Risk preference of mothers and investment in children

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1 Introduction

Investment in human capital has been considered risky since the works of Becker (2009); Levhari and Weiss (1974) and Schultz (1971). Returns to investment, ability, probability of getting a good job are few of the various accounts of risk. A traditional approach on the topic examines how an individual's risk preference affects her investment decision. This line of inquiry is, however, valid insofar as the decision maker is the individual under study. College choices, tertiary education, specific skills training largely fall under the domain of individual choice wherein an individual is the decision maker and she exercises scrutiny before making her choice. For children and teenagers, this is often not the case as they lack the appropriate capacity to make an informed choice while various factors such as pecuniary issues are beyond their control. At the same time, a vast literature on early childhood intervention has deemed such investment substantially beneficial for future outcomes of children.[1] Furthermore, as highlighted by FIND CITATION FOR THIS Banerjee?..., early interventions are most effective in levelling the playground for disadvantaged children. Thus, parents' investment during early childhood plays a pivotal role in shaping the children's future paths. If investment in human capital is risky, the importance of understanding the effect of parental risk preference on children investment naturally follows.

In general, the literature on parental risk aversion is scarce whilst results are inconclusive. In direct relation to our study, Sovero (2018) uses height-for-age, and BMI-for-age along with other several spending categories to measure investment of Mexican parents. Risk attitudes of parents are elicited using a series of questions with multiple price list structure. Her results indicate a positive linkage between risk averse mothers and their investment on sons, i.e., risk averse mothers invest more on sons than daughters. Using data on Uganda households, Tabetando (2019) confirms the positive relation between risk aversion and investment, measured by level of educational expenditure and its share of household budget. Although wealthier households tend to be more risk averse, the relationship is reversed for poor households. That is, risk aversion depresses investment in credit constrained households.

Other works involving risk preference of parents focus on educational outcomes. With the exception of Leonardi (2007) which found no effect of risk aversion on secondary school track choice for the Italian sample, the majority reported negative effects of risk aversion on educational outcomes including test scores in the US (Brown et al., 2012), college enrollment in Italy (Checchi et al., 2014), cognitive outcomes in Indonesia (Hartarto et al., 2023). Furthermore, Frempong and Stadelmann (2021) found a positive association

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[1]See Currie (2001) and Nores and Barnett (2010) for a comprehensive review on a large number of childhood intervention programs.

between risk aversion and child labour while there is evidence that increased child labour impedes learning (Heady, 2003; Bezerra et al., 2009).

2 Data & methodology

I use data of National Longitudinal Survey of Youth 1979 (NLSY79) and NLSY79 Child and Young Adults (CYA) to study the effects of parental risk aversion on children investment. The NLSY79 is a longitudinal project that follows the lives of a sample of American youth born between 1957 and 1964 with the first round of data collection in 1979. The original cohort included 12,686 respondents ages 14-22 when first interviewed but later dropped to 9,964 respondents after the exclusion of the military subsample. Data are collected annually from 1979 to 1994 and biannually thereafter. Beginning in 1986, additional information was collected biannually about children born to female NLSY79 respondents, constituting the NLSY79 CYA dataset. The Child and Young Adult contains information on a rich set of assessments on cognitive ability, temperament, motor and social development, behaviour problems, self-competence of the children as well as the quality of their home environment. By linking investment, as measured by The HOME (Home Observation Measurement of the Environment) indices along with its subsection indices in the NLSY79 CYA, and an indicator of risk attitudes generated from a series of questions in the NLSY79, it is possible to study the effect of maternal risk aversion on investment in children.

2.1 Mothers' risk preference

To measure attitudes towards risk of mothers,[2] Participants of NLSY79 were asked a series of hypothetical questions on occupational choice. The first question of the series reads:

> "...Suppose that you are the only income earner in the family, and you have a good job guaranteed to give you your current (family) income every year for life. You are given the opportunity to take a new and equally good job, with a 50-50 chance that it will double your (family) income and a 50-50 chance that it will cut your (family) income by a third. Would you take the new job?"
>
> *Questionnaire Public Report, National Longitudinal Survey of Youth 1979 (NLSY79), 1993.*

Depending on respondents' answers to this question, survey participants were asked a similar question holding the first choice constant while the income cut in the second choice is modified. If participants choose "First job" in the first question, the income cut in the second question is lowered to 20%. If "Second job" is chosen in the first question, the income cut is increased to 1/2 in the second question. The first series of questions on risk attitudes were asked in four rounds in 1993, 2002, 2004 and 2006. Based on answers to this series of questions, respondents can be categorized into four groups numbered 1-4 where individuals in group 1 choose the "First job" in both questions present to them while individuals in group 4 opt for "Second job" in both questions administered to them. Specifics of groups categorization are presented in Table 1.

A valid concern over the use of this series of questions as a measure of risk preference is how well it predicts true risk attitudes. The question wordings and structure of the NLSY79 are the same as those in the Health and Retirement Study (HRS) as well as the Panel Study of Income Dynamics (PSID). While the method of eliciting risk preference using lifetime income is uncommon and most other methods fall into the category

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[2]Since NLSY79 and NLSY79 CYA are linked by identifying unique pairs of mother-child.

Table 1: Category of risk attitudes

Response category	Question / Risk aversion	Original	Increased income cut	Reduced income cut
1	High risk aversion	First job	-	First job
2	Moderate risk aversion	First job	-	Second job
3	Low risk aversion	Second job	First job	-
4	Lowest risk aversion	Second job	Second job	-

of self-evaluated risk willingness/tolerance employing Likert scale, gamble choice (Eckel and Grossman, 2002), or multiple price list (MPL),[3] Barsky et al. (1997) showed that this measure does predict an array of risk behaviours including drinking, smoking, holding risky assets, etc. Furthermore, gamble on hypothetical choice in general has been shown to perform relatively well compared to its counterpart which offer real monetary rewards (Binswanger, 1981; Camerer and Hogarth, 1999; Dohmen et al., 2005).

Using the series of questions on risk attitudes, following Kimball et al. (2008) and Kimball et al. (2009), under the assumption that respondents have constant relative risk aversion (CRRA) and risk tolerance are log-normally distributed, I calculated and imputed values of CRRA coefficient for each respondent. The procedure is as follows. First, assuming that CRRA well approximates individuals' utility over lifetime income,

$$U(W) = \frac{W^{1-1/\theta}}{1 - 1/\theta}$$

where θ is the coefficient of relative risk tolerance and its reciprocal, $\gamma = 1/\theta$, coefficient of relative risk aversion, bounds on θ are reported in Table 2 for each category. A second assumption I would emphasize here that deviates from Kimball et al. (2008) and Kimball et al. (2009) is that respondents have time-varying risk preference. In the previously cited works, due to the structure of PSID surveys, there is only one response per individual, making the inference on the true risk preference impossible without further assumption. When there are multiple responses from each individual, under the assumption that the true risk preference remains constant over time, inference on the parameters of risk tolerance, and hence risk aversion, is possible.[4] However, according to Dohmen et al. (2011) and Dohmen et al. (2017), willingness to take risks varies over the course of life-cycle and trends downward as individuals age. Thus, to allow for time-varying risk preference, for each wave that collects the responses to risk preference questions, the mean and variance of log risk tolerance are calculated using maximum likelihood.[5] The variance of response error, on the other hand, is imputed from Kimball et al. (2009) and assumed to be fixed across waves. While fixing the variance goes against the assumption of time-varying risk preference, the treatment is necessary as Kimball et al. (2008) pointed out the substantial noise in responses to questions of this nature. The coefficient of risk aversion, γ, is then imputed using the conditional expectation that an individual belongs to a certain risk category j,

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[3]For a comprehensive review on methods of elicitation of risk preference, see Charness et al. (2013)

[4]As the true risk preference is constant, differences in responses of an individual are attributed to response error.

[5]To circumvent any biases potentially introduced by the sample selection, for each year, MLE is carried out on the entirety of NLSY79 dataset. The first wave of answers on risk preference is recoded as year 1994 instead of 1993 to match the closest corresponding investment data. Results of the MLE are reported in Appendix A.

Table 2: Risk tolerance response category

Response category	Percent of responses	Downside risk of risky jobs		Bounds on risk tolerance	
		Accepted	Rejected	Lower	Upper
1	53.12	None	20%	0[a]	0.27
2	13.58	20%	1/3	0.27	0.5
3	15.70	1/3	1/2	0.5	1
4	17.61	1/2	None	1	∞[a]

[a] For computational convenience, 0 will be recoded as 10^{-9} and ∞ as 10^{9}

$$\mathbb{E}(\gamma|c=j) = \exp\left(-\mu + \frac{\sigma_x^2}{2}\right) \frac{\Phi\left(\frac{\log(\bar{\theta}_j)-\mu-b+\sigma_x^2}{\sigma_\xi}\right) - \Phi\left(\frac{\log(\underline{\theta}_j)-\mu-b+\sigma_x^2}{\sigma_\xi}\right)}{\Phi\left(\frac{\log(\bar{\theta}_j)-\mu-b}{\sigma_\xi}\right) - \Phi\left(\frac{\log(\underline{\theta}_j)-\mu-b}{\sigma_\xi}\right)} \tag{1}$$

where μ and σ_x are respectively the mean and standard deviation of log risk tolerance for a certain wave of response. $\bar{\theta}_j$ and $\underline{\theta}_j$ are upper and lower bounds on the coefficient of risk tolerance. b denotes status quo bias and σ_ξ standard deviation of response error which take values of -0.21 and 1.3 respectively. [6] Imputed values of γ are shown in Table 3.

2.2 Investment data

Traditionally, investment is often associated with monetary expenditures or goods investment (Heckman and Mosso, 2014). Only in recent studies such as Carneiro and Ginja (2016), Bono et al. (2016) and Del Boca et al. (2016) has time input received more attention as a component of parental input. Aside time input, a

Table 3: Imputed coefficient of risk aversion (γ)

Response category	1994	2002	2004	2006
1	9.158	12.419	5.949	12.826
2	2.617	2.640	3.573	2.628
3	1.568	1.518	2.879	1.503
4	0.714	0.678	2.060	0.669
Mean	5.000	7.487	4.487	7.798
SD	3.912	5.494	1.623	5.684
Observations	8,945	7,485	7,176	7,291

The mean, standard deviation, and number of observations are reported for all NLSY79 respondents.

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[6]These values are computed for the Health and Retirement Study (HRS) capitalizing on the difference in responses to two different versions of the risk preference questions. For more information, see Kimball et al. (2009) and their accompanying appendix available at https://www.aeaweb.org/articles?id=10.1257/aer.99.2.363.

nurturing home environment has also been proven conducive to early cognitive development (Altman and Werner, 2013; Iverson and Walberg, 1982).

Following Carneiro and Ginja (2016), parental inputs are captured by various elements of HOME. HOME (Short Form) comprises of primary measures of the quality of a child's home environment included in the NLSY79 Child survey. Various components of the HOME evaluate the cognitive stimulation and emotional support children below 15 years old receive from the home environment. Items that made up the HOME score are grouped into goods input and time input. These are reported in Table 4. Apart from measures of HOME section, several items included in the self-administered questions for children between 10-14 are also present and have the (NH) prefix.

For each age group, to generate the generic investment index, indicators of all items in Table 4 for the corresponding age are totalled then normalised to have a mean zero and one standard deviation. A similar procedure is also applied to goods investment index and time investment index. Other assessments of cognitive stimulation and emotional support constitute cognitive stimulation index and emotional support index. Both of which are measured in percentages.

2.3 Summary statistics

Descriptive statistics of variables used in our analysis are reported in Table 5.

3 Results

4 Robustness checks

5 Conclusion

Table 4: Components of HOME index

Items \ Age group	0-2	3-5	6-9	10-14
Goods				
Child has 10 or more soft toys at home	x			
Child has 10 or more push/pull toys at home	x			
Child has more than 10 books at home	x	x	x	x
Family gets at least three magazines regularly		x		
Child has a CD player		x		
Family subscribes to daily newspaper			x	x
Child has a musical instrument			x	x
Time				
Child taken to grocery at least once a week	x			
Child goes on outings more than three times per month	x	x		
Child east at least one meal per day with both parents	x	x	x	x
Child sees father(-figure) daily	x	x	x	x
Mother reads to child at least once a week	x	x	x	
Child goes to museum more than twice in past year		x	x	x
Child spends time with father(-figure) at least four times a week			x	x
Family gets together with friends/relatives at least twice a month			x	x
Child spends time with father(-figure) outdoor once a week			x	x
Mother discusses TV programmes with child			x	x
Child goes to theatre/performance more than twice in past year			x	x
Activities last month[a]:				
(NH) Child went shopping with parents				x
(NH) Child went on an outing with parents				x
(NH) Child went with parents to movies				x
(NH) Child went with parents to dinner				x
Activities last week[a]:				
(NH) Child worked with parents on schoolwork				x
(NH) Child did things together with parents				x
(NH) Child play game or sports together with parents				x

[a] These items are not from HOME but from self-administered survey of children

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Table 5: Summary statistics

	High school dropout	High school	College	Total
γ	5.80	6.21	6.18	6.12
	(4.53)	(4.47)	(4.52)	(4.50)
HOME index	-0.09	0.05	0.50	0.14
	(0.97)	(0.91)	(0.87)	(0.94)
Goods index	-0.10	0.14	0.66	0.23
	(1.02)	(0.93)	(0.78)	(0.95)
Time index	-0.06	0.01	0.36	0.09
	(0.96)	(0.91)	(0.86)	(0.92)
Cognitive Stimulation score (%)	33.19	41.19	55.60	43.46
	(31.47)	(30.64)	(31.35)	(31.98)
Emotional Support score (%)	36.07	39.65	46.31	40.72
	(33.24)	(32.59)	(34.37)	(33.39)
Female	0.48	0.50	0.49	0.49
	(0.50)	(0.50)	(0.50)	(0.50)
Hispanic	0.34	0.20	0.09	0.20
	(0.47)	(0.40)	(0.29)	(0.40)
Black	0.23	0.27	0.16	0.23
	(0.42)	(0.44)	(0.36)	(0.42)
Non-Black, non-Hispanic	0.43	0.53	0.75	0.57
	(0.49)	(0.50)	(0.43)	(0.50)
Age of mother at child's birth	28.13	28.57	31.51	29.26
	(5.56)	(5.20)	(4.09)	(5.19)
Age of mother at first birth	22.35	23.70	28.67	24.76
	(5.52)	(5.14)	(4.14)	(5.52)
Number of siblings	2.38	1.84	1.55	1.87
	(1.71)	(1.23)	(1.07)	(1.33)
Mother's AFQT score (1981)	25.57	35.87	68.49	42.52
	(24.15)	(23.10)	(23.61)	(28.42)
Mother's mother's years of schooling	9.35	10.60	12.93	10.98
	(3.73)	(2.82)	(2.66)	(3.23)
Mother's father's years of schooling	9.02	10.40	13.53	10.96
	(4.38)	(3.60)	(3.64)	(4.11)
Net household income ($)	43227.86	50101.44	106743.09	64105.34
	(48740.84)	(47152.64)	(96848.39)	(69714.76)

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