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

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**Abstract**

In the Panel Study of Income Dynamics individuals' risk aversion is strongly influenced by the educational accomplishments of their parents. This observation motivates an important policy question; namely, whether attitudes such as risk aversion are partly formed by educational policy. We ask if state-level compulsory schooling laws that boosted parents' education made children less risk averse through adulthood. The answer is yes. Other significant determinants of risk aversion are age, gender, religion, and risk aversion of parents. We verify that risk aversion matters for economic behavior: it predicts individuals' volatility of income, and how likely households are to own businesses.

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# 1 Introduction

In the Panel Study of Income Dynamics (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). In this paper, we examine the determinants of risk aversion and our main finding is that parental education determines children's risk aversion.

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 of policies that increase parental education. 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 (2001), 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 (2004) seem to be the first to examine intergenerational effects of the changes in compulsory schooling, finding an effect of parental education on children's grade retention and dropping-out rates.[1]

Our focus is on the intergenerational effects of the compulsory schooling changes on risk aversion. Individuals' willingness to bear risk is important for economic outcomes. 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. The upshot

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

is that individual or even aggregate economic outcomes are dependent on attitudes towards risk taking. It is, therefore, important to study how preferences for risk taking or aversion are formed. Using instrumental variables (IV) estimation techniques, we examine if longer parental education, following tighter compulsory schooling laws, resulted in less risk aversion of children. We find that this is so. 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."

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 impacted 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] Personality theorists focus on "sensation seeking" and develop scales (e.g., Zuckerman 1979). 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

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

types of risks.[3] He also finds a correlation between instrumental risk-taking and rational thinking and future orientation. Thus, more analytical individuals would behave more risk tolerantly 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 show less risk aversion.[4] 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. Likely, such a complete map will need to be pieced together from future studies involving natural as well as planned experiments.

Our secondary results are as follows. We find, in OLS-regressions, that blacks are more risk averse than whites when we do not include measures of average income and educational level in the county where (and when) the PSID participant grew up. However, including county-level variables makes race insignificant indicating that race is correlated with the quality of the environment. In the IV-regressions, the county variables are not significant and again we do not find racial differences in risk aversion. Other significant childhood determinants of risk aversion are religion, age, and sex, with head-of-household females being more risk averse. Similar results were found by Dohmen, Falk, Huffman, Schupp, Sunde, and Wagner (2006)—using German data—although these authors do not explore neighborhood effects, nor the effects of changes on compulsory schooling laws.

Finally, we ask if risk aversion predicts economic behavior.[5] In the absence of instruments for

[3]Interestingly, the correlation seems to be stronger for women. Byrnes, Miller, and Schafer (1999) suggest that women may not be able to distinguish types of risks as well as men. Zuckerman (1994) proposes an evolutionary explanation. Men were required to make risk choices more often than women.

[4]The PSID is not well suited to address this question. A measure of IQ is available, buy 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."

[5]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 of Italian consumers.

risk aversion, we present OLS estimates.[6] 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. We find, using OLS, that tendency to own stocks is a function of agents' risk aversion in regressions that control for parental education. However, when we instrument parental education with schooling laws, we find a stronger impact of parental schooling and risk aversion turns insignificant—apparently, the role for risk aversion in explaining portfolio composition may be proxying for an effect coming from parental education.

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 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

[6]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 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 when parental education is instrumented with schooling laws.

risk aversion next.

### 2.1 Measuring risk aversion

In 1996 employed heads of household were asked about their willingness to take jobs with different income prospects. 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:

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

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 $\rho$ and $\lambda$; 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 $\rho$ in each group

[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.

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 relative coefficient of 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 where the respondent grew up. Particularly relevant for our analysis are variables relating to parents' 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/Ph.D./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. In our analysis, we also construct a combined variable for parents' education which is simply the sum of these four dummies.

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 college degrees.

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 (2001) compile information on compulsory schooling laws.[9] 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.[10] These authors document that the compulsory schooling and child labor variables vary greatly by state and over time, and correlate with individual educational attainment. 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. Moreover, for roughly 30 percent of our individuals (whose parents have also been interviewed by the PSID at one point) we know the exact year when their parents were born. For the rest, we assume the parents' age equals the respondent's age plus 25. The 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,

[9] We thank Acemoglu and Angrist for sharing their data with us.

[10] 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.

religious preference, 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.

# 3 Estimation: Determinants of Risk Aversion

## 3.1 Econometric issues

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 in which the individual grew up, while in the IV regressions we cluster based on the state in which the father grew up because the instrument varies with the variable. 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 regression is that we do not know the direction of causality if own education is correlated with risk aversion. Other potentially endogenous variables are the individual'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. To examine if our results are robust to the CRRA assumption we alternatively study the determinants of risk aversion using both a probit and an ordered logit estimator. While these estimators also depend on (statistical) assumptions, they are robust to deviations

from the CRRA assumption. We consider our findings robust if these quite different strategies result in similar conclusions to those of our initial OLS and IV regressions.

### 3.2 Descriptive statistics

Table 2 displays descriptive statistics for our main variables. In order to simplify the presentation, we have combined some less essential regressors based on pre-tests. In particular, we have combined the midwestern and southern regional dummies, and the indicators for Baptist and Lutheran religion. We do not display results for dummies for regions and religions that were consistently found to be insignificant predictors of risk aversion. The risk aversion measure has a mean of 12.4 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 19 years old. In general, the table speaks for itself but one may notice that blacks are over-sampled at 30 percent and females make up only 23 percent. This is due to the structure of the PSID where the male typically is the head of household. An implication is that females interviewed by the PSID are not typical for females in the U.S. population.

To measure the "quality" of the county where respondents grew up, we compute the county principal component, a linear combination of the four county-level variables considered—median income, education, percent of urban population, and median house value. These "components" all contribute positively to the principal component. The variable denoted "parents' education" is the sum of the 4 dummy variables for father's and mother's high school and college education. An individual will be assigned a value of 1 if either his/her father or mother finished high school, a value of 2 if both parents finished high school or one finished college while the other did not finish high school. The purpose of this variable is to simplify the analysis of the impact of parental education. We verified that the results using this variable are very similar to results obtained using the largest principal component for the 4 parental dummy variables—the interpretation of the regression results are less transparent when an education principal component is used.

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, Lutheran-Baptist, 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 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.

### 3.3 Results from OLS regressions

In Table 4, we show our results for the determinants of risk aversion. In columns (1)-(3), we include a dummy variable for the state in which the respondent grew up because attitudes that form risk may be affected by the attitudes of neighbors, teacher, relatives, etc. living near-by. In column (4), we examine if regional variation can be captured more parsimoniously using dummies for only the 4 major regions of the United States (East, Midwest, West, South). Column (1) shows that risk aversion initially declines with age and then increases. Blacks are more risk averse as are female heads. Barsky, Juster, Kimball, and Shapiro (1997) and Dohmen, Falk, Huffman, Schupp, Sunde, and Wagner (2006) also find that women are more risk averse. Parental education has a very 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). Father's college is highly significant as is mother's college.[11] Overall, the results for parents' educations reveal not only large effects but effects that are not exhausted by just one parent being highly educated. Growing up with wealthy parents (as recalled by the subject) seems to not matter. Individuals who profess to be Lutheran or Baptist are significantly more risk averse.

In column (2), we compress the parental variable dummies into one variable, which is the sum of the previous dummies. It takes values between 0 and 4 with, for example, the value 0 if no parents have finished high school and 4 if both parents have college degrees. The estimated coefficient of –0.10 implies that an individual whose parents both have college degrees is expected to have a level of risk aversion that, everything else equal, is 40 percent lower than that of an individual for whom no parents finished high school. This is a substantial effect.

[11] In a previous version, that did not include state dummies, we found a stronger effect for mother's education than for father's education. Due to high correlation between the education of parents it is hard to sort out if the education of mothers is relatively more important.

We examine the effect of the quality of the county where the respondent grew up on risk aversion. We consider median county income, the fraction of urban population, the fraction of population with a college degree, and the median house value. We found all these variables to be significant if entered one-by-one but the estimated coefficients were not robustly estimated if we included all these variables due to high collinearity (these results are not tabulated). We are, therefore, not able to separate out the effects of the different county-level variables but it is clear that individuals that grew up in "good" counties are significantly less risk averse. In column (3), we include a principal component of these variables (which all have positive loadings) and we see that the principal component, with high statistical significance, predicts risk aversion. The effect is large: the difference of the principal component between the "worst" and the "best" county is 11 units which means that growing up in the "best" rather than the "worst" county lowers log risk aversion by –0.88. One interesting result from including the county variables is that race turns insignificant. The implication is that blacks are not inherently more risk averse than whites; rather, blacks tend to live in predominantly poorer counties and growing up in such counties results in a higher level of risk aversion.

In columns (4) and (5), we drop the state dummies and add regional dummies. Our preferred specification included state dummies but it can be seen from this column that the effect of parental education is not dependent on this choice.

Table 5 examines if the OLS results are sensitive to the inclusion of potentially endogenous regressors that are likely to affect risk aversion. The exclusion of such variables could result in left-out variable bias in Table 4. We find that individuals with high education are significantly less risk averse even though we do not rule out that this may be due to reverse causality; for example, if people consider investing in education to be risky. Including this variable lowers the significance of many regressors a bit but not by much. A priori, one might worry that the estimated effect of parental education would be sensitive to the inclusion of own education but this variable retains its very strong significance. Own income and own wealth significantly predicts high risk aversion (perhaps because of reverse causation). The inclusion of these variables, however, does not change the estimated impact of the exogenous variables noticeably. We also attempt to see if individuals with higher ability, as measured by the IQ measure included in the PSID, have lower risk aversion but this variable is only significant at the 10 percent level in some specifications—maybe because it does not capture mathematical IQ well. We conclude

that the OLS regressions are robust to the most likely forms of left-out variable bias. Finally, column (5) shows that the results are unchanged if we include a dummy for the current state of residence, rather than the state in which the respondent grew up.

The overall impression is that age and sex affect risk aversion. Parental education is a very strong predictor for risk aversion as are broader environmental factors such as the "quality" of the county of childhood and the region where the person grew up. The OLS regressions show the effects of exogenous variables on risk aversion. However, one has to be very careful in interpreting the results when predicting the impact of a policy induced change in parents' education or quality of the county. Parents' education is a choice variable for the parents and whether, say, parents have a high school degree will be a function of the general attitude towards education in the family (maybe reflecting the value of investing in education), and things such as parents' abilities or attitudes. Growing up in a wealthy county may also be a choice of the parents—a very large literature on the impact of schooling on economic outcomes grabbles with this and other problems arising from education not being randomly assigned to individuals (see, e.g., Card 2001).

### 3.4 Results from IV regressions

In order to examine if educational policy affects offspring's risk aversion, we apply instrumental variables estimation using instruments that changed parental education without affecting parental abilities or endowments, namely the changes in compulsory schooling and child labor laws used by Acemoglu and Angrist (2001). We start from the specification of column (3) in Table 4 which compresses the parental education dummies into one variable (the sum of the dummies).

First, we need to establish that the instruments are able to predict the level of parental education with reasonable significance. Table 6 shows the results of first stage regressions of parents' education on the compulsory schooling law variables together with the exogenous variables. The columns reflect the different specifications and samples to be explained in connection with the second stage regression but in all columns it is clear that the instrumental variables, in particular CA11 (a dummy equal to 1 if the state where the respondent's father grew up required 11 years of schooling attendance when the father was 15 years old), are highly significant. CA and CL dummies for mothers are absent because they are not significant once the dummies for

fathers are included.[12] The correlation for fathers and mothers CA is 0.7, while the correlation for mothers and fathers CL is 0.75. The sign of CL variables is not intuitive, and is due to the high correlation with the CA variables. For the purpose of IV estimation, however, the sign of the individual coefficient is less important and our results are less strong if we restrict ourselves to using only CA variables when dummies for the state in which the father grew up are included.

In Table 7, we turn to the second stage IV estimation results. OLS results are presented in the first column for easy reference. In column IV-1, we instrument the parental education variable with the compulsory schooling/child labor laws in the state where the parents grew up. The point estimate for the impact of education is now six times as large as 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. A child whose parent moves up one educational category is likely to have a log-risk aversion coefficient that is 0.68 lower. It is striking that state schooling laws that occurred on average 50 years before the measuring of risk aversion in 1996 still have significant explanatory power.

In the instrumented regressions, the county principal component is now estimated to have a much lower impact and is far from significant. In column IV-2, we display the estimates when the county variable is left out which allows for a larger sample but the results are virtually unchanged. In column IV-4 we leave out the dummy for the state where respondents' fathers grew up which results in a slightly lower but still clearly significant coefficient.

Our interpretation of the difference between the OLS results and the IV results in Table 7 is that the coefficient to "parents' education" in the OLS estimates is smaller because parental education is a function of many factors beyond required schooling and the estimated IV-coefficient is larger because it isolates the effect of compulsory schooling.[13] The county variables are positively correlated with schooling and since the OLS estimate of parents' schooling is numerically "too low" the county principal component will, in the OLS setting, be significant as it captures some of the correlation between risk aversion and schooling. If this interpretation is correct, growing up in a "good" county does not have an independent effect on risk aversion.

An alternative explanation of why estimated returns to schooling using IV exceed estimated returns with OLS is that the IV coefficient is capturing higher gains from schooling for a peculiar

[12] If the father is absent the instruments correspond to the mother.

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

group amongst the more general population, the group affected by the compulsory schooling laws. Although we cannot rule out this explanation, Oreopoulos (2006), using data for the U.K. and a change in schooling laws that affected the majority of the population, finds a similar result concluding that the average treatment effect in the U.K. is, in fact, of similar magnitude to the marginal treatment effect found in the U.S. In any event, the main goal of the present paper is to demonstrate that changes in compulsory schooling laws can affect children's risk aversion many years later and this result is important even if the main impact was disproportionately on certain, maybe disadvantaged, segments of the population.

### 3.5 Results from probit and ordered logit regressions

A large fraction of the variation in risk aversion comes from the difference between highly risk averse individuals and other individuals. In the left-most four columns of Table 8 we demonstrate that the difference between the highly risk averse individuals and others is highly significant. We compress the information in the six risk aversion categories into two, which we refer to as "very risk averse individuals" versus "less risk averse individuals." The sample in the first category consists of heads with the highest value for risk aversion, while the remaining respondents comprise the sample in the second category. We then use a probit model to examine the probability that individuals are very risk averse. The results are similar to those obtained with the linear model. Parents' education is a strong predictor of risk aversion. If instrumental variable techniques are used, the point estimate is larger and significant at the 1 percent level. It appears that high parental education chiefly affects risk aversion by lowering the probability that children will become *very* risk averse.

The results of the probit estimations do not rely on the functional form of agents utility functions. To further examine if our results are robust to the CRRA assumption, we analyze the determinants of risk aversion using an ordered logit estimator—see the last four columns in Table 8. The overall pattern in the estimated coefficients is similar to that of the previous models with significant estimates for parents' education (in all specifications) which are larger when instrumented. Race is not robustly significant in this table—only age, sex, and parental education are significant at the 1 percent level in all columns.

### 3.6 Results from matched samples

The particular structure of the PSID, that 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 675 respondent/father pairs and 330 respondent/mother 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. Of course, more risk tolerant parents may be more educated making it hard to disentangle the two effects.[14]

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 6.8) and age is not significant (see column (1) in Table 9). The parental education variable has the right sign in IV regressions but it is far from significant (results not tabulated here for brevity), indicating that compulsory schooling laws have less of an effect on these individuals who are significantly younger on average. Therefore, Table 9 only presents (non-instrumented) linear and probit regressions. Given that the sample is small, we do not attempt to separate the effect of fathers' and mothers' risk aversion and we construct a single dummy variable "very risk tolerant parent" equal to 1 if either the respondent's father or mother have risk aversion below 1.5, comprising the three lowest values of risk aversion. According to this measure, about 23 percent of the respondents have very risk tolerant parents.

Column (2) of Table 9 shows that parents' education has a negative significant effect on risk aversion while parents risk tolerance is a near significant determinant of offspring risk aversion. Similar results are found by Charles and Hurst (2003). However, the result is not quite robust to the inclusion of the county principal component which limits the sample size even more; see column (4). Columns (5)-(8) present probit regressions, perhaps more appropriate given the sample size. In these regressions, the probability of being very risk averse decreases nearly significantly with parental education and significantly with parental risk tolerance.[15] Given the small sample, the results quite convincingly imply that attitudes towards risk are strongly correlated between parents and their offspring.

[14]The simple correlation for risk aversion and the college dummies is –0.11 for fathers and –0.08 for mothers.

[15]We here define "more risk averse" to include agents with a risk aversion coefficient of 5.44 or 33.9 (the two highest categories). We chose this split to obtain groups of about equal size.

In Table 10, we analyze the effect on risk aversion of family business ownership (a potentially risky venture) when the respondent was a child. However, we drop parental risk aversion in order to get a larger sample size. Some of the youngest respondents to the risk aversion question grew up "within" the PSID panel and we can directly observe family characteristics when the individual was a child. 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). Business ownership has a clear effect on risk aversion, even after controlling for parental education. This finding confirms our previous result that children may become more risk tolerant from interacting with risk taking parents. Table 10, columns (4) and (7), show that parental income when the respondent was a child does not predict risk aversion once we control for parental education.

Lastly, 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. Some parental attitudes may have an affect on risk aversion beyond the effect of parental schooling. On the other hand, parental schooling may affect children's risk aversion by changing parental attitudes. The variables we consider are: (1) A parental planning score, which measures parents' future orientation. (2) A trust/hostility score, to some extent a measure of positiveness. (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 to finish college). Exact variable definitions are provided in Appendix A.[16]

Table 11 presents the results. The leader dummy clearly has significant effects on children's risk aversion. While the educational aspirations variable is significant at the 5 percent level when parental education dummies are left out, it becomes insignificant when the parental education measures are included while the parental education variable itself retains its significance.[17]

Overall, the results of the matched regressions indicate that parental attitudes—in partic-

[16]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.

[17]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. 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.

ular 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 household 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.[18]

## 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, being usually unobserved, 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 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, should save more. Skinner accepts the possibility that self-employed and salesmen, having more volatile incomes, are at the same time more tolerant towards risks and

[18] Benjamin, Brown, and Shapiro (2005) find a relation between cognitive ability and risk aversion. Individuals with high cognitive ability may be less risk averse because they are able to plan better in the face of uncertainty. We, therefore, examine if the results in this part of the paper are robust to the inclusion of (children's) planning score. However, the outcomes we consider are not impacted significantly by the planning score and the significance of risk aversion is not very sensitive to whether this measure is included. We, therefore, do not tabulate these results.

that self-selection bias might lead to the finding of lower average savings for professions with larger income volatility.[19] 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 head-of-household labor income. Specifically, we relate the variation in risk aversion to the volatility of idiosyncratic head-of-household labor income. We define idiosyncratic head's labor income, as is typical in the literature, as the residual from a cross sectional regression of log head's labor labor income on the education of the head, dummies for the household state of residence, marital status, race, sex of the head, and a second degree polynomial in head's age. For these regressions, we use data from the 1969–1997 annual family files of the PSID.

Table 12 presents the results of OLS estimation of the volatility of idiosyncratic head-of-household labor income on risk aversion and demographic controls.[20] As can be seen in column (1), risk aversion is significantly negatively related to volatility of the 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.[21] Thus, the significance of the OLS coefficient may signal a strong and important effect of risk aversion on head's income volatility. We also find that blacks have more volatile incomes as do male heads, while married, high earnings, wealthy and more educated 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. The negative relation between education and the volatility of

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

[20] Parental education is not a satisfactory instrument in this regression since it may directly affect the head's income volatility through other channels, invalidating the exclusion restriction of an instrumental variables regression. 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.

[21] Heads with high income volatility may choose safer gambles in the PSID, producing a positive correlation between risk aversion and the head's income volatility. This should induce a positive covariance between risk aversion and residuals in the OLS regression in Table 12, bias the coefficient towards zero and inflate its standard error.

the idiosyncratic head-of-household labor income is well-known in the literature (e.g., Meghir and Pistaferri 2004). In column (2) of Table 12, we present results instrumenting parental risk aversion with compulsory schooling laws. Risk aversion retains its significance and importance, indicating that it has an effect on the head's income volatility beyond that induced by parental education.

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 wealth accumulation 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 or an auto-regressive process.

We estimate the volatility of permanent shocks to idiosyncratic income for households with more risk averse heads and less risk averse heads separately. Specifically, we split our sample into two sub-samples. The first sub-sample comprises households whose values of risk aversion are above the 50th percentile of the risk aversion distribution. We label these households "more risk averse" households. The second sub-sample consists of households whose values of risk aversion are below the 50th percentile of the risk aversion distribution. We label these households "less risk averse" households. We first estimate the volatility of permanent shocks to income assuming that the transitory component is white noise. The results are presented in columns (1)-(2) of Table 13 for head-of-household income. Alternatively, we estimate the relation assuming the transitory component is a moving average process of order one, since there is some empirical evidence in favor of this specification (e.g., Abowd and Card 1989, Meghir and Pistaferri 2004). The results of these estimations are presented in columns (3)-(4) 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 hy-

pothesis that the volatility of permanent shocks is the same for heads with different degrees of risk aversion can be rejected at the 2 percent level for head's idiosyncratic labor income. We conclude that risk aversion is negatively correlated with the volatility of permanent shocks to income and that the self-selection phenomenon emphasized in the precautionary savings literature is empirically relevant for this dataset.

### 4.2 Risk aversion and household portfolio composition

We now turn to the investigation of the effect of risk aversion on the composition of household portfolios. 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. For robustness, we use three different measures for the size a household portfolio: financial assets, gross assets, and net worth exclusive of net business wealth. A priori, we expect to find the clearest relation between risk aversion and the portfolio share in risky assets when the size of the portfolio is measured by financial assets alone. Non-financial assets are dominated by housing equity which is quite illiquid and net worth is a more problematic measure because it can be negative or close to 0.

For each year—1984, 1989, 1994, or 1999—the value of gross 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, valuable collections for investment purposes, and the gross value of the main residential property. Financial assets are calculated as gross assets less the gross value of housing. 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 enterprizes (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. The main results for panel Tobit regressions are shown in columns (1)-(3) of Table 15. The results are estimated for a sample

of PSID households with stable family composition between 1984–1999 and heads of 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 15. We find significant coefficients for these lagged controls with the holding of stock relative to financial assets showing the highest persistence (with a coefficient to the lagged stock share of 0.43) and the holding of stock relative to net worth showing no persistence.

Risk aversion is a significant determinant of household holdings of stocks—as also found by Barsky, Juster, Kimball, and Shapiro (1997). The 1994 dummy is statistically significant in all specifications. Households with more educated heads and more educated parents hold larger shares in stocks. In columns (4)-(6) of Table 15, we present the results of the same regressions, instrumenting parental risk aversion with compulsory schooling laws. In these regressions, the risk aversion coefficient is still negative but turns to be statistically insignificant, while the effect of parental education becomes larger. Perhaps, the effect of risk aversion on stock holdings found in OLS regressions is a proxy for an effect coming from parental education. The coefficients on net worth and average income indicate that wealthier households have a larger proclivity to hold their wealth in stocks, which is a well-known result in the literature on household portfolios (e.g., Campbell 2006). A larger family size is associated with smaller holdings of stocks.

### 4.3 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 (2003), 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 households own a business or not. Column (1) in Table 16 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. In column (3), we report results for a panel probit regression of business incidence during the same time span—in this case we include multiple observations for the same household if the head reports owning a business in different years. Column (4) presents results for the panel sample when parental education is instrumented. 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 and sex of the head. Black heads 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 an effect of some unmeasured skills relevant for running a business or knowledge of business opportunities.

In conclusion, we find that more risk tolerant households are more likely to choose careers with more volatile income streams and to own businesses. High risk aversion may also predict low 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.

We arrived at some other clear conclusions: older individuals and female heads of household 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, less likely to hold stocks in their portfolios, 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 a some college or more education.

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

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

**Lutheran-Baptist:** dummy variable. 1 if the respondent reports his/her religious preference is Lutheran or Baptist.

**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:** a dummy variable equal to 1 if either the respondent's father or the respondent's mother risk aversion is 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.

**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:** A dummy variable equal to 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.

**IQ score:** respondent's IQ score as calculated by the PSID staff from a sentence completion test administered in 1972. A point is given for each correct reply. Scores range from 0 to 13. Variables V2730-V2743 in the 1972 interview.

**Parents hope college for kids:** dummy variable equal to 1 if 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 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, $\tau_{it}$, and a transitory moving average component, $c_{it}$ (see Guiso, Pistaferri, and Schivardi (2005), Carroll and Samwick (1997), Hryshko (2006), Meghir and Pistaferri (2004) for empirical analysis of this income process on micro data and its empirical validation):

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

$\epsilon^P_{it}$ is a permanent shock to log-idiosyncratic income for head $i$ at time $t$; $\epsilon^T_{it}$ 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 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:

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

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, $\sigma_P^2$, if the income process contains a random walk and a stationary component modeled as a moving average or an auto-regressive process. We estimate the volatility of permanent shocks to idiosyncratic head income by the equally weighted minimum distance method (EWMD), calculating an empirical analog of the identifying condition in equation (2) for a sample of PSID households. The details of our sample selection are as follows. We select households with heads aged 24–65 and drop observations with an absolute percentage change in the income residual greater than or equal to 200 percent. 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 income difference.

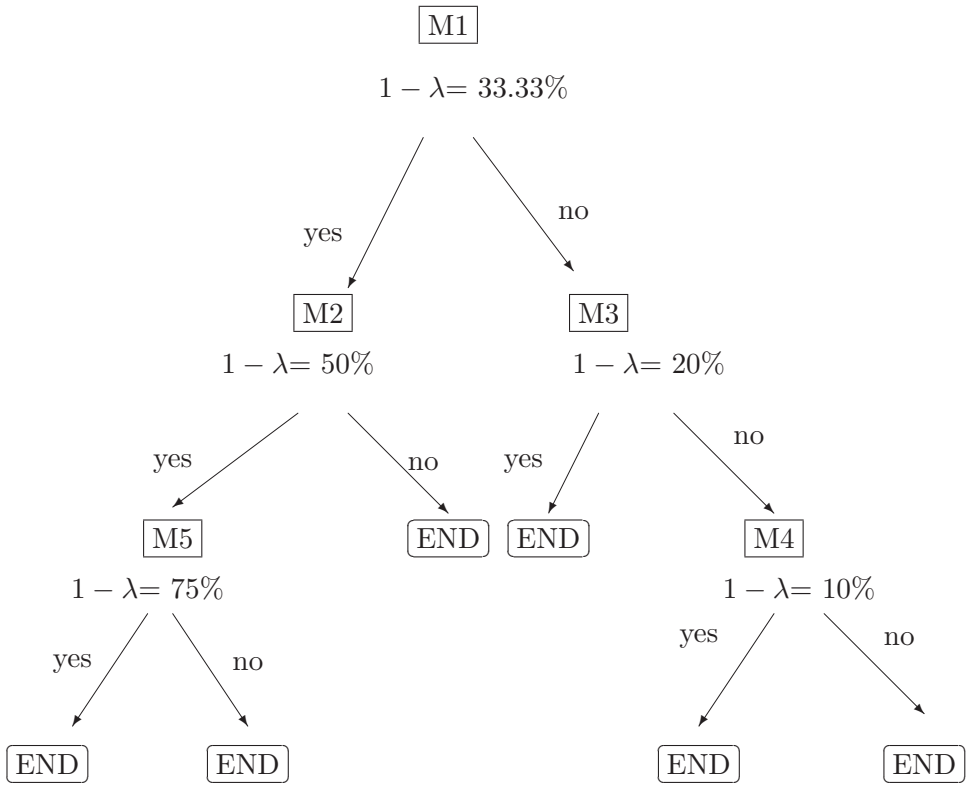


FIGURE 1: SEQUENCING OF QUESTIONS FROM THE 1996 PSID SUPPLEMENT ON RISK AVERSION

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

Table 1: Risk Aversion Mapping from the Survey Questions

| | | Relative Risk Aversion | | | | |
|---|---|---|---|---|---|---|
| Group | Answers | lower bound | upper bound | mean | $N$ | Percent |
| 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 | $\infty$ | 33.9 | 1,741 | 31.31 |

Table 2: Summary statistics

| Variable Name | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Risk aversion | 12.39 | 14.68 | 0.18 | 33.95 | 3721 |
| Log-Risk aversion | 1.45 | 1.66 | -1.72 | 3.52 | 3721 |
| Age | 41.08 | 10.88 | 19 | 87 | 3721 |
| Black | 0.3 | 0.46 | 0 | 1 | 3721 |
| Female | 0.23 | 0.42 | 0 | 1 | 3721 |
| Mother high school | 0.65 | 0.48 | 0 | 1 | 3721 |
| Father high school | 0.56 | 0.5 | 0 | 1 | 3721 |
| Mother college | 0.24 | 0.43 | 0 | 1 | 3721 |
| Father college | 0.25 | 0.43 | 0 | 1 | 3721 |
| Parents' edu./dummies sum | 1.7 | 1.4 | 0 | 4 | 3721 |
| Lutheran-Baptist | 0.38 | 0.49 | 0 | 1 | 3721 |
| Lived with both parents | 0.78 | 0.41 | 0 | 1 | 3716 |
| City | 0.39 | 0.49 | 0 | 1 | 3707 |
| Rich parents | 0.27 | 0.44 | 0 | 1 | 3633 |
| County med. income | 19,809 | 6,902 | 1,954 | 43,062 | 3721 |
| County urb. pop % | 0.65 | 0.32 | 0 | 1 | 3721 |
| % County college grad. | 0.12 | 0.05 | 0.03 | 0.43 | 3721 |
| County med. house value | 39,994 | 18,327 | 3,171 | 15,1340 | 3721 |
| County principal component | 0.02 | 1.67 | -6.28 | 5.24 | 3721 |
| Grew up in Midwest/South | 0.71 | 0.45 | 0 | 1 | 3721 |
| Grew up in West | 0.12 | 0.33 | 0 | 1 | 3721 |
| One's education (no. years) | 13.25 | 2.33 | 3 | 17 | 3682 |
| Log income (avg. 1984-1996) | 10.04 | 0.86 | 2.59 | 12.79 | 3721 |
| Log wealth (avg. 1984-1994) | 4.4 | 3.07 | -7.33 | 10.72 | 3662 |
| IQ score (respondent's) | 9.46 | 2.32 | 0 | 13 | 2719 |
| Very risk tolerant parent | 0.23 | 0.42 | 0 | 1 | 970 |
| Yrs fam. owned business (7-13) | 0.64 | 1.55 | 0 | 7 | 1401 |
| Log fam. income (avg. 7-13) | 10.11 | 0.72 | 4.75 | 12.61 | 1206 |
| Parents' planning score | 3.12 | 1.57 | 0 | 6 | 2100 |
| Parents' trust/hostility score | 2.45 | 1.29 | 0 | 5 | 2100 |
| Leader | 0.60 | 0.49 | 0 | 1 | 2100 |
| Parents hope college for kids | .41 | .49 | 0 | 1 | 2100 |

*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) | (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Log-Risk aversion | 1.00 | | | | | | | | | | | | | |
| (2) Parents' education | –0.17 | 1.00 | | | | | | | | | | | | |
| (3) County prin.comp. | –0.17 | 0.37 | 1.00 | | | | | | | | | | | |
| (4) Age | 0.18 | –0.30 | –0.43 | 1.00 | | | | | | | | | | |
| (5) Black | 0.08 | –0.32 | –0.08 | –0.06 | 1.00 | | | | | | | | | |
| (6) Female | 0.06 | –0.06 | –0.02 | –0.01 | 0.25 | 1.00 | | | | | | | | |
| (7) Lived with both parents | –0.03 | 0.06 | –0.01 | 0.05 | –0.20 | –0.08 | 1.00 | | | | | | | |
| (8) Lutheran–Baptist | 0.09 | –0.18 | –0.18 | –0.04 | 0.37 | 0.09 | –0.10 | 1.00 | | | | | | |
| (9) Rich parents | –0.05 | 0.23 | 0.14 | –0.17 | –0.03 | –0.01 | 0.04 | 0.00 | 1.00 | | | | | |
| (10) Grew up in city | –0.04 | 0.09 | 0.44 | –0.05 | 0.17 | 0.04 | –0.10 | –0.03 | 0.01 | 1.00 | | | | |
| (11) Grew up in West | –0.05 | 0.16 | 0.24 | –0.03 | –0.14 | –0.01 | –0.05 | –0.12 | 0.02 | 0.11 | 1.00 | | | |
| (12) Grew up Midwest/South | 0.04 | –0.19 | –0.33 | –0.02 | 0.28 | 0.05 | –0.03 | 0.28 | –0.03 | –0.08 | –0.57 | 1.00 | | |
| (13) Compulsory schooling law | –0.10 | 0.22 | 0.25 | –0.28 | –0.23 | –0.07 | 0.02 | –0.18 | 0.06 | 0.04 | 0.05 | –0.19 | 1.00 | |
| (14) Child labor law | –0.08 | 0.16 | 0.22 | –0.29 | –0.12 | –0.04 | 0.00 | –0.11 | 0.07 | 0.05 | 0.02 | 0.01 | 0.64 | 1.00 |

Table 4: Explaining Risk Aversion. OLS Regressions

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Age | –0.01 | –0.00 | –0.02 | –0.02 | –0.02 |
| | (–0.49) | (–0.43) | (–1.19) | (–1.69) | (–1.69) |
| Age sq./100 | 0.03*** | 0.03** | 0.04** | 0.04** | 0.04** |
| | (2.71) | (2.64) | (2.47) | (3.42) | (3.39) |
| Black | 0.14* | 0.13* | 0.09 | 0.09 | 0.09 |
| | (1.97) | (1.90) | (1.37) | (2.00) | (2.11) |
| Female | 0.11* | 0.11* | 0.18** | 0.19** | 0.19** |
| | (1.79) | (1.76) | (2.57) | (5.56) | (5.60) |
| Father high school | 0.01 | | | | |
| | (0.13) | | | | |
| Father college | –0.18*** | | | | |
| | (–2.99) | | | | |
| Mother high school | –0.11 | | | | |
| | (–1.63) | | | | |
| Mother college | –0.13* | | | | |
| | (–1.86) | | | | |
| Parents' edu./dummies sum | | –0.10*** | –0.10*** | –0.10*** | –0.10*** |
| | | (–4.78) | (–4.32) | (–6.87) | (–7.03) |
| Lived with both parents | –0.04 | –0.04 | | | |
| | (–0.56) | (–0.57) | | | |
| City | –0.08 | –0.08 | | | |
| | (–1.62) | (–1.57) | | | |
| Lutheran-Baptist | 0.13** | 0.14** | 0.16** | 0.17** | 0.17** |
| | (2.23) | (2.28) | (2.57) | (4.89) | (4.85) |
| Rich parents | 0.02 | 0.02 | | | |
| | (0.28) | (0.27) | | | |
| County principal component | | | –0.08*** | –0.08** | –0.08** |
| | | | (–3.58) | (–3.92) | (–4.07) |
| Grew up in Midwest/South | | | | | –0.13** |
| | | | | | (–5.05) |
| Grew up in West | | | | | –0.15*** |
| | | | | | (–18.82) |
| Constant | 1.09*** | 1.10*** | 1.20*** | 1.65** | 1.65** |
| | (3.79) | (3.89) | (3.36) | (5.34) | (5.41) |
| State dummies/grew up | Yes | Yes | Yes | No | No |
| Adj. R sq. | 0.055 | 0.055 | 0.058 | 0.057 | 0.057 |
| F | 26.8*** | 33.52*** | 36.91*** | 22.15** | 30.55** |
| N | 4444 | 4444 | 3721 | 3721 | 3721 |

*Notes:* 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 state where the respondent grew up in columns (1)-(3) and by the region where the respondent grew up in columns (4)-(5). t-statistics in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 5: Explaining Risk Aversion. OLS Regressions. Robustness

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Parents' edu./dummies sum | –0.10*** | –0.08*** | –0.11*** | –0.09*** | –0.10*** |
| | (–4.49) | (–4.12) | (–4.91) | (–4.08) | (–3.54) |
| County principal component | –0.08*** | –0.08*** | –0.09*** | –0.09*** | –0.06** |
| | (–3.31) | (–3.17) | (–3.30) | (–3.29) | (–2.46) |
| Age | –0.02 | –0.04** | –0.03** | –0.05*** | –0.05*** |
| | (–1.46) | (–2.30) | (–2.24) | (–3.00) | (–3.00) |
| Age sq./100 | 0.05*** | 0.05*** | 0.06*** | 0.06*** | 0.07*** |
| | (2.76) | (3.29) | (3.40) | (3.75) | (3.99) |
| Black | 0.09 | 0.16** | 0.03 | 0.10 | 0.09 |
| | (1.32) | (2.46) | (0.35) | (1.13) | (1.07) |
| Female | 0.17** | 0.32*** | 0.23*** | 0.36*** | 0.38*** |
| | (2.41) | (3.93) | (2.97) | (4.08) | (4.27) |
| Lutheran-Baptist | 0.16** | 0.15** | 0.19** | 0.18** | 0.16*** |
| | (2.46) | (2.36) | (2.53) | (2.43) | (2.86) |
| One's education (no. years) | | –0.06*** | | –0.06*** | –0.06** |
| | | (–3.96) | | (–3.35) | (–2.53) |
| Log income (avg. 1984-1996) | | 0.15*** | | 0.15*** | 0.16*** |
| | | (3.61) | | (2.87) | (2.93) |
| Log wealth (avg. 1984-1994) | | 0.03*** | | 0.03** | 0.03** |
| | | (3.45) | | (2.46) | (2.62) |
| IQ | | | –0.03* | –0.03* | –0.02 |
| | | | (–1.88) | (–1.80) | (–1.27) |
| Constant | 1.27*** | 0.64 | 1.71*** | 1.13** | 1.05* |
| | (3.52) | (1.25) | (4.66) | (2.23) | (1.75) |
| State dummies/grew up | Yes | Yes | Yes | Yes | No |
| State dummies/current | No | No | No | No | Yes |
| Adj. R sq. | 0.058 | 0.068 | 0.070 | 0.080 | 0.086 |
| F | 39.0*** | 31.1*** | 42.1*** | 33.9*** | 31.1*** |
| N | 3626 | 3626 | 2651 | 2651 | 2645 |

*Notes:* 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 state 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 6: First Stage Regressions for IV-Estimation

| | IV-1 | IV-2 | IV-3 |
|---|---|---|---|
| CA9 | 0.20* | 0.16* | 0.19** |
| | (1.95) | (1.69) | (2.48) |
| CA10 | 0.17* | 0.16* | 0.16** |
| | (1.73) | (1.83) | (2.40) |
| CA11 | 0.30*** | 0.26** | 0.29*** |
| | (2.86) | (2.68) | (2.89) |
| CL7 | –0.29*** | –0.30*** | –0.23*** |
| | (–2.78) | (–3.07) | (–2.73) |
| CL8 | –0.09 | –0.12* | –0.08 |
| | (–1.08) | (–1.80) | (–1.18) |
| CL9 | –0.16 | –0.12 | –0.09 |
| | (–1.10) | (–1.04) | (–0.90) |
| County principal component | 0.13*** | | |
| | (8.69) | | |
| Age | –0.06*** | –0.05*** | –0.06*** |
| | (–4.01) | (–3.86) | (–3.83) |
| Age sq./100 | 0.03** | 0.02 | 0.02 |
| | (2.04) | (1.25) | (1.29) |
| Black | –0.72*** | –0.66*** | –0.69*** |
| | (–9.95) | (–8.83) | (–9.98) |
| Female | 0.07 | 0.07 | 0.06 |
| | (1.36) | (1.40) | (1.29) |
| Constant | 3.88*** | 3.67*** | 3.70*** |
| | (11.72) | (11.13) | (10.94) |
| States dummies/father grew up | Yes | Yes | No |
| States dummies/grew up | Yes | Yes | Yes |
| Adj. R sq. | 0.285 | 0.259 | 0.252 |
| F | 2.85** | 2.92** | 3.09** |
| N | 3519 | 4265 | 4265 |

*Notes:* The left-hand side variable is parents' education (sum of dummies). CA9, CA10, CA11, CL7, CL8, CL9 are the dummies that capture compulsory schooling laws as proposed by and defined in Appendix A. Robust standard errors in the regressions, clustered by the state where the respondent's father grew up. t-stats in parentheses.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 7: Explaining Risk Aversion. Instrumenting for Parents' Education

| | OLS | IV-1 | IV-2 | IV-3 |
|---|---|---|---|---|
| Parents' edu./dummies sum | –0.11*** | –0.68*** | –0.61** | –0.55** |
| | (–3.98) | (–2.72) | (–2.55) | (–2.37) |
| County principal component | –0.08*** | –0.01 | | |
| | (–3.32) | (–0.13) | | |
| Age | –0.03** | –0.06*** | –0.04** | –0.04* |
| | (–2.03) | (–2.78) | (–2.39) | (–1.92) |
| Age sq./100 | 0.05*** | 0.07*** | 0.05*** | 0.05*** |
| | (3.49) | (3.52) | (3.61) | (3.39) |
| Black | 0.07 | –0.34* | –0.25 | –0.23 |
| | (1.16) | (–1.83) | (–1.65) | (–1.38) |
| Female | 0.16*** | 0.20*** | 0.16*** | 0.15** |
| | (3.31) | (3.21) | (2.75) | (2.63) |
| Lutheran-Baptist | 0.17*** | 0.13* | 0.10 | 0.11 |
| | (3.30) | (1.90) | (1.49) | (1.65) |
| Constant | 1.48*** | 3.79*** | 3.04*** | 2.85*** |
| | (4.56) | (3.58) | (3.29) | (2.84) |
| States dummies/father grew up | Yes | Yes | Yes | No |
| States dummies/grew up | Yes | Yes | Yes | Yes |
| F | 25.93*** | 43.49*** | 68.62*** | 72.77*** |
| N | 3519 | 3519 | 4265 | 4265 |

*Notes:* The left-hand side variable is the logarithm of the computed coefficient of relative risk aversion. Instruments: CA and CL dummies (for the respondent's father, when the respondent's father was 15 years old). 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 8: Explaining Risk Aversion. Probit and Ordered Logit Results

| | Probit | IV-Probit | | | Ologit | IV-Ologit | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Parents' edu./dummies sum | –0.09*** | –0.48*** | –0.50*** | –0.49*** | –0.12*** | –0.84*** | –0.69** | –0.62** |
| | (–3.46) | (–2.66) | (–3.43) | (–3.40) | (–4.03) | (–2.74) | (–2.53) | (–2.55) |
| County principal component | –0.06*** | –0.01 | | | –0.10*** | –0.00 | | |
| | (–2.98) | (–0.16) | | | (–3.56) | (–0.06) | | |
| Age | –0.04*** | –0.06*** | –0.04*** | –0.04*** | –0.05*** | –0.09*** | –0.06*** | –0.05*** |
| | (–3.23) | (–4.25) | (–3.17) | (–3.60) | (–2.59) | (–3.62) | (–2.64) | (–2.66) |
| Age sq./100 | 0.06*** | 0.07*** | 0.06*** | 0.05*** | 0.08*** | 0.10*** | 0.08*** | 0.08*** |
| | (4.73) | (5.50) | (4.49) | (4.56) | (3.92) | (4.62) | (4.51) | (4.53) |
| Black | 0.06 | –0.23 | –0.23** | –0.23** | 0.09 | –0.44* | –0.28 | –0.26 |
| | (1.30) | (–1.53) | (–2.21) | (–2.09) | (1.23) | (–1.90) | (–1.58) | (–1.46) |
| Female | 0.14*** | 0.16*** | 0.14*** | 0.13*** | 0.19*** | 0.23*** | 0.17*** | 0.16*** |
| | (3.39) | (4.05) | (3.73) | (3.40) | (3.05) | (3.68) | (2.97) | (2.86) |
| Lutheran-Baptist | 0.14*** | 0.11** | 0.06 | 0.07 | 0.19*** | 0.15** | 0.12* | 0.13* |
| | (3.25) | (2.56) | (1.43) | (1.35) | (3.36) | (2.42) | (1.94) | (1.95) |
| State dummies/father grew up | Yes | Yes | Yes | No | Yes | Yes | Yes | No |
| State dummies/grew up | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Pseudo R sq. | 0.077 | 0.073 | 0.069 | 0.057 | 0.029 | 0.028 | 0.025 | 0.021 |
| $\chi^2$ | 394.99*** | 396.40*** | 400.74*** | 422.25*** | 420.48*** | 278.00*** | 264.24*** | 277.73*** |
| N | 3500 | 3500 | 4245 | 4245 | 3519 | 3519 | 4265 | 4265 |

*Notes:* Instruments: Dummies for compulsory schooling laws (when the respondents' father was 15 years old). In the Probit specification 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 9: Explaining Risk Aversion. Parents' Risk Tolerance in a Matched Sample

| | OLS | | | | Probit | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Parents' edu./dummies sum | –0.06 | –0.07** | –0.08* | –0.05 | –0.06 | –0.06* | –0.08* | –0.08 |
| | (–1.56) | (–2.09) | (–1.98) | (–1.05) | (–1.41) | (–1.71) | (–1.82) | (–1.57) |
| Black | 0.07 | | | | 0.09 | | | |
| | (0.43) | | | | (0.65) | | | |
| Very risk tolerant parent | –0.23 | –0.23 | –0.22 | –0.28 | –0.27** | –0.28** | –0.25* | –0.37** |
| | (–1.43) | (–1.43) | (–1.31) | (–1.38) | (–2.00) | (–2.05) | (–1.85) | (–2.17) |
| County principal component | | | | –0.17** | | | | –0.09 |
| | | | | (–2.11) | | | | (–1.55) |
| Age | 0.00 | | | | –0.00 | | | |
| | (0.38) | | | | (–0.00) | | | |
| Female | 0.05 | 0.06 | 0.07 | 0.21 | 0.06 | 0.08 | 0.09 | 0.27* |
| | (0.36) | (0.43) | (0.45) | (1.16) | (0.60) | (0.80) | (0.79) | (1.87) |
| Lutheran-Baptist | 0.31** | 0.30** | 0.29** | 0.29* | 0.13 | 0.14 | 0.13 | 0.11 |
| | (2.29) | (2.31) | (2.23) | (1.89) | (1.09) | (1.16) | (1.12) | (0.85) |
| One's education (no. years) | | | –0.00 | | | | –0.00 | |
| | | | (–0.15) | | | | (–0.07) | |
| State dummies/grew up | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adj. R sq./pseudo R sq. | 0.053 | 0.057 | 0.060 | 0.067 | 0.060 | 0.061 | 0.064 | 0.081 |
| $F/\chi^2$ | 2.45** | 3.74** | 3.43** | 3.61*** | 13.20** | 12.31** | 14.65** | 17.45*** |
| N | 859 | 863 | 846 | 640 | 853 | 857 | 840 | 635 |

*Notes:* Parents risk tolerance is a dummy variable equal to 1 if either the father of the mother reports a risk aversion lower than 1.5. In the OLS specification the left-had side variable is the logarithm of the computed coefficient of relative risk aversion. In the Probit specification the left-hand side variable is 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). Robust standard errors in the regressions, clustered by the state 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. Business Ownership and Family Income in a Matched Sample

| | OLS | | | | Probit | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Parents' edu./dummies sum | –0.14*** | –0.13*** | –0.11*** | –0.14*** | –0.11*** | –0.09** | –0.11*** |
| | (–4.45) | (–4.14) | (–2.99) | (–3.95) | (–3.14) | (–2.37) | (–3.39) |
| County principal component | –0.14*** | –0.14*** | –0.14*** | –0.12** | –0.10*** | –0.09*** | –0.07** |
| | (–3.10) | (–2.97) | (–2.82) | (–2.39) | (–3.32) | (–3.15) | (–2.27) |
| Yrs fam. owned business (7-13) | | –0.07** | –0.07** | | –0.06** | –0.06** | |
| | | (–2.33) | (–2.32) | | (–2.00) | (–2.00) | |
| Log fam. income (avg. 7-13) | | | | –0.04 | | | –0.06 |
| | | | | (–0.56) | | | (–0.99) |
| Black | 0.05 | 0.00 | –0.01 | –0.01 | 0.03 | 0.01 | 0.02 |
| | (0.42) | (0.02) | (–0.05) | (–0.09) | (0.31) | (0.15) | (0.25) |
| Age | 0.00 | | | | | | |
| | (0.31) | | | | | | |
| Female | 0.23** | 0.23** | 0.26** | 0.25** | 0.24*** | 0.27*** | 0.25*** |
| | (2.16) | (2.11) | (2.43) | (2.09) | (2.83) | (3.18) | (2.78) |
| Lutheran-Baptist | 0.23** | 0.22** | 0.23** | 0.22** | 0.05 | 0.06 | 0.02 |
| | (2.34) | (2.23) | (2.26) | (2.02) | (0.65) | (0.76) | (0.28) |
| One's education (no. years) | | | –0.03 | | | –0.02 | |
| | | | (–1.14) | | | (–1.10) | |
| Constant | 1.09*** | 1.33*** | 1.60*** | 1.52* | 0.42*** | 0.65*** | 0.88 |
| | (3.81) | (9.62) | (6.03) | (1.99) | (3.20) | (2.68) | (1.44) |
| State dummies/grew up | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adj. R sq./pseudo R sq. | 0.045 | 0.049 | 0.050 | 0.042 | 0.048 | 0.051 | 0.050 |
| $F/\chi^2$ | 12.01*** | 11.61*** | 12.31*** | 10.89*** | 71.22*** | 65.05*** | 92.32*** |
| N | 1383 | 1383 | 1362 | 1191 | 1377 | 1356 | 1183 |

*Notes:* The two family level variables refer to the period when the risk aversion respondent was 7 to 13 years of age. In the OLS specification the left-hand side variable is the logarithm of the computed coefficient of relative risk aversion. In the Probit specification the left-hand side variable is 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). Robust standard errors in the regressions, clustered by the state 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. Parents' Attitudes in a Matched Sample (OLS)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Parents' planning score | –0.03 | –0.02 | –0.02 | |
| | (–1.04) | (–0.70) | (–0.50) | |
| Parents' trust/hostility score | –0.05 | –0.04 | –0.04 | –0.05 |
| | (–1.32) | (–1.07) | (–1.27) | (–1.57) |
| Leader | –0.15** | –0.13* | –0.14** | –0.16** |
| | (–2.35) | (–1.97) | (–2.17) | (–2.35) |
| Parents hope college for kids | –0.19** | –0.16 | –0.14 | |
| | (–2.08) | (–1.64) | (–1.43) | |
| Parents' edu./dummies sum | | –0.08*** | –0.06* | –0.07** |
| | | (–2.73) | (–1.99) | (–2.44) |
| County principal component | –0.13*** | –0.11*** | –0.11** | –0.11** |
| | (–3.06) | (–2.72) | (–2.61) | (–2.58) |
| one's education (no. years) | | | –0.02 | –0.03 |
| | | | (–1.02) | (–1.37) |
| Age | 0.01* | 0.01 | 0.01 | 0.01 |
| | (1.78) | (1.44) | (1.55) | (1.51) |
| Female | 0.24** | 0.25** | 0.27** | 0.28*** |
| | (2.31) | (2.42) | (2.63) | (2.76) |
| Lutheran-Baptist | 0.20* | 0.20* | 0.20* | 0.20* |
| | (1.89) | (1.85) | (1.79) | (1.82) |
| Black | 0.03 | –0.01 | –0.00 | 0.00 |
| | (0.37) | (–0.15) | (–0.03) | (0.02) |
| State dummies/grew up | Yes | Yes | Yes | Yes |
| F | 5.8*** | 7.8*** | 7.1*** | 8.4*** |
| N | 1811 | 1811 | 1787 | 1787 |

*Notes:* 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 state 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 Head's Idiosyncratic Labor Income on Risk Aversion and Demographic Controls

| | (1) (OLS) | (2) (IV) |
|---|---|---|
| (Log-) risk aversion/10 | –0.06** | –0.08** |
| | (–2.48) | (–2.51) |
| Black | 0.03*** | 0.01 |
| | (2.80) | (0.57) |
| Female | –0.09*** | –0.09*** |
| | (–6.02) | (–5.64) |
| Age/10 | 0.00 | –0.00 |
| | (0.49) | (–0.06) |
| Age sq./100 | 0.11 | 0.23 |
| | (0.31) | (0.61) |
| Parents' edu./dummies sum | 0.01** | –0.01 |
| | (2.51) | (–0.40) |
| Own education (no. years) | –0.04** | –0.01 |
| | (–2.25) | (–0.31) |
| Married | –0.07*** | –0.07*** |
| | (–4.76) | (–4.83) |
| Family size | 0.00 | 0.00 |
| | (0.59) | (0.40) |
| Log net worth (avg. 1984–1994)/10 | –0.12*** | –0.12*** |
| | (–6.35) | (–6.34) |
| Log income (avg. 1990–1995)/1000 | –0.05** | –0.04 |
| | (–2.16) | (–1.45) |
| Constant | 0.44*** | 0.49*** |
| | (5.44) | (4.77) |
| Adj. R sq. | 0.066 | 0.055 |
| F | 14.30*** | 13.78*** |
| N | 2502 | 2502 |

*Notes:* Income and demographic data are drawn from the 1969–1997 annual family files of the PSID. Idiosyncratic head's income is the residual from the cross sectional regression of household head's real income on education of the head, the household's state of residence, a second degree polynomial in the head's age, and head's race. For each year, cross sectional regressions are performed for seven age groups: heads of age 24–29, heads of age 30–35,. . . , heads of age 60–65. The sample is restricted to households with heads of age 24–65. Female and single heads are included. We drop observations with an absolute percentage change in income residual greater than or equal to 200% or with head's real labor income below 1,000 1982-1984 dollars. The standard deviation of idiosyncratic head's income is calculated for the heads with more than four observations on income residuals over the time span of 1969–1997. Average income is the average of the sum of head's and wife real income and their combined real transfer income over the time span of 1990–1995. 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 Shocks Estimated from the Dynamics of Idiosyncratic Head's Labor Income.

| | $q=0$ | | $q=1$ | |
|---|---|---|---|---|
| | Less RA (1) | More RA (2) | Less RA (3) | More RA (4) |
| St. Dev. of permanent shocks, $\sigma_P$ | 0.30 (0.006) | 0.28 (0.005) | 0.28 (0.006) | 0.25 (0.006) |
| Goodness of fit | 46.83 | 38.51 | 38.61 | 38.88 |
| Degrees of freedom | 25 | 25 | 25 | 25 |
| p-value of the model | 0.005 | 0.04 | 0.04 | 0.04 |
| Number of households (N) | 2403 | 2465 | 2403 | 2465 |
| N×T | 25,349 | 29,207 | 25,349 | 29,207 |
| p-value for $H_0$ of no difference in perm. var. in (1) and (2) | 1.6% | | | |
| p-value for $H_0$ of no difference in perm. var. in (3) and (4) | 0.0% | | | |

*Notes:* Households are split into two sub-samples. The first sub-sample consists of households below the 50th percentile of the risk aversion distribution; the second sub-sample consists of households above the 50th percentile of the risk aversion distribution. For the unobserved components income model $\Delta\ \tilde{y}_{it} = \epsilon^P_{it} + (1-L)\theta_q(L)\epsilon^T_{it}$, $\sigma_P$—the standard deviation of the permanent shocks—is identified from the following moment condition (equation 5 in Meghir and Pistaferri (2004), p.8): $E[\Delta\tilde{y}_{it}\Sigma^{(1+q)}_{k=-(1+q)}\Delta\tilde{y}_{it+k}]$, where $\Delta\tilde{y}_{it}$ is the first difference in head's log-idiosyncratic income, $\epsilon^P_{it}$ is the permanent innovation, $\epsilon^T_{it}$ is the transitory innovation, and $q$ is the order of the auto-covariance in the transitory component of log-idiosyncratic head's income (zero if $q=0$, one if $q=1$). The model is estimated by the equally weighted minimum distance (EWMD) method, where the weighting matrix is the identity matrix. We discard the empirical counterparts of the moment for the first and the last time periods of our sample, since we do not have enough data to form complete empirical moments for these periods. Data are drawn from the 1969–1997 annual family files of the PSID. Income data are residuals from cross-sectional regressions of real labor income of the head of a household on the head's education, the household's state of residence, second degree polynomial in the head's age, and race. For each year, cross sectional regressions are performed for seven age groups: heads of age 24–29, heads of age 30–35,..., heads of age 60–65. We restrict the sample to households with heads of age 24–65. Female and single heads are included. We drop observations with an absolute percentage change in income residual greater than or equal to 200% or with the head's real labor income below 1,000 1982–1984 dollars.

Table 14: Further Summary Statistics

| Variable Name | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| St. dev. of head's idiosyncr. inc. | 0.35 | 0.21 | 0.04 | 1.23 | 2502 |
| Stock wealth relative to financial assets | 0.20 | 0.32 | 0 | 1 | 1759 |
| Stock wealth relative to gross assets | 0.08 | 0.18 | 0 | 1 | 1976 |
| Stock wealth relative to net worth | 0.09 | 0.77 | 0 | 35 | 2180 |
| (Log-) risk aversion | 1.78 | 1.57 | –1.72 | 3.52 | 2180 |
| Black | 0.39 | 0.49 | 0 | 1 | 2180 |
| Female* | 0.21 | 0.41 | 0 | 1 | 2180 |
| Age* | 43.83 | 11.15 | 24 | 94 | 2180 |
| Parents' edu./dummies sum* | 1.37 | 1.31 | 0 | 4 | 2180 |
| Own education (no. years)* | 13.19 | 2.50 | 1 | 17 | 2180 |
| Married* | 0.72 | 0.45 | 0 | 1 | 2180 |
| Family size* | 3.20 | 1.40 | 1 | 9 | 2180 |
| Log income (avg. 1984–1998)* | 5.68 | 0.59 | 3.33 | 7.27 | 2180 |
| Log net worth (avg. 1984–1999)* | 8.36 | 2.01 | –7.51 | 11.76 | 2180 |
| Income (avg. 1984–1998)/100* | 342.18 | 187.67 | 28.06 | 1441.86 | 2180 |
| Net worth (avg. 1984–1999)/100* | 9254.74 | 10826.01 | –1820.29 | 127555.9 | 2180 |
| Ever owned a business (1969–1996) | 0.41 | 0.49 | 0 | 1 | 3234 |
| Business incidence (1969–1996)† | 0.16 | 0.36 | 0 | 1 | 45728 |

*Notes:* †Statistics correspond to the sample used in column (3) of Table 16. *Statistics correspond to the sample used in column (3) of Table 15. Our measure of net worth excludes net business wealth.

Table 15: Panel Tobit Regressions of Household Portfolio Share in Stocks on Risk Aversion and Demographics. Households with Stable Family Composition Between 1984–1999

| | Stock/FA (1) (Tobit) | Stock/GA (2) (Tobit) | Stock/NW (3) (Tobit) | Stock/FA (4) (IV-Tobit) | Stock/GA (5) (IV-Tobit) | Stock/NW (6) (IV-Tobit) |
|---|---|---|---|---|---|---|
| (Log-) risk aversion | –0.02** | –0.02** | –0.06** | –0.01 | –0.01 | –0.04 |
| | (–2.09) | (–2.57) | (–2.32) | (–0.69) | (–0.76) | (–1.48) |
| Black | (–0.12*** | –0.07*** | –0.35*** | –0.07 | –0.04 | –0.24 |
| | (–3.05) | (–3.27) | (–3.77) | (–1.26) | (–1.31) | (–1.56) |
| Female | –0.06 | –0.04 | –0.21 | –0.06 | –0.04 | –0.18 |
| | (–0.70) | (–0.79) | (–1.07) | (–0.65) | (–0.75) | (–1.00) |
| Age | 0.01 | 0.01 | –0.00 | 0.02 | 0.01 | 0.01 |
| | (1.32) | (1.51) | (–0.02) | (1.60) | (1.48) | (0.44) |
| Age sq./100 | –0.01 | –0.01 | 0.01 | –0.01 | –0.01 | -0.00 |
| | (–0.89) | (–0.98) | (0.25) | (–1.13) | (–0.92) | (–0.03) |
| Parents' edu./dummies sum | 0.02 | 0.02** | 0.07** | 0.14* | 0.09** | 0.33 |
| | (1.30) | (2.19) | (2.18) | (1.78) | (2.16) | (1.48) |
| Own education (no. years) | 0.06*** | 0.04*** | 0.16*** | 0.05*** | 0.03*** | 0.14** |
| | (7.42) | (8.86) | (7.99) | (4.78) | (5.91) | (2.02) |
| Married | 0.05 | –0.02 | 0.05 | 0.08 | –0.00 | 0.13 |
| | (0.59) | (–0.44) | (0.26) | (0.89) | (–0.07) | (0.66) |
| Family size | –0.03* | –0.02*** | –0.08** | –0.03* | –0.02** | –0.08* |
| | (–1.92) | (–2.64) | (–2.39) | (–1.84) | (–2.55) | (–1.93) |
| 1994 | 0.17*** | 0.10*** | 0.32*** | 0.14*** | 0.08*** | 0.30* |
| | (4.08) | (4.21) | (3.41) | (3.71) | (4.20) | (1.84) |
| 1999 | –0.10* | –0.02 | –0.23* | –0.11** | –0.02 | –0.27* |
| | (–1.88) | (–0.67) | (–1.88) | (–2.03) | (–0.76) | (–1.71) |
| Log income (avg. 1984–1998) | 0.15*** | 0.10*** | 0.36*** | 0.07 | 0.05 | 0.22 |
| | (3.26) | (4.01) | (3.44) | (1.06) | (1.32) | (1.56) |
| Log net worth (avg. 1984–1999) | 0.03** | 0.01 | 0.12*** | 0.04*** | 0.02*** | 0.13** |
| | (2.29) | (1.55) | (3.23) | (2.84) | (2.44) | (2.18) |
| Stock/FA$_{t-1}$ | 0.43*** | | | 0.43*** | | |
| | (6.92) | | | (6.71) | | |
| Stock/GA$_{t-1}$ | | 0.33*** | | | 0.28*** | |
| | | (5.53) | | | (3.81) | |
| Stock/NW$_{t-1}$ | | | 0.01 | | | 0.00 |
| | | | (0.30) | | | (0.15) |
| Constant | –2.59*** | –1.59*** | –6.10*** | –2.40 | –1.46*** | –5.86** |
| | (–7.45) | (–8.46) | (–7.82) | (–6.98) | (–7.58) | (–2.39) |
| Pseudo LL | –1191.19 | –819.29 | –1702.42 | –3876.84 | –3810.58 | –5073.57 |
| $\chi^2$ | 283.95*** | 352.78*** | 327.91*** | 420.79*** | 329.81*** | 9.76 |
| N | 1759 | 1976 | 2180 | 1759 | 1976 | 2180 |

*Notes:* In columns (1)-(4), the dependent variable is the ratio of household gross wealth in stocks to the value of household financial assets (FA); in columns (2)-(5)—the ratio of household gross wealth in stocks to the value of household gross assets (GA); in columns (3)-(6)—the ratio of household gross wealth in stocks to household net worth (NW) exclusive of business wealth. In the regressions of columns (3)-(6), we drop households with negative net worth. 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 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 respondents' father, when the respondents' father was 15 years old). Clustering 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.

Table 16: Probit Regressions of Business Incidence on Risk Aversion and Demographics. Cross Sectional and Panel Samples

| | Business Incidence Cross Section | | Business Incidence Panel | |
|---|---|---|---|---|
| | (1) (Probit) | (2) (IV-Probit) | (3) (Probit) | (4) (IV-Probit) |
| (Log-) risk aversion | –0.06*** | –0.07*** | –0.05*** | –0.04*** |
| | (–4.26) | (–4.47) | (–3.31) | (–2.89) |
| Black | –0.52*** | –0.66*** | –0.53*** | –0.53*** |
| | (–8.48) | (–4.99) | (–9.28) | (–4.09) |
| Female | –0.70*** | –0.66*** | –0.51*** | –0.51*** |
| | (–7.99) | (–6.18) | (–6.10) | (–5.87) |
| Age/10 | 0.64*** | 0.45* | 0.58*** | 0.59*** |
| | (3.80) | (1.78) | (4.75) | (3.82) |
| Age sq./100 | –0.04** | –0.03 | –0.04*** | –0.04*** |
| | (–2.28) | (–1.34) | (–3.00) | (–2.82) |
| Parents' edu./dummies sum | 0.06*** | –0.13 | 0.07*** | 0.07 |
| | (2.81) | (–0.71) | (3.49) | (0.48) |
| Own education (no. years) | 0.05*** | 0.08** | 0.05*** | 0.05* |
| | (3.70) | (2.46) | (4.15) | (1.73) |
| Married | –0.09 | –0.11 | 0.05 | 0.05 |
| | (–1.08) | (–1.32) | (0.91) | (0.90) |
| Family size | 0.03 | 0.02 | 0.03** | 0.03** |
| | (1.40) | (1.07) | (2.28) | (2.11) |
| Log income (avg. 1984–1996) | –0.01 | 0.06 | –0.06 | –0.06 |
| | (–0.19) | (0.70) | (–1.13) | (–0.85) |
| Log net worth (avg. 1984–1994) | 0.02*** | 0.02* | 0.06*** | 0.06*** |
| | (2.97) | (1.74) | (5.55) | (5.16) |
| Constant | –2.63*** | –2.46*** | –3.23*** | –3.23*** |
| | (–6.38) | (–5.27) | (–9.86) | (–9.62) |
| Time dummies | N/A | N/A | Yes | Yes |
| Pseudo LL | –1910.77 | –6875.74 | –17587.27 | –87260.18 |
| $\chi^2$ | 459.70*** | 474.74*** | 787.77*** | 785.28*** |
| N | 3234 | 3234 | 45728 | 45728 |

*Notes:* In columns (1) and (2), the dependent variable equals one if the household owns a business in any year during 1969–1996 and equals zero otherwise. In columns (3) and (4), the dependent variable equals one in the years that the household owns a business and equals zero otherwise. In the cross-sectional regressions of columns (1) and (2), the independent variables are measured in 1996. In the panel regressions of columns (3) and (4), the independent variables are measured as of the reporting year. The sample is restricted to households with heads of age 24 and above. Instruments for parental education are CA and CL dummies (for the respondents' father, when the respondents' father was 15 years old). Robust (clustering) standard errors in the (panel) regressions. t-statistics in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.