% or below –90%, or with head's real labor income below 1,000 1982-1984 dollars. The standard deviation of idiosyncratic head's income growth is calculated for the heads with more than four observations on income growth residuals over the time span of 1968–1996. Average income is the average of the sum of head's and wife's real labor income and their combined real transfer income over the time span of 1980–1995. Average real net worth is the average of the household net worth (exclusive of business net wealth) in 1984, 1989, and 1994. Instruments for parental education: CA and CL dummies (for the respondent's father, when the respondent's father was 15 years old). Robust standard errors in the regressions. t-statistics in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 13: The Volatility of Permanent Income Shocks

	Head's labor income		Household income	
	Very RA	Risk tolerant	Very RA	Risk tolerant
	(1)	(2)	(3)	(4)
St. dev. of permanent shocks, σ_P	0.234 (0.007)	0.267 (0.013)	0.152 (0.009)	0.209 (0.012)
Number of heads	1641	680	820	352
p-value for H_0 of no difference in perm. vol. in (1) and (2)	3%			
p-value for H_0 of no difference in perm. vol. in (3) and (4)	0.01%			

Notes: The first sub-sample consists of households whose head's risk aversion is higher than or equal to 5.44 (the highest two categories of the risk aversion distribution); the second sub-sample consists of households whose values of risk aversion are below 1. We recover the volatility of permanent shocks to head's idiosyncratic income by estimating the following unobserved components income model: $\Delta\ \tilde{y}_{it} = \epsilon^P_{it} + (1-L)\theta_q(L)\epsilon^T_{it}$, where $\Delta\tilde{y}_{it}$ is the first difference in head's log-idiosyncratic income, ϵ^P_{it} is the permanent innovation, ϵ^T_{it} is the transitory innovation, and q is the order of the auto-covariance in the transitory component of log-idiosyncratic head's income (we assume that $q = 1$). The model is estimated by the equally weighted minimum distance (EWMD) method, where the weighting matrix is the identity matrix. Data are drawn from the 1969–1997 annual family files of the PSID. Idiosyncratic income growth rates are defined as residuals from cross-sectional regressions of head's log-labor income changes on a third polynomial in head's age, education dummies (for high school dropouts, high school (but not college) graduates, college graduates), and the interaction of education dummies with the age polynomial. We restrict the sample to households with heads of ages 24–65. Female and single heads are included. We drop observations if income growth is above 700% or below –90%, or if head's income is below 1,000 1982–1984 dollars. Household income is the sum of combined labor incomes of the head and wife, and their combined transfer income. When analyzing the income process for household income, we drop observations if head's or wife's labor income is missing; we keep only households with married male heads, with no changes in family composition.

Table 14: Further Summary Statistics

Variable Name	Mean	Std. Dev.	Min.	Max.	N
St. dev. of head's idiosyncr. inc.	0.35	0.24	0.006	1.48	2094
Stock wealth relative to financial assets	0.21	0.33	0	1	2081
Log-Risk aversion*	1.65	1.59	–1.73	3.52	2081
Black*	0.20	0.40	0	1	2081
Female*	0.28	0.45	0	1	2081
Age*	44.4	10.34	29	90	2081
Parents' edu./HS sum*	1.32	0.82	0	2	2081
One's education (no. years)*	13.83	2.24	3	17	2081
Married*	0.63	0.48	0	1	2081
Family size*	2.82	1.42	1	9	2081
Log income (avg. 1984–1996)*	5.64	0.59	3.40	7.28	2081
Log net worth (avg. 1984–1999)*	5.54	2.35	–5.81	10.53	2081
Ever owned a business (1969–1996)	0.36	0.48	0	1	3206

Notes: *Statistics correspond to the sample used in column (1) of Table 16. Our measure of net worth excludes net business wealth.

Table 15: Probit Regressions of Business Incidence on Risk Aversion and Demographics

	(1) (Probit)	(2) (IV-Probit)
Log-Risk aversion	–0.04***	–0.05***
	(–2.93)	(–3.18)
Black	–0.48***	–0.57***
	(–7.56)	(–5.59)
Female	–0.70***	–0.69***
	(–9.54)	(–8.83)
Age	0.08***	0.08***
	(5.48)	(3.49)
Age sq./100	–0.06***	–0.06***
	(–3.69)	(–3.04)
Parents' edu./HS sum	0.08**	–0.11
	(2.42)	(–0.45)
One's education (no. years)	0.06***	0.08***
	(4.96)	(3.79)
Married	–0.06	–0.07
	(–0.76)	(–0.90)
Family size	0.04**	0.04*
	(2.12)	(1.86)
Log income (avg. 1984–1996)	–0.05	–0.01
	(–0.84)	(–0.15)
Log net worth (avg. 1984–1994)	0.03**	0.03**
	(2.55)	(2.40)
Constant	–2.96***	–3.03***
	(–5.88)	(–5.62)
Pseudo LL	–1791.12	–4831.18
χ^2	530.46***	503.31***
N	3206	3021

Notes: The dependent variable equals one if the household owns a business in any year during 1969–1996 and zero otherwise. The independent variables are measured in 1996. The sample is restricted to households with heads of age 24 and above. Instruments for parental education are CA and CL dummies (for the respondent's father, when the respondent's father was 15 years old). Robust errors in the regressions. t-statistics in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 16: Panel Tobit Regressions of Household Portfolio Share in Stocks on Risk Aversion and Demographics. Households with Stable Family Composition Between 1984–1999

	(1) (Tobit)	(2) (IV-Tobit)
Log-Risk aversion	–0.03**	–0.03**
	(–2.34)	(–2.10)
Black	–0.26***	–0.33***
	(–5.03)	(–4.06)
Female	–0.04	–0.03
	(–0.58)	(–0.55)
Age	–0.03***	–0.04***
	(–2.64)	(–3.11)
Age sq./100	0.03**	0.03***
	(2.41)	(2.83)
Parents' edu./HS sum	–0.00	–0.10
	(–0.03)	(–0.87)
One's education (no. years)	0.03***	0.04***
	(3.33)	(3.36)
Married	–0.19***	–0.20***
	(–2.65)	(–3.09)
Family size	–0.03*	–0.02
	(–1.71)	(–1.33)
1994	0.23***	0.23***
	(5.46)	(5.51)
1999	–0.04	0.00
	(–0.88)	(0.08)
Log income (avg. 1984–1996)	0.31***	0.32***
	(6.60)	(5.97)
Log net worth (avg. 1984–1999)	0.07***	0.08***
	(6.75)	(5.19)
Stock/FA$_{t-1}$	0.49***	0.46***
	(8.70)	(7.84)
Constant	–3.31***	–3.16***
	(–7.14)	(–7.36)
Pseudo LL	–1360.16	–3213.12
χ^2	544.55***	619.47***
N	2081	1963

Notes: The dependent variable is the ratio of household gross wealth in stocks to the value of household financial assets (FA). For each year—1984, 1989, 1994 or 1999—the value of gross assets is calculated as the sum of the value of stocks, mutual funds, investment trusts, money in checking and savings accounts, money market funds, certificates of deposit, government savings bonds, treasury bills, other savings or assets, such as bonds, rights in a trust or estate, cash value in a life insurance policy, valuable collections for investment purposes, and the gross value of main housing. Financial assets are calculated as gross assets less the gross value of main housing. Households that reported having a business in at least one year out of 1984, 1989, 1994 or 1999 have been removed from the sample. We restrict the sample to households with heads of age 24 and above. Instruments for parental education are CA and CL dummies (for the respondent's father, when the respondent's father was 15 years old). Robust standard errors in the IV-Tobit regressions. t-statistics in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.